DEPARTMENT OF THE AIR FORCE
AIR FORCE BASE CONVERSION AGENCY

June 25, 2002

MEMORANDUM FOR Mr. Jonathan Greco
NYS Department of Environmental Conservation
Bureau of Eastern Remedial Action
Division of Hazardous Waste Remediation
625 Broadway
Albany, NY 12233-7015

Mr. Douglas Pocze
USEPA-Region II
Federal Facilities Section
290 Broadway, 18th Floor
New York, NY 10007-1866

Henriette Hamel
Office of Public Health
217 S. Salina St., 3rd Floor
Syracuse, NY 13202

RECEIVED
BUREAU OF EASTERN
REMEDIAL ACTION

FROM: AFBCA/DA-Griffiss
Environmental Section
153 Brooks Road
Rome NY 13441-4105

SUBJECT: Document Transmittal - Final Field Sampling Plan, Health and Safety Plan, and Quality Assurance Project plan for 2002 Expanded Site Investigation

1. Attached is the subject document for the 2002 Expanded Site Investigation. The sites include PCI 20, AOI 473 (formerly AOI 469-Room 10), OTH 305 and Building 211.

2. Responses to regulatory comments on the May 2002 plan are also attached.

3. If you have any questions please contact Cathy Jerrard, 315-330-2275.

MICHAEL F. MCDERMOTT
BRAC Environmental Coordinator

Attachment: As noted

cc: Mr. Phil Rosewicz, USACE, KC

Responses to Comments on Draft 2002 AOC 9 Work Plan by Douglas Pocze, United States Environmental Protection Agency, Dated: May 20, 2002.

USEPA Comment 1: Page 3-5 references AOC9-55-02, however, I cannot locate this boring on the figure.

Response to USEPA Comment 1: AFBCA agrees, the boring number in question should be labeled AOC9-SS02. The work plan text states that this boring will be installed in the upgradient portion of the area determined to be the chlorobenzene source area. Therefore, the boring is not shown on the figure because the boring location has not yet been determined.

Responses to Comments on Draft 2002 ESI work Plan by Jonathan Greco, New York State Department of Environmental Conservation, Dated: May 16, 2002.

NYSDEC Comment 1: I don't usually comment on health and safety issues because I am not an expert, but the plan for building 112, Room 10 seems a little lax to me. Particularly, there doesn't seem to be any extra safety measures called for in the event coring is required through the rooms floor. I assume this would be done with a gas powered, portable auger, which could cause an oxygen deletion in the poorly ventilated area. Has this been considered?

Response to NYSDEC Comment 1: AFBCA agrees, air monitoring with an oxygen/explosive gas meter and organic vapor meter will be performed prior to entering AOI 473 Room 10 and continuously during all sampling activities. In the event that coring is required through the room's floor, an electric coring drill will be used. A generator located outside AOI 473 in a well-ventilated area will power the drill. The safety plan has been changed to include the statement "No gasoline (internal combustion engine) powered equipment will be use inside AOI 473".

001002_UK10_02_01-B930

FINAL
Field Sampling Plan, Health and Safety Plan, and Quality Assurance Project Plan for the 2002 Expanded Site Investigation
Former Griffiss Air Force Base, Rome, New York

RECEIVED
JUN
BUREAU OF EASTERN
REMEDIAL ACTION

Contract No.: DACW41-99-D-9005
Work Authorization Directive 9

June 2002

Prepared for:

U.S. ARMY CORPS OF ENGINEERS
Kansas City District
601 East 12th Street
Kansas City, Missouri 64106

ecology and environment, inc.
International Specialists in the Environment
BUFFALO CORPORATE CENTER 368 Pleasant View Drive, Lancaster, New York 14086
Tel: 716/684-8060, Fax: 716/684-0844

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List of Abbreviations and Acronyms

AFB	Air Force Base
AFBCA	Air Force Base Conversion Agency
AOI	Area of Interest
ASC	Analytical Services Center
AST	aboveground storage tank
BGS	below ground surface
CS	confirmatory sampling
DQO	data quality objective
E & E	Ecology and Environment, Inc.
EBS	environmental baseline survey
EDD	electronic data deliverable
ERPIMS	Environmental Restoration Program Information System
ESI	Expanded Site Investigation
FSP	field sampling plan
gpr	ground-penetrating radar
HASP	health and safety plan
IDW	investigation-derived waste
IRA	interim removal action
LIMS	laboratory information management system
mcl	maximum contaminant level
MDL	method detection limit
MS/MSD	matrix spike/matrix spike duplicate
NFA	no further action
NFS	no further study
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health

List of Abbreviations and Acronyms (cont.)

OHM	OHM Remediation Services Corp.
OSWER	Office of Solid Waste and Emergency Response
OTH	Other Miscellaneous Environmental Factors (site)
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCI	Panamerican Consultants, Inc. (site)
PQL	practical quantitation limit
QA/QC	quality assurance/quality control
QAPjP	quality assurance project plan
RBC	risk-based concentrations
RCRA	Resource Conservation and Recovery Act
SVOC	semivolatile organic compound
TAGM	Technical and Administrative Guidance Memorandum
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TIC	tentatively identified compound
TOC	total organic carbon
TRPH	total recoverable petroleum hydrocarbons
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
WAD	Work Authorization Directive

Executive Summary

Ecology and Environment, Inc. (E & E), under contract to the United States Army Corps of Engineers (USACE), Kansas City District, Contract DACW41-99-D-9005, Work Authorization Directive (WAD) 9, was tasked to scope additional Expanded Site Investigation (2002 ESI) activities/remedial actions at the former Griffiss Air Force Base (Griffiss AFB) in Rome, New York. These activities will be performed at an Other Miscellaneous Environmental Factors site (OTH-305), a Panamerican Consultants, Inc., site (PCI Site 20), the Building 211 – Pipe Vault (OTH-211, DRY-211), and one Area of Interest (AOI 473 - Building 112 Room 10). The 2002 ESI activities will be performed to (1) further define whether any environmental contaminants are present at these sites that may pose a threat to human health and/or the environment or (2) to remediate environmental contamination that had been previously detected.

The additional investigations are in response to a request by the New York Department of Environmental Conservation (NYSDEC) and the United States Environmental Protection Agency (USEPA) to continue the process of identifying where remedial actions may be needed and to conduct the necessary remedial actions to classify the sites as "No Further Action." The results of this 2002 ESI program will be used to determine which, if any, of these sites should be added to the current list of sites that require no further study (NFS), no further action (NFA), whether additional sampling should be performed, or, if significant contamination is found, whether remedial action is needed.

This field sampling plan (FSP) addendum presents the sampling investigation objectives and describes the methodologies that will be used to investigate the sites. The 2002 ESI will be performed in accordance with the procedures (where applicable) outlined in the February 2000 *Field Sampling Plan, Health and Safety Plan (HASP), and*

Quality Assurance Project Plan (QAPjP) Addendum for the ESI AOI/OTH/PCI/EOD Sites Program (E & E 2000) and the October 1997 *Field Sampling Plan, Health and Safety Plan, and Quality Assurance Project Plan for the Expanded Site Investigation Program at Griffiss Air Force Base, Rome, New York* (E & E 1997). Procedures not covered in the October 1997 or February 2000 FSPs are presented in Section 4 of this addendum.

The 2002 program will consist of both field and non-field activities. Field activities will include reconnaissance surveys where necessary; near-surface (NS) soil sample collection; subsurface soil (SS) sample collection; wipe sample collection; sediment sample collection; grab water sampling; investigation-derived waste (IDW) drum sampling; removal of contaminated water/sediment from a floor drain sump and filling the sump with concrete; Removal of water from a pipe vault; and encapsulation of residual contamination on a pipe vault floor with concrete. Non-field activities consisting of an inhouse review of historical information, including drawings and previous sampling data, were performed prior to the scoping of this investigation.

1 Introduction

Ecology and Environment, Inc. (E & E), under contract to the United States Army Corps of Engineers (USACE), Kansas City District, Contract DACW41-99-D-9005, Work Authorization Directive (WAD) 9, will be performing additional Expanded Site Investigation (ESI) activities at the former Griffiss Air Force Base (Griffiss AFB) in Rome, New York (see Figure 1-1).

This field sampling plan (FSP) presents the investigation objectives and describes the methodologies that will be used to investigate or remediate the four sites. This 2002 ESI addendum will be performed in accordance with the procedures (where applicable) outlined in the February 2000 *Field Sampling Plan, Health and Safety Plan (HASP), and Quality Assurance Project Plan (QAPjP) Addendum for the ESI AOI/OTH/PCI/EOD Sites Program* (E & E 2000) and the October 1997 *Field Sampling Plan, Health and Safety Plan, and Quality Assurance Project Plan for the Expanded Site Investigation Program at Griffiss Air Force Base, Rome, New York* (E & E 1997).
Procedures not covered in the October 1997 or February 2000 FSPs are presented in Section 4 of this addendum.

These activities will be performed at an Other Miscellaneous Environmental Factors site (OTH-305), a Panamerican Consultants, Inc., site (PCI Site 20), the Building 211-Pipe Vault (OTH-211, DRY-211), and AOI 473-Building 211 Room 10 (see Figure 1-2).

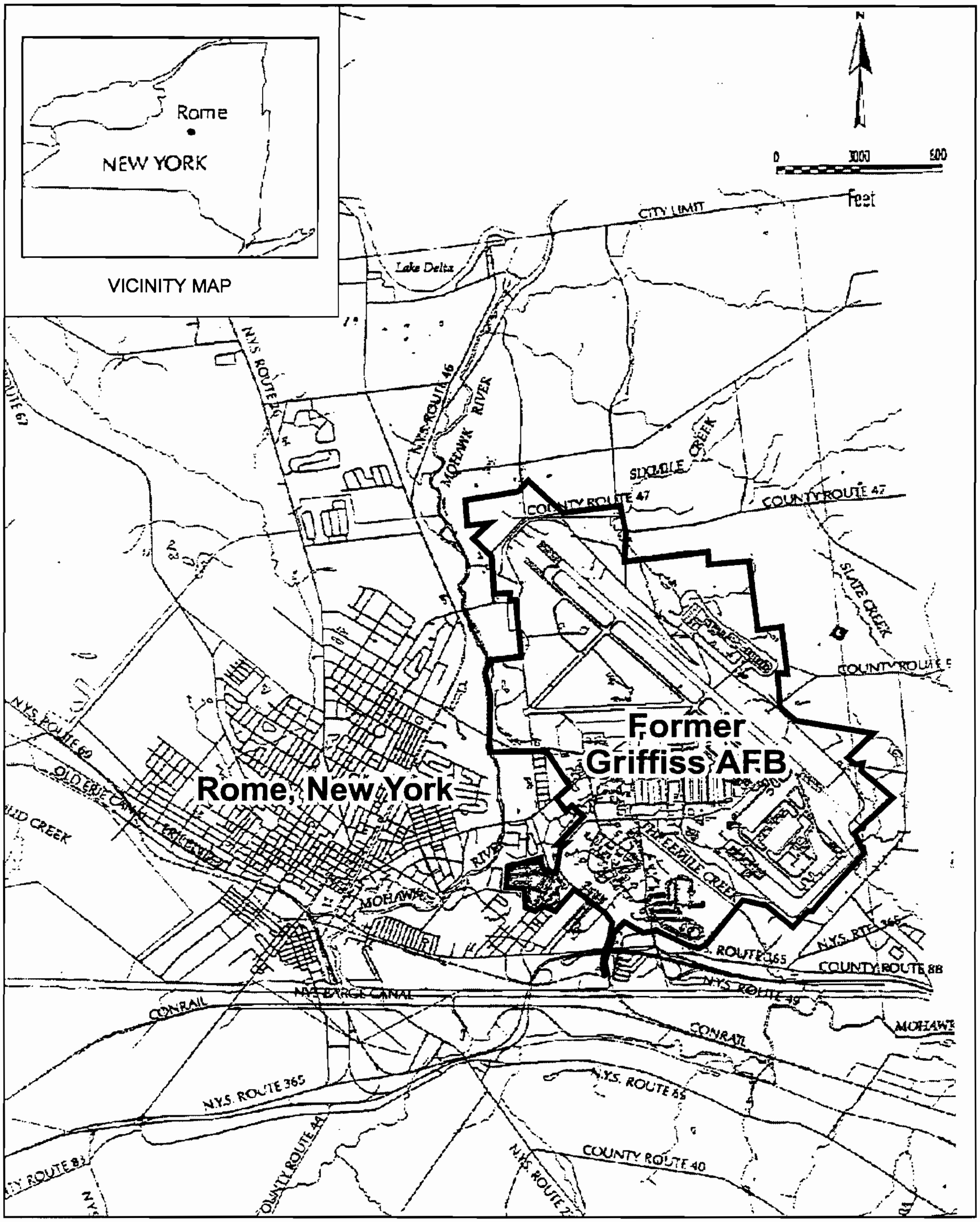

Figure 1-1 Former Griffiss AFB – Site Location Map

Purpose and Goals

The purpose of the 2002 ESI program at these four sites is to (1) further define whether environmental contaminants are present at certain areas of the former Griffiss AFB that may pose a threat to human health and/or the environment, (2) to continue the process of identifying where remedial actions may be needed, and (3) to conduct the necessary remedial actions to classify the sites as "No Further Action." The results of this additional work will be used to determine whether any of these sites should be added to the current list of sites that require no further study (NFS) or no further action (NFA), the need for additional sampling, and if significant contamination is found, the need to develop appropriate remedial plans.

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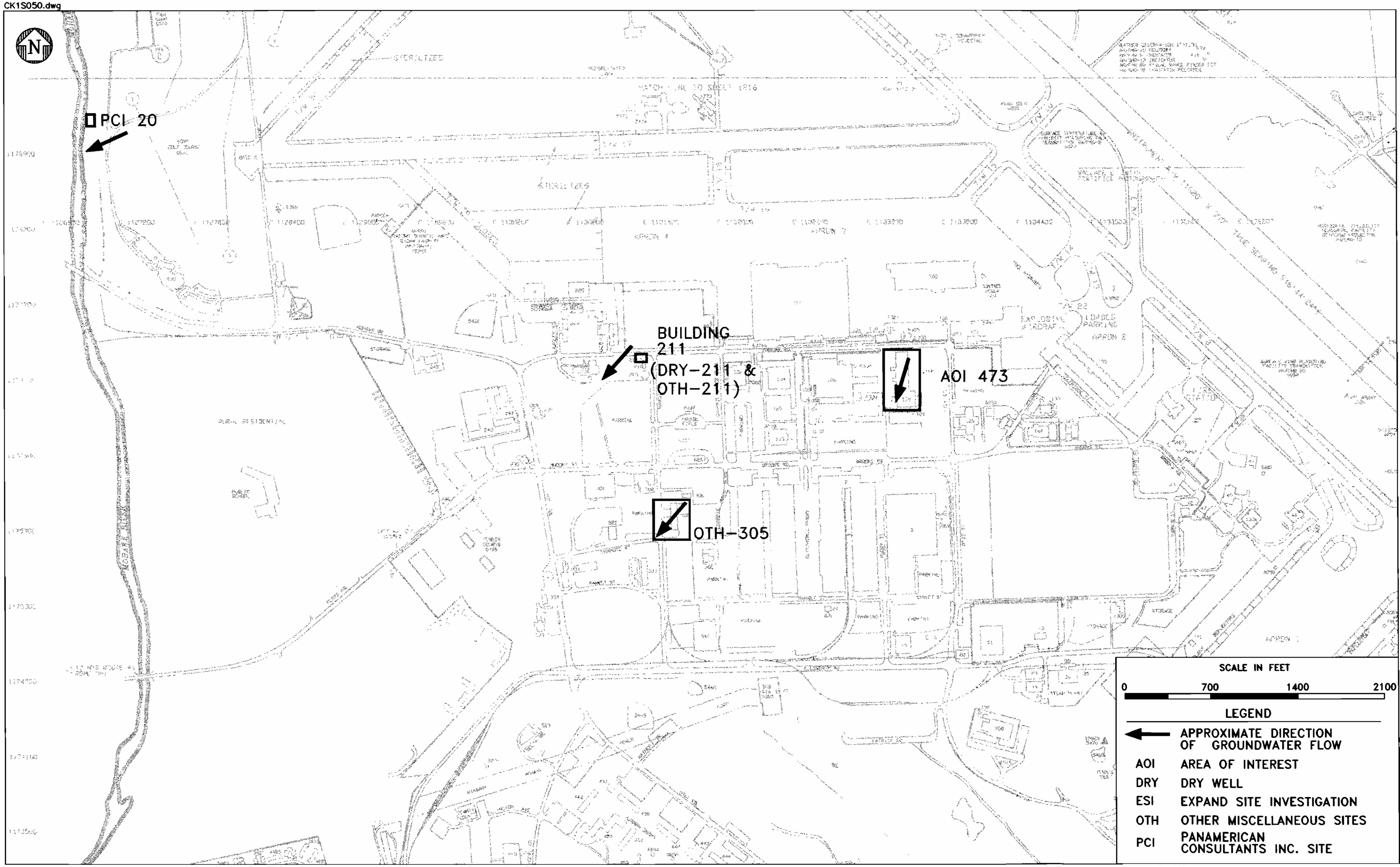

FIGURE 1–2 FORMER GRIFFISS AIR FORCE BASE SITES
WHERE 2002 ESI ADDENDUM FIELD
INVESTIGATIONS WILL BE PERFORMED

2 Sampling Scheme and Rationale

2.1 Identification of Data Quality Objectives

The same data quality objectives (DQOs) described in the 2000 ESI Addendum FSP (E & E 2000) will apply to this field effort.

2.2 Site-wide Sample Summary

Table 2-1 presents a summary of the background information, previous sampling activities, and proposed sampling activities for the OTH-305, PCI Site 20, Building 211 - Pipe Vault (OTH-211, DRY-211), and AOI 473-Building 112 Room 10 sites. This summary includes E & E's evaluation of existing documents and the analytical results of the samples previously collected; the objectives of the proposed sampling activities; the number of samples and proposed depths of samples at each sampling area; and the analytical tests and methods to be conducted.

Table 2-1 Expanded Site Investigation (ESI) Additional Sampling 2002, Summary of Field Investigations and Justifications, Former Griffiss Air Force Base, Rome, New York.

		EBS Designation						Proposed Investigations						
1 Site No.	2 Group No.	3 Study Area	4 ID No.	5 Site Name	6 Figure No.	7 Dates of Operation	8 Justification for Further Investigation	9 Sample Type	10 Number of Locations	11 Number of Samples Per Location	12 Boring Depth (ft BGS unless otherwise noted)	13 Sample Depth^b (ft BGS unless otherwise noted)	14 Sample identification	15 Analytical Tests and Methods to be conducted
OTH-305	–	20	OTH-305, STW-305-02	**Building 305 Paint Spray Booth Floor Drain**	Figure 1-2 (site location) Figure 3-1 (drain location)	–	**Background.** This paint spray booth is located inside Building 305, the Auto Skills Center, at the south end of the building. This enclosed unit (doors at one end and a filter wall at the other end) is used for painting automobiles and small trucks. **Previous Investigations.** During a site inspection conducted in April 1994 by Tetra Tech, paint residue and over-spray was evident on the floor and walls of the booth, but the booth was in generally good condition. A satellite hazardous waste accumulation point (STW -305-02 [paint thinners]) was located inside the booth. E & E inspected the booth on May 26, 1999, and confirmed its condition. There was no waste or evidence of spills at the satellite waste accumulation point. However, a floor drain half filled with water was noted at the east end of the booth. A drainpipe exited the floor drain toward the northwest. The discharge point of the drainpipe could not be determined during the inspection. Year 2000 ESI Addendum. The Year 2000 ESI investigation consisted of a dye trace test to determine the discharge point of the floor drain, and sampling of the sediment and water contained within the floor drain. Results of the dye test indicate that the floor drain discharges into the storm sewer along March Street which discharges into Three Mile Creek. The sediment and grab water samples collected from the floor drain were analyzed for TCL VOCs, SVOCs, Pest./PCBs, TAL metals, and % solids (sediment only). Elevated levels of PCBs (27.74 mg/kg total PCBs in sediment and 3.44 µg/L total PCBs in water), and lead (4,910 mg/kg in sediment and 922J µg/L in water) as well as other organic and inorganic compounds were detected in both samples. **ESI 2002 Proposed Additional Sampling**. The objective of this work is to clean out the contaminated floor drain, seal the discharge piping with concrete, fill the floor drain with concrete to bring it even with the floor of the paint spray booth, and determine if the soil beneath the floor drain is contaminated. The contaminated water and remaining sediment will be containerized and sampled for the parameters listed for proper disposal. In addition, after the floor drain has been cleaned out, the bottom of the concrete pit which contains the floor drain will be cored and three subsurface soil samples will be collected from the	WG	1	1	–	–	OTH305-WG02	TCLP VOCs (SW1311/8260B), TCLP SVOCs (SW1311/8270C), TCLP Pesticides (SW1311/8081A), TCLP Herbicides (SW1311/9151A), TCLP Metals (SW1311/6010B), TCLP Mercury (SW1311/7470A), Total PCBs (SW8082), Ignitability (SW1030), PH (SW9045), Reactivity-cyanide (SW7.3.3.2), and Reactivity-sulfide (SW7.3.4.2).
								SS	1	3	–	0.0 TO 0.5, 0.5 to 1.0, and 1.0 to 2.0 (feet below bottom of concrete pit containing floor drain)	OTH305-SS01 OTH305-SS02 OTH305-SS03	TCL VOCs (SW8260B), TCL SVOCs (SW8270C), TCL pesticides/PCBs (SW8081A/8082), TAL Metals/Mercury (SW6010B/7470A), and % Solids (ASTM_D2216).

Table 2-1 Expanded Site Investigation (ESI) Additional Sampling 2002, Summary of Field Investigations and Justifications, Former Griffiss Air Force Base, Rome, New York.

		EBS Designation						Proposed Investigations						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Site No.	Group No.	Study Area	ID No.	Site Name	Figure No.	Dates of Operation	Justification for Further Investigation	Sample Type	Number of Locations	Number of Samples Per Location	Boring Depth (ft BGS unless otherwise noted)	Sample Depth^b (ft BGS unless otherwise noted)	Sample identification	Analytical Tests and Methods to be conducted
PCI Site 20	–	8	PCI Site 20	Panamerican Consultants, Inc. Site 20	Figure 1-2 (site location) Figure 3-2 (sample location)	–	top 6 inches, 6 inches to 1 foot, and 1 foot to 2 feet below the bottom of the concrete drain pit. The soil samples will be analyzed for the parameters listed. **Background**. Panamerican Consultants, Inc. (PCI) Site 20 is located on a wooded bank of the Mohawk River on the western edge of a golf course. The approximate dimensions of the site are 49 feet by 97 feet, and it has an approximate depth of 3 to 6 inches BGS. Erosion, additional dumping, and possible earth-moving activities have disturbed the site. According to PCI's archival search, this site is not depicted on any historical map (PCI 1997). PCI conducted Phase I and Phase II archaeological investigations of the site in 1994 and 1995, respectively. Excavations performed by PCI during the Phase I and Phase II archaeological investigations did not reveal any hazardous or potentially hazardous materials. Artifacts recovered during the Phase I archaeological investigation originated predominately from the post-World War II era. Other materials present during the Phase I investigation may be from an industrial community, including canning factories, dating from the late 19th century to the 1940s. The PCI Phase II investigation consisted of shovel tests and collection of artifacts. The artifacts recovered during the Phase II investigation included glass, ceramic, metal, rubber, plastic, leather, bone, shell, and coal. In addition to the artifacts recovered, a mound of modern asphalt rubble was observed on site during the archaeological investigations. PCI Site 20 was not recommended for eligibility on the National Register of Historic Places (PCI 1997). E & E inspected the site on May 27, 1999 and confirmed the presence of a small amount of surface debris and a mound of asphalt rubble. The surface debris and mound of asphalt were removed as part of the Year 2000 ESI Addendum field program.	NS	3	1	-	0 to 2 (inches)	PCI20-NS06 Through PCI20-NS08	Lead Only (SW 6010B), and % Solids (ASTM_D2216)

Table 2-1 Expanded Site Investigation (ESI) Additional Sampling 2002, Summary of Field Investigations and Justifications, Former Griffiss Air Force Base, Rome, New York.

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Site No.	Group No.	Study Area	ID No.	Site Name	Figure No.	Dates of Operation	Justification for Further Investigation	Sample Type	Number of Locations	Number of Samples Per Location	Boring Depth (ft BGS unless otherwise noted)	Sample Depth^b (ft BGS unless otherwise noted)	Sample identification	Analytical Tests and Methods to be conducted
PCI Site 20 (Cont.)							**Previous Investigations.** PCI conducted Phase I and Phase II archaeological investigations of the site in 1994 and 1995, respectively. E & E inspected the site on May 27, 1999. Year 2000 ESI Addendum. Due to the presence of surface debris and a mound of asphalt, an ESI was performed at this site. The ESI consisted of a geophysical survey using an EM31 and a magnetometer, debris removal, and collection of five NS soil samples. Prior to debris removal and based on the debris present, five locations were selected for biased near-surface soil sample collection. All near-surface soil samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals, and percent solids. Elevated levels of lead were detected in two of the NS soil samples, PCI20-NS03 (2,220 mg/kg) and PCI20-NS04 (1,640 mg/kg) Upon completion of the surface debris removal, a Geophysical survey was performed. The geophysical survey indicates that no buried metallic debris is present on site. **ESI 2002 Proposed Additional Sampling.** The objective of this work is to determine if lead contamination detected in the NS soil during the Year 2000 ESI remains on site following the removal of the surface debris. Due to the elevated levels of lead detected in two NS soil samples, PCI20-NS03 (2,220 mg/kg) and PCI20-NS04 (1,640 mg/kg) during the Year 2000 ESI, additional sampling is recommended. Three NS soil samples will be collected. Two will be collected from the 2000 ESI sample locations at which the elevated levels of lead were detected (PCI20-NS03 and -NS04), and the third will be collected from in between the first two samples. All near-surface soil samples will be analyzed for Lead, and percent solids. Proposed sample locations are shown on Figure 3-2.							

Table 2-1 Expanded Site Investigation (ESI) Additional Sampling 2002, Summary of Field Investigations and Justifications, Former Griffiss Air Force Base, Rome, New York.

		EBS Designation						Proposed Investigations						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Site No.	Group No.	Study Area	ID No.	Site Name	Figure No.	Dates of Operation	Justification for Further Investigation	Sample Type	Number of Locations	Number of Samples Per Location	Boring Depth (ft BGS unless otherwise noted)	Sample Depth^{b} (ft BGS unless otherwise noted)	Sample identification	Analytical Tests and Methods to be conducted
Building 211	–	15	OTH-211, DRY-211	**Building 211 pipe vault**	Figure 1-2 (site location) Figure 3-3 (Sample location)	1943 to present	**Background.** Building 211 is located near the intersection of Hangar Road and March Street in the west-central portion of the former GAFB and was originally used as a drinking water chlorination facility. The building is currently used as a water supply facility. A large manifolding pressure-control gauge inside the building broke in 1991, resulting in a mercury spill in the building. **Previous Investigations.** This site was investigated in 1997 under the Expanded Site Investigation (ESI) and Confirmatory Sampling of Areas of Interest and Drywell/Wastewater-Related Systems program (JREZ 97-7001), which recommended further action for the site. A geophysical survey using Ground Penetrating Radar (GPR) and drain tracing were performed in an attempt to locate the drywell (DRY-211) adjacent to Building 211. The drywell was not located by using either method. The investigation inside Building 211 consisted of obtaining a total of three swipe samples from the two floor drains and the grate covering the pipe vault, and one grab water sample from inside the water main pipe vault. The investigation outside Building 211 consisted of drilling and installing one temporary well (D211-SS01) at the suspected drywell location on the east side of the building, and collecting one subsurface soil sample from 2 to 4 feet BGS, one subsurface soil sample from 8 to 12 feet BGS (groundwater interface), and one groundwater sample from the temporary well. The borehole was drilled to a depth of 22 feet BGS, and the temporary well was installed in the borehole with a 10-foot screened interval. Saturated soils were encountered at a depth of 14 feet BGS during drilling, and groundwater was measured at 16.44 feet BGS in temporary well D211-SS01 at the time of sampling. The soil and filtered groundwater samples collected at the approximate location of the drywell did not contain mercury or other contaminants of concern at levels above the screening criteria. However, mercury was detected at 0.84 µg/L in the unfiltered groundwater sample collected from the temporary well. This concentration is above the NYSDEC groundwater/drinking water standard of 0.7 µg/L for mercury. The filtered and unfiltered grab water samples collected from the pipe vault beneath Building 211 contained mercury at concentrations		1	1	-	-	Bldg211-WG01	TAL Metals/Mercury (SW6010B/7470A)

Table 2-1 Expanded Site Investigation (ESI) Additional Sampling 2002, Summary of Field Investigations and Justifications, Former Griffiss Air Force Base, Rome, New York.

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Site No.	Group No.	Study Area	ID No.	Site Name	Figure No.	Dates of Operation	Justification for Further Investigation	Sample Type	Number of Locations	Number of Samples Per Location	Boring Depth (ft BGS unless otherwise noted)	Sample Depth^b (ft BGS unless otherwise noted)	Sample identification	Analytical Tests and Methods to be conducted
Building 211 (cont.)							of 3.6 and 2.7 µg/L, respectively. Three of the four swipe samples collected from the area around the two floor drains and pipe vault grate also contained mercury at concentrations ranging from 0.93 to 3.7 µg/wipe. An attempt was made to decontaminate the site in 2000 under the Drywell and Miscellaneous Sites Removal Program, project JREZ-97-0636. Under this program OHM Remediation Services Corp. decontaminated the building floor and the floor of the water main vault located under Building 211 twice for mercury. The results of confirmation wipe samples indicated that the site specific action level for mercury in wipes (5 µg/100 cm^2) was achieved for the floor of Building 211, but that residual mercury contamination above the action level (35.20 g/100 cm^2) remained on the vault floor. Since the vault floor has been decontaminated twice and the likelihood of human exposure is low due to the remote location of the contaminated surface, no further cleaning was recommended by OHM. An alternative solution recommended by OHM was to encapsulate the residual mercury contamination by painting the vault floor. On November 27, 2001, E & E inspected the pipe vault and observed that it contained approximately 800 gallons of water (2 1/2 feet deep), which reportedly comes from a leaking pipe within the vault. The vault is four feet wide by 11 feet long, and approximately nine feet deep. **ESI 2002 Proposed Additional Sampling.** The objective of this work is to remove existing water and to encapsulate the residual mercury contamination present on the pipe vault floor. Prior to removal the water within the vault will be sampled and analyzed for TAL metals and mercury for disposal purposes. Based on the results of the analyses it is anticipated that the water will be discharged to the sanitary sewer adjacent to Building 211 with the approval of the City of Rome Water Pollution Control Facility. Upon removal of the water a layer of concrete between three and six inches in thickness will be pumped into the bottom of the vault to prevent future contact with the residual mercury contamination present on the existing concrete floor.							

Table 2-1 Expanded Site Investigation (ESI) Additional Sampling 2002, Summary of Field Investigations and Justifications, Former Griffiss Air Force Base, Rome, New York.

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AOI 473	—	16	AOI 473, AOI 469, UST- 112-1 to UST-112-3, AST-112-1 to AST 112-5, DRY 112, IRP-SS-08	**Building 112- Room 10**	Figure 1-2 (site location) Figure 3-4 (sample locations)	1943-1990s (currently inactive)	**Background.** Building 112, formerly a High Power Laboratory, is located in the central industrialized area of GAFB. Two aboveground storage tanks (AST) and one underground storage tank (UST) were located near the northeast corner of Building 112 before they were removed sometime prior to 1994. The loading dock area was used for the storage of PCB containers, which resulted in PCB soil contamination. The PCB Dump Area south of Building 112, consisting of a fenced in gravel area 16 by 44 feet, was used to store PCB transformers, until 1994 when they were removed.	SD	1	1	—	—	G473-Rm10-SD01	TCL SVOCs (SW8270C), TCL PCBs (SW8082), 418.1M TRPH, TAL Metals/Mercury (SW6010B/7470A), and % Solids (ASTM_D2216).
							Site investigations have been conducted at four locations in and around Building 112: a drywell located east of Building 112; the southwest roof of the building; the area around the southwest loading dock; and the PCB dump site located south of the building. In 1981, Griffiss AFB bioenvironmental engineers sampled site soils to determine whether PCBs were present. In 1982, soils collected from areas adjacent to the building and were analyzed for PCBs. PCBs were detected on the west and south sides of Building 112 and on a transformer pad on the roof. A limited groundwater investigation in the vicinity of Building 112 indicated the presence of inorganic compounds in groundwater. In 1984 a leaking transformer on the roof of Building 112 and contaminated roof materials were removed. In 1994 and early 1995, in accordance with a Federal Facility Agreement, Law Environmental performed a remedial investigation for the Building 112 AOC (Law 1995). In 1996, E & E prepared a design analysis report to address remediation of contaminants at the Building 112 AOC. A drywell investigation for Building 112 was conducted by OHM Remediation Services Corp. in January 1997. Two presumed drywells were investigated. Drywell # 1 was recommended for closure. Based on a smoke trace test, it was concluded that there was no second drywell; therefore, no further study was recommended for what was believed to be Drywell # 2.	SP	10	1	—	—	G473-Rm10-SP01 Through G473-Rm10-SP10	TCL PCBs (SW8082), 418.1M TRPH, TAL Metals/Mercury (SW6010B/7470A), and TCL SVOCs (SW8270C)
								SS	4	1	—	—	**Provisional Samples** G473-Rm10-SS01 Through G473-Rm10-SS04	TCL PCBs (SW8082), 418.1M TRPH, TAL Metals/Mercury (SW6010B/7470A), TCL SVOCs (SW8270C) and % Solids (ASTM_D2216).

Table 2-1 Expanded Site Investigation (ESI) Additional Sampling 2002, Summary of Field Investigations and Justifications, Former Griffiss Air Force Base, Rome, New York.

		EBS Designation						Proposed Investigations						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Site No.	Group No.	Study Area	ID No.	Site Name	Figure No.	Dates of Operation	Justification for Further Investigation	Sample Type	Number of Locations	Number of Samples Per Location	Boring Depth (ft BGS unless otherwise noted)	Sample Depth^b (ft BGS unless otherwise noted)	Sample identification	Analytical Tests and Methods to be conducted
AOI 473-Room 10 (cont.)							In 1999, a removal action was performed to remove PCB-contaminated materials at the Building 112 AOC (Project No. JREZ 97-7006). The Building 112 AOC removal action included removal of a contaminated transformer pad from the roof, removal of contaminated soil and a concrete block retaining wall from the south side of the building, and removal of contaminated soils from the southwest side of the building. During the Spring of 1999, a former GAFB employee informed AFBCA that he dumped transformer oil along the northern wall of the building and the northern section of the east and west walls. According to this employee, the soil adjacent to the northeast corner of the building could not grow grass until topsoil was placed over the spill area. Oil was also allegedly dumped in a concrete pit (terra-cotta sump) beneath a false floor in the northernmost bay of the building. During a site visit in May 1999, E & E inspected the north end of Building 112, both inside and outside. A terra-cotta sump approximately 2 feet deep and 2 feet in diameter was discovered beneath the tile floor in the northwest corner of the basement beneath the stairway access. The terra-cotta sump had a concrete bottom. The concrete floor of the sump appeared clean and intact, thus not warranting sampling. There were no signs of stressed vegetation outside the building. These areas were designated AOI 469 and investigated during the Year 2000 ESI program. No further study was recommended for these areas in the Final Year 2000 ESI Report. However, in winter 2002, the same former Griffiss AFB employee reported to AFBCA that the terra-cotta sump investigated during the Year 2000 ESI program was not the concrete pit he was referring to in the Spring of 1999.							

Table 2-1 Expanded Site Investigation (ESI) Additional Sampling 2002, Summary of Field Investigations and Justifications, Former Griffiss Air Force Base, Rome, New York.

		EBS Designation						Proposed Investigations						
1 Site No.	2 Group No.	3 Study Area	4 ID No.	5 Site Name	6 Figure No.	7 Dates of Operation	8 Justification for Further Investigation	9 Sample Type	10 Number of Locations	11 Number of Samples Per Location	12 Boring Depth (ft BGS unless otherwise noted)	13 Sample Depth^b (ft BGS unless otherwise noted)	14 Sample identification	15 Analytical Tests and Methods to be conducted
AOI 473-Room 10 (cont.)							The former employee stated that a basement room (Room 10), which had since had a false floor put of over it, previously contained a large oil tank. The former employee stated there were two 150-gallon tanks outside the room, and a large tank inside the room, and the pipes/fittings often leaked and soaked the entire floor of the room with oil. This basement room has been designated AOI 473-Building 112 Room 10. During a site visit in February 2002, E & E inspected the Room 10. Room 10 currently has a false floor over it (half inch thick steel plate). Room 10 can be accessed through a three-foot square opening in the false floor, which is situated above a metal ladder. A sump is located near the northeast corner of the room. The sump pump has been removed from the sump and is presently located on the concrete floor adjacent to the sump. The floor and walls of the room were observed to be clean and in good condition. No significant signs of spilled oil were observed on the floor or walls of the room. **Previous Sampling.** Extensive sampling for PCBs was previously performed at the south side of the building (dump area). However, prior to the Year 2000 ESI sampling, there was no sampling performed at the north side, except for a three-point composite sample collected from Drywell 1. AOI 469 was investigated during the Year 2000 ESI program. A sampling grid with 25-foot spacing, covering the area where PCBs were allegedly dumped, was used to collect 22 near-surface soil samples (0 to 2 inches BGS) (see Figure 3-4a). All the samples were analyzed for TCL SVOCs, TCL PCBs, total recoverable petroleum hydrocarbons (TRPH), TAL metals, and % solids. Also, based on the analytical results of the 22 near-surface soil samples, 11 locations with elevated PCB concentrations were completed as soil borings with additional sampling. At nine of these borings, an intermediate depth soil sample							

Table 2-1 Expanded Site Investigation (ESI) Additional Sampling 2002, Summary of Field Investigations and Justifications, Former Griffiss Air Force Base, Rome, New York.

		EBS Designation						Proposed Investigations						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Site No.	Group No.	Study Area	ID No.	Site Name	Figure No.	Dates of Operation	Justification for Further Investigation	Sample Type	Number of Locations	Number of Samples Per Location	Boring Depth (ft BGS unless otherwise noted)	Sample Depth^{b} (ft BGS unless otherwise noted)	Sample identification	Analytical Tests and Methods to be conducted
AOI 473-Room 10 (cont.)							(approximately 5 to 7 feet BGS) and a deeper soil sample (immediately above the water table [approximately 10 to 14 foot BGS]) were collected. Soil boring G469-NS19 was located due east of Room 10 approximately six feet from the eastern exterior wall of Building 112 (See Fig. 3-4a). PCBs were detected at very low levels (0.0160 J mg/kg) in the soil sample collected from immediately above the water table (12 to 13 feet BGS) and were not detected in the soil sample collected from 6 to 7 feet BGS. TRPH was not detected in either soil sample collected from boring G469-NS19. Soil samples were collected continuously from ground surface to the water table at the remaining two borings (G469-NS01 and G469-NS20). All deeper soil samples were analyzed for the same parameters as specified previously for the near-surface soil samples. The primary contaminants detected at AOI 469 are PCBs and lead. Three PCBs were detected in the 22 near-surface soil samples collected, including Aroclor 1242, Aroclor 1254, and Aroclor 1260. Concentrations for Aroclor 1242 ranged from non-detected to 0.495 mg/kg in NS01. Concentrations of Aroclor 1254 ranged from non-detected to 1.04 mg/kg in NS01. Concentrations of Aroclor 1260 ranged from .0206 mg/kg to 7.12 mg/kg in NS20. None of the concentrations of Aroclor 1242 detected exceeded either NYSDEC or EPA RBC criteria values. Concentrations of Aroclor 1254 only marginally exceeded the NYSDEC criterion (1 mg/kg) in NS01 (1.02 mg/kg) and NS01/D (1.04 mg/kg). Concentrations of Aroclor 1260 exceeded the NYSDEC and EPA RBC criteria value only in NS20 (7.12 mg/kg). Thirty-one subsurface soil samples were collected at AOI 469 from the 11 soil borings installed. Two PCBs were detected in the subsurface soil samples, including Aroclor 1254 and Aroclor 1260 (see Figure 3-4a). Concentrations of Aroclor 1254 ranged from non-detected to 0.684 mg/kg in SS01-Z1. Concentrations of Aroclor 1260 ranged from non- detected to 12.40 mg/kg in SS20-Z1.							

Table 2-1 Expanded Site Investigation (ESI) Additional Sampling 2002, Summary of Field Investigations and Justifications, Former Griffiss Air Force Base, Rome, New York.

		EBS Designation						Proposed Investigations						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Site No.	Group No.	Study Area	ID No.	Site Name	Figure No.	Dates of Operation	Justification for Further Investigation	Sample Type	Number of Locations	Number of Samples Per Location	Boring Depth (ft BGS unless otherwise noted)	Sample Depth^b (ft BGS unless otherwise noted)	Sample identification	Analytical Tests and Methods to be conducted
AOI 473-Room 10 (cont.)							Concentrations of Aroclor 1260 exceeded screening criteria values in only two shallow subsurface soil samples, which were collected from soil boring G469-NS20. The concentration of Aroclor 1260 detected in SS20-Z1 (12.40 mg/kg) exceeded both NYSDEC and EPA RBC criteria values. The concentration of Aroclor 1260 in SS20-Z2 (3.88 mg/kg) exceeded EPA RBC criteria values, but not the NYSDEC values. No other PCBs were detected in the subsurface soil samples above NYSDEC or EPA RBC screening criteria values. Concentrations of lead ranged from 8.29 mg/kg in NS09 to 1,880 mg/kg in NS10, and exceeded both the NYSDEC and EPA RBC criteria values in NS10, NS14, NS16, and NS21. No other metals exceeded EPA RBCs. An Assessment of Adult Exposure to Lead in Soil was performed due to the levels of lead detected in the near-surface soil. The assessment indicates that the levels of lead present are unlikely to pose any significant health risk to future industrial/commercial workers. **ESI 2002 Proposed Additional Sampling.** The objective of this work is to determine if petroleum hydrocarbons, potentially containing PCBs, have been spilled in AOI 473-Building 112 Room 10. Collection of samples from the sump and the floor of Room 10 are recommended. Sampling of the sump will include collection of a sediment sample if sediment is present in the sump, and collection of a swipe sample. Nine additional swipe samples will be collected from the floor of Room 10. The floor swipe samples will be evenly spaced in a grid pattern as shown on Figure 3-4b. The sediment sample and 10 swipe samples will be analyzed for TCL SVOCs, PCBs, TRPH, TAL metal with mercury, and % solids (sediment only). **Provisional ESI 2002 Additional Sampling.** In addition, up to four provisional subsurface soil samples may be collected from AOI 473-Building 112 Room 10. If upon closer inspection of Room 10, either the sump has an open bottom or cracks are observed in the floor, then soil samples will be collected from beneath the sump and/or cracks in the floor with a hand auger. If necessary, the concrete floor will first be cored and the soil samples collected from the first soil encountered. All subsurface soil samples collected will be analyzed for TCL SVOCs, PCBs, TRPH, and TAL metal with mercury.							

Table 2-1 Expanded Site Investigation (ESI) Additional Sampling 2002, Summary of Field Investigations and Justifications, Former Griffiss Air Force Base, Rome, New York.

		EBS Designation						Proposed Investigations						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Site No.	Group No.	Study Area	ID No.	Site Name	Figure No.	Dates of Operation	Justification for Further Investigation	Sample Type	Number of Locations	Number of Samples Per Location	Boring Depth (ft BGS unless otherwise noted)	Sample Depth[b] (ft BGS unless otherwise noted)	Sample identification	Analytical Tests and Methods to be conducted

Key:

AFBCA = Air Force Base Conversion Agency.
AOI = Area of Interest.
BGS = Below ground surface.
CS = Confirmatory sampling.
DRY = Drywell.
E & E = Ecology and Environment, Inc.
EBS = Environmental baseline survey.
EPA = United States Environmental Protection Agency.
ESI = Expanded site investigation.
ft = Feet.
Griffiss AFB = Griffiss Air Force Base.
GW = Groundwater screening sample.

ID = Identification.
IRP = Installation Restoration Program.
LSA = Lead-screen auger.
MW = Monitoring well.
No. = Number.
NS = Near-surface soil sample.
NYSDEC = New York State Department of Environmental Conservation.
OTH = Other miscellaneous environmental factors.
PAH = Polynuclear aromatic hydrocarbon.
PCB = Polychlorinated biphenyl.
Pest. = Pesticides.
RBCs = Risk-based criteria.
SD = Sediment sample.
SP = Swipe Sample.

SS = Subsurface soil sample.
STW = Satellite hazardous waste accumulation point.
SVOC = Semivolatile organic compound.
TAGM = Technical Administrative Guidance Memorandum.
TAL = Target Analyte List.
TBD = To be determined.
TCL = Target Compound List.
TRPH = Total recoverable petroleum hydrocarbons.
VOC = Volatile organic compound.
WG = Grab water sample.
— = Not applicable.

3 Field Sampling Plan, Part I: - Site-Specific Problem Definition and Sampling Rationale

3.1 OTH-305: Building 305 - Paint Spray Booth/Floor Drain

The objective of this work is to remove contaminated water and sediment detected in the paint spray booth floor drain during the Year 2000 ESI program, sample the soil beneath the floor drain to see if it has been impacted by the contamination within the floor drain, and seal the floor drain and associated discharge pipe with concrete.

3.1.1 Site Background

Building 305 was originally a quartermaster motor pool garage before being converted to an automotive hobby shop (AFCEE 1998). The paint spray booth (OTH-305) is located inside Building 305 at the building's south end. The dates of operation and activities carried out at this site are unknown. At one time the location of a satellite waste accumulation point (STW 305) for paint thinners, the site is currently used to paint auto and truck parts.

3.1.2 Physical Characteristics

Building 305 is located in the central industrial area of the base. The area around the building is generally flat, with less than 5 feet of topographic relief. It is grassed to the north, south, and west, and paved to the east. Building 305 is not located near any major surface water drainage features. Site runoff is channeled to the base stormwater drainage system, which drains into Three Mile Creek, which in turn drains to the New York State Barge Canal approximately 1.5 miles south of the base.

The 13- by 22-foot paint spray booth is located inside Building 305 (the Auto Skills Center), at the building's south end. This enclosed unit (doors at one end and a filter wall at the other) is used for painting automobiles and small trucks. The filter wall consists of a forced air ventilation system with disposable filter elements.

The floor drain inside the paint spray booth consists of a concrete-lined sump (approximately 2 feet wide, 2.5 feet long, and 2 feet deep) with an overflow pipe that exits the sump to the northwest. This floor drain was covered by a steel grate, which was found to be sealed with plywood and tape during both the 1999 site inspection conducted by E & E and the Year 2000 ESI field program.

Most of Building 305 is being used to store lawn-mowing and snow-removal equipment. Five interconnected floor drains in this part of the building drain to the north before discharging to the sanitary sewer system (U.S. Army Air Corps 1942).

3.1.3 Previous Investigations

During a site inspection conducted in April 1994 by Tetra Tech, paint residue and overspray was observed on the floor and walls of the booth. Overall, however, the booth was in good condition. A satellite waste accumulation point (STW 305) was located inside the booth.

Parsons Engineering Science, Inc., and OHM Remediation Services Corp. performed a Closure of Hazardous Waste/Hazardous Materials Storage Areas Investigation at the former Griffiss Air Force Base in 1996. Building 305 was included in this investigation and underwent a closure action under RCRA. The investigation included pre-closure sampling in July 1996, remediation in December 1996, and post-remediation sampling in December 1996.

The pre-closure sampling consisted of the collection of six wipe samples from within Building 305, one of which was collected from STW 305 within the paint spray booth (OTH-305). All six of the wipe samples were analyzed for metals and extractable organic halides. Three of the six samples (collected from north of the paint spray booth) were also analyzed for PCBs, and one of the three was analyzed for pesticides. Lead was detected in two samples and aldrin was detected in one sample at concentrations above action levels in samples collected from north of the paint spray booth. None of the samples exceeded the PCB action level, and none of the analytes in the sample collected from STW 305 (inside the paint spray booth) exceeded action levels.

Due to the percentage of exceedances of action levels for aldrin and lead, Building 305 was recommended for remediation. Approximately 225 square feet of the area north of OTH-305 were remediated for lead and aldrin.

Three post-remediation wipe samples were collected and analyzed for lead and aldrin. Lead and aldrin were not detected at concentrations above action levels. Remediation goals were met, and the building was recommended for closure (AFCEE 1998).

E & E inspected the booth on May 26, 1999, and confirmed its condition. There was no waste or evidence of spills at the satellite waste accumulation point. However, a floor drain partly filled with water and containing sludge approximately 1 inch deep was observed at the eastern end of the booth. A drainpipe exited the floor drain toward the northwest. The discharge point of the drainpipe could not be determined during the inspection.

In spring 2000, E & E investigated OTH-305 as part of the Year 2000 ESI program. To determine the discharge point of the floor drain, a dye test was conducted. Results of the dye trace test indicated that the overflow pipe contained within the paint spray booth floor drain discharged westward into the storm sewer system that parallels March Street, west of Building 305. This 1,000-foot storm sewer discharges into the headwaters of Three Mile Creek approximately 1,000 feet south of Building 305.

To establish whether hazardous substances were present in the floor drain pit, a water sample and a sludge sample were collected from the floor drain. The samples were analyzed for Target Compound List volatile organic compounds (TCL VOCs), semivolitile organic compounds (SVOCs), pesticides/PCBs, and Target Analyte List (TAL) metals.

Levels of two PCBs, two pesticides, three VOCs, five SVOCs, and thirteen metals detected in samples collected from the Building 305 floor drain pit were found to exceed state or federal standards (see Figure 3-1). However, the standing water and sludge were contained within the floor drain sump (beneath the level of the overflow pipe), appeared to be stagnant, and did not appear to be leaking into the ground beneath Building 305. The floor drain is currently restricted from use, there is no flow into the storm sewer, and the water and sludge remaining in the floor drain pit are contained.

Based on these findings and on the planned commercial use of this site (USAF 1995), the Final Year 2000 ESI Report (E & E 2002) recommended that the water and sludge within the paint spray booth floor drain be removed and the floor drain pit and associated piping be plugged with concrete.

3.1.4 2002 ESI Addendum Sampling and Remedial Actions

The objectives of the 2002 ESI program/addendum program are to remove and properly dispose of the contaminated water and sediment from within the floor drain sump, sample the soil beneath the floor drain to determine whether it has been impacted by the contamination within the floor drain, and plug the sump and associated piping with concrete. The waste water/sediment will be analyzed for Toxicity Characteristic Leaching Procedure (TCLP) VOCs, SVOCs, pesticides, herbicides, metals, and mercury; TCL PCBs; ignitability; reactive cyanide; reactive sulfide; pH; and percent solids for disposal purposes.

Three subsurface soil samples will be collected from beneath the floor drain. The subsurface soil samples will be collected from 0.0 to 0.5 foot, 0.5 foot to 1.0 foot, and 1.0 foot to 2.0 feet beneath the bottom of the floor drain sump after the sump has been cleaned out and a hole has been drilled through the bottom (see Figure 3-1). The subsurface soil samples will be analyzed for TCL VOCs, SVOCs, pesticides, PCBs, TAL metals, mercury, and percent solids.

The Year 2000 ESI sampling locations and results and the proposed 2002 ESI sampling locations are shown on Figure 3-1. A list of the 2002 ESI Addendum sample identifications and analyses is presented on Table 3-1.

TABLE 3-1
OTH-305 SAMPLE LISTING
FORMER GRIFFISS AIR FORCE BASE

							ANALYSES															
Location	Date	Sample Number	Lab	Matrix	Depth	Type	TCLP VOCs SW1311/8260B	TCLP SVOC's SW1311/8270C	TCLP Pesticides SW1311/8081A	TCLP Herbicides SW1311/9151A	TCLP Metals + Extraction SW1311/6010B	TCLP Mercury1311/7470A	Total PCBs SW8082	Ignitability SW1030	pH SW9045	Reactivity - Cyanide SW7.3.3.2	Reactivity - Sulfide SW7.3.4.2	% Solids ASTM_D2216	TCL VOCs SW8260B	TCL SVOC's SW8270C	TCL Pesticides SW8081A	TCL PCBs SW8082	TAL Metals/Mercury SW1311/6010B
OTH-305	TBD	OTH305-WG02	ASC	Water Grab		N1	X	X	X	X	X	X	X	X	X	X	X						
	TBD	OTH305-SS01	ASC	Subsurface soil	0.0'-0.5'	N1												X	X	X	X	X	X
	TBD	OTH305-SS02	ASC	Subsurface soil	0.5'-1.0'	N1												X	X	X	X	X	X
	TBD	OTH305-SS03	ASC	Subsurface soil	1.0'-2.0'	N1												X	X	X	X	X	X

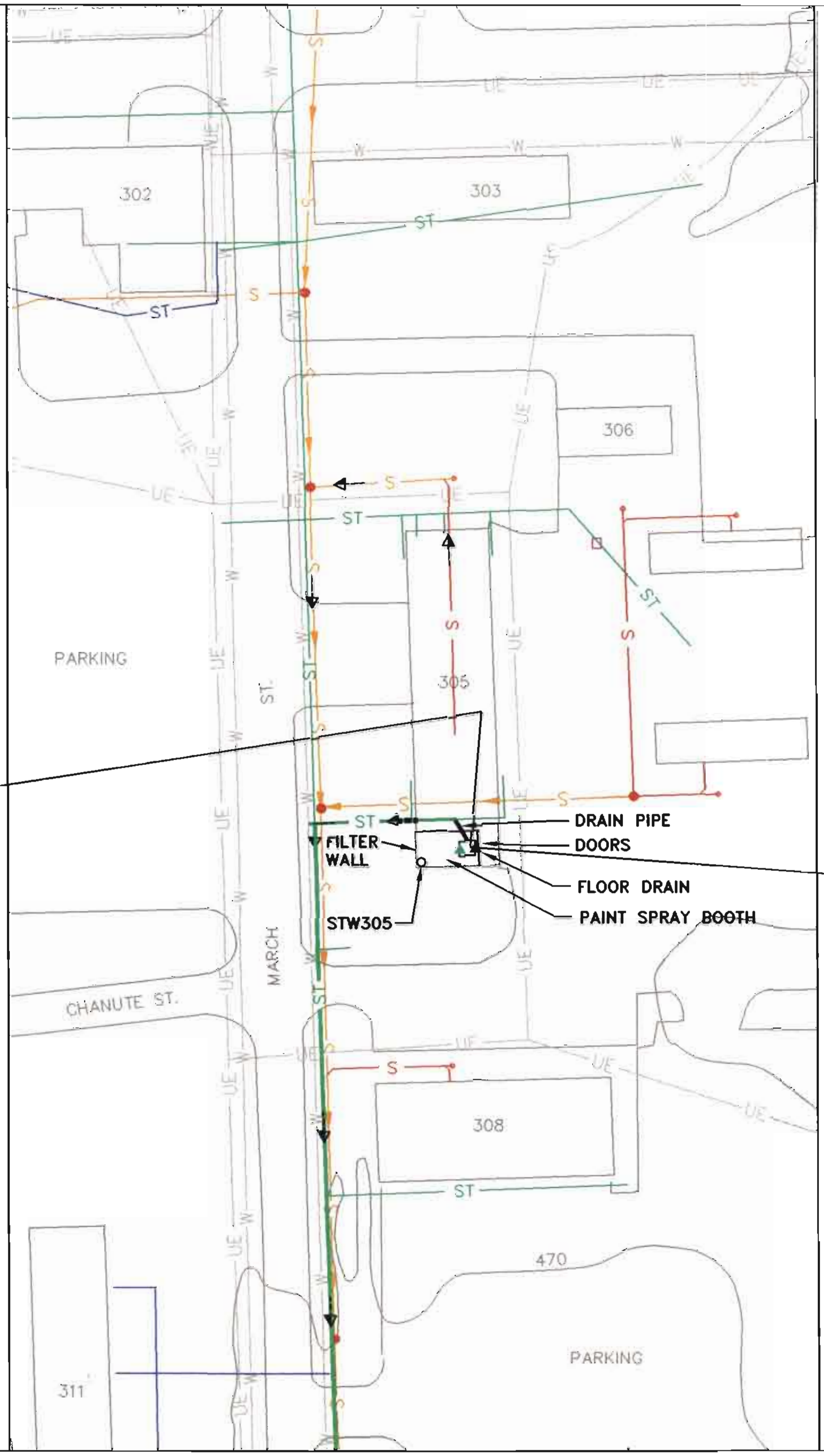
Key:

ASC = E & E's Analytical Services Center
N = Original
OTH = Other Miscellaneous Environmental Factor sites
PCB = polychlorinated biphenyls
SS = Subsurface soil sample
SVOCs = semivolatile organic compounds

TAL = Target Analyte List
TBD = to be determined
TCL = Target Compound List
TCLP = Toxicity Characteristic Leaching Procedure
VOCs = volatile organic compound
WG = water grab sample

OTH305–WG01	
ORGANICS (µg/L)	
Ethylbenzene	149
m,p–Xylene	492
Bis(2–ethylhexyl)phthalate	33.8
Butylbenzylphthalate	181
Aroclor 1254 (Total PCBs)	3.07
INORGANICS (µg/L)	
Aluminum	1420
Antimony	17.0J
Barium	3050
Cadmium	9.38J
Chromium	220J
Iron	10400J
Lead	822J
Manganese	225
Sodium	48700
Zinc	3130

OTH305–WG01/D	
ORGANICS (µg/L)	
Ethylbenzene	159
m,p–Xylene	448
Bis(2–ethylhexyl)phthalate	56.2
Butylbenzylphthalate	134
Aroclor 1254 (Total PCBs)	3.44
INORGANICS (µg/L)	
Aluminum	828
(Al exceeded federal MCL only)	
Antimony	9.62J
Barium	2000
Cadmium	5.14J
Chromium	123J
Iron	5320J
Lead	449J
Manganese	146
(Mn exceeded federal MCL only)	
Sodium	48200
Zinc	1660J



OTH305–SD01	
ORGANICS (µg/kg)	
Ethylbenzene	489000
m,p–Xylene	1590000
Xylenes, Total	1610000
Bis(2–ethylhexyl)phthalate	173000J
Butylbenzylphthalate	383000J
Di–n–butylphthalate	116000J
Di–n–octylphthalate	64800J
Naphthalene	18500J
Dieldrin	226J
PCBs (mg/kg)	
Aroclor 1242	4.88
Aroclor 1254	10.6
Total PCBs	15.48
INORGANICS (mg/kg)	
Antimony	80.8
Barium	12000
Cadmium	65.7
Calcium	28900
Chromium	1440
Cobalt	165
Copper	586
Iron	56700
Lead	4910
Mercury	1.52J
Nickel	105
Selenium	7.89J
Sodium	263
Zinc	14500J

OTH305–SD01/D	
ORGANICS (µg/kg)	
Ethylbenzene	505000
m,p–Xylene	1670000
Xylenes, Total	1690000
Heptachlor epoxide	133J
Butylbenzylphthalate	82900J
Di–n–butylphthalate	23400J
Chrysene	202J
Dieldrin	501J
PCBs (mg/kg)	
Aroclor 1242	8.84
Aroclor 1254	18.9
Total PCBs	27.74
INORGANICS (mg/kg)	
Antimony	57.6
Barium	15100
Cadmium	51.2
Calcium	23700
Chromium	1020
Cobalt	143
Copper	532
Iron	58000
Lead	3080
Mercury	1.43J
Nickel	91.2
Selenium	6.86J
Zinc	10800J

LEGEND

▲	YEAR 2000 ESI GRAB WATER AND SEDIMENT SAMPLE LOCATION
▲	YEAR 2002 ESI PROPOSED SUBSURFACE SOIL SAMPLE LOCATION
—S—	SANITARY SEWER 1942
—S—	SANITARY SEWER CURRENT
—ST—	STORMWATER SEWER 1942
—ST—	STORMWATER SEWER 1968
—ST—	STORMWATER SEWER 1973
○	SATELLITE WASTE ACCUMULATION POINT (STW)
◀— — —	DIRECTION OF DRAIN FLOW
▨	EXCEEDS RISK BASED SCREENING CRITERIA
3.07	VALUE ALSO EXCEEDS FEDERAL MCL
Al	Aluminum
OTH	OTHER MISCELLANEOUS SITES
J	ESTIMATED VALUE
MCL	MAXIMUM CONTAMINANT LEVEL
Mn	Manganese
NYSDEC	NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

NOTES:
1. ONLY ANALYTICAL DATA FROM THE YEAR 2000 ESI INVESTIGATION THAT EXCEEDED SCREENING CRITERIA ARE SHOWN.
2. ALL DATA EXCEEDED NYSDEC CRITERIA UNLESS OTHERWISE NOTED.

N

SCALE IN FEET

0 100 200 300

Figure 3–1 2002 ESI ADDENDUM SAMPLING LOCATIONS AND YEAR 2002 ESI SAMPLE RESULTS BUILDING 305 PAINT SPRAY BOOTH (OTH–305)

3.2 PCI Site 20

The objective of this work is to determine if lead contamination detected in the near-surface soil at this site is still present following the removal of surface debris and near-surface soil during the Year 2000 ESI program.

3.2.1 Site Background

Panamerican Consultants, Inc. (PCI) Site 20 is located on a wooded bank of the Mohawk River on the western edge of a present-day golf course. According to PCI's archival search, this site is not depicted on any historical map (PCI 1997).

PCI conducted Phase I and Phase II archaeological investigations of the site in 1994 and 1995, respectively. Excavations performed by PCI during the Phase I and Phase II archaeological investigations did not reveal any hazardous or potentially hazardous materials. Artifacts recovered during the Phase I archaeological investigation originated predominately from the post-World War II era. Other materials present during the Phase I investigation may be from an industrial community, including canning factories, dating from the late 19th century to the 1940s. The PCI Phase II investigation consisted of shovel tests and collection of artifacts. The artifacts recovered during the Phase II investigation included glass, ceramic, metal, rubber, plastic, leather, bone, shell, and coal. In addition to the artifacts recovered, a mound of modern asphalt rubble was observed on site during the archaeological investigations. PCI Site 20 was not recommended for eligibility on the National Register of Historic Places (PCI 1997).

E & E inspected the site on May 27, 1999 and confirmed the presence of a small amount of surface debris and a mound of asphalt rubble. No evidence of a release to the environment was observed.

3.2.2 Physical Characteristics

PCI identified the site as a modern, or possibly recent, historic dump with no significant or intact historic deposits. The approximate dimensions of the site are 49 feet by 97 feet, and small debris particles were observed to extend to an approximate depth of 3 to 6 inches below ground surface (BGS). Erosion, additional dumping, and possible earth-moving activities have disturbed the site.

3.2.3 Previous Investigations

PCI conducted Phase I and Phase II archaeological investigations of the site in 1994 and 1995, respectively. E & E inspected the site on May 27, 1999.

In spring 2000, E & E investigated PCI Site 20 as part of the Year 2000 ESI program. A geophysical survey, near-surface soil sampling, and debris removal were performed.

The geophysical survey performed at the site using an EM31 ground conductivity meter and magnetometer indicated no buried metallic materials or geophysical anomalies.

Five near-surface soil samples were collected prior to debris removal. All near-surface soil samples were analyzed for TCL VOCs and SVOCs, TCL pesticides/PCBs, TAL metals, and percent solids (see Figure 3-2).

Four polynuclear aromatic hydrocarbons (PAHs) were detected at concentrations above NYSDEC screening criteria. No SVOCs were detected above USEPA risk-based concentrations (RBCs).

Aroclor 1260 and nine pesticides were detected in the near-surface soil samples at concentrations below NYSDEC screening criteria and USEPA RBCs.

The arsenic concentration in one sample exceeded only USEPA RBCs, concentrations of 13 metals exceeded only NYSDEC criteria, and lead concentrations in two samples exceeded both. Most metals were detected at concentrations slightly above the screening levels.

Since the samples were collected prior to debris removal at locations with the most debris accumulation, the isolated presence of metals was considered to be associated with the surface debris at the two sampling locations. Based on the potential future use of this site and the elevated levels of lead detected in near-surface soil samples NS03 and NS04, further sampling was recommended in the Final Year 2000 ESI Report (E & E 2002).

3.2.4 2002 ESI Addendum Sampling

To determine if lead detected prior to debris removal in the near-surface soil is still present, three additional near-surface soil samples will be collected (see Figure 3-2). The 2002 ESI Addendum near-surface soil samples (0 to 2 inches BGS) will be collected from the 2000 ESI sample locations (NS02, NS03, and NS04), which contained the highest levels of lead. The 2002 samples will be analyzed for lead content to determine if the debris removal conducted during the Year 2000 ESI program has sufficiently addressed the elevated lead levels.

The proposed 2002 ESI Addendum sampling locations for PCI Site 20 are provided on Figure 3-2. A list of sample identifications and analyses is presented on Table 3-2.

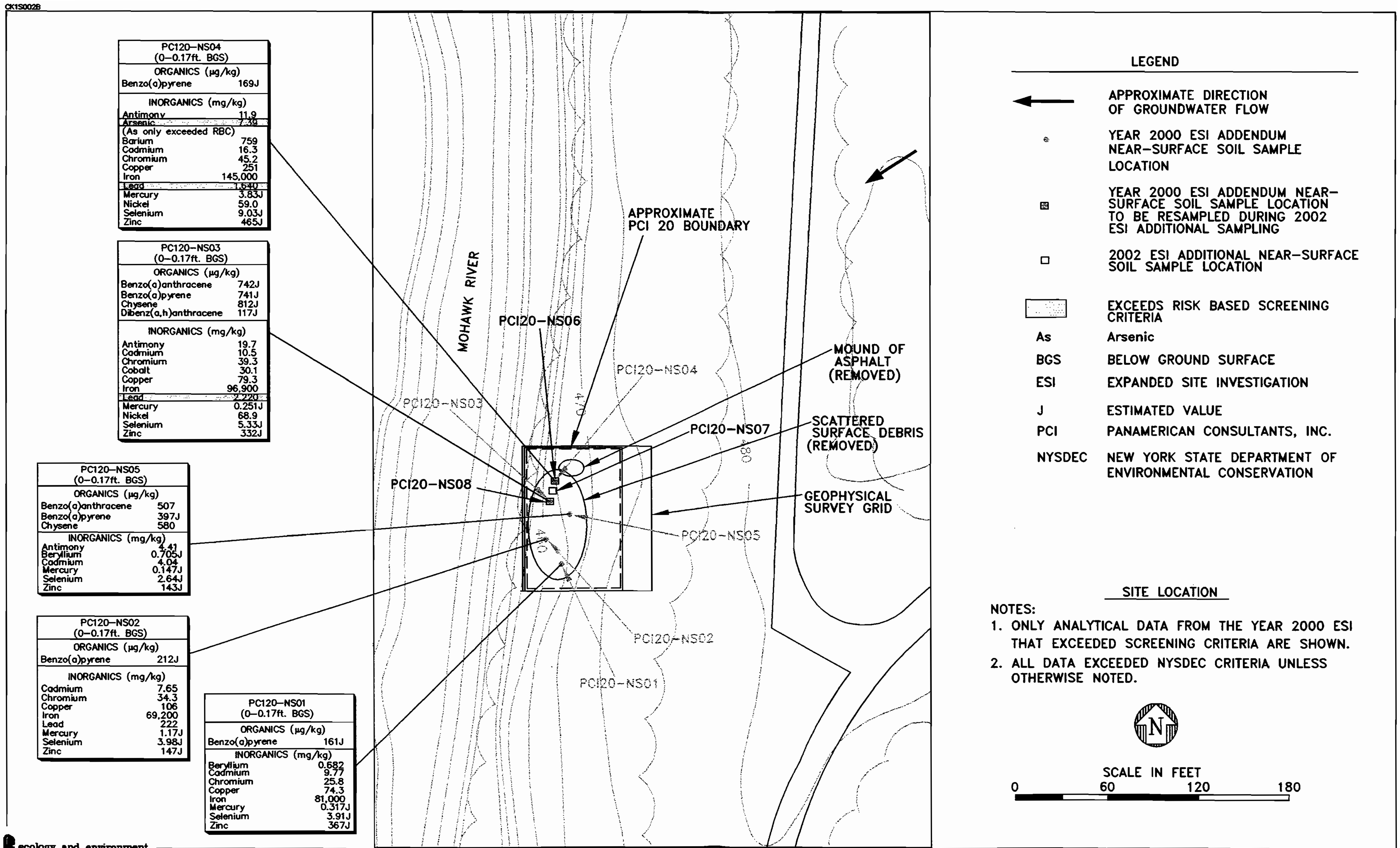
TABLE 3-2
PCI 20 ADDITIONAL SAMPLING
SAMPLE LISTING
FORMER GRIFFISS AIR FORCE BASE

							ANALYSES	
Location	Date	Sample Number	Lab	Matrix	Depth (feet)	Type	Lead Only SW6010B	% Solids ASTM_D2216
PCI-20	TBD	PCI20-NS06	ASC	Near-surface Soil	0.00-0.17	N1	X	X
	TBD	PCI20-NS06/D	ASC	Near-surface Soil	0.00-0.17	FD1	X	X
	TBD	PCI20-NS06/S	ERDC	Near-surface Soil	0.00-0.17	FR1	X	X
	TBD	PCI20-NS07	ASC	Near-surface Soil	0.00-0.17	N1	X	X
	TBD	PCI20-NS08	ASC	Near-surface Soil	0.00-0.17	N1	X	X
	TBD	PCI20-NS08 (extra volume)	ASC	Near-surface Soil (MS/MSD	0.00-0.17	MS1	X	X

Key:

ASC = E & E's Analytical Services Center
/D = duplicate
Depth = Depth interval at which sample was collected
ERDC = U.S. Army Engineer Research and Development Center Quality Assurance
FD = field duplicate
FR = field split/replicate

MS/MSD = matrix spike/matrix spike duplicate
N = Original
NS = near-surface soil sample
/S = split
TBD = to be determined
TCL = Target Compound List



LEGEND

←	APPROXIMATE DIRECTION OF GROUNDWATER FLOW
•	YEAR 2000 ESI ADDENDUM NEAR-SURFACE SOIL SAMPLE LOCATION
▨	YEAR 2000 ESI ADDENDUM NEAR-SURFACE SOIL SAMPLE LOCATION TO BE RESAMPLED DURING 2002 ESI ADDITIONAL SAMPLING
□	2002 ESI ADDITIONAL NEAR-SURFACE SOIL SAMPLE LOCATION
▒	EXCEEDS RISK BASED SCREENING CRITERIA
As	Arsenic
BGS	BELOW GROUND SURFACE
ESI	EXPANDED SITE INVESTIGATION
J	ESTIMATED VALUE
PCI	PANAMERICAN CONSULTANTS, INC.
NYSDEC	NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

NOTES:

1. ONLY ANALYTICAL DATA FROM THE YEAR 2000 ESI THAT EXCEEDED SCREENING CRITERIA ARE SHOWN.
2. ALL DATA EXCEEDED NYSDEC CRITERIA UNLESS OTHERWISE NOTED.

FIGURE 3–2 PCI SITE 20
YEAR 2000 ESI RESULTS AND PROPOSED
2002 ESI ADDITIONAL SAMPLE LOCATIONS

3.3 Building 211-Pipe Vault Floor

The objective of this work is to encapsulate residual mercury contamination present on the floor of the pipe vault beneath Building 211 (OTH-211, DRY-211).

3.3.1 Site Background

A large manifolding pressure-control gauge in Building 211 broke in 1991 resulting in a mercury spill in the building. Some of the mercury was collected from the floor by one of the shop workers; however, it is unknown whether a proper mercury spill cleanup was conducted at that time. Building 211 is currently used as a drinking water chlorination facility. No mercury-containing equipment is currently used in this building.

In 1997, during the Expanded Site Investigation (ESI) and Confirmatory Sampling of Areas of Interest and Drywell/Wastewater-Related Systems program (see E & E July 1998), swipe samples collected on the floor near the drains and the pipe vault grate were found to contain low levels of mercury. In addition, a grab water sample taken from within the concrete pipe vault contained low levels of mercury. Based on these results, NYSDEC and the USEPA concurred with the recommendation made in the Draft ESI Report (E & E 1998) to clean up the residual mercury contamination at Building 211.

In response to the recommendation made in the Draft ESI Report, an Interim Removal Action (IRA) was performed by OHM Remediation Services Corp. (OHM) in 2000. However, upon completion of the IRA, residual mercury contamination above the action level remained on the pipe vault floor.

3.3.2 Physical Characteristics

Building 211 is located near the intersection of Hangar Road and March Street (see Figure 1-2) in the west-central portion of the base. There is a concrete pipe vault to service the main water pipe below the floor inside Building 211. The pipe vault for the water main consists of a 9-foot deep, 4-foot wide, and 11-foot long concrete vault beneath the center of Building 211 covered with a 2-foot square steel grate. There was approximately 2.5 feet of standing water inside this vault during a site inspection performed by E & E on November 27, 2001.

The subsurface log for temporary well D211-SS01 drilled at this site in 1997 during the ESI and Confirmatory Sampling of Areas of Interest and Drywell/Wastewater-related Systems Investigation (E & E July 1998) indicates that the subsurface soils consist predominantly of sand and gravel with some silt and clay. Saturated soils were encountered at a depth of 14 feet BGS during drilling, and groundwater was measured at 16.44 feet BGS at the time of sampling.

3.3.3 Previous Investigations

This site was investigated in 1997 under the Expanded Site Investigation and Confirmatory Sampling of Areas of Interest and Drywell/Wastewater-Related Systems program, primarily because of a mercury spill from a manometer, which occurred in 1991. A geophysical survey using ground-penetrating Radar (GPR) and drain tracing were performed in an attempt to locate the drywell (DRY-211) next to Building 211. The drywell was not located by using either method. The investigation inside Building 211 consisted of obtaining a total of three swipe samples from the two floor drains and the grate covering the pipe vault and one grab water sample from inside the water main pipe vault. The investigation outside Building 211 consisted of drilling and installing one temporary well (D211-SS01) at the suspected drywell location on the east side of the building and collecting one subsurface soil sample from 2 to 4 feet BGS, one subsurface soil sample from 8 to 12 feet BGS (groundwater interface), and one groundwater sample from the temporary well. The borehole was drilled to a depth of 22 feet BGS, and the temporary well was installed in the borehole with a 10-foot screened interval. Saturated soils were encountered at a depth of 14 feet BGS during drilling, and groundwater was measured at 16.44 feet BGS in temporary well D211-SS01 at the time of sampling.

The results of the GPR survey did not indicate the presence of a drywell at this site. The soil and groundwater samples collected at the approximate location of the drywell did not contain mercury or other contaminants of concern at levels above the screening criteria. Mercury was detected at 0.84 μg/L in the unfiltered groundwater sample collected from the temporary well. This concentration is below the NYSDEC criterion, the maximum contaminant level (MCL), and the RBC for mercury. The filtered and unfiltered grab water samples collected from the pipe vault beneath Building 211 contained mercury at concentrations of 3.6 and 2.7 μg/L, respectively. Three of the four swipe samples collected from the area around the two floor drains and pipe vault grate also contained mercury at concentrations ranging from 0.93 to 3.7 μg/wipe (E & E July

1998). Based on these results, NYSDEC and the USEPA concurred with the recommendation made in the Draft ESI Report to clean up the residual mercury contamination at Building 211.

In response to the recommendation made in the Draft ESI Report, an Interim Removal Action (IRA) was performed at Building 211 by OHM Remediation Services Corp. (OHM) between July 10 and August 23, 2000. IRA objectives for this site were established by the Air Force Base Conversion Agency (AFBCA) in conjunction with NYSDEC and USEPA.

The building floor and the floor of the pipe vault located under Building 211 were decontaminated for mercury twice by OHM. Several small beads of free mercury were discovered during the cleaning of the pipe vault. The results of confirmation wipe samples indicated that the site-specific action level for mercury in wipes was achieved for the floor of the building but that residual mercury contamination above the action level remained on the pipe vault floor. Since the pipe vault floor has been decontaminated twice and the likelihood of human exposure is low due to the remote location of the contaminated surface, no further cleaning was recommended by OHM. An alternative recommendation made by OHM was to encapsulate the residual mercury contamination by painting the pipe vault floor (OHM 2000).

3.3.4 2002 ESI Addendum Remedial Actions

The objectives of this 2002 ESI Addendum are to remove and properly dispose of the standing water within the pipe vault and encapsulate the residual mercury contamination present on the pipe vault floor. Prior to removal, the water within the vault will be sampled and analyzed for TAL metals for disposal purposes. Based on the results of the analyses it is anticipated that the water will be pumped to the sanitary sewer adjacent to Building 211 with the approval of the City of Rome Water Pollution Control Facility. Upon removal of the water, a layer of concrete between 3 and 6 inches thick will be pumped into the bottom of the vault to prevent contact with the residual mercury contamination present on the existing concrete floor.

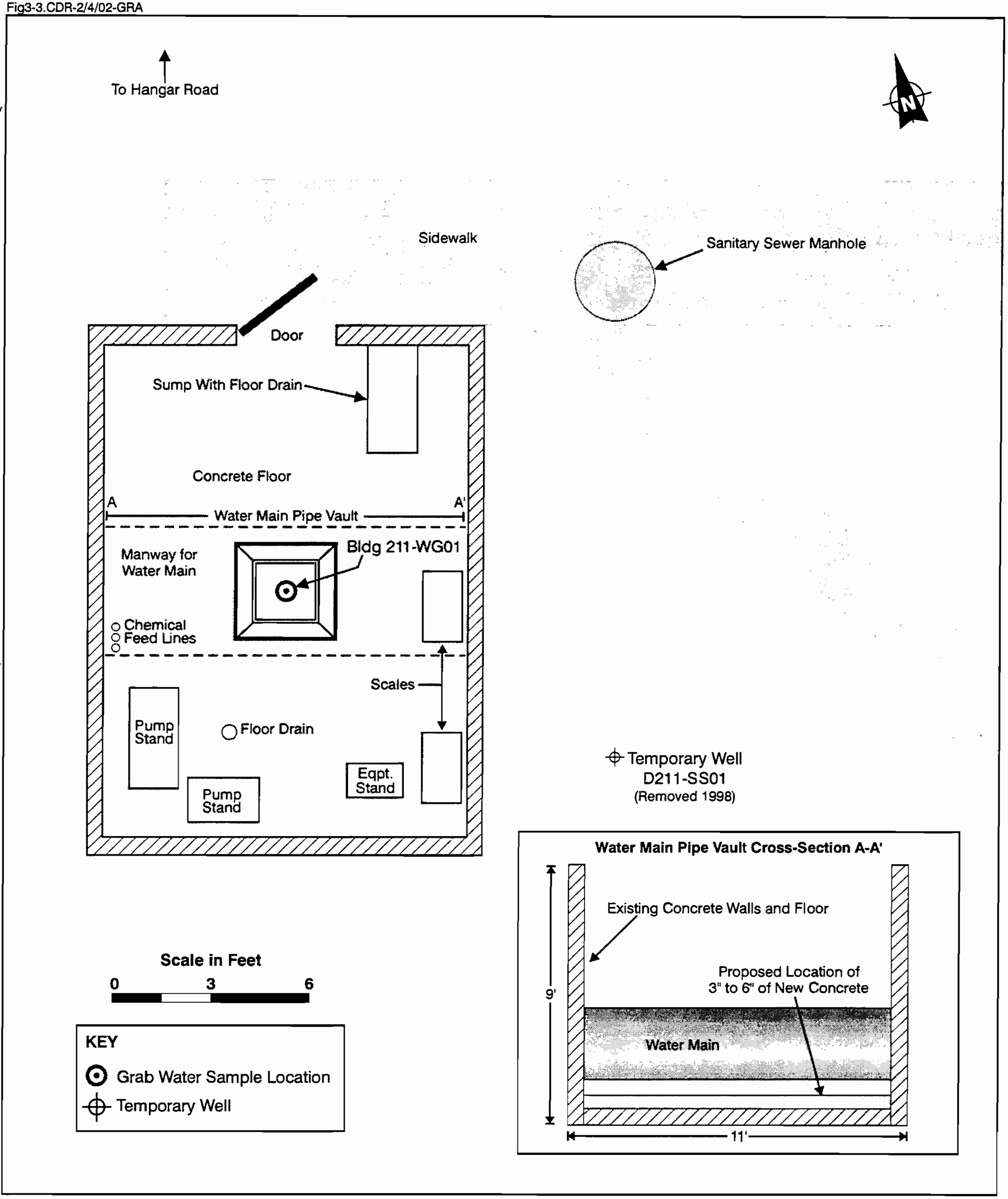
The proposed 2002 ESI Addendum sampling locations for Building 211 are provided on Figure 3-3. A list of sample identifications and analyses is presented on Table 3-3.

TABLE 3-3
Building 211 PIPE VALUT FLOOR ADDITIONAL SAMPLING
SAMPLE LISTING
FORMER GRIFFISS AIR FORCE BASE

						ANALYSES
Location	Date	Sample Number	Lab	Matrix	Type	TAL Metals SW6010B/7470/71A
Bldg 211	TBD	Bldg211-WG01	ASC	Water Grab	N1	X

Key:

ASC = E & E's Analytical Services Center
N = Original
TAL = Target Analyte List
TBD = To be determined
WG = grab water sample



SOURCE: Ecology and Environment, Inc., 2002

Figure 3-3 BUILDING 211 EXPANDED SITE INVESTIGATION 2002
ADDITIONAL SAMPLING LOCATION
FORMER GRIFFISS AIR FORCE BASE, ROME, NEW YORK

3.4 AOI 473 - Building 112 Room 10

A former base employee stated that a basement room, which has since had a false floor put over it, previously contained a large oil tank. The former employee stated there were two 150-gallon tanks outside the room and a large tank inside the room and that the pipes/fittings often leaked and soaked the entire floor of the room with oil. The objective of this work is to determine if petroleum hydrocarbons, potentially containing PCBs, have been spilled in AOI 473-Building 112 Room 10.

3.4.1 Site Background

Building 112, formerly a High Power Laboratory, is located in the central industrialized area of Griffiss AFB. Two aboveground storage tanks (ASTs) and one underground storage tank (UST) were located near the northeast corner of Building 112 before they were removed prior to 1994. The loading dock area was used for the storage of PCB containers, which resulted in PCB soil contamination. A PCB Dump Area south of Building 112, comprising a 16-foot by 44-foot fenced-in gravel area, was used to store PCB transformers until they were removed in 1994.

In spring 1999, a former Griffiss AFB employee reported to AFBCA that he dumped transformer oil along the northern wall of the building and the northern section of the east and west walls. Oil reportedly was also dumped into a concrete pit (terra-cotta sump) in the northernmost cell of the basement floor. These areas were designated AOI 469 and investigated during the Year 2000 ESI program. No further study was recommended for AOI 469 in the Final Year 2000 ESI Report.

However, in winter 2002, the same former Griffiss AFB employee reported to AFBCA that the terra-cotta sump investigated during the Year 2000 ESI program was not the concrete pit he was referring to in the spring of 1999. The former employee stated that he was referring to a basement room, which has since had a false floor put over it. The former employee stated there were two 150-gallon tanks outside the room and a large tank inside the room and that the pipes/fittings often leaked and soaked the entire floor of the room with oil. This area has been designated AOI 473-Building 112 Room 10.

3.4.2 Physical Characteristics

Building 112 is located in the central industrial area of the base. The site is generally flat, with less than 5 feet of topographic relief across the site. The area surrounding Building 112 is grassed to the east and predominantly paved to the west. A substation is present on the south side of the building.

Building 112 is not located near any major surface water drainage features. Runoff from the site is channeled to the base stormwater drainage system, which drains into Six Mile Creek, which, in turn, ultimately drains to the New York State Barge Canal approximately 1.5 miles south of the base.

Based on field descriptions of soils encountered in 74 borings drilled during a remedial investigation (RI) (Law 1995) and 11 borings drilled during the Year 2000 ESI, the upper 10 feet of soil at Building 112 consists of predominantly brown, silty, fine to coarse sand and gravel. Soils encountered from 10 to 20 feet BGS consisted predominantly of brown, silty, fine to coarse sand.

The groundwater zone investigated at Building 112 exists under unconfined conditions within an unconsolidated aquifer. The saturated zone in the vicinity of Building 112 was encountered at depths ranging from 4 feet BGS in well TF3MW-1 east of Building 112 to 16 feet BGS in boring 112SB-57 south of Building 112.

3.4.3 Previous Investigations

Four areas were investigated at Building 112 prior to the Year 2000 ESI: a drywell located east of Building 112; the southwest roof of the building; the area around the loading dock located to the southwest; and the PCB dump site located south of the building.

In 1981, Griffiss AFB bioenvironmental engineers sampled site soils to determine whether PCBs were present. In 1982, soils were collected from areas next to the building and were analyzed for PCBs. PCBs were detected on the west and south sides of Building 112 and on a transformer pad on the roof. A limited groundwater investigation in the vicinity of Building 112 also identified the presence of inorganic compounds in groundwater. In 1984, a leaking transformer on the roof of Building 112 and contaminated roof materials were removed. In 1994 and early 1995, in accordance with a Federal Facility Agreement, Law Environmental Services performed a remedial investigation for the

Building 112 Area of Concern (AOC) (Law 1996). The RI for the Building 112 AOC included collection of surface soil samples, subsurface soil samples, and a grab water sample and preparation of a baseline risk assessment. Based on the results of the baseline risk assessment, no further action was recommended at the drywell location. In 1996, E & E prepared a design analysis report to address remediation of contaminants at the Building 112 AOC (E & E 1997). A drywell investigation for Building 112 was conducted by OHM Remediation Services Corp. in January 1997 (OHM 1998). Two presumed drywells were investigated. Drywell No. 1 was recommended for closure. Based on a smoke trace test, it was concluded that there was no second drywell; therefore, no further study was recommended for what was initially identified as Drywell No. 2.

In 1999, a removal action was performed to remove PCB-contaminated materials at the Building 112 AOC. The action included removal of a contaminated transformer pad from the roof, contaminated soil and a concrete retaining wall from the south side of the building, and contaminated soils from the southwest side of the building.

Extensive sampling for PCBs was performed at the south side of the building (dump area). However, prior to the Year 2000 ESI there was no sampling performed at the north side, except for a three-point composite sample collected from Drywell No. 1.

During a site visit in May 1999, E & E inspected Building 112 both inside and outside. A terra-cotta sump approximately 2 feet deep and 2 feet in diameter was discovered beneath the tile floor in the northwest corner of the basement beneath the stairway access. The terra-cotta sump had a concrete bottom. Both the sump and the concrete appeared clean and intact. Therefore sampling was not warranted in the area of the sump. There were no signs of stressed vegetation outside of the building.

In spring 2000, E & E investigated the north side of Building 112, where the waste oil was reportedly spilled (AOI 469), as part of the Year 2000 ESI program.

A sampling grid with 25-foot spacing, covering the area where PCBs were allegedly dumped, was used to collect 22 near-surface soil samples (0 to 2 inches BGS) (see Figure 3-4a). All the samples were analyzed for TCL SVOCs, TCL PCBs, total recoverable petroleum hydrocarbons (TRPH), TAL metals, and percent solids. Also, based on the analytical results of the 22 near-surface soil samples, additional sampling of soil borings at 11 locations with elevated PCB concentrations was completed. At nine of these borings, an intermediate depth soil sample (approximately 5 to 7 feet BGS) and a deeper soil sample (immediately above the water table [approximately 10 to 14 foot BGS]) were collected. Soil boring G469-NS19 was located due east of AOI 473-Building 112 Room 10, approximately 6 feet from the eastern exterior wall of Building 112 (See Fig. 3-4b). PCBs were detected at very low levels (0.0160J mg/kg) in the soil sample collected from immediately above the water table (12 to 13 feet BGS) and were not detected in the soil sample collected from 6 to 7 feet BGS. TRPH was not detected in either soil sample collected from boring G469-NS19. Soil samples were collected continuously from ground surface to the water table at the remaining two borings (G469-NS01 and G469-NS20). All deeper soil samples were analyzed for the same parameters as specified previously for the near-surface soil samples. The primary contaminants detected at AOI 469 are PCBs and lead.

Three PCBs were detected in the 22 near-surface soil samples collected, including Aroclor 1242, Aroclor 1254, and Aroclor 1260. Concentrations of Aroclor 1242 ranged from non-detected to 0.495 mg/kg in NS01. Concentrations of Aroclor 1254 ranged from non-detected to 1.04 mg/kg in NS01. Concentrations of Aroclor 1260 ranged from 0.0206 mg/kg to 7.12 mg/kg in NS20. None of the concentrations of Aroclor 1242 detected exceeded either NYSDEC or EPA RBC criteria values. Concentrations of Aroclor 1254 only marginally exceeded the NYSDEC criterion (1 mg/kg) in NS01 (1.02 mg/kg) and NS01/D (1.04 mg/kg). Concentrations of Aroclor 1260 exceeded the NYSDEC and EPA RBC criteria value only in NS20 (7.12 mg/kg).

Thirty-one subsurface soil samples were collected at AOI 469 from the 11 soil borings installed. Two PCBs were detected in the subsurface soil samples, including Aroclor 1254 and Aroclor 1260 (see Figure 3-4a). Concentrations of Aroclor 1254 ranged from non-detected to 0.684 mg/kg in SS01-Z1. Concentrations of Aroclor 1260 ranged from non-detected to 12.40 mg/kg in SS20-Z1.

Concentrations of Aroclor 1260 exceeded screening criteria values in only two shallow subsurface soil samples, which were collected from soil boring G469-NS20. The concentration of Aroclor 1260 detected in SS20-Z1 (12.40 mg/kg) exceeded both NYSDEC and EPA RBC criterion value. The concentration of Aroclor 1260 in SS20-Z2 (3.88 mg/kg) exceeded EPA RBC criterion value but not the NYSDEC value. No other PCBs were detected in the subsurface soil samples above NYSDEC or EPA RBC screening criteria values.

Concentrations of lead ranged from 8.29 mg/kg in NS09 to 1,880 mg/kg in NS10 and exceeded both the NYSDEC and EPA RBC criteria values in NS10, NS14, NS16, and NS21. No other metals exceeded EPA RBCs. An Assessment of Adult Exposure to Lead in Soil was performed due to the levels of lead detected in the near-surface soil. The assessment indicated that the levels of lead present are unlikely to pose any significant health risk to future industrial/commercial workers.

During a site visit in February 2002, E & E inspected AOI 473-Building 112 Room 10. Room 10 currently has a false floor over it (half-inch thick steel plate) and can be accessed through a 3-foot-square opening in the false floor, which is situated above a metal ladder. A sump is located near the northeast corner of the room. The sump pump has been removed from the sump and is presently located on the concrete floor next to the sump. The floor and walls of the room were observed to be clean and in good condition. No significant signs of spilled oil were observed on the floor or walls of the room.

During a site visit in March 2002, E & E inspected AOI 473-Building 112 Room 10 a second time in an attempt to determine the discharge point of the sump pump observed during the previous inspection. The sump pump discharge line appeared to consist of a flexible hose, which currently is coiled on the floor and extends up to the northwest ceiling of the room and then out of sight. The discharge point of the hose could not be determined during the site inspection without entering Room 10. E & E personnel also reviewed the existing Building 112 drawings in an attempt to determine the discharge point of the sump pump, but were unable to find a drawing showing the sump pump discharge line.

3.4.4 2002 ESI Addendum Sampling

The objective of this work is to determine if petroleum hydrocarbons, potentially containing PCBs, have been spilled in AOI 473-Building 112 Room 10. Collection of samples from the sump and the floor of Room 10 are planned (see Figure 3-4b). Sampling of the sump will include collection of a sediment sample if sediment is present in the sump and collection of a swipe sample. Nine additional swipe samples will be collected from the floor of Room 10. The floor swipe samples will be evenly spaced in a grid pattern as shown on Figure 3-4b. The sediment sample and 10 swipe samples will be analyzed for TCL SVOCs, PCBs, TRPH, and TAL metals. A list of sample identifications and analyses is presented on Table 3-4. In addition, the field crew will attempt to determine the discharge point of the sump pump upon entering Room 10.

Provisional 2002 ESI Addendum Sampling

In addition, up to four provisional subsurface soil samples may be collected from AOI 469-Room 10. If, upon closer inspection of Room 10, either the sump has an open bottom or cracks are observed in the floor, then soil samples will be collected from beneath the sump and/or cracks in the floor with a hand auger. If necessary, the concrete floor will first be cored and the soil samples collected from the first soil encountered. All subsurface soil samples collected will be analyzed for TCL SVOCs, PCBs, TRPH, and TAL metal with mercury.

The proposed 2002 ESI Addendum sampling locations for AOI 469-Room 10 are provided on Figure 3-4b. A list of sample identifications and analyses is presented on Table 3-4.

TABLE 3-4
ADDITIONAL SAMPLING
SAMPLE LISTING FOR BUILDING 112 AOI 469-Room 10
FORMER GRIFFISS AIR FORCE BASE

						ANALYSES				
Location	Date	Sample Number	Lab	Matrix	Type	TCL PCBs 8082	% Solids ASTM_D2216	TCL SVOC SW8270C	TRPH 418.1M	TAL Metals SW6010B/7471
AOI 469-Room 10	TBD	G473-Rm10-SD01	ASC	Sediment	N1	X	X	X	X	X
	TBD	G473-Rm10-SD01/D	ASC	Sediment	FD1	X	X	X	X	X
	TBD	G473-Rm10-SD01/S	ERDC	Sediment	FR1	X	X	X	X	X
	TBD	G473-Rm10-SD01 (extra volume	ASC	Sediment (MS/MSD)	MS1	X	X	X	X	X
	TBD	G473-Rm10-SP01	ASC	Swipe	N1	X		X	X	X
	TBD	G473-Rm10-SP01/D	ASC	Swipe	FD1	X		X	X	X
	TBD	G473-Rm10-SP01/S	ERDC	Swipe	FR1	X		X	X	X
	TBD	G473-Rm10-SP02	ASC	Swipe	N1	X		X	X	X
	TBD	G473-Rm10-SP02 (extra volume	ASC	Swipe (MS/MSD)	MS1	X		X	X	X
	TBD	G473-Rm10-SP03	ASC	Swipe	N1	X		X	X	X
	TBD	G473-Rm10-SP04	ASC	Swipe	N1	X		X	X	X
	TBD	G473-Rm10-SP05	ASC	Swipe	N1	X		X	X	X
	TBD	G473-Rm10-SP06	ASC	Swipe	N1	X		X	X	X
	TBD	G473-Rm10-SP07	ASC	Swipe	N1	X		X	X	X
	TBD	G473-Rm10-SP08	ASC	Swipe	N1	X		X	X	X
	TBD	G473-Rm10-SP09	ASC	Swipe	MS1	X		X	X	X
	TBD	G473-Rm10-SP10	ASC	Swipe	N1	X		X	X	X
	TBD	FIELDQC-FB473-Rm10-SP1	ASC	Swipe	FB1	X		X	X	X
	TBD	G473-Rm10-SS01	ASC	Subsurface soil	**N1	X	X	X	X	X
	TBD	G473-Rm10-SS01/D	ASC	Subsurface soil	**FD1	X	X	X	X	X
	TBD	G473-Rm10-SS01/S	ASC	Subsurface soil	**FR1	X	X	X	X	X
	TBD	G473-Rm10-SS01 (extra volume	ASC	Subsurface soil	**MS1	X	X	X	X	X
	TBD	G473-Rm10-SS02	ASC	Subsurface soil	**N1	X	X	X	X	X
	TBD	G473-Rm10-SS03	ASC	Subsurface soil	**N1	X	X	X	X	X
	TBD	G473-Rm10-SS04	ASC	Subsurface soil	**N1	X	X	X	X	X

TABLE 3-4
ADDITIONAL SAMPLING
SAMPLE LISTING FOR BUILDING 112 AOI 469-Room 10
FORMER GRIFFISS AIR FORCE BASE

						ANALYSES				
Location	Date	Sample Number	Lab	Matrix	Type	TCL PCBs 8082	% Solids ASTM_D2216	TCL SVOC SW8270C	TRPH 418.1M	TAL Metals SW6010B/7471
	TBD	FIELDQC-RB473-Rm10-SS1	ASC	Eqpt. Washwater	**RB1	X		X	X	X

Key:

AOI = Area of Interest.
ASC = E & E's Analytical Services Center.
Eqpt.= Equipment Washwater.
ERDC = U.S. Army Engineer Research and Developmer Center Quality Assurance Laboratory.
/D = Duplicate sample.
FB= Field blank sample.
FD = Field duplicate.
FR = Field split/replicate.
MS/MSD = Matrix spike/matrix spike duplicate.
N = Original.
NS = Near-surface soil sample.
PCB = Polychlorinated biphenyls.
QC = Quality control.
RB = Rinsate blank sample.
/S = Split sample.
SD = Sediment sample.
SP= Swipe sample.
Stat = Status (T = Taken, S = Skipped).
SVOC = Semivolatile organic compounds.
TAL = Target Analyte List.
TCL = Target Compound List.
**= Provisional samples collected only if cracks are observed in floor.

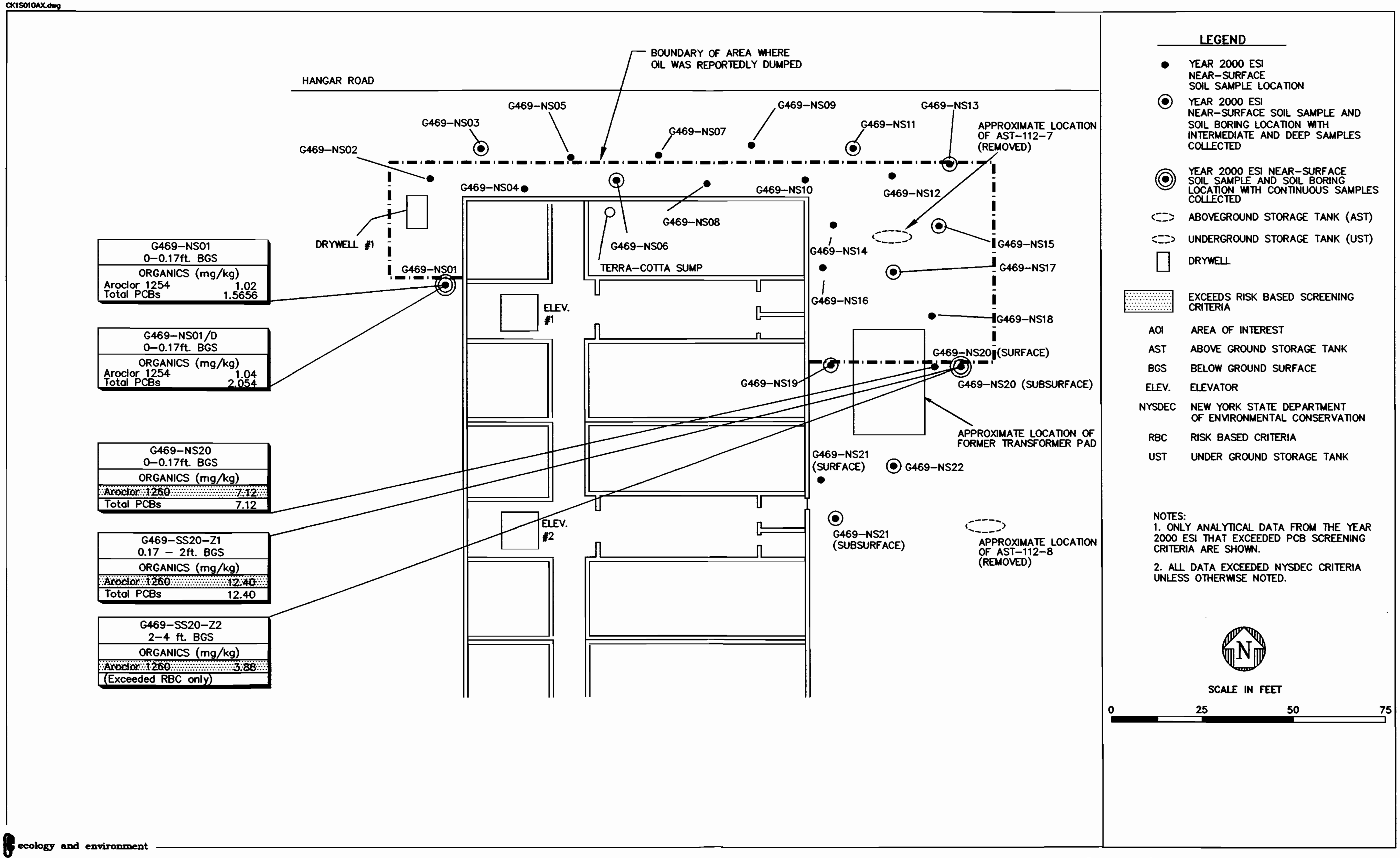


Figure 3-4a YEAR 2000 ESI RESULTS FOR PCBs SAMPLE LOCATIONS NORTH HALF OF BUILDING 112 (AOI 469)

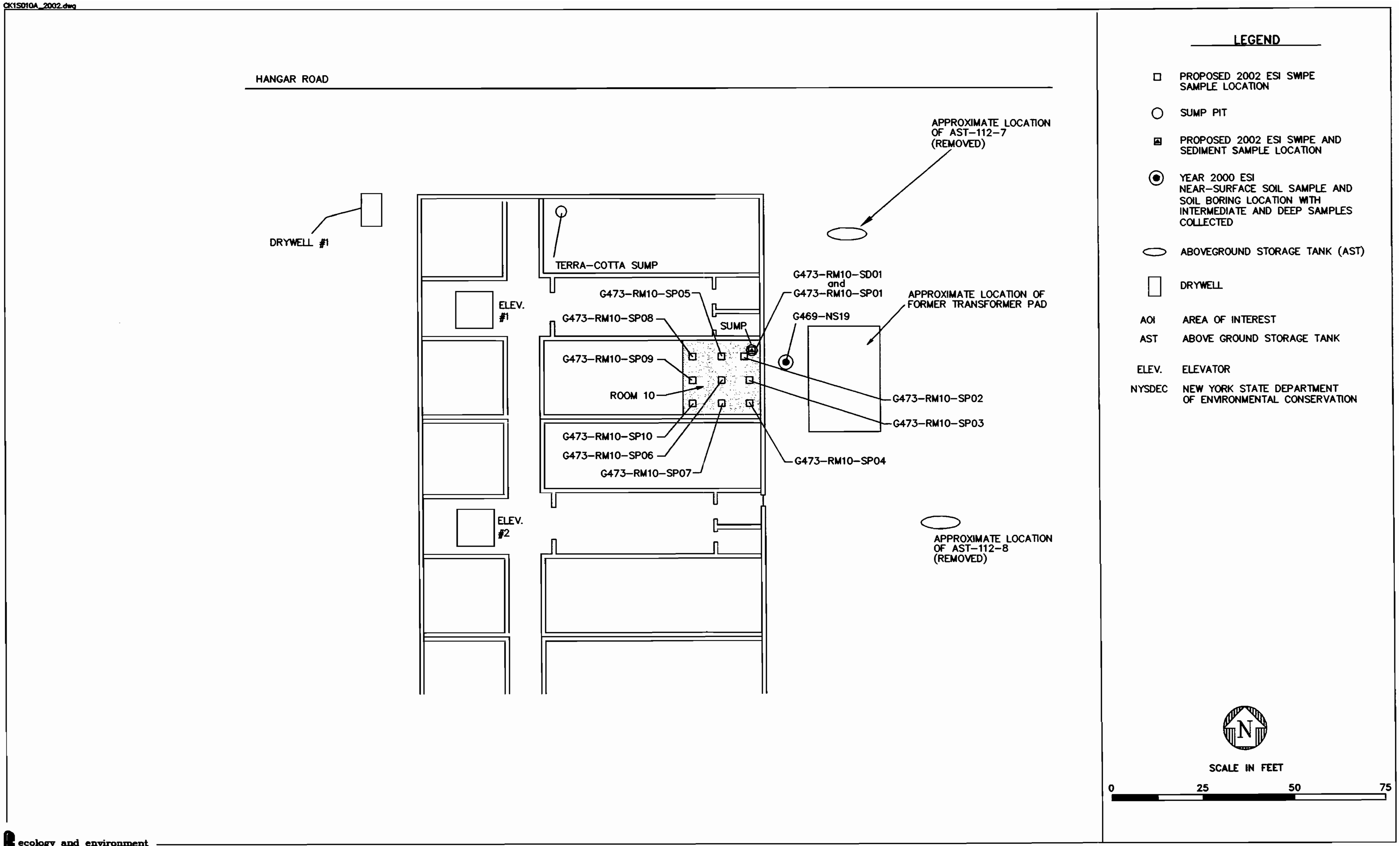


Figure 3-4b PROPOSED 2002 ESI SAMPLE LOCATIONS
AOI 473-BUILDING 112, ROOM 10

4 Field Sampling Plan, Part II: Field Methodology

4.1 Introduction

The fieldwork for this program will be performed in accordance with applicable sections of the FSP, HASP, and QAPjP Addendum for the ESI (E & E 2000) and the appropriate modifications and additions described in this addendum. This section of the 2002 ESI work plan addendum defers to all of the 2000 ESI Addendum FSP methodology sections except for modifications that are applicable to this program. These modifications include changes or additions to field methodologies that are specific to the objectives of this program.

4.2 Sample Tracking System

Sample tracking will be accomplished using Excel spreadsheets similar to those provided in this work plan addendum (e.g., sample listing tables). The sample listing tables will be updated and e-mailed to the laboratory project manager. The same general record keeping and reports will be generated as for the 2000 ESI Addendum, including the necessary electronic data deliverables (EDDs) required for the Environmental Restoration Program Information Management System (ERPIMS) deliverable.

4.3 Field Notebooks

No change to the 2000 ESI Addendum FSP.

4.4 Near-Surface Soil Sampling

Near-surface soil samples will be collected as described in the 2000 ESI Addendum FSP. Samples from the 0- to 2-inch depth interval will be collected by directly filling the appropriate sample containers using dedicated, precleaned, stainless steel spoons or trowels.

4.5 Grab Water Sampling

Grab water samples will be collected from containerized waste water at OTH-305 and from the pipe vault at Building 211 according to the surface water sampling methodology described in the 2000 ESI Addendum FSP with the following modification:

- The samples will be analyzed for the chemical parameters required for proper disposal presented in Section 3 of this addendum.

4.6 Sediment Sampling

A sediment sample will be collected from the bottom of the sump located in the northeast corner of AOI 473-Building 112 Room 10 according to the sediment sampling methodology described in the 2000 ESI Addendum FSP with the following modification:

- The sample will be analyzed for the chemical parameters presented in Section 3 of this addendum.

4.7 Sample Labeling, Packaging, and Custody

A summary of sample containers, amounts, preservation methods, and holding times is presented in Table 4-1 of this addendum.

4.7.1 Sample Labeling

Sample labeling will be performed in the following manner:

- All samples will be assigned a unique sample identifier consistent with previous sampling efforts at the sites being investigated and in accordance with ERPIMS requirements. Labels containing the sample identifier, date of sample collection, analytical parameters, and type of preservation used will be generated. The sampler will initial any change in the label information.

4.7.2 Sample Packaging

No change to the 2000 ESI Addendum FSP.

4.7.3 Sample Custody

No change to the 2000 ESI Addendum FSP.

4.8 Equipment Decontamination

No change to the 2000 ESI Addendum FSP.

4.9 Disposal of Investigation-derived Waste

Investigation-derived waste (IDW) will be handled as described in the 2000 ESI Addendum FSP with the following modifications:

- Grab water samples will be collected from containerized waste water at OTH-305 and from the pipe vault at Building 211 for disposal purposes.
- The samples will be tested for the chemical parameters required for proper disposal presented in Section 3 of this addendum.
- For costing purposes, the hauling and off-site disposal of two drums of contaminated water from OTH-305, and the discharge of 800 gallons of water within the Building 211 pipe vault to the sanitary sewer are included in this project.

4.10 Site Survey

No change to the 2000 ESI Addendum FSP.

4.11 Additional 2002 ESI Addendum Activities

4.11.1 OTH-305 Floor Drain Remediation

The water and remaining sediment within the Building 305 floor drain sump will be removed using a wet/dry shop vacuum. The sump will then be rinsed with potable water and the rinse water removed with the shop vacuum. All water and sediment removed from the floor drain sump will be containerized in 55-gallon drums for disposal.

Prior to filling the floor drain sump with concrete, the bottom of the sump will be drilled through and three subsurface soil samples will be collected from 0.0 to 0.5 foot, 0.5 to 1.0 foot, and 1.0 to 2.0 feet beneath the concrete bottom of the sump. The soil samples will be collected with a dedicated stainless steel spoon if possible, or if the thickness of concrete prevents the use of a spoon, a decontaminated hand auger will be used. The subsurface soil beneath the floor drain will be analyzed for TCL VOCs, SVOCs, pesticides, PCBs, TAL metals, mercury, and percent solids.

The analytical results from the subsurface soil sample collected from beneath the floor drain sump will then be discussed by the USEPA, NYSDEC, AFBCA, the U.S. Army Corps of Engineers (USACE), and E & E. Based on the discussion of the analytical results, either the discharge pipe inside the floor drain sump will be plugged and concrete placed in the floor drain sump up to the level of the existing floor of the paint spray booth, or further investigation/remeditation will be recommended.

4.11.2 Building 211 - Pipe Vault Floor Remediation

The pipe vault beneath Building 211 currently contains approximately 2.5 feet of standing water (approximately 800 gallons). Prior to performing the remedial action (encapsulating residual mercury contamination on the floor with 3 to 6 inches of concrete) at Building 211, the standing water will be sampled and analyzed for TAL metals and mercury. Permission to discharge the water within the vault into the sanitary sewer next to Building 211 will then be obtained from the City of Rome Water Pollution Control Facility. The water will then be pumped from the pipe vault directly into the sanitary sewer. Following removal of the water, 3 to 6 inches of self-leveling concrete will be pumped onto the floor of the pipe vault. Care will be taken not to cover any existing valves or other apparatus that may be found beneath the water in the vault with concrete.

4.11.3 AOI 473 - Building 112 Room 10 Swipe Sampling

Ten swipe samples will be collected from within AOI 473 - Building 112 Room 10. One swipe sample will be collected from within the sump in the northeast corner of Room 10 and nine additional swipe samples will be collected from the concrete floor. The floor swipe samples will be collected from a grid with evenly spaced sampling points as shown on Figure 3-4b. In addition to these samples, a duplicate, split, a matrix spike/matrix spike duplicate (MS/MSD), and a field blank sample will also be collected. Since true duplicate, split, and MS/MSD samples cannot be collected from the original swipe location, they will be collected from the area immediately next to the original sample location. The field blank will consist of three unused gauze pads moistened with hexane. Sampling equipment and procedures are described below.

Equipment and Supplies

- New sterile 1- to 2-inch-square gauze pads;
- Hexane;
- Acetone;
- Freon 113;
- HNO_3
- Precleaned stainless steel or teflon template: 10-cm by 10-cm square hole;
- Appropriate sample containers; and
- Cooler with ice.

Swipe Sampling Procedures

- Place precleaned template on area to be swiped;
- Moisten new gauze pad with appropriate solvent listed on Table 4-1 (do not saturate);
- Completely wipe area inside the template with the moistened gauze pad; and
- Immediately place the gauze pad in a sample container listed on Table 4-1, place the sample container in the sample cooler with ice, and maintain samples at 4°C.

4.11.4 AOI 473-Building 112 Room 10 Provisional Subsurface soil sampling

Up to four provisional subsurface soil samples may be collected from AOI 469-Room 10. If, upon closer inspection of Room 10, either the sump has an open bottom or cracks are observed in the floor, then soil samples will be collected from beneath the sump and/or cracks in the floor with a precleaned hand auger. If necessary, the concrete floor will be cored with an electric powered 4-inch-diameter diamond-tipped core barrel wet saw. The soil samples will be collected from the first soil zone encountered. Soil samples will then be collected as described in the 2000 ESI Addendum FSP.

Table 4-1 Summary of Sample Containers, Amounts, Preservation Methods, and Holding Times Griffiss Air Force Base

Method	Parameter	Sample Container^{a,b,c}	Amount	Preservation Method	Holding Time	
					Extraction	Analysis
Water Samples						
SW 8260B	TCL VOCs	Three 40-mL glass VOA vials with teflon septae	Full; no headspace	HCl to pH < 2 Cool to 4°C	—	7 days
SW 8270C	TCL SVOCs	Two 1-L amber glass bottles	Full	Cool to 4°C	5 days	40 days
SW 8081A	TCL Pesticides	One 1-L amber glass bottle	Full	Cool to 4°C	5 days	40 days
SW 8082	TCL PCBs	One 1-L amber glass bottle	Full	Cool to 4°C	5 days	40 days
EPA 418.1	TRPH	One 1-L amber glass bottle	Full	H_2SO_4 to pH < 2 Cool to 4°C	NA	26 days
SW 6010B	TAL Metals	One 1-L high-density polyethylene (HDPE) bottle	Full	HNO_3 to pH < 2 Cool to 4°C	6 months	6 months
SW 7470A	Mercury				26 days	26 days
Soils/Sediments						
SW 8260B	TCL VOCs	One 4-ounce, clear, wide-mouth VOA jar with teflon septae	Full; no headspace	Cool to 4°C	NA	7 days
SW 8270C SW 8081A SW 8082	TCL SVOCs TCL Pesticides TCL PCBs	One 8-ounce, clear, wide-mouth glass jar	Full	Cool to 4°C	5 days	40 days
ASTM D2216	Percent solids				—	—
SW 6010B	TAL Metals				6 months	6 months
SW 7470A	Mercury				26 days	26 days
EPA 418.1M	TRPH				NA	26 days
Swipes						
SW 8270C	TCL SVOCs	One 4-ounce, clear, wide-mouth glass jar	1 wipe	Acetone Cool to 4°C	5 days	40 days
SW 8082	TCL PCBs	One 4-ounce, clear, wide-mouth glass jar	1 wipe	Hexane Cool to 4°C	5 days	40 days
EPA 418.1M	TRPH	One 4-ounce, clear, wide-mouth glass jar	1 wipe	Freon 113 Cool to 4°C	NA	26 days
SW 6010B	TAL Metals	One 4-ounce, clear, wide-mouth glass jar	1 wipe	5% HNO_3 soln. Cool to 4°C	6 months	6 months

Table 4-1 Summary of Sample Containers, Amounts, Preservation Methods, and Holding Times Griffiss Air Force Base

Method	Parameter	Sample Container[a,b,c]	Amount	Preservation Method	Holding Time	
					Extraction	Analysis
SW 7470A	Mercury	One 4-ounce, clear, wide-mouth glass jar	1 wipe	5% HNO_3 solution Cool to 4°C	26 days	26 days
Wastewater						
SW 1311 ZHE	TCLP VOCs	Two 40-mL glass VOA vials with teflon septae	Full; no headspace	Cool to 4°C	7 days	See above
SW 1311	TCLP Organics and Metals	Two 1-L amber glass bottles	Full	Cool to 4°C	7 days	See above
SW1030/SW9045C	Ignitability and pH	One 1-L amber glass bottle	Full	Cool to 4°C		ASAP

Note: Holding times are from verified time of sample receipt as required by New York State Department of Environmental Conservation, Analytical Services Protocol (ASP). All soil samples must be analyzed for percent solids, and all sediment samples must be analyzed for TOC. These test samples can be collected from any soil container.

[a] All containers to have teflon-lined lids; VOA containers for waters to have teflon-lined septa.

[b] Samples chosen for quality assurance analysis require double the number of containers indicated.

[c] Sample chosen for matrix spike/matrix spike duplicate requires triple volume (including original sample) except for portions collected in 1-L amber glass bottles, which only require double volume.

Key:

ASTM =American Society for Tests and Materials.
EPA =United States Environmental Protection Agency, "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020, 1983.
HCl = Hydrochloric acid.
HNO_3 =Nitric acid.
H_2SO_4 =Sulfuric acid.
L= Liter.
NA = Not applicable.
PCBs =Polychlorinated biphenyls.
SVOC =Semivolatile organic compound.
SW = United States Environmental Protection Agency, "Test Methods for Evaluating Solid Wastes," SW-846, Third Edition, 1986.
TAL =Target Analyte List.
TCL= Target Compound List.
TRPH =Total Recoverable Petroleum Hydrocarbon.
VOA =Volatile organic analysis.
VOC =Volatile organic compound.

5 References

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A Health and Safety Plan

2002 Modifications to ESI Health and Safety Plan Amendment

ecology and environment, inc.

HEALTH AND SAFETY PLAN ADDENDUM FORM

Site Name: Former Griffiss Air Force Base	TDD/Pan/Project Number: 001002UK10

Date of original HSP: August 1997

Date of amendment: June 19, 2002

Date of proposed new work: May 2002

Added activities and hazard evaluations: For OTH-305; PCI Site 20; Building 211; and AOI 473-Building 112 Room 10; IDW sampling, removing waste water and sediment from floor drain pit and cleaning out pit, soil sampling, grab water sampling, swipe sampling, coring of concrete floor and pouring of concrete.

Cleaning out floor drain pit: Splash protection (saranex) will be worn during this task in addition to protective gloves and booties. Constant air monitoring will be performed with an FID/PID, team will upgrade to level C (respirators) if readings above background are obtained in the breathing zone.

Concrete pouring: Concrete will be used to fill a floor drain pit (OTH-305) and the bottom 3 to 6 inches of a pipe vault (Building 211). Level D PPE is required for this task.

Added monitoring activities: OVA and O_2/Explosimeter will be used with extension hose to monitor atmosphere within AOI 473 prior to entry and during sampling activities (See attached Confined Space Review Form). No gasoline (internal combustion engine) powered equipment will be used in AOI 473.

Level of protection: ~ A ~ B ~ C X D

Reason for up/downgrading: As outlined in the original SSP.

PPE: All tasks shall be performed in Level D, Tyvek suits optional, based on work conditions (i.e., potential for gross contamination).

Decon: As outlined in the original SSP.

Team Members	Responsibility
Robert Meyers	Field Team Leader
Jim Mays/Gene Florentino	Site Safety Officer
Vassilia Angelaki	Geologist
TBD	Sampler

Equipment	Quantity	Equipment	Quantity
Concrete truck	1	Electric Concrete Coring Drill	1
Hammer drill	1		
Shop vacuum	1		

THE TERMS OF THE ORIGINAL SSP SHALL BE IN EFFECT EXCEPT AS NOTED ON THIS FORM AND THE ATTACHED UPDATED SECTIONS (SECTIONS 1.2, 6.1, AND 10.2)

Prepared by: Robert Meyers	Date: 6/19/02
Reviewed by:	Date: 6/19/02

Confined Space Review Form

Project Name: Griffiss AFB
Project Number: 001002UK10
Location: Building 112 Room 10
Date: 4/3/02
Project Manager: Bob Meyers
Description of work: wipe sampling of floor and collection of sump ~~water and~~ RAM sediment sample (if any).
Description of space: Building 112, Room 10. Basement area where fuel storage tanks had been located. Tanks have been removed PCBs found in soils around building.

	Yes	No
Is space designed for occupancy?	☐	☒
Is there potential for hazardous atmosphere?	☒	☐

Describe:
Possible oxygen depletion. Test air prior to entry

Does the space contain a material with the potential for engulfing an entrant?	☐	☒
Does the space have an internal configuration such that the entrant could become trapped?	☐	☒
Does the space contain any other recognized serious safety hazard?	☐	☒

Reviewed By: Tom Siener
Date: 4/3/02
Signature: Tom Siener

Determination:

Permit Required: Yes ☐ No ☒

Additional Precautions:
Use O_2/LEL meter to test prior to entry and during sampling activities.

August 1997 Ecology and Environment, Inc., Amendment to Original Law Environmental Health and Safety Plan for Griffiss Air Force Base

Ecology and Environment, Inc., Amendment to:

Law Environmental Health and Safety Plan for Griffiss Air Force Base

Amended: August 1997

The Griffiss Air Force Base Draft Final Primary Report Remedial Investigation Planning Documents Volume IV Health and Safety Plan July 1993 is amended as follows:

Pg 1-1, Para 1.1 <u>SCOPE OF HEALTH AND SAFETY PLAN</u> The work plan must be modified to include the tasks to be performed by E & E. The site-specific Field Operations Plan (FOP) (volume III) will be utilized when site-specific information pertaining to health and safety is needed.

Pg 2-1, Para 2.2 <u>CONTAMINANT CHARACTERIZATION</u> An additional probable contaminant of concern is hydrogen sulfide.

Pg 2-8, Para 2.3 <u>ON-SITE TASKS TO BE PERFORMED</u> On-site tasks to be performed during this work period are 1) Geophysical survey, 2) Near-surface soil sampling, 3) Surface water/sediment sampling, 4) Soil borings, 5) Subsurface soil sampling, 6) Groundwater sampling, 7) Investigation derived waste (IDW) sampling (if needed), and 8) Decontamination. Tasks 1and 8 are nonintrusive. All other tasks will be considered intrusive activities.

Pg 3-11, Table 3-1 OSHA PEL for cadmium was reduced to 0.005 mg/m^3.

Pg 3-21, Para 3.6 <u>ACTION LEVELS</u> Action levels and monitoring equipment are identified in the modified HASP attached.

Pg 3-25, Para 3.6.2 <u>ACTION LEVELS: OXYGEN</u> Oxygen levels will be monitored during drilling continuously using a combination LEL/O_2. (An EXOTOX 40 will not be used).

Pg 4-1, Para 4.0 ACCIDENT PREVENTION E & E's safety meetings are held at least daily. This is noted in the HASP.

Pg 5-2, Para 5.2 SITE SAFETY OFFICER E & E's Site Safety Officer at Griffiss AFB projects will be identified in E & E's Site-Specific HASP.

Pg 5-2, Para 5.3 MEDICAL CONSULTANT E & E's medical consultant is Dr. Richard V. Lee, the Corporate Medical Director.

Pg 6-2, Para 6.1.3.1 CORPORATE HEALTH AND SAFETY OFFICER Dr. Paul Jonmaire is the Corporate Health and Safety Director at E & E.

Pg 6-3, Para 6.1.4 CPR/FIRST AID TRAINING REQUIREMENTS This is an annual requirement of all E & E field personnel.

Pg 8-1, Section 8.0 MEDICAL SURVEILLANCE E & E's policy of medical surveillance is attached and is found in the attached HASP.

Pg 9-1, Section 9.0 EXPOSURE MONITORING/AIR SAMPLING PROGRAM The equipment used during field operations is listed in the attached HASP.

Pg 15-2, Para 15.2 PERSONNEL ROLES AND LINES OF AUTHORITY Emergency telephone numbers for E & E personnel and the MedTox system are located in the attached HASP.

NOTE: The amendment will contain a modified version of Ecology and Environment, Inc., (E & E) Health and Safety Plan (HASP) attached to this document.

ecology and environment, inc.

SITE-SPECIFIC HEALTH AND SAFETY PLAN

Project: Former Griffiss AFB

Project No.: KH-4000

TDD/PAN No.:

Project Location: Former Griffiss Air Force Base New York

Proposed Date of Field Activities: Fall 1997

Principal In Charge: Gerald A. Strobel, P.E.

Task Order Manager: Thomas Ferraro, P.G.

Original Prepared by: B. Wright

Date Prepared: 22 April 1995 (updated 2 July 96, 29 July 97, and 26 September 97)

Approved by: T. Siener

Date Approved: 7 October 1997

1. INTRODUCTION

1.1 POLICY

It is E & E's policy to ensure the health and safety of its employees, the public, and the environment during the performance of work it conducts. This site-specific health and safety plan (SHASP) establishes the procedures and requirements to ensure the health and safety of E & E employees for the above-named project. E & E's overall safety and health program is described in *Corporate Health and Safety Program for Toxic and Hazardous Substances* (CHSP). After reading this plan, applicable E & E employees shall read and sign E & E's Site-Specific Health and Safety Plan Acceptance form.

This SHASP has been developed for the sole use of E & E employees and is not intended for use by firms not participating in E & E's training and health and safety programs. Subcontractors are responsible for developing and providing their own safety plans.

This SHASP has been prepared to meet the following applicable regulatory requirements and guidance:

Applicable Regulation/Guidance
29 CFR 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER)
Other: EM 385-1-1

1.2 SCOPE OF WORK

Description of Work: On-site tasks associated with field investigations at the Griffiss AFB will vary with each site. Activities that may be conducted during field work include:

Non-Intrusive Activities	Intrusive Activities
Geophysical Surveys	Near-Surface Soil Sampling
	Surface Water/Sediment Sampling
Decontamination	Soil Borings
	Subsurface Soil Sampling
	Groundwater Sampling
	Investigation Derived Waste (IDW) Sampling

Equipment/Supplies: Attachment 1 contains a checklist of equipment and supplies that will be needed for this work.

The following is a description of each numbered task:

Task Number	Task Description
1	Geophysical Surveys
2	Near-Surface Soil Sampling
3	Surface Water/Sediment Sampling
4	Soil Borings
5	Subsurface Soil Sampling
6	Groundwater Sampling
7	IDW Sampling (optional)
8	DECON
9	Test pit excavation at AOI 17 (optional task)

1.3 SITE DESCRIPTION

Site Map: A site map or sketch is attached at the end of this plan.

Site History/Description (see project work plan for detailed description):
Griffiss AFB has been realigned under the Base Realignment and Closure (BRAC). During the Expanded Site Investigation program, E & E will be conducting both intrusive and non-intrusive tasks.
Is the site currently in operation? ☒ Yes ☐ No

Locations of Contaminants/Wastes: This HASP contains information pertinent to general conditions at Griffiss AFB. The Field Operations Plan (FOP's) (Volume III) from Law Environmental, Inc., contain site-specific information pertaining to health and safety procedures to be implemented at each Area of Interest (AOI).

Types and Characteristics of Contaminants/Wastes:

☒ Liquid
☒ Flammable/Ignitable
☐ Explosive
☐ Medical/Pathogenic
☒ Solid
☒ Volatile
☐ Reactive
Other:
☐ Sludge
☐ Corrosive
☒ Carcinogenic
☐ Gas/Vapor
☐ Acutely Toxic
☐ Radioactive

2. ORGANIZATION AND RESPONSIBILITIES

E & E team personnel shall have on-site responsibilities as described in E & E's standard operating procedure (SOP) for Site Inspection. Th project team, which is planned at the time this HASP is issued, is identified below. Depending on availability, changes in personnel may required when the field work commences.

Name	Site Role/Responsibility
Don Johnson	Project Geologist/Field Team Leader FTL
TBD	Site Safety Officer
Robert Meyers	Field Geologist
Richard Watt	Geophysicist
Gene Florentino	Geophysicist

3. TRAINING

Prior to work, E & E team personnel shall have received training as indicated below. As applicable, personnel shall have read the project work plan, sampling and analysis plan, and/or quality assurance project plan prior to project work.

Training	Required
40-Hour OSHA HAZWOPER Initial Training and Annual Refresher (29 CFR 1910.120)	X
Annual First Aid/CPR	X
Hazard Communication (29 CFR 1910.1200)	X
40-Hour Radiation Protection Procedures and Investigative Methods	

Training	Required
8-Hour General Radiation Health and Safety	
Radiation Refresher	
DOT and Biannual Refresher	
Other:	

4. MEDICAL SURVEILLANCE

4.1 MEDICAL SURVEILLANCE PROGRAM

E & E field personnel shall actively participate in E & E's medical surveillance program as described in the CHSP and shall have received, within the past year, an appropriate physical examination and health rating.

E & E's health and safety record (HSR) form will be maintained on site by each E & E employee for the duration of his or her work. E & E employees should inform the site safety officer (SSO) of any allergies, medical conditions, or similar situations that are relevant to the safe conduct of the work to which this SHASP applies.

4.2 RADIATION EXPOSURE

4.2.1 External Dosimetry

Although previous use of Thermoluminescent Dosimeter (TLD) Badges at this site has indicated no level of concern, it is E & E's policy that TLDs may be worn by any field employee if they choose to do so.

Pocket Dosimeters:

Other:

5. SITE CONTROL

5.1 SITE LAYOUT AND WORK ZONES

Site Work Zones: Refer to the maps (Figures 1-2 and 1-3) in the Field Sampling Plan for designated work areas.

Normally, the hazardous waste site will be divided into three zones: Zone 1 - Exclusion Zone; Zone 2 - Contamination Reduction Zone; and Zone 3 - Support Zone. These zones will be established on the basis of contamination potential, ranging from the highest levels of contamination in the exclusion zone to little or no contamination potential in the support zone. All zones will be defined and marked on the site map. Barricades and placards will be used when necessary to control access to all three zones.

The exclusion zone, the area of active site investigation (i.e., the area immediately surrounding each borehole), presents the highest risk of worker exposure. Personnel entering this zone will be required to wear the previously mandated level of protection. In some instances, more than one level of protection will be required within the same zone, depending on the tasks to be performed.

The contamination reduction zone will be a transition zone between the contaminated and clean zones. Decontamination of equipment and clothing will occur in this zone.

The support zone will be considered the noncontaminated or clean area. Support equipment will be located in this zone.

Site Access Requirements and Special Considerations:

Illumination Requirements:

TBD

Sanitary Facilities (e.g., toilet, potable water):

Available in Building 520. For more remote sites (AOI 9 and AOI 90), closer sanitary facilities will be located and designed prior to beginning work.

On-Site Communications:

Hand-held radio and telephone (Building 520).

Other Site-Control Requirements:

Conformance with existing site security policies (Oneida County Sheriff Patrol).

5.2 SAFE WORK PRACTICES

Daily Safety Meeting: A daily safety meeting will be conducted for all E & E personnel and documented on the Daily Safety Meeting Record form or in the field logbook. The information and data obtained from applicable site characterization and analysis will be addressed in the safety meetings and also used to update this SHASP, as necessary. .

Work Limitations: Work shall be limited to a maximum of 12 hours per day. If 12 consecutive days are worked, at least one day off shall be provided before work is resumed. For heavy equipment operators, work shall be limited to a maximum of 10 hours. Work will be conducted in daylight hours unless prior approval is obtained and the illumination requirements in 29 CFR 1910.120(m) are satisfied.

Weather Limitations: Work shall not be conducted during electrical storms. Work conducted in other inclement weather (e.g., rain, snow) will be approved by project management and the regional safety coordinator or designee.

Other Work Limitations:

Buddy System: Field work will be conducted in pairs of team members according to the buddy system.

Line of Sight: Each field team member shall remain in the line of sight and within verbal communication of at least one other team member.

Eating, Drinking, and Smoking: Eating, drinking, smoking, and the use of tobacco products shall be prohibited in the exclusion and contamination reduction areas, at a minimum, and shall only be permitted in designated areas.

Contamination Avoidance: Field personnel shall avoid unnecessary contamination of personnel, equipment, and materials to the extent practicable.

Sample Handling: Protective gloves of a type designated in Section 7 will be worn when containerized samples are handled for labeling, packaging, transportation, and other purposes.

Other Safe Work Practices:

6. HAZARD EVALUATION AND CONTROL

6.1 PHYSICAL HAZARD EVALUATION AND CONTROL

Potential physical hazards and their applicable control measures are described in the following table for each task.

Hazard	Task Number	Hazard Control Measures
Biological (flora, fauna, etc.)	1,2,3,4,5,6,7,8,9	• Potential hazard: Poison Ivy/Oak; Ticks • Establish site-specific procedures for working around identified hazards. • Other:
Cold Stress	N/A	• Provide warm break area and adequate breaks. • Provide warm noncaffeinated beverages. • Promote cold stress awareness. • See *Cold Stress Prevention and Treatment* (attached at the end of this plan if cold stress is a potential hazard).
Compressed Gas Cylinders	2,3,4,5,6,7	• Use caution when moving or storing cylinders. • A cylinder is a projectile hazard if it is damaged or its neck is broken. • Store cylinders upright and secure them by chains or other means. • Other:
Confined Space	N/A	• Ensure compliance with 29 CFR 1910.146. • See SOP for Confined Space Entry. Additional documentation is required. • Other:
Drilling	4,5	• See SOP for Health and Safety on Drilling Rig Operations. Additional documentation may be required. • Other: • Other:
Drums and Containers	4,5,6,7,8	• Ensure compliance with 29 CFR 1910.120(j). • Consider unlabeled drums or containers to contain hazardous substances and handle accordingly until the contents are identified. • Inspect drums or containers and assure integrity prior to handling. • Move drums or containers only as necessary; use caution and warn nearby personnel of potential hazards.
		• Open, sample, and/or move drums or containers in accordance with established procedures; use approved drum/container-handling equipment. • Other:
Electrical	4,5,9	• Ensure compliance with 29 CFR 1910 Subparts J and S. • Locate and mark energized lines. • De-energize lines as necessary. • Ground all electrical circuits. • Guard or isolate temporary wiring to prevent accidental contact. • Evaluate potential areas of high moisture or standing water and define special electrical needs. • Other:
Excavation and Trenching	9	• Ensure that excavations comply with and personnel are informed of the requirements of 29 CFR 1926 Subpart P. • Ensure that no entry is made into excavations. • Identify special personal protective equipment (PPE) (see Section 7) and monitoring (see Section 8) needs if personnel are required to enter approved excavated areas or trenches.

Hazard	Task Number	Hazard Control Measures
		• Maintain line of sight between equipment operators and personnel in excavations/trenches. Such personnel are prohibited from working in close proximity to operating machinery. • Suspend or shut down operations at signs of cave in, excessive water, defective shoring, changing weather, or unacceptable monitoring results. • Other: • Other:
Fire and Explosion	4,5	• Inform personnel of the location(s) of potential fire/explosion hazards. • Establish site-specific procedures for working around flammables. • Ensure that appropriate fire suppression equipment and systems are available and in good working order. • Define requirements for intrinsically safe equipment. • Identify special monitoring needs (see Section 8). • Remove ignition sources from flammable atmospheres. • Coordinate with local fire-fighting groups regarding potential fire/explosion situations. • Establish contingency plans and review daily with team members. • Other:
Heat Stress	1,2,3,4,5,6,7,8,9	• Provide cool break area and adequate breaks. • Provide cool noncaffeinated beverages. • Promote heat stress awareness. • Use active cooling devices (e.g., cooling vests) where specified. • See *Heat Stress Prevention and Treatment* (attached at the end of this plan if heat stress is a potential hazard).
Heavy Equipment Operation	4,5,9	• Define equipment routes, traffic patterns, and site-specific safety measures. • Ensure that operators are properly trained and equipment has been properly inspected and maintained. Verify back-up alarms. • Ensure that ground spotters are assigned and informed of proper hand signals and communication protocols. • Identify special PPE (Section 7) and monitoring (Section 8) needs.
		• Ensure that field personnel do not work in close proximity to operating equipment. • Ensure that lifting capacities, load limits, etc., are not exceeded.
		• Other:
Heights (Scaffolding, Ladders, etc.)	N/A	• Ensure compliance with applicable subparts of 29 CFR 1910. • Identify special PPE needs (e.g., lanyards, safety nets, etc.) • Other:
Noise	2,4,5,9	• Establish noise level standards for on-site equipment/operations. • Inform personnel of hearing protection requirements (Section 7). • Define site-specific requirements for noise monitoring (Section 8). • Other:
Overhead Obstructions	2,4,5,9	• Wear hard hat. • Other:
Power Tools	4,5	• Ensure compliance with 29 CFR 1910 Subpart P. • Other:
Sunburn	1,2,3,4,5,6,7,8,9	• Apply sunscreen. • Wear hats/caps and long sleeves.

Hazard	Task Number	Hazard Control Measures
		• Other:
Utility Lines	4,5,9	• Identify/locate existing utilities prior to work. • Ensure that overhead, underground, and nearby utility lines are at least 25 feet away from project activities. • Contact utilities to confirm locations, as necessary. • Other:
Weather Extremes	1,2,3,4,5,6,7,8,9	• Potential hazards: • Establish site-specific contingencies for severe weather situations. • Provide for frequent weather broadcasts. • Weatherize safety gear, as necessary (e.g., ensure eye wash units cannot freeze, etc.). • Identify special PPE (Section 7) needs. • Discontinue work during severe weather. • Other:
Other:		• •
Other:		• •

N/A - Not applicable
* To be determined during daily health and safety meetings based on site conditions.

6.2 CHEMICAL HAZARD EVALUATION AND CONTROL

6.2.1 Chemical Hazard Evaluation

Adequate information for major known contaminants is included in the tables developed by LAW Engineering, pages B-25 through B-42 and in Table 6-1.

Table 6-1

POTENTIAL CHEMICAL HAZARD EVALUATION

Task Number	Compound	Exposure Limits (TWA)			Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID	
		PEL	REL	TLV					Relative Response	Ioniz. Poten. (eV)
4,5,9	H_2S (hydrogen sulfide)	10 ppm; 15 ppm (Ceil.)	10 ppm (Ceil.)	10 ppm; 15 ppm (Ceil)		Inhal, Ing, Contact	Apnea, Eye Irritation, Irrit. Resp, System, Dizzy, HA, Irritability	Rotten Eggs		10.46 eV
Seepages B-25 through B-42 for other potential chemical hazards of concern.										

6.2.2 Chemical Hazard Control

An appropriate combination of engineering/administrative controls, work practices, and PPE shall be used to reduce and maintain employee exposures to a level at or below published exposure levels (see Section 6.2.1).

Applicable Engineering/Administrative Control Measures:

When possible, work activities will be conducted upwind of the contamination source. Also, tasks will be planned when possible in such a way as to limit duration of activities in the hot zone (see Table 6-2).

PPE: See Section 7.2.

TABLE 6-2 CHEMICAL HAZARDS AND CONTROL MEASURES BY SITE

SITE NUMBER	CHEMICAL HAZARDS	TASK DESCRIPTIONS	CONTROL MEASURES LEVEL OF PROTECTION D	 C	 B	 INSTRUMENT	 COMMENT
AOI 7	Lead	Near-surface soil sampling	X	(X)		OVA	Monitor for volatile organics in BZ
	Copper	Surface boring	X	(X)			during drilling operations
	Phosphorus	Groundwater screening sample	X	(X)		---	Avoid creating dust
AOI 9	VOCs	Soil gas	X	(X)		OVA	Monitor for volatile organics in BZ
	Metals	Subsurface boring	X	(X)			during drilling operations
	Pesticides	Groundwater screening smaple	X	(X)		LEL/O2	Monitor for LEL in the borehole
	PCBs	Surface water	X	(X)			during drilling operations
	Petroleum compounds	Sediment sample	X	(X)		---	Avoid creating dust
	Semi-volatile compounds						
AOI 16/193	VOCs	Subsurface boring	X	(X)		OVA	Monitor for volatile organics in BZ
	PAHS	Groundwater screening smaple	X	(X)			during drilling operations
	Trichloroethylene					LEL/O2	Monitor for LEL in the borehole
						---	Avoid creating dust
AOI 17	VOCs	Near-surface soil sampling	X	(X)		OVA	Monitor for volatile organics in BZ
	Semi-volatile compounds	Subsurface boring	X	(X)		LEL/O2	Monitor for LEL in the borehole
	Pesticides	Groundwater screening sample	X	(X)			during drilling operations
	PCBs					---	Avoid creating dust
	Petroleum compounds						
	Metals						
AOI 24	Lead	Near-surface soil sampling	X	(X)		OVA	Monitor for volatile organics in BZ
	PAHs					---	Avoid creating dust

TABLE 6-2 CHEMICAL HAZARDS AND CONTROL MEASURES BY SITE

			CONTROL MEASURES				
			LEVEL OF PROTECTION				
SITE NUMBER	CHEMICAL HAZARDS	TASK DESCRIPTIONS	D	C	B	INSTRUMENT	COMMENT
AOI 58/101	VOCs	Subsurface boring	X	(X)		OVA	Monitor for volatile organics in BZ
	Semi-volatile compounds	Groundwater screening sample	X	(X)		LEL/O2	Monitor for LEL in the borehole during drilling operations
	PCBs						
	Petroleum compounds					---	Avoid creating dust
AOI 67	PCBs	Near-surface soil sampling	X	(X)		OVA	Monitor for volatile organics in BZ
							Avoid creating dust
AOI 90	Semi-volatile compounds	Near-surface soil sampling	X	(X)		OVA	Monitor for volatile organics in BZ
	Petroleum compounds						Monitor southeast vault prior to entry
	Lead					---	Avoid creating dust
AOI 100	VOCs	Near-surface soil sampling	X	(X)		OVA	Monitor for volatile organics in BZ
	Semi-volatile compounds	Subsurface boring	X	(X)		LEL/O2	Monitor for LEL in the borehole during drilling operations
	Petroleum compounds	Groundwater screening sample	X	(X)			
	Metals					---	Avoid creating dust
AOI 102	Pesticides	Near-surface soil sampling	X	(X)		OVA	Monitor for volatile organics in BZ during drilling operations
		Subsurface boring	X	(X)			
		Groundwater screening sample	X	(X)			Avoid creating dust
		Groundwater-existing well	X	(X)			

KEY:

BZ = Breathing Zone
LEL = Lower Explosive Limit
LEL/O2 = combustible gas/ oxygen meter
OVA = Organic Vapor Analyzer
PAH = Polycyclic Aromatic Hydrocarbon
PCBs = Polychlorinated Biphenyls
VOC = Volatile Organic Compound

7. LEVEL OF PROTECTION AND PERSONAL PROTECTIVE EQUIPMENT

7.1 LEVEL OF PROTECTION

The following levels of protection (LOPs) have been selected for each work task based on an evaluation of the potential or known hazards, the routes of potential hazard, and the performance specifications of the PPE. On-site monitoring results and other information obtained from on-site activities will be used to modify these LOPs and the PPE, as necessary, to ensure sufficient personnel protection. The authorized LOP and PPE shall only be changed with the approval of the regional safety coordinator or designee. Level A is not included below because Level A activities, which are performed infrequently, will require special planning and addenda to this SHASP.

Task Number	B	C	D	Modifications Allowed
1			X	No hard hat/safety glasses, Tyvek optional
3,4,5,6,8,9		(X)	X	Splash protection
7		(X)	X	No respirator required if OVA readings do not exceed background in breathing zone

Note: Use "X" for initial levels of protection. Use "(X)" to indicate levels of protection that may be used as site conditions warrant.

7.2 PERSONAL PROTECTIVE EQUIPMENT

The PPE selected for each task is indicated below. E & E's PPE program complies with 29 CFR 1910.120 and 29 CFR 1910 Subpart I and is described in the detail in the CHSP. Refer to 29 CFR 1910 for the minimum PPE required for each LOP.

PPE	Task Number/LOP								
	1	2	3	4	5	6	7	8	9
Full-face APR Ultra Twin		(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)
PAPR									
Cartridges:									
H									
GMC-H		(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)
GMA-H									
Other:									
Positive-pressure, full-face SCBA									
Spare air tanks (Grade D air)									
Positive-pressure, full-face, supplied-air system									
Cascade system (Grade D air)									
Manifold system									

PPE	Task Number/LOP								
	1	2	3	4	5	6	7	8	
5-Minute escape mask									
Safety glasses		X	X	X	X	X	X	X	X
Monogoggles									
Coveralls	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)
Protective clothing:									
Tyvek		(X)	(X)	(X)	(X)	X	X	X	(X)
Saranex						(X)	(X)	(X)	
Other:									
Splash apron									
Inner gloves:									
Cotton									
Nitrile		(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)
Latex									
Other:									
Outer gloves:									
Viton									
Rubber									
Neoprene			X	(X)	(X)	X	X	X	(X)
Nitrile									
Other:									
Work gloves	(X)								
Safety boots	X	X	X	X	X	X	X	X	X
Neoprene safety boots (as per ANSI Z41)									
Boot covers (type: Disposable booties)			(X)	(X)	(X)	(X)	X	X	(X)
Hearing protection (type:)			(X)	(X)					
Hard hat		(X)		X	X				X
Face shield									
Other:									
Other:									

8. HEALTH AND SAFETY MONITORING

Health and safety monitoring will be conducted to ensure proper selection of engineering/administrative controls, work practices, and/or PPE so that employees are not exposed to hazardous substances at levels that exceed permissible exposure/dose limits or published exposure levels. Health and safety monitoring will be conducted using the instruments, frequency, and action levels described in Table 8-1. Health and safety monitoring instruments shall have been appropriately calibrated and/or performance-checked prior to use.

Table 8-1

HEALTH AND SAFETY MONITORING

Instrument	Task Number	Contaminant(s)	Monitoring Location	Monitoring Frequency	Action Levels[a]	
☐ PID (e.g., HNu 1S-101) ☒ FID (e.g., OVA 128-GC)	2,3,4,5,6,7, 9	Volatile Organic Vapors	See Pertinent AOIs	Continuously during drilling (for tasks 4 and 5); as needed for other tasks	**Unknown Vapors** Background to 1 ppm: Level D 1 to 5 ppm above background: Level C 5 to 500 ppm above background: Level B >500 ppm above background: Level A	**Contaminant-Specific**
Oxygen Meter/Explosimeter	4,5,9	Explosive atmospheres	See Pertinent AOIs	Continuously during drilling	**Oxygen** <19.5% or >22.0%: Evacuate area; eliminate ignition sources; reassess conditions. 19.5 to 25.0%: Continue work in accordance with action levels for other instruments.	**Explosivity** ≤10% LBL: Continue work in accordance with action levels for other instruments; monitor continuously for combustible atmospheres. >10% LBL: Evacuate area; eliminate ignition sources; reassess conditions.
Radiation Alert Monitor (Rad-mini or RAM-4)	1,4,5,9	Radiation	See Pertinent AOIs	Continuously	<0.1 mR/hr: Continue work in accordance with action levels for other instruments. ≥0.1 mR/hr: Evacuate area; reassess work plan and contact radiation safety specialist.	
Mini-Ram Particulate Monitor	N/A		See Pertinent AOIs		**General/Unknown** Evaluate health and safety measures when dust levels exceed 2.5 milligrams per cubic meter.	**Contaminant-Specific**
H_2S	4,5,9	H_2S	See Pertinent AOIs	Continuously	≥4 ppm: Leave area and consult with SSO.	

[a] Unless stated otherwise, airborne contaminant concentrations are measured as a time-weighted average in the worker's breathing zone. Acceptable concentrations for known airborne contaminants will be determined based on OSHA/NIOSH/ACGIH and/or NRC exposure limits.

9. DECONTAMINATION PROCEDURES

Personnel Decontamination Procedures: All equipment, materials, and personnel will be evaluated for contamination upon leaving the exclusion area. Equipment and materials will be decontaminated and/or disposed and personnel will be decontaminated, as necessary. Decontamination will be performed in the contamination reduction area or any designated area such that the exposure of uncontaminated employees, equipment, and materials will be minimized. Decontamination will consist of disrobing and properly disposing of all tyveks, gloves, and boots in bags labeled "Hot Trash." Following this procedure, all field personnel will wash their hands and face with soap and potable water. Personnel should shower at the end of each work shift. Any excessive exposure to contaminated soil or groundwater will be immediately brought to the attention of the site SSO.

Equipment/Material Decontamination Procedures (see additional specifications in work plan): One or a combination of the following—High-pressure steam, alconox soap, 10% nitric acid rinse, deionized water.

Ventilation: All decontamination procedures will be conducted in an open, well-ventilated area.

PPE Requirements for E & E Personnel Performing Equipment Decontamination: Work gloves and tyvek coveralls will be worn if on-site monitoring indicates presence of contamination.

Disposition of Disposable PPE: Disposable PPE must be rendered unusable and disposed of in an appropriate manner.

Disposition of Decontamination Wastes (e.g., dry wastes, decontamination fluids, etc.): As specified in the work plan and contract scope of work.

10. EMERGENCY RESPONSE

This section contains additional information pertaining to on-site emergency response and does not duplicate pertinent emergency response information contained in earlier sections of this plan (e.g., site layout, monitoring equipment, etc.). Emergency response procedures will be rehearsed regularly, as applicable, during project activities.

10.1 EMERGENCY RESPONSIBILITIES

All Personnel: All personnel shall be alert to the possibility of an on-site emergency; report potential or actual emergency situations to the team leader and SSO; and notify appropriate emergency resources, as necessary.

Team Leader: The team leader will determine the emergency actions to be performed by E & E personnel and will direct these actions. The team leader also will ensure that applicable incidents are reported to appropriate E & E and client project personnel and government agencies.

SSO: The SSO will recommend health/safety and protective measures appropriate to the emergency.

Other:

Other:

10.2 LOCAL AND SITE RESOURCES (including phone numbers)

Ambulance: AMCARE Ambulance Service, Inc. 315/339-5600

Hospital:
Rome Hospital, Rome NY
911 (emergency)
(315)338-7000, (315)336-1234

Directions to Hospital (see Figure 10-1 attached at the end of this plan):

Exit base through Mohawk Gate (west side) on Mohawk drive. Go west approximately one mile, and turn left on Black River Boulevard. Hospital is on right within 0.25 miles.

Poison Control: Poison Control Center, Rome 800/252-5655

Police Department: Rome Police 315-339-3311

Fire Department: City of Rome, Emergency Phone Number: 315-339-7784

Client Contact: AFBCA/OL-X, Environmental Section, Building 301, Ext. 2275

Site Contact: AFBCA/OL-X, Environmental Section, Building 301, Ext. 2275

On-Site Telephone Number: 315/339-1185

Cellular Telephone Number: TBD

Radios Available:

Other: Emergency Dial 911

10.3 E & E EMERGENCY CONTACTS

E & E Emergency Response Center (24 Hours):	716/684-8940	
Corporate Health and Safety Director, Dr. Paul Jonmaire:	716/684-8060 (office) 716/655-1260 (home)	
Regional Office Contact:		(office)
		(home)
Other:		(office)
		(home)

10.4 OTHER EMERGENCY RESPONSE PROCEDURES

On-Site Evacuation Signal/Alarm (must be audible and perceptible above ambient noise and light levels):

On-Site Assembly Area: Building 520

Emergency Egress Route to Get Off Site: Nearest gate or as directed by base security (Oneida County Sheriff).

Off-Site Assembly Area: N/A

Preferred Means of Reporting Emergencies: Two-way radio and telephone.

Site Security and Control: In an emergency situation, personnel will attempt to secure the affected area and control site access.

Emergency Decontamination Procedures: Emergency eyewash will be available in first aid kit(s). Clean running water will be available in Building 520.

PPE: Personnel will don appropriate PPE when responding to an emergency situation. The SSO and Section 7 of this plan will provide guidance regarding appropriate PPE.

Emergency Equipment: Appropriate emergency equipment is listed in Attachment 1. Adequate supplies of this equipment shall be maintained in the support area or other approved work location.

Incident Reporting Procedures: Notify site safety officer and field team leader. The base and AFBCA will be immediately notified, and appropriate incident reports will be completed by these personnel.

ATTACHMENT 1
EQUIPMENT/SUPPLIES CHECKLIST

INSTRUMENTATION	No.	**EMERGENCY EQUIPMENT**	No.
OVA	1	First aid kit	2
Thermal desorber		Stretcher	
O_2/explosimeter w/cal. kit	1	Portable eye wash	2
Photovac tip		Blood pressure monitor	
HNu (probe: eV)		Fire blanket	
Magnetometer	1	Fire extinguisher	
Pipe locator		Thermometer (medical)	
Weather station		Spill kit	
Draeger tube kit (tubes:)			
Brunton compass	1		
Real-time cyanide monitor			
Real-time H_2S monitor	1		
Heat stress monitor			
Noise equipment		**DECONTAMINATION EQUIPMENT**	
Personal sampling pumps and supplies		Wash tubs	2
MiniRam dust monitor		Buckets	
Mercury monitor		Scrub brushes	2
Spare batteries (type:)		Pressurized sprayer	
EM31	1	Spray bottle	2
EM61			
		Detergent (type: Alconox)	1
RADIATION EQUIPMENT/SUPPLIES		Solvent (type: HN03 [10%])	1
Documentation forms		Plastic sheeting	1
Portable ratemeter		Tarps and poles	
Scaler/ratemeter		Trash bags	1
1" NaI gamma probe		Trash cans	
2" NaI gamma probe		Masking tape	
ZnS alpha probe		Duct tape	1
GM pancake probe		Paper towels	1
Tungsten-shielded GM probe		Face mask	1
Micro R meter		Face mask sanitizer	
Ion chamber		Step ladders	
Alert monitor	1	Distilled water	
Pocket dosimeter		Deionized water	1
Dosimeter charger			
Radiation warning tape			
Radiation decon supplies			
Spare batteries (type: ________________________)			

ATTACHMENT 1
EQUIPMENT/SUPPLIES CHECKLIST

SAMPLING EQUIPMENT		MISCELLANEOUS (Cont.)	
8-oz. bottles	TBD	Gatorade or equivalent	TBD
Half-gallon bottles	TBD	Tables	
VOA bottles	TBD	Chairs	
String		Weather radio	
Hand bailers	5	Two-way radios	4
Thieving rods with bulbs	3	Binoculars	
Spoons	6	Megaphone	
Knives	2	Cooling vest	
Filters	24		
Bottle labels	TBD		
		SHIPPING EQUIPMENT	
		Coolers	TBD
MISCELLANEOUS		Paint cans with lids, 7 clips each	
Pump (hand)	1	Vermiculite	
Surveyor's tape		Shipping labels	TBD
100' Fiberglass tape		DOT labels:	
300' Nylon rope		"Up"	TBD
Nylon string		"Danger"	TBD
Surveying flags	TBD	"Inside Container Complies ..."	TBD
Camera	1	Hazard Group	
Film	1	Strapping tape	TBD
Bung wrench	1	Baggies	TBD
Soil auger	1	Custody seals	TBD
Pick		Chain-of-custody forms	TBD
Shovel		Federal Express forms	TBD
Catalytic heater		Clear packing tape	4
Propane gas		Permanent markers	6
Banner tape	1		
Surveying meter stick			
Chaining pins and ring			
Logbooks (large, small)	8		
Required MSDSs			
Intrinsically safe flashlight	1		
Potable water			

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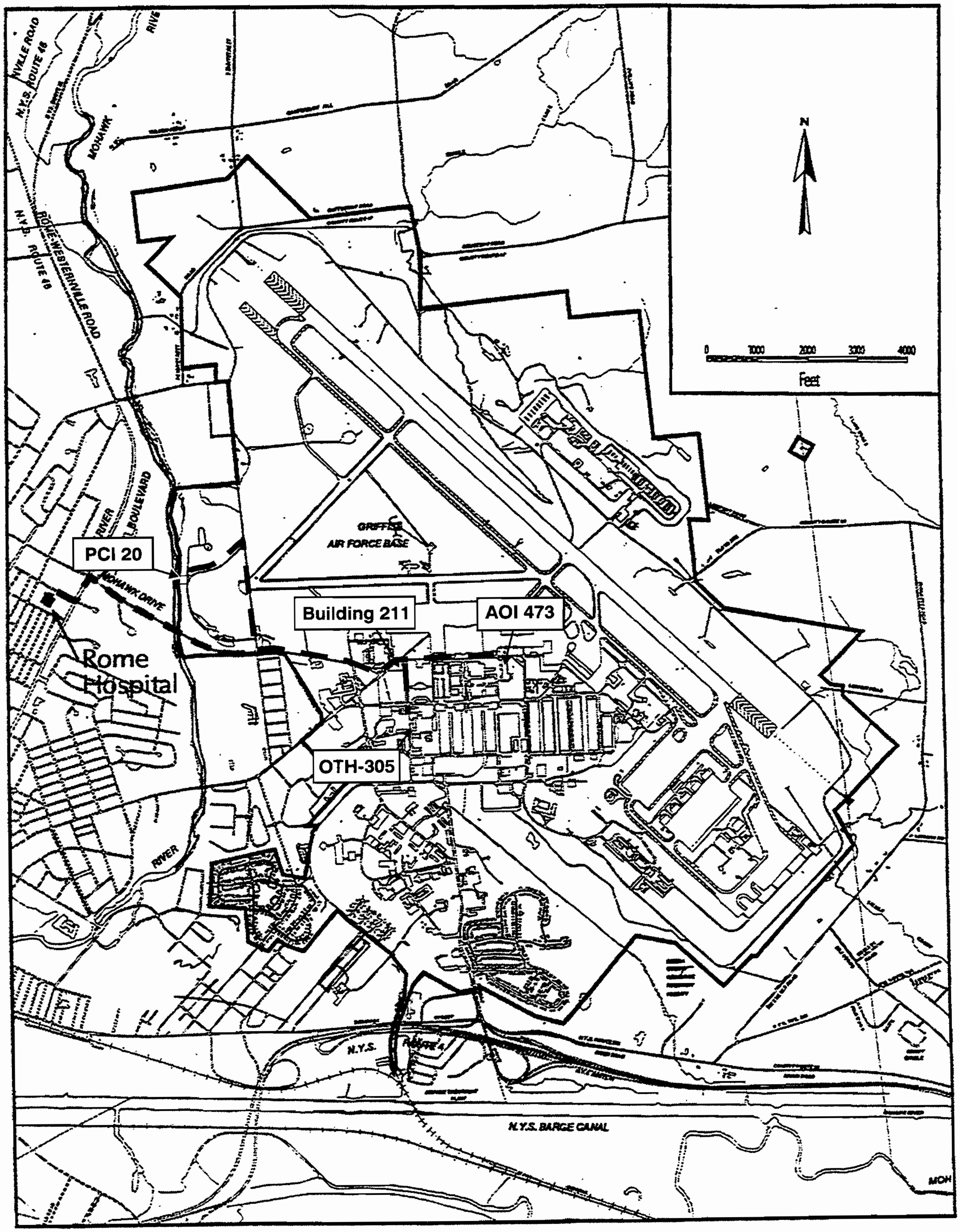

Route to Hospital From Griffiss AFB

COLD STRESS PREVENTION AND TREATMENT

Cold temperatures are potentially hazardous, especially when work is conducted without appropriate precautions. The following sections describe cold stress prevention and the recognition and treatment of cold stress emergencies.

Preventing Emergencies Due to Cold Stress

When working in situations where the ambient temperature is low, especially if low temperatures are accompanied by windy conditions, personnel should use the following cold-stress prevention measures:

- Wear warm, dry, loose-fitting clothing that is preferably worn in layers. Outer clothing should be waterproof and windproof. Inner clothing should be capable of retaining warmth even when it is wet (e.g., wool or polypropylene) or have wicking capabilities (to draw moisture and perspiration away from the skin).
- Wear lined and insulated footwear and warm gloves or mittens.
- Alternately remove and don clothing layers as necessary to regulate body temperature and reduce excess perspiration.
- Drink warm fluids as often as desired.
- Take frequent breaks to provide for cold stress monitoring.

Cold Stress Emergencies

Hypothermia. Exposure to cold can cause the body's internal temperature to drop to a dangerously low level. Hypothermia occurs when a person's body loses heat faster than it can be produced. The body's normal deep-body temperature is approximately 98.6 degrees Fahrenheit. If body temperature drops to 95 degrees Fahrenheit, uncontrollable shivering may occur. If cooling continues, these other symptoms may occur:

- Vague, slow, slurred speech;
- Forgetfulness, memory lapses;
- Inability to use hands;
- Frequent stumbling;
- Drowsiness;
- Exhaustion, collapse;
- Unconsciousness; and
- Death.

Hypothermia impairs the judgment of the victim. Hypothermia is possible even in temperatures above freezing and can be prevented by remaining warm and dry and avoiding overexposure to the cold.

If a person shows symptoms of hypothermia, perform the following:

- Remove the victim from exposure to wet and cold weather.
- Remove wet clothing.
- If the victim is only mildly affected, provide warm drinks and dry clothing.
- If the victim is more seriously affected (clumsy, confused, unable to shiver), begin safe-warming procedures such as hugging, wrapping in dry blankets, and the use of warm objects such as hot water bottles or heat packs, and arrange for evacuation. Do not give the victim warm drinks until he or she exhibits a clear level of consciousness and appears to be warming up.

Frostbite. Frostbite occurs when body tissue freezes. Severe frostbite can lead to reduced circulation and the possible need for amputation. To prevent frostbite, maintain good circulation and keep extremities warm and dry. In extreme cold, it is important to prevent heat loss from as many areas of the body as possible. Exposed limbs and the head are major areas of heat loss.

Tall, thin people; those in poor physical condition; people with chronic diseases; heavy smokers; children; the elderly; and those who have been drinking alcohol are more susceptible to frostbite than other people due to poor circulation, poor production of body heat, or both.

There may be no pain or numbness experienced with gradual freezing of body tissues. While in the cold, it is important to test extremities for sensation and ensure that clothing is loose-fitting and warm. Exposed parts of the body should be inspected routinely. Just before freezing, skin becomes bright red. As freezing continues, small white patches will appear and the skin will become less elastic, often remaining pitted after it is touched or squeezed.

Serious freezing is most common in the feet because people are less aware of them, circulation and sensation are poorer, and warm footwear is difficult to obtain. Hands are usually the next to freeze. Exposed parts of the head will freeze less rapidly because they are conditioned to exposure and have a better blood supply.

In very cold weather, avoid touching cold metal with bare body parts. In the event that this happens, release the skin gently using heat, warm water, or urine. Avoid handling gasoline, kerosene, or similar liquids which, when handled in cold weather, can cause immediate frostbite.

If a person shows symptoms of frostbite, consult a medical professional, if possible, and perform the following:

- Initiate rewarming only if subsequent refreezing is not a possibility (thawing and refreezing should always be avoided because this is very injurious to tissue). Rewarm body parts in water that is approximately 100 to 105 degrees Fahrenheit. Do not try to thaw the body parts using cold water, snow, or intense heat from fires or stoves. The whole body may be immersed in warm water if necessary.

- If a large portion of an extremity is frozen when rewarming is initiated, the deep body temperature may drop as cooled blood begins to circulate throughout the body. Provide warm liquids to alleviate this situation.
- Move the afflicted part gently and voluntarily during rewarming.
- Use pain medication if it is available. Rewarming can be acutely painful. After thawing is completed, a deep pain may persist for several days, depending on the severity of the frostbite. Pain may be a good sign as it indicates that nerve function is present.
- A dull purple color, swelling, or blisters indicate serious injury and the need for medical attention. Consult a medical professional.

TITLE:	**HEALTH AND SAFETY ON DRILLING RIG OPERATIONS**
CATEGORY:	H&S 5.3
REVISED:	April 1998

STANDARD OPERATING PROCEDURE

HEALTH AND SAFETY ON DRILLING RIG OPERATIONS

ecology and environment, inc.
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TITLE: HEALTH AND SAFETY ON DRILLING RIG OPERATIONS
CATEGORY: H&S 5.3 REVISED: April 1998

1. Introduction

This document is meant to be used in conjunction with Ecology and Environment, Inc., (E & E) standard operating procedures (SOPs) for field operations and hazardous waste site operations, and incorporates by reference all safety precautions required therein. It specifically addresses the functions and responsibilities of personnel working on or around drilling operations.

E & E personnel are frequently required to oversee a subcontractor's work in the field using drill rigs to take soil and rock samples, and install piezometers and monitoring wells. This document discusses the supervision of subcontract drillers by E & E.

2. Responsibilities and Authority of Subcontract Driller

The subcontract driller has authority to direct its personnel within the area while drilling operations are in progress. Access to the hazardous area around the auger and borehole is restricted by a "super exclusion zone" delineated by a 4-foot by 8-foot sheet of plywood centered over the borehole before drilling. A large hole cut in the plywood allows penetration of the augers. No E & E personnel are allowed in this "super exclusion zone" at any time while drilling is underway.

Housekeeping around the rig is the responsibility of the driller, but all team members should, when necessary, participate in this effort.

2.1 Responsibility and Authority of E & E Personnel

E & E personnel working at a drilling site must act as support to the subcontract drilling team by providing any necessary support functions; however, it is important that E & E personnel are careful not to interfere with the drilling process. Personnel are restricted from approaching the "super exclusion zone" while drilling is underway. If an E & E crew member recognizes an unsafe condition in the work area or on the rig, he should bring it to the attention of the site safety officer (SSO) and team leader if it is not resolved in a timely manner by the subcontractor driller. If conditions are still deemed to be hazardous, team members have the option of contacting their regional safety coordinator (RSC) or Corporate Health and Safety Group in Buffalo.

It is the responsibility of all E & E personnel to have with them on site their issued nondisposable gear, including hard hat, face shield, respirator, steel-toed boots, eyepiece inserts, safety glasses, and appropriate outerwear for the expected weather. It is the E & E employee's responsibility to ensure that all of his/her equipment is in proper working order.

All personnel should be aware of emergency facilities, egress routes, and special medical conditions of their team members. As with all E & E fieldwork, the buddy system is to be enforced.

3. Training Requirements for Site Personnel

3.1 E & E Site Safety Officer

In addition to basic health and safety training, annual health and safety refresher training, first aid, cardiopulmonary resuscitation (CPR), and necessary training in field monitoring of personnel, an SSO should have previous experience as a team member on field drilling projects in order to have a working knowledge of the drill rig and the extreme hazards that can occur with its operation. Where monitoring instrumentation is to be used, the SSO must be properly trained prior to fieldwork. The SSO must have an understanding of the hazards of heat and cold stress, their associated symptoms, and proper work modifications to protect field staff from potential injury.

3.2 Other E & E Personnel

All E & E personnel present on site shall have taken the basic 40-hour health and safety course and annual 8-hour refresher training course. Field personnel also must meet medical and respiratory fitness test requirements established by E & E and Occupational Safety and Health Agency (OSHA).

3.3 Subcontract Driller and Other Subcontract Drilling Personnel

Subcontract drillers and their support personnel on site must, at a minimum, have passed basic 40-hour health and safety training as prescribed by OSHA 29 Code of Federal Regulations (CFR)1910.120. They shall be medically approved and trained to use the level(s) of respiratory protection required on site. Certification of training by the subcontractor shall be required as a deliverable included in E & E's contractual documentation. This training shall be verbally verified and logged on site by the SSO or team leader before starting work.

4. Supervision of Subcontract Drillers

4.1 Responsibilities and Authority of Site Safety Officer

The responsibilities of the SSO at a drilling site where subcontracted drillers are used include the following: rig inspections, personnel monitoring, and personnel protection.

A rig inspection should begin by verifying the following:

- The mast must be located at least 25 feet from any overhead or underground utility lines;
- The location and operation of operational and unencumbered kill switches must be reiterated to all site personnel;
- Outriggers, stabilizers, or jacks are in place, and the rig is level;
- A geophysical survey (e.g., electromagnetic or ground-penetrating radar) or a reliable site history must be obtained to verify the absence of underground utilities, buried obstacles, tanks, and drums;
- A first aid kit and filled eyewash bottle must be readily available;
- A fire extinguisher should be charged to the proper pressure and placed at the rear of the rig during drilling;
- The condition of ropes, chains, and cables must be checked;
- A lifeline or safety belt must be available if mast climbing is necessary;
- The Site Safety Plan (SSP) must be posted with emergency phone list and map of hospital route; and
- A "super exclusion zone" must be established around the borehole, using traffic cones or a 4-foot by 8-foot sheet of plywood. This defined area will be entered during active drilling only by the subcontract driller and his helper(s), except in emergency situations.

If, upon review, the SSO deems that any material item noted above requires replacement or repair, the SSO must make necessary the arrangements for that repair or replacement, and later verify that repair or replacement is sufficient before actual drilling begins. Similarly, if the conditions listed above are not met, the SSO must request that they be met to his satisfaction before allowing drilling to proceed. Working together, the SSO and the subcontract driller should verify that the rig has been checked against the operator's checklist.

The SSO's monitoring duties include calibration and setup of the appropriate monitoring devices, as specified in the SSP. At a minimum, this generally includes an O_2/explosimeter and real-time organic-vapor monitoring capabilities (e.g., HNU, organic vapor analyzer [OVA]). Noise and heat-stress monitoring are employed where appropriate. If the SSO believes additional monitoring devices beyond the directive of the SSP should be employed (e.g., Rad Mini, Mini Ram), it is his/her responsibility to obtain this equipment from the nearest E & E office through the cooperation of the RSC or the Corporate Health and Safety Group. The SSO is also responsible for ensuring that a trained operator for this additional equipment is on site.

It is the responsibility of the SSO to ensure that all safety equipment is in good working order. Day-to-day operations, as well as calibration data, must be recorded in the equipment log or SSO log. Adequate supplies such as breathing air, drinking liquids, and calibration gas must be maintained.

E & E personnel are forbidden from entering the "super exclusion zone" around the borehole while drilling is underway. The SSO must not attempt to take air readings in or around the auger while it is in use, or from cutting samples while the auger is in motion. If possible, an O_2/explosimeter should be set up for unmanned (alarmed) operations at the rig, using an extension hose to continuously draw samples from the borehole area during drilling operations.

The SSO has ultimate authority over the subcontractor with regard to whether work practices meet the requirements of the SSP. Shutdown of work or restriction of personnel are options available to the SSO. The SSO should hold informal site safety briefings at the start of both fieldwork and daily work shifts throughout the course of the project. Although E & E contractually requires subcontractors to provide properly trained and outfitted staff, the SSO should verify verbally at the start-up meeting that the field staff has necessary respiratory approval and OSHA-mandated training, especially at hazardous waste sites. Site safety briefing topics, as well as the names of attendees, will be recorded in the site safety log.

If the SSO has reason to believe that either E & E or subcontractor personnel are under the influence of alcohol or drugs, or are otherwise ill before or during work on site, he or she should consider restricting those team members from site work. Personnel who are to perform work that requires Level C protection must be clean-shaven or they may be restricted at the discretion of the SSO.

The following is a list of basic topics to be discussed at site safety meetings:

- Personnel responsibilities;
- Planned investigation and presumed potential hazards;
- Levels of protection, monitoring plan, and equipment;
- Emergency scenario plans, including use of kill switches;
- Location and operation of kill switches, fire extinguisher, and first aid kits;
- Heat and cold stress hazards;
- "Super exclusion zone" around borehole; and
- Warnings to subcontractors about hazards of climbing the mast without proper safety equipment.

Because heat stress is a constant threat during warm weather, the SSO is responsible for determining whether conditions are unsuitable for work. If site conditions require the assistance of work modifications, cooling vests, and other cooling means, the SSO may decide that work should not continue. The need for worker monitoring through blood pressure and oral temperature checks will be determined by the SSO with assistance from the RSC and Corporate Health and Safety Group staff, if necessary.

The SSO will be responsible for shutting down the drilling operation if electrical storms occur in the site area.

No refueling operations will be performed until rig engines are shut down. Motor fuels should be stored and dispensed from spring-loaded, OSHA/Factory Mutual-approved metal or polyethylene gas cans.

The SSO should ensure and document that no boreholes are left open or unfilled after drilling equipment is moved. In instances where a hole must be left open and unattended, suitable barricades or the equivalent will be staged around the hole to prevent personnel and equipment from falling in.

4.2 Responsibilities and Authority of Other E & E Personnel

All E & E personnel on site are required to follow the terms of the SSP and the direction of the SSO. Because the SSO cannot be in all places at all times, the crew should observe the subcontractors and condition of their equipment at all times, and report immediately to the team leader and SSO any safety-related issues that are unresolved. Included are such details as dressout, site functions, and decontamination. It is important that the SSO be involved so that proper log entries can be made.

It is a policy of E & E not to provide safety equipment or monitoring instrumentation to subcontractors. Some projects, however, may be arranged in such a manner that allows E & E personnel and subcontractors to share the same expendable supplies.

E & E personnel are forbidden from approaching augers during drilling. Activities at the borehole, such as sampling, require that the operation of equipment be stopped.

5. Drilling Hazards

5.1 General Drilling Hazards

Drilling operations present numerous health and safety hazards to site personnel, subcontractor drillers, and members of the public who may approach the rigs. Drilling hazards that apply to all drilling methods and possible control methods include:

- Slip/trip/fall hazards;
- Ergonomic hazards;
- Moving objects;

- Unguarded points of operation;
- Heat/cold stress;
- Noise;
- Buried or overhead utilities;
- Radiological hazards;
- Lightning;
- Chemical hazards; and
- Biological hazards.

5.2 Physical Hazards (Slip/Trip/Fall Hazards)

Personnel may be injured if they trip over tools or objects, walk on uneven terrain, fall from heights or into holes, or slip on surfaces.

Controls

- Store all tools and supplies away from the super exclusion zone;
- Personnel should use caution when walking on uneven surfaces so that they do not lose their balance;
- Subcontractor drillers must wear a lifeline or safety belt if mast climbing is necessary;
- Boreholes should be barricaded or marked with flags when drilling has been completed to prevent personnel from stepping in the hole; and
- Soil or sand should be applied to wet or slippery surfaces.

5.3 Ergonomic Hazards

Muscle strains, sprains, and injuries can occur when personnel use improper lifting methods, lift objects that are too heavy, improperly reach for objects, or work in awkward positions.

Controls

- Lift with the back as straight as possible, bend the knees, and keep the object close to the body;
- Use two people to move heavy objects such as augers;
- Avoid excessive stretching of the arms when picking up objects; and
- Avoid sudden twisting of the back or working in awkward positions.

5.4 Moving Objects

Site personnel may be injured if they are struck by debris from the borehole or by drilling machinery or components.

Controls

- Wear the appropriate personal protective equipment such as safety boots, safety glasses, and a hard hat; and
- Adequate inspection and maintenance of the drill rig will reduce the likelihood of worn equipment or parts falling and causing accidents.

5.5 Unguarded Points of Operation

The spinning auger on a drill rig or the V-belt drive on a motor are unguarded points of operation that can pull site personnel into the machinery and cause serious injuries.

Controls

- Mechanical guards cannot be placed around the spinning auger on a drill rig. Site personnel must stay away from the spinning auger and avoid wearing loose clothing that could get caught in the auger; and
- Mechanical guards must be placed over V-belt drives.

5.6 Heat/Cold Stress

Drilling is a strenuous job, and heat stress is a major hazard in hot, humid environments, especially when personnel are wearing protective equipment such as coveralls, gloves, boots, and respirators. Cold injury can occur at low temperatures and when the wind-chill factor is low.

Heat Stress

Controls

- Recognize the signs and symptoms of heat stress;
- Monitor workers who are wearing protective clothing; and
- Provide fluid replacement and schedule rest periods in cool locations.

Cold Stress

Controls

- Recognize the signs and symptoms of cold stress;
- Personnel must wear appropriate clothing during cold weather; and
- A warm rest location and fluid replacement should be provided.

5.7 Noise

Excessive noise can cause hearing damage, distract workers, and interfere with communications.

Controls

- In excessive noise areas, wear the hearing protection recommended by the SSO.

5.8 Buried or Overhead Utilities

Contact of drilling tools with electric, gas, steam, process, or other utility lines can result in fires, explosions, electric shock hazards, burns, etc.

Controls

- The boom on the drill rig must be kept at least 25 feet from overhead and buried utilities;
- After buried utilities have been located using an appropriate geophysical survey, the line locations should be marked with flags. Maps of underground utilities should also be checked, if available, to verify locations; and

- Drilling operations should proceed slowly in areas near buried utilities, as the actual utility location may not exactly correspond to the area identified by a flag or as illustrated on a map.

5.9 Radiological Hazards

5.9.1 Nonionizing Radiation

Nonionizing radiation is radiation that emits photon energy that is not sufficient to produce ionization in biological systems. Radio frequencies (including radar and microwave), infrared, visible light, and ultraviolet regions of the electromagnetic spectrum are considered to be nonionizing. Ultraviolet radiation from the sun is usually the major nonionizing radiation hazard present during drilling operations. Ultraviolet radiation can damage the skin and eyes. Potential effects include, but are not limited to, sunburn, skin cancer, photosensitization, and cataracts.

Controls

- Wear sunscreen on all exposed skin areas; and
- Wear safety glasses that block ultraviolet radiation (or sunglasses worn over safety glasses).

5.9.2 Ionizing Radiation Hazards

Ionizing radiation is electromagnetic or particulate radiation with sufficient energy to ionize atoms. Ionizing radiation may be present on some drilling sites and includes:

- Electromagnetic radiation
  - Gamma rays
  - X-rays
- Particulate radiation
  - Alpha
  - Beta
  - Neutrons

Controls

Site personnel can minimize their exposure to external radiation hazards by:

- Limiting exposure time;
- Increasing the distance from the radiation source; and
- Shielding the radiation source.

Some radiation sources can enter the body through inhalation, ingestion, and/or skin contact. Exposure can be controlled through the wearing of personal protective equipment and thorough washing of skin surfaces with soap and water.

5.10 Lightning Hazard

The elevated mast on a drill rig is a potential target of lightning.

Controls

- The SSO will halt drilling operations when electrical storms approach the drilling location.

5.11 Chemical Hazards

Chemical contaminants may be present in the form of gases, vapors, aerosols, fumes, liquids, or solids. Site personnel may be exposed to these contaminants through one or more of the following pathways: inhalation, ingestion, skin, and/or eye contact.

Controls

- Become familiar with the specific drilling operation being used to identify and avoid chemical discharge locations;
- Wear appropriate personal protective equipment;
- Practice contamination avoidance; and
- Stay upwind during grout mixing (silica inhalation hazard).

5.12 Biological Hazards

Biological hazards that may be present during drilling operations include poisonous plants, animals, and insects, and infectious agents.

Controls

- Wear insect repellant at sites where biting insects are prevalent;
- Learn to identify poisonous plants that cause dermatitis, such as poison ivy and poison oak;
- Wear impervious personal protective clothing (e.g., saranex coveralls, latex booties, nitrile surgical gloves) if work must be conducted in areas where site personnel will contact poisonous plants; and
- Avoid potential animal nesting areas and animal carcasses.

6. Drilling Methods and Hazards

6.1 Solid Flight and Bucket Augers

Solid-flight augers (also referred to as solid-stem augers, continuous flight augers, and disk augers) use solid-stem auger sections, with the flighting (curved corkscrew-like blades) connected end-to-end to the cutting head (see Figure 1). Soil cuttings are moved upward to the ground surface by the flighting as the auger penetrates into the soil. Samples are typically collected by removing an auger section, attaching a split-spoon or thin-wall sampler to the end of a drill rod, and placing this arrangement into the borehole. Split-spoon samples are collected by using a hammer connected to the drill rod and split-spoon. The hammer is operated by wrapping sections of rope around a rotating cathead hoist (a wide metal cylinder). A disk auger is similar to a solid-flight auger except that it is larger in diameter and the flighting goes around the stem once. Bucket augers have a cutting edge on the bottom. Once the bucket auger fills with soil cuttings, it is brought to the surface to be emptied. Figure 1 shows various types of bucket augers.

Auger drill methods are used in unconsolidated material for sampling subsurface media, installing groundwater monitoring wells, and identifying depth to bedrock.

6.2 Hollow-Stem Auger

A drill rig rotates a hollow-stem auger (see Figure 2) and moves it vertically into the soil. The hollow stem allows use of continuous or intermittent soil sampling techniques. Once the required depth has been reached, screens and casing for monitoring wells can be placed in the

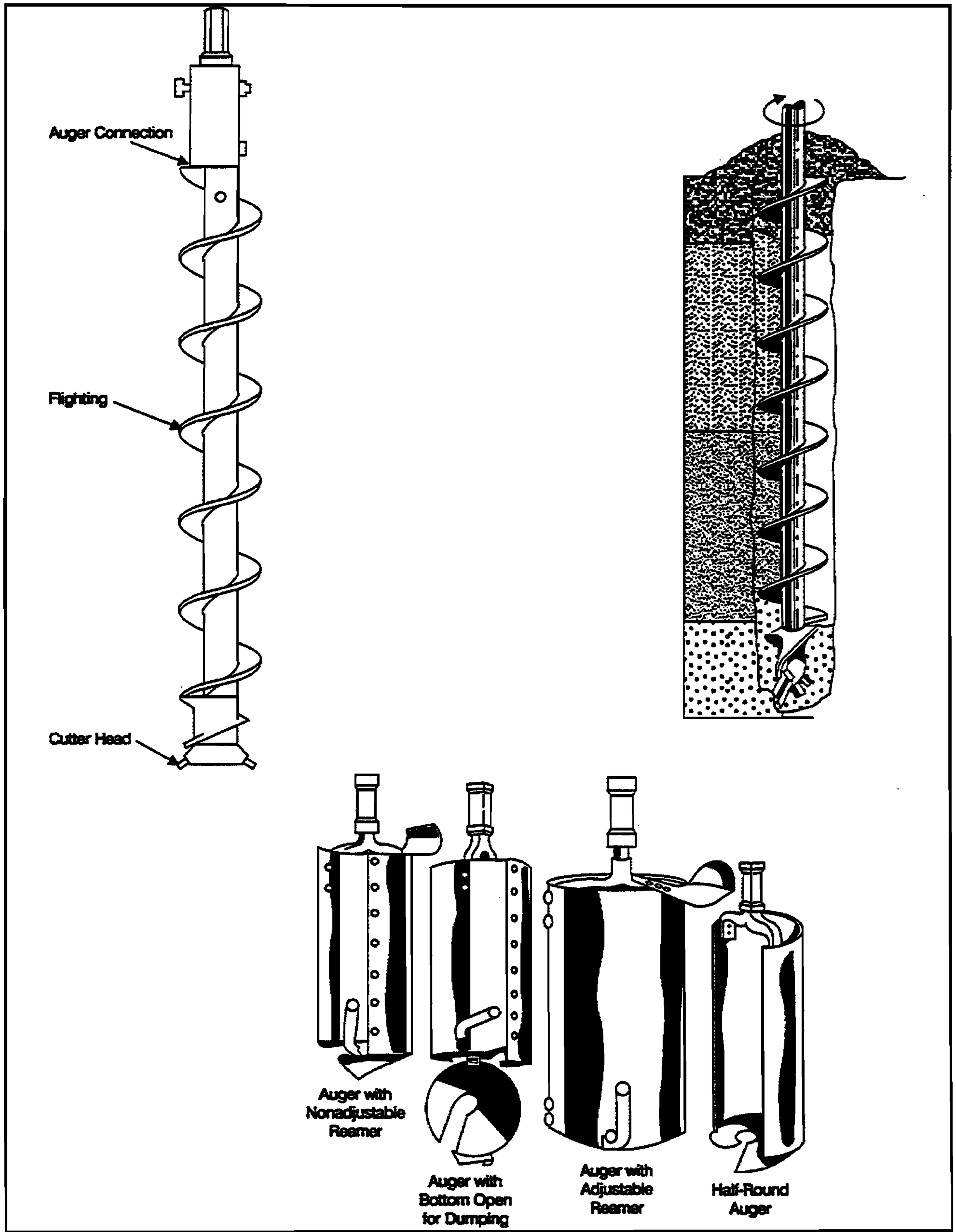

Figure 1 Solid Flight and Bucket Augers

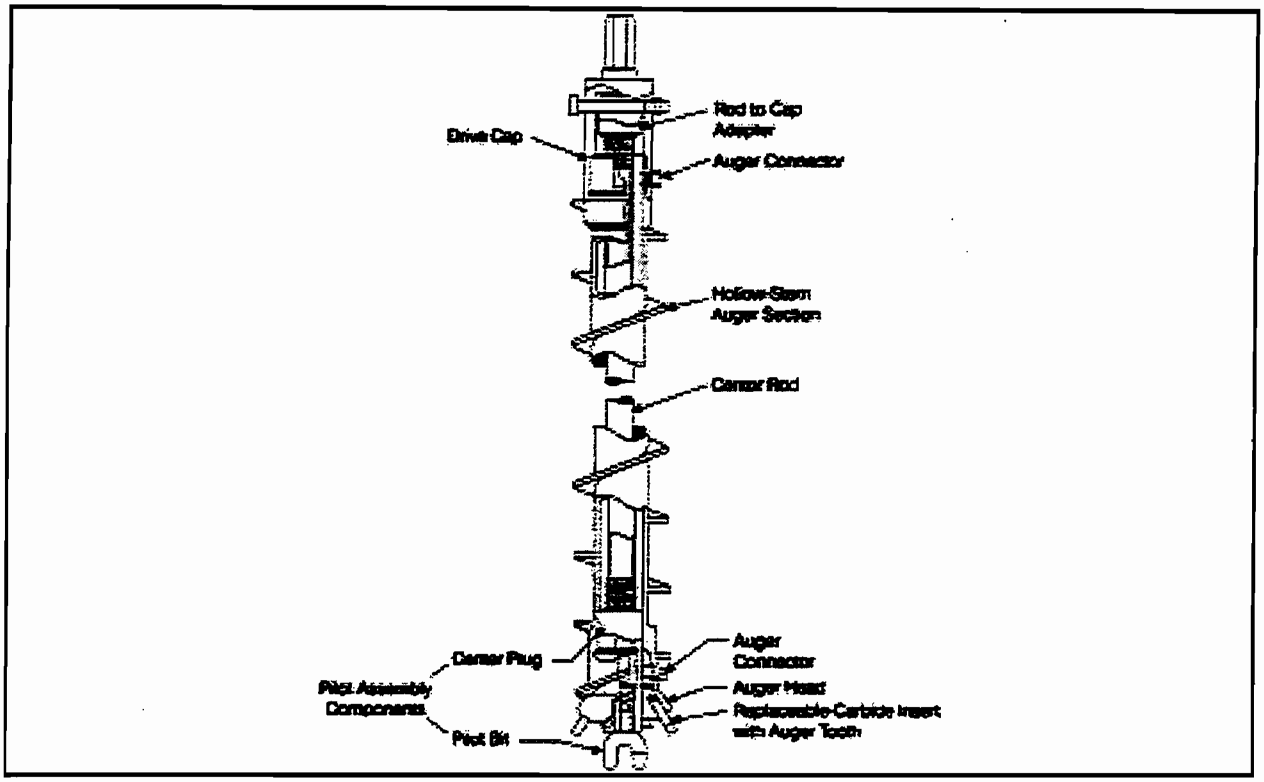

Figure 2 Hollow-Stem Auger

hollow-stem gravel pack and grout is added as the auger is pulled out of the borehole. Hollow-stem auger drilling is a common method of monitoring well installation.

6.2.1 Auger Drilling Hazards

Physical Hazards

Spinning Auger. The spinning auger is not equipped with a metal guard; therefore, it is imperative that personnel use extreme caution when working near spinning augers, as contact with the auger can cause personnel to be pulled into the auger and crushed between the auger and the drill rig. Only approved drillers will remain in proximity to the borehole during drilling, and an approximate 4- by 8-foot "super exclusion area" will be established around the moving auger at all times. The "super exclusion zone" may be established by placing a 4- by 8-foot sheet of plywood over the borehole, or by placing flagging or traffic cones around a 4- by 8-foot perimeter. No personnel, except the driller and the driller's helper, will enter this zone during drilling. The SSO will issue warnings to those personnel not authorized to enter this zone.

Overhead Equipment. If wire line core sampling is conducted, drill steel and sampling gear will be lifted overhead. Site personnel must conduct the necessary equipment inspections to ensure it is in good condition prior to the start of drilling operations. In addition, drillers must make sure that proper hoisting procedures are used to reduce the likelihood of dropping drill steel or sampling gear.

Drill Rig Lurching. The drill rig has a tendency to lurch and shake when the auger comes into contact with harder materials. This is especially true when hollow-stem auger drilling methods are utilized. The rig can also lurch seriously in hearing sands. Site personnel should be aware of possible drill rig movement and move away from the rig if lurching or shaking occurs.

Noise. If split-spoon sampling is conducted, a hammer is used to drive the spoon into the soil. The hammer generates a loud noise when it contacts a metal surface. Site personnel are required to wear appropriate hearing protection during hammering operations.

6.3 Open-Hole Rotary Methods

A direct mud rotary drilling system (also direct [liquid] rotary, hydraulic rotary, or reverse [circulation] rotary) is shown in Figure 3. Drilling fluid (mud) is pumped through drill rods to a bit. The mud flows back to the surface through the space between the drill rods and the borehole and is discharged at the surface through a pipe into a tank, tub, pond, or pit. After the cuttings settle, a pump recirculates the liquid back through the drill rods. The mud serves to:

- Cool and lubricate the bit;
- Stabilize the borehole well; and
- Prevent the inflow of fluids from formations.

A shale shaker can collect a sample from the circulated fluid by placing it in the discharge flow before the settling pit. In addition, the drilling fluid flow can be shut off and split-spoon, thin-wall, or consolidated-core samplers can be used to collect a sample by inserting a sampler through the drill rods. Reverse circulation rotary drilling is a variation of mud rotary drilling in that the mud flows from the mud pit down the borehole outside the drill rods, passes up through the bit carrying cuttings into the drill rods, and is then discharged into the mud pit. The equipment used is similar to the direct mud rotary method, except most of the equipment is larger.

Equipment Breaks. A break in support equipment for drill steel could cause equipment to fall and injure site personnel. Equipment inspection is required to ensure it is in good condition prior to the start of drilling operations.

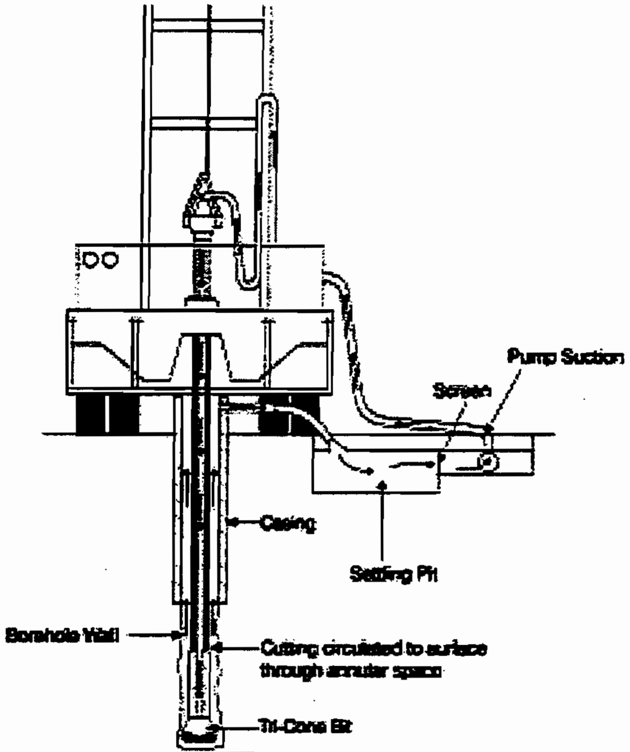

Figure 3 Open-Hole Rotary Method

Slippery Conditions. Because the use of drilling mud will create slippery conditions around the drill rig and support area, mud should be contained to the immediate work area. Slippery spots should be dried with sand/dirt to reduce slipping hazards. Gloves should be changed when they become coated with mud.

6.4 Direct Air Rotary with Rotary Bit/Downhole Hammer

Also called an air rotary with roller-cone (tri-cone) bit, down-the-hole hammer, or air percussion rotary, the rig setup for air rotary with a tri-cone or roller-cone bit is similar to direct mud rotary (see Figure 3), except the method uses air instead of water and drilling mud. The main components of a drill string using a tri-cone bit are illustrated in Figure 4. Compressed air is forced down through the drill rods to cool the bit, and cuttings are carried up the open hole to the surface. A cyclone slows down the air velocity, forcing the cuttings into the container. A roller-cone drill bit is used for hard-to-soft consolidated rock and unconsolidated formations. When a downhole hammer is utilized, it replaces the roller-cone bit (see Figure 4). The hammer produces a pounding action as it rotates. Other features are similar to the rotary bit, except small amounts of surfactant and water are used for dust and bit temperature control.

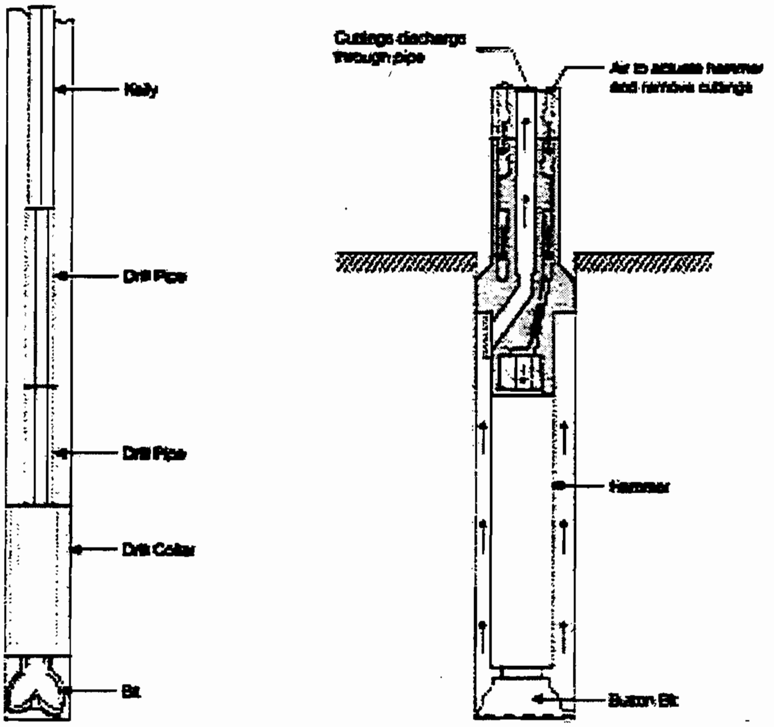

Figure 4 Direct Air Rotary

Physical Hazards

Noise. Excessive noise is generated from the use of air compressors, casing drivers, and downhole hammers. Site personnel are required to wear hearing protection during drilling operations.

Cuttings and Water. Cuttings and water blown from the hole can strike and injure site personnel. Site personnel must stay away from this discharge location and wear appropriate personal protective equipment.

Overhead Equipment. If wire line core sampling is conducted, drill steel and sampling gear will be lifted overhead. Site personnel must conduct the necessary equipment inspections to ensure it is in good condition prior to the start of drilling operations. In addition, drillers must make sure that proper hoisting procedures are followed to reduce the likelihood of falling drill steel or sampling gear.

6.5 Cable Tool

A cable tool drill rig operates by repeatedly lifting and dropping tools attached to a cable into a borehole. Figure 6-5 shows the components of a cable tool rig. This drilling method crushes rock and a spudding beam mixes the crushed particles with water. The water and debris is removed by a bailer or pump. In unconsolidated formations, a casing is driven into the ground. In consolidated formations, drilling is conducted without the use of a casing.

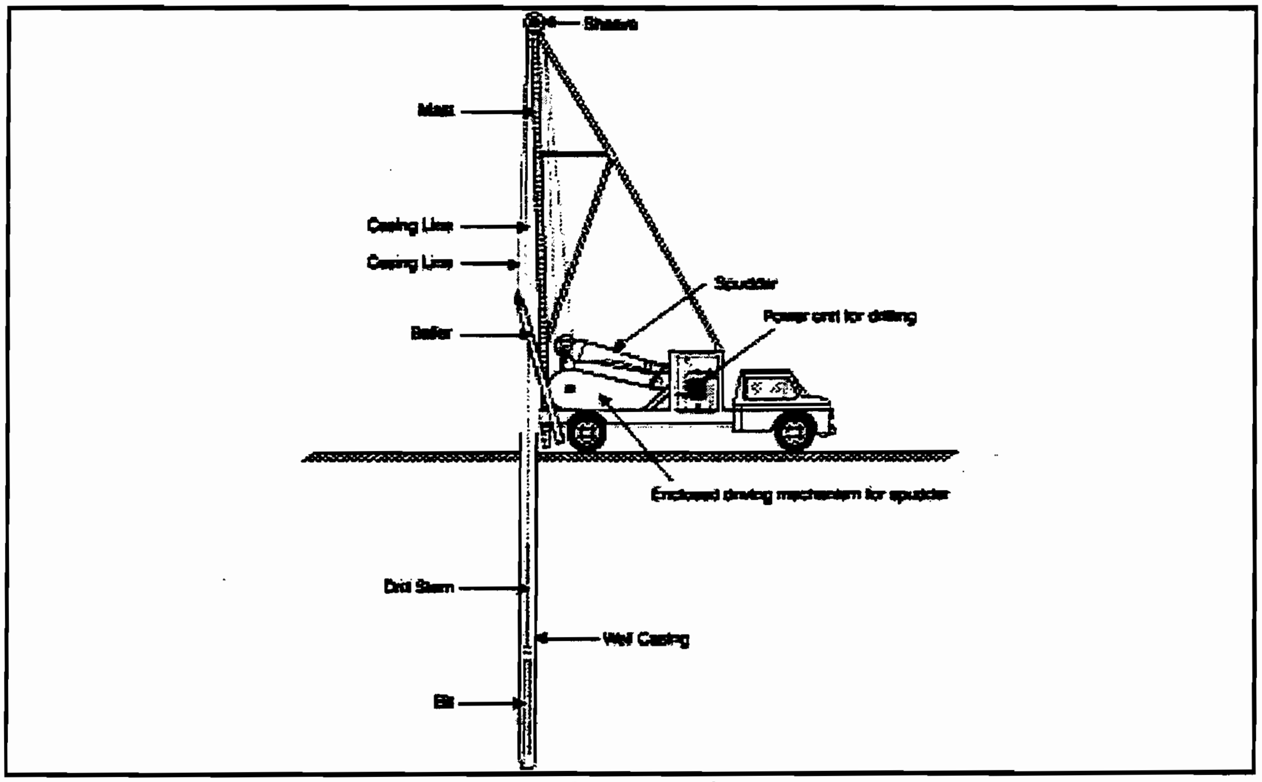

Figure 5 Cable Tool Drill Rig

Physical Hazards

Noise. The spudding beam generates excessive noise. All personnel must wear appropriate hearing protection during drilling operations.

Rig Movement. The drill rig tends to lurch as the drill string is raised and lowered. Site personnel must maintain an adequate distance from the rig during drilling operations.

Overhead Equipment. Drill string and bailers are hoisted during drilling operations and present an overhead hazard to site personnel if a tool falls from a height.

6.6 Casing Advancement: Rotary Drill-Through Methods

6.6.1 Drill-Through Casing Driver and Dual Rotary Method

Casing driver advancement (also referred to as air (mud) rotary drill or downhole hammer with casing drivers, air rotary casing hammer, and air drilling with casing hammer) involves a driver that moves the casing as drilling occurs (see Figure 6) during the use of conventional direct air (mud) or downhole hammer equipment. Drill cuttings move upward in the space between the drill pipe and the casing. The diameter of the casing is slightly larger than the bit so it can be easily removed.

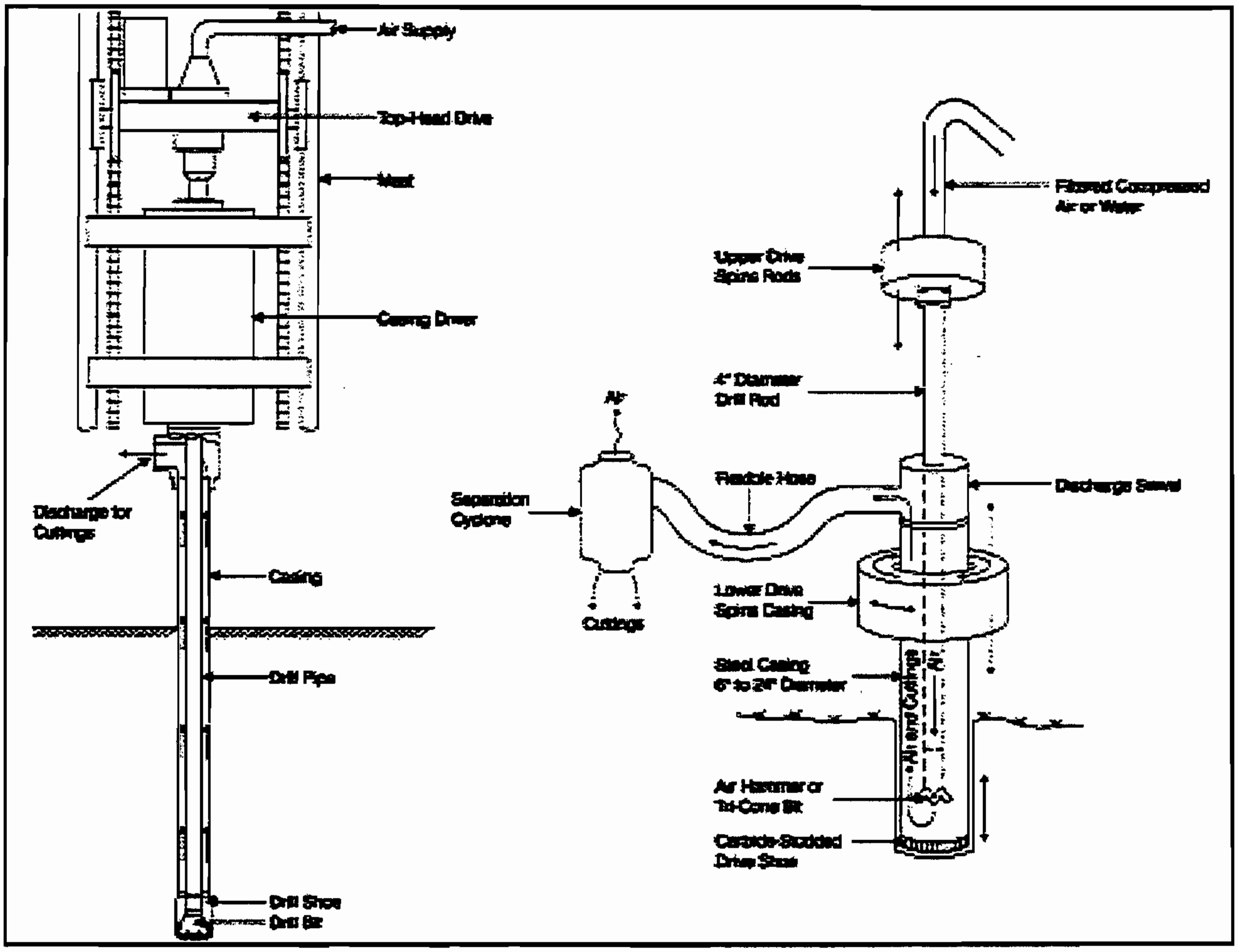

Figure 6 Casings

In dual rotary advancement, the casing is moved by using a rotating steel casing provided with a carbide-studded drive shoe. The carbide ring cuts through the overburden material. Rotary drilling (usually air) takes place at the same time using a downhole hammer or tri-cone bit. Drilling can be conducted either inside or ahead of the casing.

This type of drilling is used to install monitoring wells in unconsolidated formations, where loss of circulation of drilling fluids is a problem, and/or where prevention of cross-contamination of aquifers is important.

6.6.2 Reverse Circulation (Rotary, Percussion Hammer, and Hydraulic Percussion)

The reverse-circulation rotary drilling method can utilize air rotary with a downhole hammer or bit or mud rotary. Two or three casings can be used.

Reverse circulation dual-wall rotary. This method is similar to downhole hammers with a casing driver or air rotary-cone bit, except air is moved down the space between the casing and the drill pipe to the bit, and soil cuttings are pushed to the surface through the drill pipe (see Figure 7).

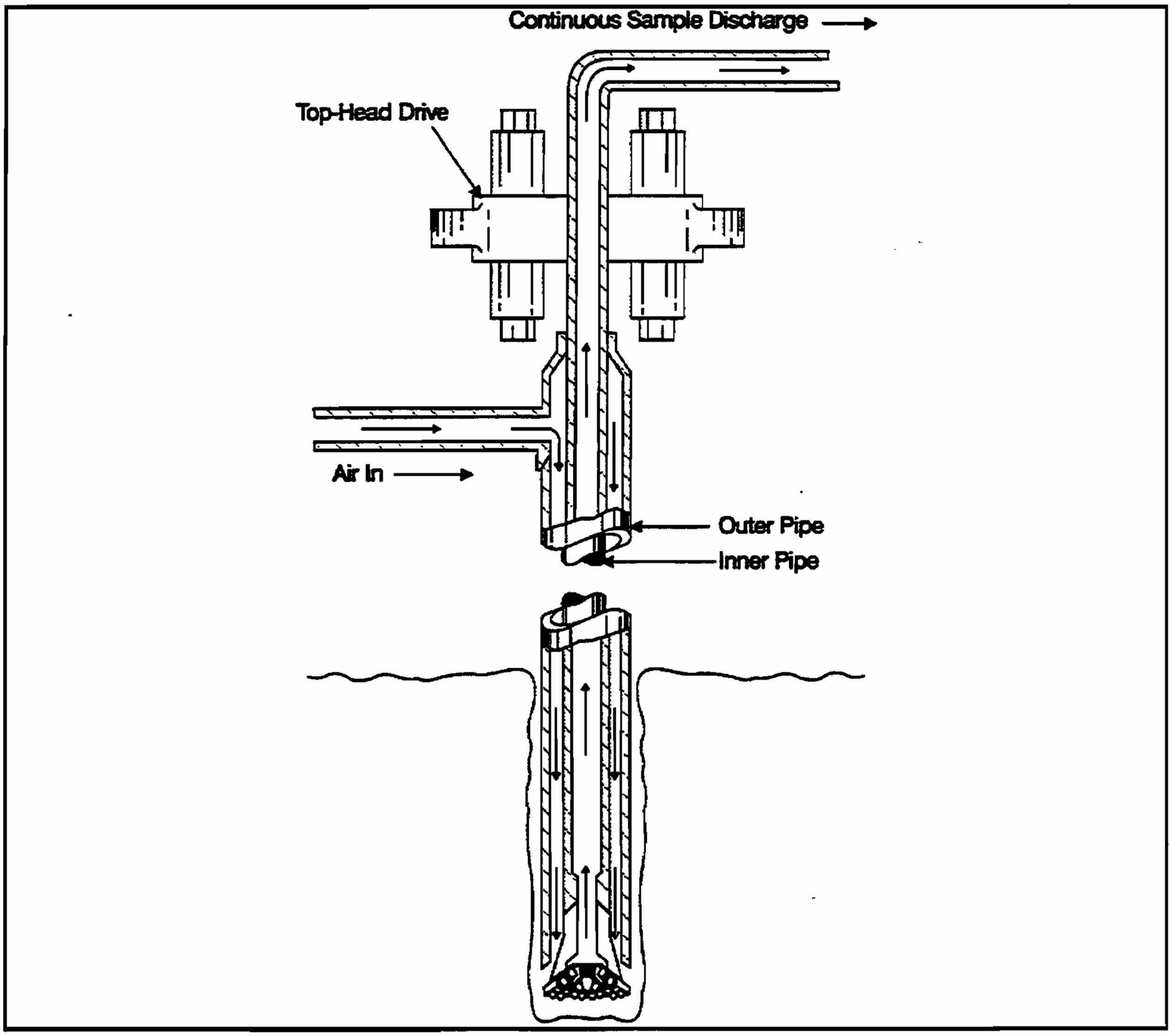

Figure 7 Reverse Circulation Rotary Method

Reverse circulation dual-wall percussion hammer. The percussion hammer operates in a similar manner of reverse circulation as the dual-wall rotary method, except the drive method is different. Either two or three casings are used. Compressed air is moved into the space between the outer and inner pipes, and soil cuttings are discharged from the inner pipe to a cyclone. A percussion hammer on the most of the drill rig strikes an anvil on the top of the drive assembly. Two or three casings are driven, and the bit does not rotate.

Hydraulic percussion. This method is similar to the jet-percussion method, except a check valve is located between the bit and the lower part of the drill pipe. Water fills the space between the drill rods and well casing and the drill rods are lifted and dropped. A reciprocating motion moves the water and drill cuttings to the surface where they enter a tank. Water is returned to the hole from the tank. Casing is driven as drilling proceeds.

Physical Hazards—Reverse Circulation Dual-Wall Rotary

Noise. Excessive noise is generated from the use of air compressors, casing drivers, and downhole hammers. Site personnel are required to wear hearing protection during drilling operations.

Cuttings. Cuttings and debris discharged from the hole can strike and injure site personnel. Site personnel must stay away from the discharge point and wear appropriate personal protective equipment.

Overhead Equipment. If wire line core sampling is conducted, drill steel and sampling gear will be lifted overhead. Site personnel must conduct the necessary equipment inspections to ensure it is good condition prior to the start of drilling operations. In addition, drillers must make sure that proper hoisting procedures are followed to reduce the likelihood of dropping drill steel or sampling gear.

Physical Hazards—Hydraulic Percussion

Slips/Falls. Site personnel can slip on wet ground around the drill rig or fall into the water tank. Site personnel must keep the drilling location clear of debris and contain spillage prior to and during drilling operation.

PROGRESS REPORT

Project Title: ______________________ **Report Period:** __________/__________

Project Status: Active ☐ Inactive ☐ Closed: ☐

Client: ____

Project Manager: ______________________ Project Director: ______________________

Total Budget: ______________________ Expended to Date: ______________________

Scheduled Completion Date: ______________________

Summary of Past Week's Activities: ______________________________________

Summary of Coming Week's Activities: ______________________________________

Problem Areas Requiring Special Attention: ______________________________________

Other Comments: ______________________________________

Request for Status Change:

Current Status: Active ☐ Inactive ☐

Change to: Active ☐ Inactive ☐ Closed: ☐

Reason for Change: ______________________________________

Signature (Project Manager)	Date	Signature (Project Director)	Date

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cc: Vice President Technical Services, Technical Management Coordinator, Project Director, Project Manager, Project File, Marketing Representative

Instructions:

(1) Project Manager completes Form G, signs it, attaches the latest revised Project Status Report, and forwards package to Project Director.

(2) Project Director approves Progress Report, signs Form G. and distributes package as indicated on form.

(3) Vice President Technical Services, forwards to Controller's Office for updating of computer system.

B Quality Assurance Project Plan

Quality Assurance Project Plan for Expanded Site Investigation at Griffiss Air Force Base, Rome, New York

Contract No. DACW41-99-D-9005
Work Authorization Directive 10

April 2002

Prepared for:

U.S. ARMY CORPS OF ENGINEERS
Kansas City District
601 East 12th Street
Kansas City, Missouri 64106

This Quality Assurance Project Plan (QAPjP) is an addendum to the expanded site investigation (ESI) planning documents prepared for the ESI (E & E 1997). The laboratory for this project will be Ecology and Environment, Inc.'s (E & E) Analytical Services Center (ASC) or a qualified subcontractor. United States Army Corps of Engineers (USACE) and New York State Department of Health (NYSDOH) currently approve the ASC for all methods listed below. Quality assurance (QA) procedures at the ASC are implemented in accordance with the current version of the Laboratory Quality Assurance Manual (QAM), Revision 4, January 2002. All project-specific QA procedures will be implemented in accordance with the ESI QAPjP (E & E 1997). Any modifications to existing ESI QAPjP forms, tables, or figures that do not change the underlying technical content of QA procedure are not included in this addendum. All other modifications relative to the completion of the QA procedures for this project are described as follows.

ESI QAPP Section	Modifications	Description
1 - Introduction 2 - Project Description	New sampling	See 2002 ESI Field Sampling Plan Addendum (E & E 2002)
3 - Project Organization	New staff	The Delivery Order Manager for this project will be Thomas Ferraro. The Field Team Leader for this phase will be Robert Meyers or Gene Florentino. The project chemist will be Marcia Meredith Galloway.
4 - Data Use and QA Objectives for Measurement Data	Analysis of groundwater screening samples	Groundwater screening samples will be analyzed at the ASC with a 24-hour turnaround.
5 - Sampling Procedures	New reference	Sample holding times and preservatives are listed on Table 4-1 of the FSP. The table lists NYSDEC holding times. NYSDEC holding times are calculated based on verified time of sample receipt (VTSR), not date of collection. This is reflected in Table 4-1. Previous tables used NYSDEC holdings times, but did not specify VTSR. All sampling procedures are listed in the FSP.
6 - Sample Chain-of-Custody, Packing, and Transportation	New form	A new Chain-of-Custody (COC) form is used by E & E.
7 - Analytical Procedures	Updated methods	See table below.

ESI QAPP Section	Modifications	Description
8 - Calibration Procedures	New reference and method changes	Calibration of laboratory equipment will follow current method or manufacturer requirements as specified in E & E Standard Operating Procedures (SOPs).
9 - Data Reporting, Evaluation, and Reduction	New computer system	The ASC will use a recently installed laboratory information management system (LIMS), a Microsoft Access program, for all data processing and reporting. Data packages consistent with the EPA Contract Laboratory Program (CLP) are not required for this project.
10 - Internal QC Checks for Field and Laboratory Operations	New laboratory designation for split samples	All split samples will be shipped to U.S. Army Engineer Research and Development Center Quality Assurance Laboratory.
11 - Performance and System Audits	Field audit	Field oversight will be done as part of the concurrent supplemental investigation conducted by E & E.
12 - Preventive Maintenance	None	
13- Data Assessment Procedures	None	
14 - Corrective Action	New form	New corrective action form is used at the ASC.
15 - Quality Assurance Reports	No CLP	No CLP data packages are anticipated for this project.
Appendix C-A - Resumes of Key Personnel	New staff	New biographies are provided in Attachment B-1 to this QAPP addendum.
Appendix C-B - E &E ASC Master QA Plan	New plan	Laboratory Quality Assurance Manual, Revision 4, January 2002. A copy of the manual is provided in Attachment B-2.
Appendix C-K - Internal QC Procedures and Acceptance Criteria	New methods	All analytical procedures will be implemented in accordance with current versions of SOPs, as approved by USACE. Calibration procedures will follow the most current methods as reflected in the SOPs. Project-specific corrective actions listed in Appendix K of the Law QAPP remain applicable to this project, but the criteria are based on the current method. For metals analysis of solids by Method 6010B, the Law QAPP requires analysis of a solid sample as the Laboratory Control Sample (LCS). For this project, the ASC will use a water LCS for soils as required under their current USACE approval.

ESI QAPP Section	Modifications	Description
Appendix C-L - List of Analytes of Interest and Detection Limits	New detection limits	Attachment B-4 contains updated lists of analytes of interest and detection limits for the analytical methods listed below. (Note: The updated tables were reprinted directly from E & E's LIMS and do not directly reference tables in the existing SI QAPjP.)
Appendix C-M - Control limits for Analytical Methods	New limits	Attachment B-5 contains updated control limits for the analytical methods listed below. (See note above.)

Samples planned for this project are to be analyzed according to the following methods as outlined on the table below:

- **SW** - Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, 3rd ed., 1986, Volumes 1A, 1B, 1C and Volume 2 (includes all promulgated updates), U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response.

Test Name	Matrix	Method Number
Target Compound List (TCL) Volatile Organic Compounds (VOCs)	Water	SW5030B/8260B Low level purge
	Soil	SW5030B Modified /8260B
TCL Semivolatile Organic Compounds (SVOCs)	Water	SW3510C/8270C
	Soil/Swipe	SW3550B/8270C
TCL Pesticides	Water	SW3510C/8081A
	Soil	SW3550B/8081A
TCL Polychlorinated Biphenyls (PCBs)	Water	SW3510C/8082
	Soil/Swipe	SW3550B/8082
Target Analyte List (TAL) Metals by ICP	Water	SW3010A/6010B
	Soil	SW3050B/6010B
	Soil/Swipe	SW3050B/6010B
Mercury	Water	SW7470A
	Soil/Swipe	SW7471A
Total Recoverable Petroleum Hydrocarbons	Swipe	EPA 418.1 Modified
	Sediment	EPA 418.1 Modified
Toxicity Characteristic Leaching Procedure (TCLP) for disposal purposes only	Wastewater	SW 1311/Method listed above.

B-1 Resumes of Key Personnel

THOMAS E. FERRARO, P.G. **Delivery Order Manager**

EDUCATION:

M.S., Geology, Oklahoma State University at Stillwater
B.S., Geology, James Madison University
B.S., Earth Science Education, Slippery Rock State College

EXPERIENCE:

A registered Professional Geologist and the manager of E & E's field support group, Mr. Ferraro has 19 years' experience. He specializes in the performance of remedial investigation/ feasibility studies (RI/FSs) and the planning/implementation of remedial action programs.

For Carborundum Corporation in Niagara Falls, New York, Mr. Ferraro managed E & E's RI/FS concerning contamination of groundwater in fractured Lockport dolomite bedrock by volatile organic compounds (VOCs). Responsible for project scheduling, cost control, and client/agency liaison, he led all technical aspects of the work, including groundwater modeling and evaluation of data obtained from 30 monitoring wells, interpretation of pump test data, and assessment of contaminant transport; report preparation; and implementation of initial remedial measures (tank cleaning and vacuum extraction of soil contaminants). Mr. Ferraro subsequently assisted Carborundum during the negotiation of the consent order for remedial action. He managed the phased remediation of the bedrock aquifer and the innovative use of soil vapor extraction (SVE) to remediate VOC contamination of low-permeability soil within the unsaturated aquifer. Mr. Ferraro helped develop the SVE design based on site-specific contaminant characteristics, the extent of contamination, soil characteristics, depth to groundwater, emission control requirements, and site cleanup goals. Low-permeability surface soil was covered with a temporary liner and injected with air to increase system effectiveness. The client's Environmental Properties Manager for the Carborundum site recommended Mr. Ferraro for his responsive, cost-effective management of this project.

Mr. Ferraro managed the RI/FS and remedial action for the Schilling Farm site in Michigan. To address VOC, PCB, and heavy metal contamination, the RI included installation/sampling of 24 monitoring wells; a statistical characterization of surface and nearsurface soil by use of quick-turnaround, in-field soil-gas and inductively coupled argon plasma analyses; surface geophysical surveys; wetland delineation; and residential well, stream, and sediment sampling. Mr. Ferraro led the completion of 16 lead-screen auger borings and in-field screening of gas samples from the shallow aquifer for chlorinated hydrocarbons, demonstrating the configuration of the downgradient groundwater plume. The results of a 48-hour pumping test demonstrated the feasibility of groundwater recovery and supported the groundwater modeling. The FS involved evaluation of remedial alternatives including vapor extraction, surfactant flushing, and dehalogenation.

SPECIAL EXPERIENCE:

International

Mr. Ferraro is assistant project manager for E & E's support for the Uzen Oilfield Rehabilitation Project in Kazakhstan. The World Bank-funded program involves assessment of the extent of environmental degradation in the country's largest fully operational oilfield; development of remedial strategies; and consultation to help USC Uzenmunaigas (the oilfield operator) strengthen its environmental management capacity, including the capacity to measure/monitor the environmental effects of field operations.

DOE

For the Idaho National Engineering and Environmental Laboratory, he provided critical reviews of several remedial programs. He recommended cycling of the technology for the vapor extraction program and modification of the treatment method for extracted vapor. To determine the feasibility of a surfactant program, he recommended a risk analysis approach.

For the New York State Energy Research and Development Authority, Mr. Ferraro directed the RCRA facility investigation (RFI) for six solid waste management units at the Western New York Nuclear Service Center. He provided QA for E & E's development of the four-volume RFI work plan (including the project and data management plan, quality assurance project plan, health and safety plan, and a community relations plan); drilling and sampling; and preparation of the RFI report. He also directed the development of the Waste Analysis Plan for the state-licensed low-level radioactive waste disposal area (SDA) and provided technical reviews for the SDA groundwater monitoring program.

Additional Waste Sites

For the Kansas City District of the United States Army Corps of Engineers, Mr. Ferraro was principal in charge of E & E's preliminary assessment/site inspections for 465 areas of interest (AOIs) at Griffiss Air Force Base (AFB). He participated in the evaluation of over 400 AOIs to identify and rank characterization/remediation priorities for areas most likely to be transferred from DoD to private concerns. For sites selected for confirmation sampling, he provided overall direction and QA for the geophysical investigations; groundwater sampling and screening; soil and sediment sampling; and development of a basewide geographic information system.

Under the Alternative Remedial Contracting Strategy (ARCS) program for EPA Region 3, Mr. Ferraro was the hydrogeology task leader for the Berks Sand Pit in Pennsylvania. He planned and managed a supplemental groundwater investigation to further characterize the extent of VOC contamination in fractured bedrock. The work involved installation/sampling of 10 well nests and packer production testing for deep wells. Mr. Ferraro also led the data interpretation, design/siting of recovery wells, and performance of pumping tests to determine the recovery well capture area. Following the evaluation of the pumping test data, he managed the installation of additional downgradient monitoring wells to define the distal portion of the contaminant plume, then managed the installation/pump testing of three additional recovery wells to remediate that portion of the plume.

EDUCATION:

B.S., Geoscience, State University of New York College at Buffalo

EXPERIENCE:

A registered Professional Geologist with 11 years' experience at E & E, Mr. Meyers leads and participates in the planning, geologic logging, drilling, installation, development, and sampling of groundwater monitoring-well networks; surface water, sediment, and soil sampling; sample field screening; and electromagnetic conductivity (EM), magnetometer, ground-penetrating radar, seismic refraction, and resistivity surveys. In support of his field activities, he conducts site file searches, background literature reviews, interviews, and aerial photointerpretation. He also monitors contractor activities to ensure cost-effectiveness, timeliness, and compliance with contract stipulations and applicable permits/regulations.

In support of E & E's Phase II site investigations for the New York State Department of Environmental Conservation (NYSDEC), Mr. Meyers provided oversight for drilling operations and monitoring-well installation at several hazardous waste sites in Buffalo, Niagara-Wheatfield, Evans, Tonawanda, and Pittsford, New York. For the Fedders Automotive site in Niagara-Wheatfield, he also wrote the Phase II investigation report.

Under the NYSDEC standby contract, Mr. Meyers led and participated in monitoring-well installation, sampling, and abandonment activities. He performed both rising- and falling-head slug tests in new wells using a Hermit 2000 model data logger with pressure transducers. As project geologist for the preliminary site assessment (PSA) for the Leastman Landfill, he conducted a site walkover, EM and magnetometer surveys, and a New York State Department of Health file search; and wrote the PSA report. He also wrote the geology and hydrogeology sections of the PSA for the Perinton Landfill. As team geologist for the PSA for Scotia Navy Depot, he was responsible for drilling and monitoring-well installation, well development, groundwater sampling, and residential well sampling. Under the same contract, he was field team leader/geologist for the drilling and installation of monitoring wells and geologic logging at the Roblin Steel site.

For three months, Mr. Meyers was field team leader for E & E's RCRA facility investigation (RFI) for the state-licensed disposal area (SDA) at the Western New York Nuclear Service Center in West Valley. He determined drilling locations; drilled and installed wells in and around the SDA; led the sampling of subsurface soil, lagoon sediment, and surface water and sediment; and helped write the RFI report.

At the Noyes Island site in Binghamton, New York, he was E & E's geological field team leader for an underground storage tank investigation for New York State Electric and Gas. He located, drilled, and installed a recovery well; supervised and helped construct a temporary carbon-filter water treatment system; performed a step-drawdown pump test on the new recovery well using a Hermit 2000 model data logger with pressure transducers; collected groundwater samples; and assisted in the preparation of the site report.

EUGENE FLORENTINO, P.G. **Alternate Field Team Leader**

EDUCATION:

M.S., Geology, University of Akron
B.S., Geology, State University of New York College at Oneonta

EXPERIENCE:

A registered Professional Geologist with 15 years' experience, Mr. Florentino manages/ conducts remedial investigation/feasibility studies (RI/FSs) and geophysical, geological, and hydrogeological investigations.

He has managed five geophysical investigations and sampling projects for the St. Louis District of the United States Army Corps of Engineers (USACE). As project manager for the former Nike Battery N-52 site in Chesapeake, Virginia, he led the drilling, installation, and sampling of groundwater monitoring wells; near-surface soil sampling; and sampling of USTs and hydraulic fluid from the generator building and missile silos. He managed soil and groundwater investigations at the Dover Survival Training Annex and Governor Bacon Health Center in Delaware. He was assistant manager/field team leader for investigations at the former Naval Ammunition Depot in Hingham, Massachusetts. At the Naval Ship Parts Control Center in Mechanicsburg, Pennsylvania, he led the electromagnetic conductivity survey team and participated in the resistivity survey and hydrologic testing of groundwater monitoring wells.

For the USACE Kansas City District, Mr. Florentino managed investigations of over 450 areas of interest and 31 areas of concem at Griffiss Air Force Base (AFB) in Rome, New York. He also conducted metal detector surveys to locate over 100 USTs at the AFB.

He has investigated sites throughout New York State under E & E's various contracts with the New York State Department of Environmental Conservation (NYSDEC). As a key program manager/geologist for the standby contract, he managed the RI for Perfection Plating in Watervliet; was RI task leader/project geologist for the two-phased RI/FSs for the Abandoned Solvent Center site in Pompey and the Dearcop Farm site in Gates; and managed the investigation of the American Cleaners site in Binghamton. He was responsible for soil-gas sampling; the installation/sampling of monitoring wells; performance of dye tracer studies; sampling of USTs, test pits, surface water, and sediment; and report preparation. He also coordinated and oversaw the activities of the seismic survey subcontractors. As geophysical team leader for the RI/FS for the Madison Wire/Orban Industries site, he led electromagnetic (EM) conductivity, magnetometer, and ground-penetrating radar (GPR) surveys; groundwater monitoring-well purging, and sampling; and the maintenance of site logs for soil boring. In addition, Mr. Florentino has managed numerous preliminary site assessments under the NYSDEC standby contract.

VASSILIA ANGELAKI **Geologist**

EDUCATION:

M.S., Geology, Kent State University
B.S., Geology, National and Capodistrian University of Athens, Greece

EXPERIENCE:

Ms. Angelaki provides hydrogeological, geotechnical, and geophysical support at sites containing USTs, pipeline facilities, and hazardous waste. She conducts site investigations; plans and monitors the installation of groundwater monitoring-well networks; prepares and implements sampling plans for groundwater, surface water, soil, and sediment; conducts geophysical surveys involving use of magnetometer, ground-penetrating radar, electromagnetic conductivity, resistivity, X-ray diffractometer, and SediGraph particle-size analyzer instrumentation; participates in soil-gas surveys and sample field screening; and assists in the preparation of environmental assessments. She interprets the results of her field work, associated laboratory analyses, and computer modeling to delineate the nature, magnitude, pathways, and receptors of surface and subsurface contamination; evaluate multiaquifer groundwater systems; and develop site-specific remedial measures. In addition, she helps write well network specifications; evaluates facility compliance with environmental regulations and permits; and monitors the work of drilling and construction contractors.

Ms. Angelaki was E & E's field team leader for a two-phased environmental regulatory compliance audit of a rubber plant Shenyang, People's Republic of China. In addition to coordinating the preparation for field activities and the shipment of equipment and sampling containers, she led all fieldwork, including drilling; groundwater, surface/subsurface soil, and sampling; and preparation/shipment of samples from China to E & E's Analytical Services Center in Buffalo, New York. Upon returning to the United States, she interpreted field data and the results of the sample analyses to delineate groundwater flow and the nature/extent of on-site contamination, provided daily communication with the joint-venture client's United States-based office, and wrote the Phase II (field investigation/sampling) report section and integrated it with the section for Phase I.

As a geologist with Coogan & Associates, Inc., in Ohio, Ms. Angelaki conducted geological site assessments, mapped geological features, and provided geotechnical support for stormwater management and erosion control projects.

In Budapest, Hungary, she conducted field research, literature reviews, and geological analyses to support projects being conducted by the Eòtvos Lorand Geophysical Institute of Palaeomagnetism.

B-2 Laboratory Quality Assurance Manual

Quality Assurance
Manual

Revision No. 4
January 2002

ECOLOGY AND ENVIRONMENT, INC.
Analytical Services Center
4493 Walden Avenue
Lancaster, New York 14086
(716) 685-8080
Facsimile (716) 685-0852

The quality assurance system described in this Quality Assurance Manual has the support of the management at Ecology and Environment, Inc., Analytical Services Center. Every member of the Analytical Services Center staff is tasked to provide quality data to our clients. It is the responsibility of all personnel to use and follow this manual as a guide for quality improvement.

Signature: **Date:**

Gary Hahn 1-29-02
Gary Hahn
Technical Director

Raymond W. Piccione January 29, 2002
Raymond Piccione, Ph.D.
Laboratory Quality Assurance Coordinator

Caryn Wojtowicz January 29, 2002
Caryn Wojtowicz
General Manager

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Appendix

List of Tables and Illustrations

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List of Acronyms

% D	percent difference
% R	percent recovery
AA	atomic absorption spectrophotometers
APHA	American Public Health Association
ASC	Ecology and Environment's Analytical Services Center
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BFB	bromofluorobenzene
BOD	biochemical oxygen demand
BOD_5	5-day biochemical oxygen demand
CAD	computer-aided design
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	chain-of-custody
COD	chemical oxygen demand
DFTPP	decafluorotriphenylphosphine
DOT	United States Department of Transportation
DQOs	data quality objectives
E & E	Ecology and Environment, Inc.
EDD	electronic data deliverables
EPA	United States Environmental Protection Agency
GAC	general analytical chemistry
GB	gigabyte
GC/MS	gas chromatography/mass spectrometry
HMTA	Hazardous Materials Transportation Act

List of Acronyms (Cont.)

HP	Hewlett Packard
HPLC	high performance liquid chromatography
IC	ion chromatography
ICP	inductively coupled plasma
ICS	interference check samples
ICV	initial calibration verification
IPR	initial precision and recovery
KCl	potassium chloride
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LIMS	laboratory information management system
LRS	Laboratory Report System
MB	megabyte
MDL	method detection limit
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
MSDS	material safety data sheets
NELAC	National Environmental Laboratory Accreditation Conference
NELAP	National Environmental Laboratory Accreditation Program
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NYCRR	New York Code of Rules and Regulations
OSH	Occupational Safety and Health Act
OSHA	Occupational Safety and Health Administration
PARCC	precision, accuracy, representativeness, completeness, comparability
PCR	polymerase chain reaction
PE	performance evaluation; same as PT
PT	performance test sample
ppm	parts per million
PQL	practical quantitation limit
QA	quality assurance

List of Acronyms (Cont.)

QAM	Quality Assurance Manual
QAPP	quality assurance project plan
QC	quality control
RAM	random access memory
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
SOP	Standard Operating Procedure
SOW	statement or scope of work
TKN	total Kjeldahl nitrogen
TOC	total organic carbon
TOX	total organic halogen
TRPH	total recoverable petroleum hydrocarbons
UPS	uninterruptible power source
VIM	International Vocabulary of Basic and General Terms in Metrology

Distribution Policy

The Quality Assurance Manual (QAM) distribution is controlled by the Ecology and Environment, Inc. (E & E) Analytical Services Center (ASC) Document Control Officer. The document is not released without approval by the Corporate Quality Assurance (QA) Director or Laboratory QA Coordinator. Uncontrolled copies are generally released to outside clients or agencies. Internal copies are controlled and maintained by the Document Control Officer.

When this QAM is revised and approved, it is distributed to each laboratory section. The distributed copies are recorded, along with the current revision number, in a distribution database maintained by the Document Control Officer. The names of the QAM recipients outside the laboratory are also recorded in the database. The recipients will be sent all revisions for a period of one year.

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1

Introduction

This manual describes the quality assurance (QA) program employed at Ecology and Environment's Analytical Services Center (ASC). It is intended to provide employees, accrediting agencies, and clients with an understanding of how the ASC maintains an effective QA system. The QAM is divided into 16 sections. The sections provide general descriptions of ASC objectives, policies, facilities, organization, personnel, services, and specific QA and quality control (QC) procedures as practiced within each area of operation. Referenced figures, tables, and standard operating procedures (SOPs) support the descriptions in the QAM sections and related documentation. The content of the QAM sections is not modified for specific clients or agencies unless the requirements of these clients become standard policy. Client-specific requirements are included in project-specific documents or in the client-specific sections of the operational SOPs, as appropriate.

QA
quality assurance

ASC
Analytical Services Center

QAM
Quality Assurance Manual

QC
quality control

SOPs
standard operating procedures

The SOPs are maintained written procedures for implementing the activities described in this manual. The SOPs are made available to the staff as electronic documents as defined in the Document Control Procedure (see Section 11). All laboratory personnel assigned responsibilities outlined in this QAM are to adhere to the procedures and policies described here and in the laboratory SOPs.

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2

Definitions

NELAC
National Environmental Laboratory Accreditation Conference

EPA
United States Environmental Protection Agency

Definitions for this QAM are taken from the National Environmental Laboratory Accreditation Conference (NELAC) *Quality Systems Manual* (Revision 14, July 29, 2000); “Test Methods for the Evaluating of Solid Waste, Physical/Chemical Methods,” United States Environmental Protection Agency (EPA) SW-846, Update III, June 1997; and other relevant state and federal guidance. The NELAC manual quotes relevant definitions from ISO/IEC Guide 2; ISO 8402; ANSI/ASQC E-4, 1994; the EPA “Glossary of Quality Assurance Terms and Acronyms”; and the *International Vocabulary of Basic and General Terms in Metrology* (VIM), 1994 and others. These definitions are provided in Appendix A. The list of standard definitions is referenced in internal SOPs. The SOPs include any definitions related specifically to that procedure.

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3

Organization and Management

3.1 Company

The location, mailing address, and phone numbers for ASC are:

Ecology and Environment, Inc.
Analytical Services Center
4493 Walden Avenue
Lancaster, New York 14086
Telephone: (716) 685-8080
Facsimile: (716) 685-0852
Electronic mail: cwojtowicz@ene.com
Website: www.ene.com

E & E
Ecology and Environment, Inc.

GC/MS
gas chromatography/ mass spectrometry

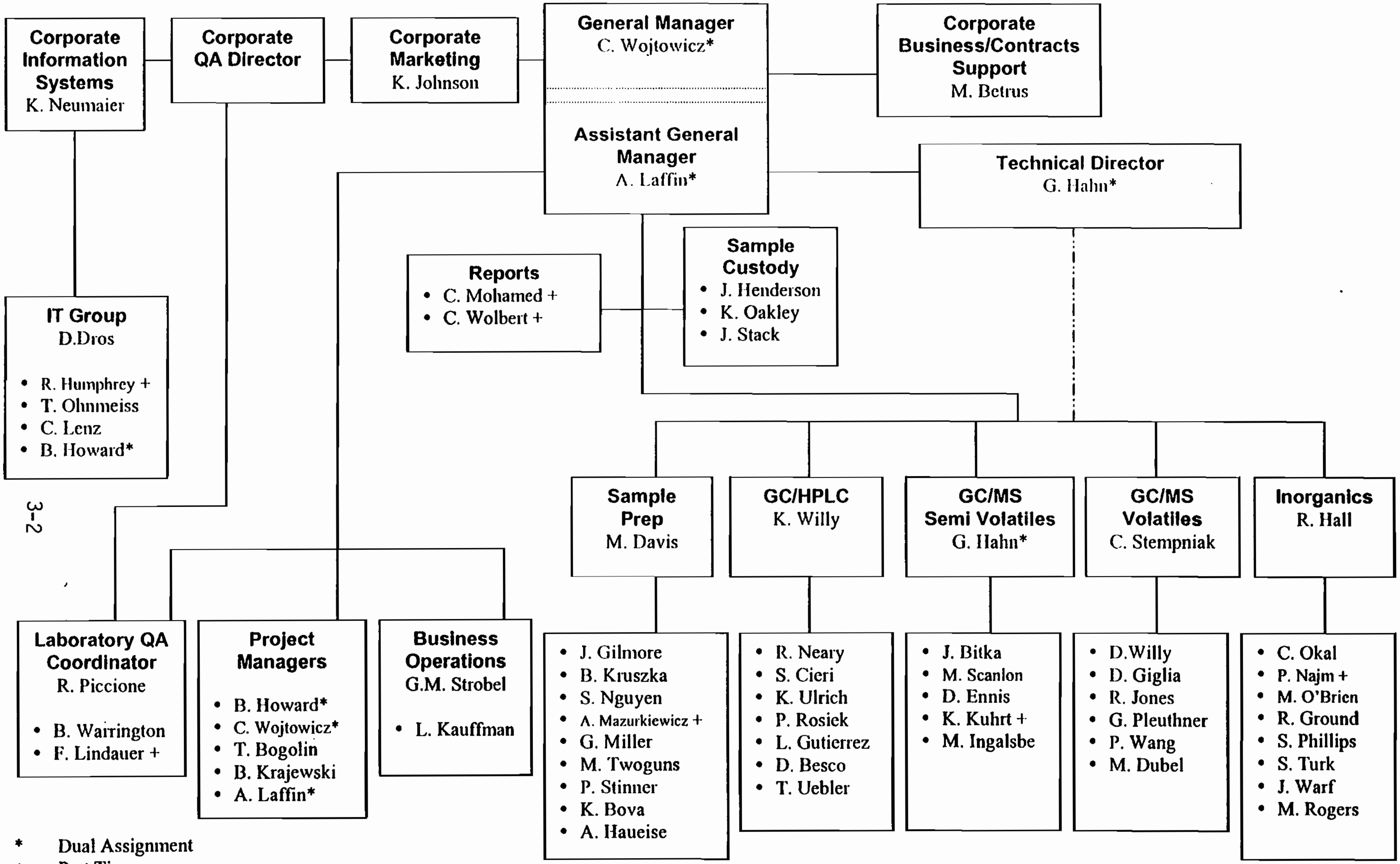
HPLC
high performance liquid chromatography

Ecology and Environment, Inc. (E & E) is a publicly held corporation registered and incorporated in the State of New York. E & E has been in business since 1970; ASC is a division of E & E. ASC serves environmental businesses; local, state, and federal agencies; industry; and various international projects.

3.2 Organization

The ASC's services include analysis of samples. The primary contact at ASC for analytical testing is the Business Operations Manager. In addition to standard laboratory analyses, ASC provides other services in conjunction with E & E's corporate staff.

The QA and management structure at ASC is presented on Figure 3-1. Appendix G shows the organizational chart with current staffing. The ASC is divided into the following production sections: organic and inorganic sample preparation, gas chromatography/mass spectrometry (GC/MS) semivolatiles, GC/MS volatiles, GC volatiles, GC semivolatiles (pesticides, etc.) and high performance liquid chromatography (HPLC), inorganics (metals analysis and general chemistry), and sample custody. Project management, information technology, QA, and administrative units operate in conjunction with production work groups but report independently to the Laboratory General Manager.



Corporate Information Systems
K. Neumaier

Corporate QA Director

Corporate Marketing
K. Johnson

General Manager
C. Wojtowicz*

Assistant General Manager
A. Laffin*

Corporate Business/Contracts Support
M. Betrus

Technical Director
G. Hahn*

Reports
- C. Mohamed +
- C. Wolbert +

Sample Custody
- J. Henderson
- K. Oakley
- J. Stack

IT Group
D.Dros
- R. Humphrey +
- T. Ohnmeiss
- C. Lenz
- B. Howard*

Sample Prep
M. Davis
- J. Gilmore
- B. Kruszka
- S. Nguyen
- A. Mazurkiewicz +
- G. Miller
- M. Twoguns
- P. Stinner
- K. Bova
- A. Haueise

GC/HPLC
K. Willy
- R. Neary
- S. Cieri
- K. Ulrich
- P. Rosick
- L. Gutierrez
- D. Besco
- T. Uebler

GC/MS Semi Volatiles
G. Hahn*
- J. Bitka
- M. Scanlon
- D. Ennis
- K. Kuhrt +
- M. Ingalsbe

GC/MS Volatiles
C. Stempniak
- D.Willy
- D. Giglia
- R. Jones
- G. Pleuthner
- P. Wang
- M. Dubel

Inorganics
R. Hall
- C. Okal
- P. Najm +
- M. O'Brien
- R. Ground
- S. Phillips
- S. Turk
- J. Warf
- M. Rogers

Laboratory QA Coordinator
R. Piccione
- B. Warrington
- F. Lindauer +

Project Managers
- B. Howard*
- C. Wojtowicz*
- T. Bogolin
- B. Krajewski
- A. Laffin*

Business Operations
G.M. Strobel
- L. Kauffman

* Dual Assignment
\+ Part Time

ASC ORGANIZATIONAL PLAN

----Technical Supervision of Operations

Responsibilities and authority of key personnel are summarized in this section. Resumes of key ASC personnel are found in the company's training record files.

3.2.1 Responsibility and Authority

All personnel are responsible for establishing, implementing, maintaining, and enforcing procedures for data quality management and control as defined in the QA Manual (QAM) and related documentation. Each person is responsible for the day-to-day quality of data and the services performed. The overall responsibilities of the ASC staff are defined below. Additional specific job functions and duties are listed in the job descriptions for the following positions. Job descriptions are maintained in the QA files.

General Manager

- Ethics training.
- Reports to E & E ASC Executive Committee.
- Directs Marketing.
- Designates the Laboratory Quality Assurance Coordinator.
- Designates Section Supervisors.
- Oversees Support staff.
- Ensures adequate resources are available to all staff to meet the objectives of the QA program.
- Directs business operations.
- Information Technology coordination.

Assistant General Manager

- Performs General Managerial functions as delegated by or in absence of the General Manager.

Technical Director

- Reports to the General Manager and is responsible for all technical operations.
- Exercises day-to-day supervision of laboratory operations.
- Duties include monitoring standards of performance in quality control and quality assurance; monitoring the validity of the analyses performed and data generated to assure reliable data.
- Understanding client and market needs, requirements, or standards.
- Ensuring that data reported meet the method or client-specific requirements.
- Overseeing data quality issues that affect the client.
- Participating in quality decisions affecting any client.
- Conducts an annual management review of all quality systems in conjunction with the General Manager and Corporate QA Director.
- Names, in the event of a temporary absence (15 consecutive calendar days) of Technical Director, a chief-level project manager to fulfill the director's duties.

Laboratory QA Coordinator

- Reports to the General Manager and Assistant General Manager. May report directly to the Corporate QA Director any QA concerns.
- Implements and reviews all QA practices, including corrective actions, internal audits, training, and other activities as defined in Section 4.3 and throughout the QAM.
- Monitors and reports to the Technical Director and General Manager on the status of all QA-related matters.

- Oversees maintenance of the QAM, the QA files, and other version-controlled documents as current documents.
- Oversees retrieval of all laboratory records as defined for archiving in the document control procedure.
- Is independent of all production responsibilities.
- Has authority to halt production for continuing QC or QA problems.

Section Supervisors

- Report to the Technical Director for all technical and production matters.
- Coordinate with the Technical Director to evaluate the resources available for daily work production.
- Review data and evaluate the QC elements for recurring or continuing nonconformances.
- Work with the Technical Director and General Manager to resolve process and system nonconformances.

Project Managers

- Report to the General Manager for all matters related to client services.
- Implements and reviews all QA and QC practices as defined in the project- or client-specific requirements.
- Maintains all project files and client QA/QC documentation.
- Communicates relevant information to the appropriate staff.
- Reports all client complaints via the corrective action process.

Technical Staff

- Report to the Section Supervisor for work assignments and scheduling of samples to be analyzed.
- Responsible for performing work according to the SOP, meeting agreed-upon time scale, and achieving the QC criteria defined in the SOP (or advising supervisor of failure).
- Records information on a corrective action form when QC criteria are not within defined limits, or when procedures deviate from the SOP or client requirements.
- Performs all necessary administrative operations according to the documented SOP, including corrective action, document control, data review, traceability, and sample management.
- Performs all necessary ancillary technical operations according to the documented SOP or good laboratory practice, including routine preventative maintenance, standard preparation and inventory, and calibration of instruments and equipment.

Sample Custody Staff

- Report to the Assistant General Manager or designee for all matters related to sample receipt, handling, and disposal.
- Responsible for performing work according to the sample management SOPs and performing all operations within agreed-upon time scale.
- Record information on a Project Manager notification form when samples or materials are received that do not conform with client or method requirements.
- Perform all necessary administrative operations according to the documented SOP, including corrective action, document control, data review, and traceability.

Quality Assurance Staff

- Report to the Laboratory QA Coordinator for the job duties assigned.
- Record information on a corrective action form when data or other information is received that does not conform with the SOP or client requirements.
- Perform all necessary administrative operations and record keeping according to the documented SOP, including corrective action, document control, and data review.

Administrative Staff

- Report to the Assistant General Manager or designee for the work area assigned.
- Responsible for performing work according to the assigned SOP and performing all operations within agreed-upon time scale.
- Record information on a corrective action form when data or other information is received that does not conform with the SOP or client requirements.
- Perform all necessary administrative operations and record keeping according to the documented SOP, including corrective action, document control, and reporting.

Corporate Quality Assurance Director

The corporate QA Director ensures compliance with the Corporate QA Program. The corporate QA Director remains independent of day-to-day, direct project activities, but is responsible for ensuring that all QA/QC requirements are met. The parent company assists with QA oversight at the laboratory and utilizes staff with appropriate training and expertise to evaluate those operations.

3.2.2 Verification

Verification activities include inspection and monitoring of process and data quality, and auditing the quality system, processes, and data. Effective verification is achieved by providing personnel with adequate resources, including adequate training, supplies, and equipment; time for verification activities; knowledge of requirements and documented procedures; and access to quality records.

Technical personnel, under the direct supervision of the Section Supervisors, are responsible for the inspection and monitoring of in-process and final data. Audits of the quality system and process are performed by personnel who do not have direct responsibility for the work being performed. Quality system audits are carried out by the Laboratory QA Coordinator. Process audits are scheduled by the Laboratory QA Coordinator and carried out by designated personnel and trained internal auditors (see Section 4.4).

3.2.3 Management Review

The Laboratory QA Coordinator reports directly to the General Manager, functions independently of production, and has the authority to implement and maintain the quality system. The Laboratory QA Coordinator meets monthly with supervisors and management representatives to discuss the status of quality issues and expectations in the laboratory sections. The Laboratory QA Coordinator reports to management on the status of all QA activities, including open and closed corrective actions, internal audit results, external audit results, status of certifications and approvals, client complaints, and major quality issues. Updates are provided via electronic mail. The Laboratory QA Coordinator interacts with personnel at all levels throughout the organization.

A management review of the quality system is conducted annually by the Technical Director, General Manager, and Corporate QA Director. The management review must ensure that the quality system remains effective, meets quality objectives and policies, and satisfies the requirements of state and federal certifications or approvals held by the ASC. Management review includes review of the annual QA systems audit and changes in laboratory operations, staff activities, and client concerns. The management review includes areas for improvement in relation to quality systems.

4

Quality System

4.1 Objective

The objective of the staff at ASC is to provide data and services that are legally defensible, scientifically valid, timely, and to the satisfaction of clients' expectations.

4.2 Policies

The management of ASC supports the following policies in order to achieve the objective and promote the overall QA program:

- Laboratory procedures, including client requirements, are documented in SOPs that clearly communicate these procedures to laboratory personnel.
- Management emphasizes quality improvement through commitment and leadership.
- A comprehensive QC system has been established and is maintained to verify and assure continued precision and accuracy of analytical results.
- Adequate training on laboratory operations is provided for all employees whose decisions affect the quality of laboratory data and services.
- A comprehensive program of documentation has been implemented and is maintained to ensure accountability and traceability throughout the analytical process.
- Measures are taken to ensure that sample integrity is protected.
- Studies are performed to demonstrate the capabilities for each analytical method.

- The instrumentation, equipment, and materials used in the production process are controlled to ensure that required quality standards are within specifications.
- A comprehensive program for data reduction, review, reporting, and archiving is maintained.
- Preventive and corrective actions are taken, as necessary, to eliminate the causes of potential or actual nonconformance.
- Measures are taken to fulfill the requirements of agencies from whom certifications and accreditations have been granted.
- Client-specific requirements are incorporated in the overall QA program by addendum to appropriate SOPs.

4.3 Quality Assurance

Through a formal QA system, ASC provides testing services that meet specific quality standards. These quality standards are defined to meet the needs and requirements of clients, the analytical methods used, government agencies, and E & E's senior management. Quality Assurance is composed of **quality control** and **quality assessment**.

Quality control: A system of activities applied at each stage of the data production process designed to ensure that data meet defined quality standards. This system includes the following: system, operational, and performance audits; reference materials; statistical evaluations; reanalysis; and measurement bias investigation (when measurements may be operator-, instrument-, or methodology-dependent).

Quality assessment: A system of activities designed to ensure that quality control takes place at each stage of the production process. This system includes the following: employee education, training, and experience; documentation (e.g., instructions, document control, records); instrument calibration and maintenance; traceability of samples, data, and methods; laboratory facilities; and inspection.

The ASC management is accountable for the quality of the services provided, and each employee is an integral part of achieving the system objectives. This section is limited to a discussion of the major activities performed and administered by the QA unit; policy details are discussed throughout this manual.

The QA program at ASC is affected by the requirements of certification agencies. The Laboratory QA Coordinator is directly responsible for coordination of the following external quality assessment activities:

- On-site audits by outside agencies;
- Analysis of performance test (PT) samples;
- Corrective action responses to deficiencies cited in external audit reports and external PT results; and
- Dissemination of requirements and status of certifications to relevant laboratory personnel and project managers.

PT
Performance test sample. Variously known as performance evaluation sample (PE).

4.3.1 Quality Assurance Unit

At ASC, the QA unit monitors the QA system and reports the results of its observations to the Technical Director and the General Manager. The Laboratory QA Coordinator has no direct responsibility for production, scheduling, or workflow in the laboratory. The objective of this independence is to eliminate all conflicts of interest in the performance of QA duties. Major activities performed and administered by the QA unit are summarized below. Each activity is discussed in greater detail elsewhere in the QAM.

- Performance of internal audits and coordination of external audits (Section 4.4);
- Administration of laboratory certification/accreditation programs (Section 4.7);
- Administration of a system for formal corrective action reports (Section 4.5);
- Administration of the document control system, including the publication of the QAM (Section 11) and other documents that describe ASC's QA system; and
- Administration of the in-house training program (Section 5.5).

4.4 Audits

The ASC conducts internal audits in which the laboratory reviews and examines itself, and undergoes external audits in which the laboratory is audited by outside organizations. Internal system audits are defined in the internal audit SOP QA.19 as operational and system audits.

4.4.1 Internal Audits

The internal audit is a review of the quality system as it is employed in the laboratory. Auditors verify that adequate written instructions are available for use; that analytical practices performed in the laboratory are consistent with SOPs; that the QC practices are applied during production; that corrective actions are applied as necessary; that deviations from approved protocols occur only with proper authorization and documentation; and that SOPs, quality records, analytical records, and magnetic tape are properly maintained.

System Audit

Internal system audits are conducted by the Laboratory QA Coordinator at least once per year. The system audit is a review of the overall system of operations and is used to verify that corrective actions are being implemented effectively. The system audit is a sampling of all operations and include sample tracking from receipt to disposal, a data audit of a completed report, and audits of ancillary operations as necessary to support the data audit. Data audits ensure that data comply with method and SOP requirements, deliverable specifications and standard traceability. The internal system audit report is provided to laboratory management and forms the basis for management review of the quality systems described in Section 3.2.3.

Operational Audit

The Laboratory QA Coordinator schedules internal operational audits for all sections at least once per year. The operational audits are a more detailed review of laboratory (procedure) operations. They are performed by analysts, Section Supervisors, or supervisors from sections other than those being audited or by the Laboratory QA Coordinator. This manner of conducting operational audits allows for the exchange of ideas, improving production flow and operations.

Prior to a scheduled audit, checklists or the SOP specific to the area are reviewed by the assigned auditor. The checklist or notes from the audit are returned to the Laboratory QA Coordinator as part of the audit report. The specific contents and process for conducting and reporting on the audit are detailed in the internal audit SOP QA.19. Any deficiencies or nonconformances found during the audit are recorded on a corrective action form. The corrective action procedure is followed to ensure the nonconformance is corrected.

4.4.2 External System Audits

Representatives sent by clients, government, or accrediting agencies often perform system audits at the ASC. These audits are announced inspections. The Laboratory QA Coordinator accompanies the external audit team through the laboratory. The auditors receive a brief overview of company objectives, activities, and facilities. Interviews with essential supervisory and technical staff are arranged and any documentation pertinent to the audit is retrieved. Auditors typically provide a report on their findings shortly after the audit. This account is evaluated by the Laboratory

QA Coordinator and reported to management, along with a corrective action form responding to any cited deficiencies.

4.4.3 Performance Test Samples (or Proficiency Evaluation Samples)

A PT sample analysis is the analysis of a fortified blank sample or real world sample for the purpose of evaluating laboratory or analyst performance. The PT samples are submitted by or purchased from a NELAC-approved PT provider and have analyte concentrations unknown to the ASC. The PT sample may be analyzed in conjunction with accreditation programs, or as blind and double blind check samples submitted by clients.

Generally, the PT samples are used to maintain the laboratory's NELAP accreditation, but are also used for other (non-NELAP) state certifications. Performance test samples may be used to provide information to an accrediting agency on correction of past performance on a performance test sample.

4.5 Corrective Action

The ASC takes the necessary actions to prevent or correct nonconformances in data and services. When corrective actions result in permanent procedural changes, pertinent documentation (e.g., SOPs) is modified to reflect these changes. A formal corrective action reporting system, administered by the QA unit, is in place at ASC. The process is described in the corrective action SOP QA.1 and is applicable to all nonconformances or client concerns.

Routine corrective actions are made by the analysts, technicians, or other personnel who detect problems or nonconformances during analysis of samples. The SOPs for testing procedures contain instructions for implementing and documenting corrective actions for typical problems. These actions are typically noted in the laboratory section documentation. Any data reported outside SOPs or project requirements must be described on a corrective action form submitted with the results for project manager approval.

Sample custody concerns, such as problems during cooler receipt or holding time violations, are reported immediately on a Project Manager Notification form to the project manager for resolution. Deviations from the SOP and other activities that require approval or actions by others also may be recorded on the corrective action form (see Appendix B).

All non-routine problems, deficiencies, or irregularities are reported to management as part of the corrective action process. The corrective action process is used to report all audit findings from both external and internal audits as well as client issues or complaints from the review of analytical data.

The QA unit monitors the progress of corrective actions, maintains completed documentation, and provides reports to the General Manager on the status of the corrective action activities. Corrective action forms may be originated by any ASC personnel. The original form is sent to the person responsible for completing the corrective action. This person is responsible for recording the corrective action plans, implementations, and follow-up actions to be completed. During the corrective action process, several measures may be taken, including: determination of the root cause through careful analysis of processes, specifications, quality records, customer complaints, and use of statistical process control; implementation of process controls to ensure that effective corrective action is taken; application of remedial actions to reports or data affected by the identified problem; and revision of documentation for procedures that changed as a result of the corrective action. The goal of the corrective action process is to complete all corrective action forms before data are reported to the client.

4.6 Quality Control

QC is applied at every stage of the testing process at the ASC. Its purpose is to assure that the data reported to clients are within defined acceptance and performance criteria. QC activities are described in many sections of this manual; this section presents those QC activities that are quantified with defined acceptance and performance criteria.

The criteria are derived from several sources, including requirements of the analytical methods, needs stated by clients, and standards established within the ASC. During the generation of data, verification activities evaluate the performance of the measurement to the specified criteria. These verification activities include data review by a peer reviewer, proofreading of all data entry, project-specific review, and a data review by the Laboratory QA Coordinator on a random selection of the final reports (see Section 12.2).

When defined quality standards have not been met (a nonconformance), the corrective action process is initiated to document and track the nonconformance and the corrective actions taken. The Laboratory QA Coordinator and Technical Director or their designees review the information to determine the effectiveness of the QC system.

4.6.1 Data Quality Objectives

DQO
data quality objective

SOW
scope of work or statement of work

PARCC
precision, accuracy, representativeness, completeness, and comparability

RPD
relative percent difference

LCS
laboratory control sample

The data quality objectives (DQOs) are developed by the client during the design of a given study and typically presented to the laboratory as a QAPP or contract scope or statement of work (SOW). The DQOs are qualitative and quantitative indicators used to define the quality of the data needed to support specific project decisions. DQOs specify critical data points or acceptance criteria to be achieved to make the proper decision. The qualitative and quantitative indicators are often expressed as precision, accuracy, representativeness, completeness, and comparability (PARCC). Achievement of these quality indicators helps to demonstrate that the data are scientifically valid, legally defensible, and adequately meet client requirements as stated by the DQOs. The laboratory reviews all project-specific DQOs made available to it and identifies any areas in which internal QC criteria indicate project DQOs may not be achievable (see Section 13).

Precision

Precision measures the reproducibility of measurements under a defined set of conditions. It is a quantitative measure of the variability of a group of measurements compared to their average value. Precision is usually stated in terms of standard deviation, coefficient of variation, or relative percent difference (RPD) between two values. Precision is determined in the laboratory by evaluating laboratory duplicates, matrix spike duplicates, or replicate measurements of the sample or standard. Precision measurements for overall sampling and analytical testing are evaluated through field duplicates or split samples.

Accuracy

Accuracy is a quantitative measure of the relationship of reported data compared to the true or expected values and includes a combination of random and systematic error. Accuracy is determined in the laboratory by evaluating the recoveries of laboratory control samples (LCS), through the use of surrogate spikes, and stated in terms of percent recovery or the average (arithmetic mean) of the percent recovery. Accuracy measures for overall sampling and analytical testing are evaluated through blank samples, background samples, or external PT samples.

Representativeness

Representativeness expresses the degree to which data represent a characteristic of a population, a parameter variation at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that is most concerned with proper design of the measurement program. Sample measurement locations may be biased (judgmental) or unbiased (random or systematic). For unbiased schemes, the sampling must be designed not only to collect samples that represent conditions at a sample location, but also to select sample locations that represent the total area to be sampled.

Representativeness is usually dependent upon sampling techniques not controlled by the laboratory; however, there is representativeness of sub-samples prepared within the laboratory from collected samples. Parent samples must be subjected to thorough homogenization prior to sub-sampling to ensure unbiased measurements within the laboratory. Sample duplicates prepared in the laboratory are a measure of the representativeness.

Completeness

Completeness is defined as the percentage of measurements performed that are judged to be valid. A quantitative goal defines how much valid data must be generated to make a decision regarding completeness. Critical samples typically have higher completeness goals than noncritical samples and require additional measures of QC. In the laboratory, the quantitative measure of the amount of valid data is obtained from the analytical process and compared to the amount that was expected to be obtained. Valid data are data that are not rejected for failure to meet project DQOs.

Comparability

Comparability is a qualitative measure of the confidence with which one set of data can be compared to another. Sample data should be comparable with other measurement data for similar samples and sample conditions. Characteristics that make comparison possible include method performance samples as defined in Section 4.6.2; QC samples as defined Section 4.6.3; standardized report format; consistency of units (e.g., milligrams per liter [mg/L], parts per million [ppm]); and standardized sample collection, preparation, and analysis procedures. PT samples also help establish comparability of results between laboratories.

mg/L
milligrams per liter

ppm
parts per million

4.6.2 Method Performance

For a given analytical method, the ASC demonstrates laboratory capability in performing the method by extension of an analyst's demonstration of capability to perform the method. Analysts continue to demonstrate this ability as long as the method is used. The laboratory analysts demonstrate the ability to meet the precision and accuracy criteria stated in the method (if available) and defined in the demonstration of capability SOP A.23. The demonstration normally requires analysis of four replicate samples. Each individual analyst also demonstrates the ability to perform the method in accordance with the training SOP QA.5 and method requirements. On an ongoing basis, the laboratory analyzes calibration standards as defined in Section 8, QC samples as defined in Section 4.6.3, and PT samples as defined in Section 4.4.3 to demonstrate method capability.

Method Detection Limits

Method sensitivity is defined as the concentration of an analyte in a given matrix necessary to produce a detectable response. The sensitivity is measured for each analytical method as defined below.

MDL
method detection limit

PQL
practical quantitation limit

The method detection limit (MDL) for all quantitative analyses is determined based on the reference procedure found in 40 CFR Part 136, Appendix B and is verified annually per the MDL SOP A.18. The MDL SOP details the calculations and iterative process for determining the MDL. An MDL is determined for each method and matrix during method start-up and whenever the basic chemistry of the procedures is changed.

For some clients or programs, the MDL determination is an annual requirement for each instrument of use. These special considerations are also detailed in the SOP A.18.

Practical Quantitation Limits

The practical quantitation limit (PQL) is the reporting limit used by the laboratory. The PQL must be greater than the MDL and is approximately twice the MDL but is also dependent on client requirements (SOP A.18). The lowest standard used for calibration is at or below the PQL.

4.6.3 Quality Control Samples and Splits

Analytical performance is monitored through QC samples and spikes, such as laboratory method blanks, surrogate spikes, laboratory control samples, matrix spikes, matrix spike duplicates, duplicate samples, and duplicate injections. Many of the QC measures applied at ASC are summarized below. Laboratory QC criteria are defined in the appropriate method SOP. A heirarchy is established in the application of QC criteria: project-specific, method then laboratory-derived requirements.

All QC samples are applied on the basis of a laboratory batch. The laboratory batch associates samples that are prepared or analyzed together as described in the batching SOP A.22. The laboratory defines two basic types of batches: the preparation batch and the run (i.e., analytical) batch. The preparation batch includes all samples processed as a unit during organic sample preparation, metals digestion, or General Analytical Chemistry preparation. Preparation batches do not exceed 20 samples excluding associated QC samples except as noted in certain projects in the method SOP. The QC samples associated with sample preparation include method blanks, LCS, matrix spikes, and duplicates. The run batch is all samples analyzed together in the run sequence. The run sequence is typically limited to 24 hours unless defined differently for the analytical method. For some analyses, such as volatile organics, the run batch is equivalent to the preparation batch. The QC samples associated with the run sequence include calibration standards, instrument blanks, and verification standards. The specific procedures for documenting the laboratory batch are defined in the batching SOP. Additional batches may be defined for unique steps of the analytical process, such as a clean-up batch or reporting batch, and these additional batches are defined in the laboratory case narrative.

Laboratory Method Blank

A laboratory method blank is an analyte-free material processed in the same manner and at the same time as a client sample. The blank is prepared using American Society for Testing and Materials (ASTM) Type II water when analyzing water samples, and where practical, pre-cleaned sand or other solid material, such as sodium sulfate, when analyzing solid samples. The laboratory method blank sample is prepared along with the client samples at a frequency of one laboratory method blank per batch of 20 (or fewer) of client samples for the given matrix type.

ASTM
American Society for Testing and Materials

The laboratory method blanks serve to demonstrate a contamination-free environment in the laboratory. The goal is for method blanks to be free of contamination. Low level contamination may be present, but must be less than the level in the samples as defined by the method SOP or the project. If contaminants are present in the method blank but not in client samples, no further action is required. If contamination is greater, the entire batch is reprepared and reanalyzed. All sources of contamination that are not common laboratory contaminants as defined in the method SOPs are investigated as part of the corrective action process. Sample results are not blank subtracted unless specifically required by the analytical method.

Surrogate Standards

For certain organic methods, all samples, including the laboratory method blank, QC samples (MS, MSD, LCS), and standards, are spiked with a set of specific surrogate standards to monitor the accuracy of the analytical determination. Surrogate spikes are added at the start of the laboratory preparation process. Surrogate compounds are not typically found in environmental samples. QC criteria for surrogate recoveries are method-and matrix-specific. Laboratory QC criteria are established after a sufficient number of data points (30 or more) is performed and updated annually as defined in the Control Charting SOP QA.20.

Surrogate recoveries within QC criteria for method blanks and LCS samples demonstrate acceptable method performance. If surrogate recoveries are outside QC criteria for method blanks or LCS samples, corrective action is required as defined in the appropriate method SOP. Surrogate recoveries in the samples indicate the method performance on the particular sample matrix. Surrogate recoveries that are outside QC criteria for a sample indicate a potential matrix effect. Matrix effects are verified based on review of recoveries in the method blank or LCS, sample reanalysis, or evaluation of interfering compounds. Sample clean-up procedures may be appropriate to alleviate potential matrix problems. Standard procedures for evaluating surrogate recoveries in samples are listed in the appropriate method SOPs. However, these procedures are often modified by project- or client-specific requirements.

Laboratory Control Sample

An LCS consists of ASTM Type II water, and where practical, precleaned sand, glass beads, Teflon™ chips, or sodium sulfate for solid matrices, or a purchased PT sample. The LCS is spiked with the analytes of interest (or a representative subset) usually near the mid-point of the calibration range. It then follows the same sample preparation, standard addition, and analysis as client samples. The LCS concentration may be specified in the reference method or project-specific requirements. Laboratory Control Samples are analyzed at the frequency of one per batch of every 20 samples or fewer. The recovery of target analytes in the LCS is a measure of method accuracy and laboratory performance.

LCS recoveries are monitored on control charts. Laboratory QC criteria are established for each method and matrix using a minimum of 30 points. If all target analytes are not included in the LCS spike, then the spike mixture is rotated over two years to evaluate control limits for all parameters. When the LCS recovery is within the control limits, the method performance is considered acceptable.

If the number of LCS recoveries as specified in the SOP are outside QC criteria for the target analytes, corrective action is required. QC criteria and appropriate corrective actions are defined in the specific method SOPs. After corrective action is complete, sample reanalysis may be required for the failed parameters. If LCS recoveries are above the high limit, exceed the QC criteria, and that parameter is not found in any of the samples, reanalysis is not necessary unless specifically required for the project.

Matrix Spike Sample

An MS sample consists of a client sample (often specified by the client) split into two parts and processed as two separate samples in a manner identical to that of the rest of the samples in the batch. In addition to the regular addition of monitoring standards (internal standards, surrogate), spiking analytes are added to one aliquot of the chosen sample before preparation. Generally, all method target analytes, if compatible are added. A subset, as indicated in the method SOP, is reported unless specified otherwise by the client. The spike concentration levels for the target analytes are defined by the analytical method or by project-specific requirements or are specified by the laboratory in the analytical SOP. An MS is prepared for every extraction batch of 20 samples (or fewer) for a given matrix if sufficient sample allows. The sample chosen for matrix spike is random except that field and trip blanks are not chosen for spiking. Clients may specify the sample(s) to be spiked. The client must provide ASC with extra sample amounts for samples requiring matrix spikes.

Due to matrix effects, matrix spike recoveries are not a measure of the performance of the method on the sample being analyzed. In the absence of observable quantitative interferences, an MS sample recovery that exceeds QC limits indicates matrix effects. For these reasons, MS recoveries are not used to control the method, i.e., determine reanalyses. The results of the MS are evaluated, in conjunction with other QC information to determine the effect of the matrix on the bias of the analysis.

Matrix Spike Duplicate Sample

The MSD sample is commonly prepared in conjunction with the MS sample. The MSD is prepared from a separate portion of the client sample and processed with the same additions as the MS. The sample chosen for matrix spike duplicate must be the same as that chosen for MS. The MSD is prepared for methods that do not typically show concentrations of target analytes above MDLs, such as organic methods. The RPDs between the recoveries in the MS and MSD measure the precision of the analytical method on the actual client samples. Laboratory QC criteria for RPDs may be established as specified in the Control Chart SOP QA.20 or by method requirements. Control charts are available to investigate recoveries on client-specific samples or for troubleshooting. For the MSD sample, the client must provide ASC with extra sample amounts. If insufficient sample is available, the laboratory may run an LCS duplicate to measure precision, depending on the method.

The percent recovery (%R) is calculated as:

$$\%R = \frac{X_1 - X_2}{|\,TV\,|} x\,100$$

where:
% R = the percent recovery
X_1 = the measured concentration of the sample with the spike addition
X_2 = the measured concentration of the sample
TV = concentration of the spike added

Duplicate Sample

A duplicate sample consists of a set of two samples obtained in an identical manner from the same client sample. The collection of duplicate samples from a heterogeneous matrix requires homogenization to ensure that representative portions are analyzed. One duplicate sample per batch of same matrix of 20 samples or fewer is analyzed. The sample chosen for duplicate analysis is random except that field and trip blanks are not used. Clients may designate the sample for duplicate analysis. The client must provide sufficient sample to allow for duplicate testing.

The relative percent difference (RPD) is calculated as:

$$RPD = \frac{|X_1 - X_2|}{\left(\frac{X_1 + X_2}{2}\right)} x\,100$$

where:
RPD = the relative percent difference
X_1 = the concentration or percent recovery of the sample
X_2 = the concentration or percent recovery of the duplicate sample

The duplicate is prepared for methods that typically show concentrations of target analytes above MDLs, such as metals and GAC methods. The RPDs between the recoveries in the original and duplicate measure the precision of the analytical method on the actual client samples. Laboratory QC criteria for RPDs are established for each method and matrix as defined in the Control Chart SOP QA.20. Control charts are available to investigate recoveries on client-specific samples or for troubleshooting.

If all other QC criteria are met, matrix effects may be established by observing the sample to determine any visual heterogeneity. If visual observation does not indicate a potential problem, the sample may be reanalyzed. Potential matrix effects are reported in the case narrative.

Splits

Clients may request that samples be split and sent to another laboratory, or they may split the samples and submit them to a minimum of two laboratories. Splits are often performed to evaluate the comparability and reproducibility of the data for critical decision making, or when sample re-collection is not practical. These inter-laboratory studies are defined in the client documentation. Data resulting from splits are evaluated by the client. Sample splits must be representative of the sample submitted. Errors from sample splitting must be minimized by ensuring that the sample is adequately mixed prior to splitting.

Other Laboratory QC Samples

The laboratory performs analysis of other QC samples or standards, depending on the analytical method. Standard QC samples or standards are documented in the specific method SOP. Method-specific QC samples or standards include internal standard spikes for GC/MS methods; post-digestion spikes and serial dilutions for metals analysis; and interference check samples (ICS) for inductively coupled plasma (ICP) analysis.

ICS
interference check sample

ICP
inductively coupled plasma

Field QC Samples

To evaluate the overall sampling and analytical data quality indicators, the client submits QC samples from the field. The field QC samples include trip blanks, field blanks (such as ambient condition blanks or equipment blanks), and field duplicates. Trip blanks may be prepared in the laboratory as described in Section 10. The project managers will normally track the field QC samples to ensure that the frequency of sampling and analysis is consistent with project requirements. In most cases, the analytical staff are typically not aware of which samples are the field QC samples. In cases when MS/MSD samples are not client-specific for water sample analysis, the analyst should review the client samples to ensure that MS/MSD analysis is not performed on field blanks.

4.6.4 Statistical Evaluation

Statistical evaluations are performed for the quality indicators, MDL, surrogates, and laboratory control samples. Control charts offer the most graphic representation of a statistical evaluation. Control charts identify potential problems, and the causes of these problems are promptly investigated and eliminated. Internal QC criteria are determined through historical trend analysis of data collected on QC charts. The control chart process is defined in the control chart SOP QA.20. The control chart procedure allows for identification of points outside QC criteria or potential QC problems by evaluation of trends.

Control charts are plotted for the percent recovery of surrogates, and LCS compounds, as determined by the individual method SOP or certifying agency requirement.

4.7 Accreditations, Certifications, Licenses, and Registrations

The ASC has received approval from various state, federal, and national agencies for performing analytical testing. The laboratory has been granted numerous certifications and accreditations, based upon compliance with standards set forth by the granting agencies. The certifications are summarized in Appendix C. The ASC is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory in a number of states, with primary accreditations from New York State and Florida. The scope of approval is based on each agency's requirements with regard to regulatory requirements, methodologies, or matrix. Specific information on the parameters approved is maintained in the QA files. The scope of evaluation as presented in Table C-1 in Appendix C is the process used for granting the approval.

5

Personnel

5.1 Job Qualifications for Key Technical Personnel

The following are the minimum experience, education, and qualifications required for key personnel. Specific job descriptions for each laboratory function are maintained in the QA files.

Technical Director: Experience in environmental laboratory managing administrative, business, personnel, and production activities. Minimum qualifications:

- Education: Bachelor's degree in chemistry or any related scientific/engineering discipline with at least 24 college semester hours in chemistry.
- Experience: Two years laboratory experience.

Laboratory Staff: The laboratory has sufficient personnel, having the necessary education, training, technical knowledge, and experience for their assigned functions.

All personnel are responsible for complying with all quality assurance/quality control requirements that pertain to their organizational/technical function. Each technical staff member must have a combination of experience and education to adequately demonstrate a specific knowledge of his/her particular function and a general knowledge of laboratory operations, test methods, quality assurance/quality control procedures, and records management. Specific requirements for training are found in the training SOP QA.5

Some clients or programs may have specific requirements for specific positions. These requirements are specified in SOP QA.5.

5.2 Recruitment Policy

The ASC's recruitment policy is defined by the corporate program. Recruitment is the responsibility of the General Manager and corporate human resources personnel. Orientation training of all new employees includes review of the QAM, Chemical Hygiene Plan, and all SOPs required for the job function.

5.3 Corporate Ethics Policy

Laboratory ethics and ASC's ethics policy are discussed during initial training for new employees. All new personnel receive ethics training and are required to sign an ethics agreement. Ethical standards training is reinforced on an annual basis. All employees are required to sign an ethics agreement following annual training. The corporate ethics policy is posted throughout the laboratory. Any employee found to have knowingly reported data values that are not actual values obtained, or improperly manipulated or intentionally reported dates and times of data analyses that are not the actual dates and times of analyses, is immediately terminated. Any laboratory personnel identifying an accidental or suspected intentional reporting of non-authentic data must report the finding immediately. Information can be provided to the Technical Director, Laboratory QA Coordinator, Laboratory General Manager, or Assistant General Manager, or in cases where anonymity is desired, to the person at Corporate Headquarters designated on the employee bulletin board. The project manager immediately notifies the client if any improper data have been reported.

5.4 Corporate Confidentiality and Propriety Rights

All work is performed in the strictest confidence. During orientation training, new and contract employees are required to review the corporate policy and practices for protecting client confidentiality and proprietary rights. The policy and practices are designed to ensure that information from the laboratory is transmitted only to the appropriate and responsible parties.

5.5 Training

New employees receive all necessary training for their job function. Refresher training is provided for current employees as required for their current job function. Training is performed both on and off site by members of ASC staff, contractors, equipment manufacturers, academic institutions, or regulatory authorities. Training procedures are detailed in the training SOP QA.5.

Off-site training takes place on an as-needed or availability basis. Completed studies are documented and updated in the training files of each employee. Off-site training may include the following:

- Courses taken at local colleges and universities.
- Workshops and seminars conducted by instrument manufacturers, software companies, and national associations specializing in analytical chemistry or laboratory quality assurance.
- Specific training classes for instruments or software purchased at the laboratory.

Personnel provide the Document Control Officer with any attendance information and copies of any certificates earned during such training.

On-site training takes place for all new personnel according to the training procedure SOP. Personnel must demonstrate proficiency in the analytical and/or administrative procedures before independent operation in the job function. On-site training includes the following:

- Training in the QAM for all employees when newly hired and at yearly refresher training.
- Training on appropriate SOPs and all major revisions to those SOPs, including QC requirements.
- Instruction for the trainee performing a procedure by a peer analyst or section supervisor.
- Observation and oversight of the trainee performing a procedure by section supervisor or peer analyst.
- Verification that the trainee demonstrates proficiency in the procedure. Each analyst is required to show demonstration of capability through analysis of four known standards or other means described in SOP A.23 and continuing demonstration of proficiency annually through analysis of a proficiency test sample, repetition of initial demonstration of capability or other means described in SOP A.23. Other approaches to demonstrating proficiency in tests not amenable to spiking are given in SOP A.23.

5.5.1 Training Records Maintenance

The Document Control Officer is responsible for maintaining the training record files and entering information into the tracking database. Reports from the database provide training summaries by individual, and by SOP. The Document Control Officer notifies appropriate personnel when a revision is finalized for the controlled versions of the documents that will require retraining of all appropriate personnel.

Résumés, job descriptions, and biographies are included in the training record files. Biographies are put in a uniform format by the corporate human resources department and are updated with additional education and experience as needed.

5.6 Safety and Health Policies

OSHA
Occupational Safety and Health Administration

MSDS
Material Safety Data Sheets

All laboratory personnel receive orientation training upon initial employment as well as on-the-job training concerning health and safety issues related to the operations being performed. In compliance with the Occupational Safety and Health Administration (OSHA), ASC conducts safety and health training annually, with a careful introduction to new principles. Personnel have access to the master Chemical Hygiene Plan and are trained in reading and locating the Material Safety Data Sheets (MSDS). Personnel required to manage hazardous waste are trained in safety, legal, and shipping aspects of waste management.

6

Laboratory Facilities

6.1 Facility

The laboratory facility has an area of 25,000 square feet with over 800 linear feet of laboratory benching and over 120 linear feet of fume hood space. The ASC floor plan is provided on Figure 6-1. The laboratory is divided into the following areas: administration and offices; GAC; metals sample preparation; organic sample preparation; metals analysis; HPLC, PCR; GC and GC/MS analysis for volatile and semivolatile compounds; and other laboratory support functions. The sample management office is approximately 1,500 square feet and has a 390-square-foot walk-in cooler. A separate ventilated room is used to store laboratory waste prior to pickup by a licensed waste hauler.

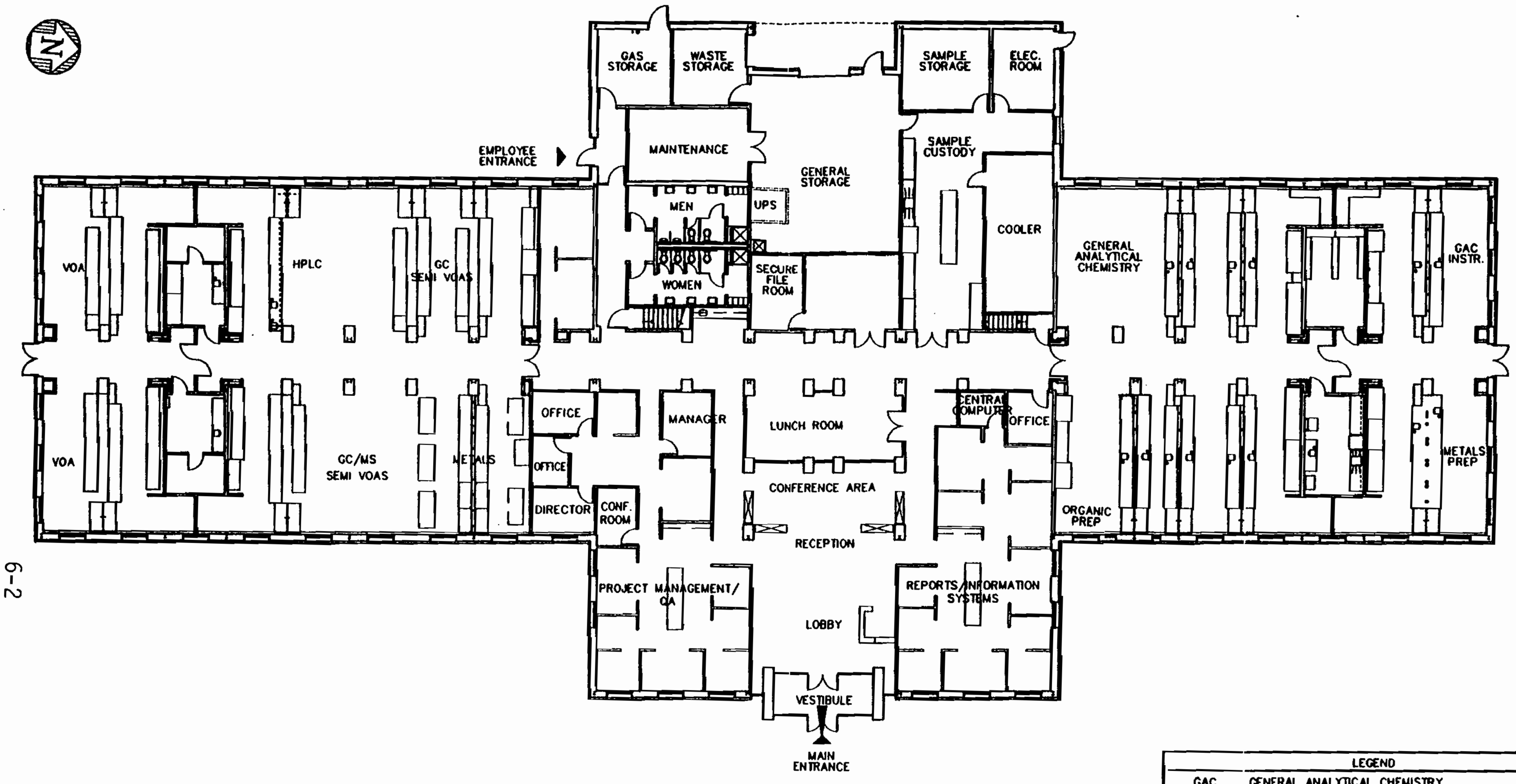
Off-site facilities are used for material storage and file archiving. The warehouse is located behind the laboratory facility and the corporate headquarters is located within four miles of the laboratory facility.

Deionized water from a recirculating reverse osmosis/ion exchange system is piped to all laboratory benches. Gases for laboratory instruments and operations are distributed from a central source to the required areas through piping and manifolds. Laboratory benches have chemical resistant work tops and surface bench-level exhaust grills to remove vapors.

6.2 Security Systems and Environmental Controls

The ASC provides a secure environment for our employees, guests, clients, samples, and analytical data.

1E592C



LEGEND	
GAC	GENERAL ANALYTICAL CHEMISTRY
GC	GAS CHROMATOGRAPHY
HPLC	HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY
MS	MASS SPECTROSCOPY
QA	QUALITY ASSURANCE
VOA	VOLATILE ORGANIC ANALYSIS
SEMI VOA	SEMI VOLATILE ORGANIC ANALYSIS

Figure 6-1 LABORATORY FLOOR PLAN
ECOLOGY AND ENVIRONMENT, INC.
ANALYTICAL SERVICE CENTER
WALDEN AVE. AT RANSOM RD.
LANCASTER, NEW YORK

6.2.1 Access

To ensure security, all exterior doors remain locked unless directly monitored by personnel. Access to the laboratory is limited to employees and contractors. Visitors not under signed contract to E & E are required to sign the Visitor Log and must be accompanied by an E & E employee.

The sample management area is the defined high security area. Entry into this area is controlled by identification card activated locks on the internal and external entry doors. Personnel not assigned to the high security area must be accompanied by an employee assigned to the area.

The sample reports storage area is defined as a limited access area. Individuals requiring access must get a key from a designated staff member.

6.2.2 Security

All doors are locked after normal business hours and require a card for entry (SOP A.7). The security alarm at ASC continuously monitors for smoke, extreme fire-related heat, cold room temperatures, motion, and door contacts. When the alarm is activated, the appropriate emergency response offices are notified. An emergency contact list is provided to the local emergency offices for contact in case of an emergency.

6.2.3 Archives

Access to the archive facilities is limited to the Laboratory QA Coordinator, Document Control Officer, or personnel designated by them (SOP A.27). The archives include all ASC copies of analytical reports, raw data, inactive logbooks, and other data that facilitate traceability of analytical results that are typically older than one year. Materials housed in the archives are labeled with identification numbers to ensure retrievability. Electronic storage tapes and disks are maintained by the IT Group.

6.2.4 Environmental Control

Lighting, noise, and other environmental factors at ASC are maintained at appropriate levels. Heating, ventilation, and air-conditioning systems satisfy the needs of the testing being performed. The laboratory building is designed to ensure constant temperature control for analytical equipment. The building has three completely separate air-handling systems to minimize airborne contaminants that may jeopardize sample integrity. Laboratory activities that involve use of large quantities of organic solvents or inorganic acids are conducted in the northern end of the building, well away from instrument areas.

The working and storage environments are maintained in a safe and appropriate manner. Sample and standard storage areas are monitored and temperature controlled. Separate storage areas are designated for samples, standards, and other identified sources of potential cross-contamination. Sample storage areas for volatiles are separated from other storage areas and monitored for any cross-contamination effects.

Safety measures and equipment which protect personnel and property from injury or illness include: fume hoods, fire extinguishers, fire blankets, alarm systems, safety training, protective clothing, emergency showers, eyewashes, and spill control kits.

6.3 Chemical Storage

All chemicals are stored in appropriate cabinets and are properly disposed of when necessary. All flammable solvents are kept in OSHA and National Fire Protection Association (NFPA)-approved areas. Acids are stored in OSHA-approved areas.

NFPA
National Fire Protection Association

All chemicals, samples, and wastes are accumulated in satellite areas in the laboratory as specified in the waste disposal SOP A.10 and Chemical Hygiene Plan. The samples and wastes are then transferred to the waste storage area. This area is specially designed and separately ventilated to accommodate waste storage prior to proper disposal.

An authorized waste carrier is contracted to pick up waste as needed and dispose of it, in accordance with all regulatory requirements. Post-analysis disposition of samples is dependent upon project-specific requests. Remaining sample material may be returned to the client, safely discarded, or archived for a specific period of time prior to disposal. Section 10.5 defines the specific requirements for sample disposal and other waste disposal operations.

7

Equipment and Materials

Accurate analysis consists of setting up proper instrument operating conditions, calibrating instruments, monitoring instrument performance tests, analyzing prepared samples, and collecting data from the analyses. Instrumental analysis procedures, frequencies, and acceptance criteria are described in the test method SOP. The basis for performance criteria, instrument conditions, and the steps of each procedure are derived from EPA or client-specified reference methods.

7.1 Instruments

Analytical instrumentation at ASC includes:

GC
gas chromatograph

GC/MS
gas chromatograph/
mass spectrometer

IC
ion chromatograph

AA
absorption
spectrophotometer

- Gas chromatographs (GC);
- Gas chromatographs/mass spectrometers (GC/MS);
- High performance liquid chromatographs (HPLC);
- Ion chromatographs (IC);
- ICP-atomic emission spectrophotometers;
- Atomic absorption spectrophotometers (AA);
- UV/visible and infrared spectrophotometers; and
- Flow injection analyzers.

The ASC's major equipment is summarized in Table D-1 in Appendix D. All instrumentation is uniquely identified by an instrument code and serial number.

Regular maintenance procedures and frequency for all equipment are defined in the test method SOP. A stock of spare parts and consumables are maintained for all analytical equipment. Backup

UPS
uniterruptible power source

instrumentation for most analytical equipment is available in the event of major equipment failure. The laboratory has a large uninterruptible power source (UPS) capable of sustaining power to the instruments and computers for up to three hours in the event of a power failure. The UPS prevents problems caused by fluctuations in the power source.

The laboratory has an uninterruptible power source (UPS) capable of sustaining power to the instruments and computers for up to three hours in the event of a power failure. The UPS prevents problems caused by fluctuations in the power source.

Service contracts are maintained for major instrumentation. Service technicians may be called for on-site service of major equipment if routine maintenance operations do not eliminate any problems. Procedures and schedules for preventive maintenance are available in the test method SOPs. All preventative and corrective instrument maintenance is recorded in the logbooks assigned to the equipment. Records of external service are stored in files by the Section Supervisor. Instruments will be tagged as out-of-service until maintenance procedures are completed.

After instrument maintenance or repair, the instruments must be successfully recalibrated following the method SOP. Laboratory personnel must demonstrate acceptable QC performance on the instrument before sample analysis is conducted with it.

7.2 Instrument Operating Conditions

The reference methods for a given analysis define the instrument operating conditions. In many of the reference methods, a range or general guidance for the operating conditions is defined. The operating conditions may be modified to clarify the reference methods or improve the quality of the results. In all cases where the method is modified, the performance criteria from the reference method must be within the defined acceptance limits. Acceptable modifications to the operating conditions are stated in the method SOP. Any change in the operating conditions not stated in the SOP is documented on a corrective action form. When a change in the operating condition is proven to improve performance for all matrices, the method SOP is revised.

7.3 Computer Systems

E & E maintains an extensive network of computer systems centralized in the corporate headquarters building. The ASC's domain includes an integrated network of standalone instrument computers, instrument data systems, servers, and personal computers.

The GC/MS data system is a UNIX-based Hewlett Packard (HP) 9000/735 system running Target Chromatographic Analysis software by Thru-put. The central server (i.e., PA-RISC, 208 megabyte (MB) random access memory (RAM) and 8 gigabytes (GB) disk space) is supported with PC stations and three HP1000 minicomputers. The GC and HPLC data system is Perkin Elmer Turbochrom Client-server Chromatographic Analysis software running on an HP Netserver LH Pro/200 with 128 MB RAM and 42 GB of disk space. The GC data system supports seven Windows NT™ workstations. The two PE Optima ICP stand-alone Winlab data systems run on a Windows NT™ workstations. All other instruments operate standalone data systems.

Developed in Microsoft Access®, the Laboratory Information Management System (LIMS) is a proprietary customized hybrid of a commercial LIMS product, Khemia Omega II™. The LIMS system is a Microsoft Windows™ based, multi-user Relational Database Management System (RDBMS). This system operates under a modified client/server model. The front-end application runs on a mix of Windows NT™ Workstation and Windows 95™ desktop PCs, the backend database is stored on a Windows NT™ Server with dual Pentium Pro dual processors. The server is a Dell Poweredge 2400 with 512 MB RAM and 90 GB of disk space and is set up in a RAID 5 configuration incorporating commercial software to provide automated failover to a redundant comparable server. This configuration provides both software and hardware fault tolerance. Omega II™ provides full-feature, flexible laboratory information management including sample management, work assignment, sample tracking, data reporting, QA, financial planning, and resource allocation. For Contract Laboratory Program (CLP) reporting, ASC runs Target software for organics analysis and Ward software for inorganic reporting on network PC stations.

In addition to the LIMS, all ASC support software is Microsoft Office 97 running in Windows 95. All the systems are linked to over 45 PCs and 20 printers.

E & E's Corporate Computer Support Center, publications network, graphics, and computer-aided design (CAD) departments also support the ASC. Through these groups, ASC has complete access to the programming and office support software required by clients.

7.4 Sampling Materials

While ASC does not routinely perform sampling, ASC does provide clients with materials needed for sampling upon request. Materials are assembled to meet project-specific requests. The materials provided may include the bottles, blanks, custody

HP
Hewlett Packard

MB
megabyte

RAM
random access memory

GB
gigabytes

LIMS
Laboratory Information Management System

RDBMS
Relational Database Management System

CLP
Contract Laboratory Program

CAD
computer-aided design

form(s), preservatives, and cooler(s) to be used during sample collection. Tables 7-1 and 7-2 list standard containers provided by the ASC. The sample containers or bottles for sample collection are purchased either precleaned, with a certificate of the test results, or precleaned but without a certificate for which ASC then tests lots for contamination. The certificates of analysis are maintained by shipping personnel. The lot numbers, expiration date, and amount of reagent used for sample preservation are recorded and tracked by shipment. Field and trip blanks are preserved with the same reagents as the samples and are tracked by lot number.

Table 7-1 Sample Containers and Volumes for Soil Samples

Type of Analysis	Type and Size of Container	Number of Containers and Sample Volume (per sample)	Minimum Volume per Test (grams)
Purgeable (volatile) organics	40-mL glass VOA vial with Teflon™-backed septum or 4-oz. VOA glass jar with Teflon™-lined cap	Two 40-mL or one 4-oz; fill completely, minimal air space	Fill container
Extractable organics	8-oz. glass jar with Teflon™-lined cap	One; fill completely	50
Metals	8-oz. glass jar with Teflon™-lined cap	One; fill completely	25
General analytical tests	8-oz. glass jar with Teflon™-lined cap	One; fill completely	15

Notes:

All sample bottles are prepared in accordance with generally accepted bottle-washing procedures.

Several types of analyses may be performed on samples from the same container, depending on the sample density and minimum volume requirements.

When project-specific laboratory QC samples are required, a double volume of the sample should be collected and labeled as MS/MSD, or duplicate, etc. Minimum volumes do not include QC samples.

Sample preservation requirements and holding times are presented in Appendix E.

Key:

VOA = Volatile organic analysis.

Materials used for sampling are stored in the warehouse building adjacent to the laboratory building. Reagents for preservation are stored in designated areas to avoid contamination during storage. Trip blanks are prepared as needed in the laboratory volatiles area. All glass containers are packaged to prevent breakage. The containers are placed in plastic coolers, filled with additional packing material, and sealed with tape for shipping.

Table 7-2 Sample Containers and Volumes for Water Samples

Type of Analysis	Type and Size of Container	Number of Containers and Sample Volume (per sample)	Minimum Volume per Test (mL)
Purgeable (volatile) organics	40-mL glass vial with Teflon™-backed septums	Three; fill completely; no air space	40
Extractable organics	0.5-gallon or 1-liter amber glass bottle with Teflon™-lined caps	One 0.5-gallon or 1-liter per test; fill completely	1,000
Metals	1-liter polyethylene bottle with polyethylene-lined cap	One; fill 7/8 full	100
Cyanide	1-liter polyethylene bottle with polyethylene-lined cap	One; fill 7/8 full	50
TOC	125-mL polyethylene bottle	One; fill completely	10
Sulfide	1-liter polyethylene bottle	One; fill completely, no air space	200
Acidity, alkalinity, pH. dissolved solids, suspended solids	1-liter polyethylene bottle with polyethylene-lined cap (multiple analyses) all from one bottle)	One; fill completely	500
Hardness	1-liter polyethylene bottle with polyethylene-lined cap	Can take out of metals analysis bottles	100
Chloride	1-liter polyethylene bottle with polyethylene-lined cap	One; fill completely	10
Sulfate	1-liter polyethylene bottle with polyethylene-lined cap	One; fill completely	100
Nitrate	1-liter polyethylene bottle	One; fill completely	10
Nitrite	1-liter polyethylene bottle	One; fill completely	10
Total phenol	1-liter amber glass bottle	One; fill completely	50
TOX	1-liter amber glass bottle	One; fill completely, no air space	200
Ammonia-nitrogen	1-liter polyethylene bottle with polyethylene-lined cap	One; fill completely	200
BOD_5	1-liter polyethylene bottle with polyethylene-lined cap	One; fill completely	500
COD	125-mL polyethylene bottle with polyethylene-lined cap	One; fill completely	10
Color	1-liter polyethylene bottle with polyethylene-lined cap	One; fill completely	50
Fluoride	1-liter polyethylene bottle with polyethylene-lined cap	One; fill completely	10
TKN	1-liter polyethylene bottle with polyethylene-lined cap	One; fill completely	100
Hexavalent chromium	125-mL polyethylene bottle with polyethylene-lined cap	One; fill completely	100

Table 7-2 Sample Containers and Volumes for Water Samples

Type of Analysis	Type and Size of Container	Number of Containers and Sample Volume (per sample)	Minimum Volume per Test (mL)
Oil and Grease	1-liter amber glass bottle	One; fill completely	1,000
TRPH	1-liter amber glass bottle	One; fill completely	1,000
Orthophosphate	1-liter polyethylene bottle with polyethylene-lined cap	One; fill completely	50

Notes:

All sample bottles are prepared in accordance with generally acceptable bottle-washing procedures.

Several types of analyses may be performed on samples from the same container depending on the minimum sample volume and preservation requirements.

When project-specific laboratory quality control samples are required, a double volume of the sample should be collected and labeled as a matrix spike/matrix spike duplicate, duplicate, etc. Minimum volumes do not include QC samples.

Sample preservation requirements and holding times are presented in Appendix E.

Key:

BOD_5 = Five-day biochemical oxygen demand.
COD = Chemical oxygen demand.
TKN = Total Kjeldahl nitrogen.
TOC = Total organic carbon.
TOX = Total organic halogen.
TRPH = Total recoverable petroleum hydrocarbons.

Sample containers are purchased from vendors using EPA-approved glass cleaning procedures. Vendors are approved approximately every one to two years. The vendor selection process includes a pre-selection review of qualifications, preparation of a request for quotation, and receipt and review of proposals. Competitive bidders are required to send a series of bottles for testing. The ASC tests a subset by batch of containers to ensure product quality prior to awarding contracts. Once a vendor is awarded the contract, the vendor secures large lots of bottles required by the laboratory. Bottles are shipped to the ASC or directly to sampling sites from the lots allocated to E & E.

7.5 Glassware and Glassware Cleaning

Glassware subjected to heat or chemicals are of borosilicate glass. The laboratory also possesses Teflon™ ware for certain tests. Volumetric glassware is Class A.

All glassware used for the preparation of samples is cleaned as described in the SOP for glassware cleaning, A.31, defined for each laboratory preparation area. These procedures include pre-rinses and soapy water washes. The pre-rinse may be solvent, water, or acid solution, depending on the analysis. Glassware is washed with laboratory grade detergents, followed by multiple ASTM Type II water rinses. Cleaning procedures required by specific methods may include solvent, acid, or other rinses. The clean glassware is air dried unless other drying is recommended by the reference test method. The clean glassware is stored in the laboratory area as specified in the reference method or on designated shelves.

Cleaning areas and materials are segregated to avoid cross-contamination. Glassware used for high concentration analyses is kept segregated from glassware used for low concentration analyses. Dedicated glassware is used for volatiles, extractable organic compounds, GAC, and metals analyses.

8

Standards and Calibration

During the analytical process, a variety of measurements are required including volume, weight, concentration, pH, and temperature measurements. The ASC follows established practices as documented in SOPs that ensure the calibration and verification of all equipment and the traceability of standards to national standards of measurement (where available).

8.1 Chemical Standards

The procurement, preparation, handling, storage, and documentation of chemical standards is critical to the analytical process. It is through these chemical standards that reported analyte measurements in samples are traceable to reference values. The ASC uses only quality chemicals as reference materials. Whenever possible, standard solutions must be traceable to national standards, such as National Institute of Standards and Technology (NIST) or NELAP-certified providers.

NIST
National Institute of Standards and Technology

Preparation of the chemical standards is documented in the method SOP. The documentation requirements for ensuring traceability are defined in the reagent and standard traceability SOP A.28. The procedures describe the management of these analytical standards and the reagents used in preparing the standards. All analysts are trained in the reagent and traceability SOP and are responsible for implementing the procedures.

8.1.1 Sources of Standards, Traceability, and Verification

The ASC purchases chemical standards from approved suppliers. Information about the standards along with any client requirements are recorded in the pertinent standards logbook. The analyst receiving a chemical standard shipment verifies that the information on the standard label is consistent with that on the supplier's certificate or other paperwork. Information about the standard is recorded in a standards logbook. Codes that unambiguously identify the supplier materials and all derived preparations are also used to trace standard solutions. Non-certified materials are verified against certified reference standards, when certified reference materials are available.

8.1.2 Types of Standards

Analytical methodologies define a variety of QC samples that are used by the laboratory and include: surrogate and matrix spikes, laboratory control samples, internal standards, other QC check standards, and calibration standards. The composition and concentration of these QC samples must conform to method specifications. Standards used to prepare QC samples are categorized at ASC according to primary standard, secondary standard, stock standard, and working standard.

Primary Standard - A neat or concentrated standard received from a supplier. A primary standard is traceable to NIST or verified as equivalent to a certified reference material.

Secondary Standard - A neat or concentrated standard received from a supplier or prepared at a laboratory. The solution's concentration is determined against a primary standard.

Stock Standard - A solution of a standard at a high concentration, used to prepare working standards. These may be prepared in-house or received from a supplier. This standard may be a primary or secondary standard.

Working Standard - A solution of one or more standards or stock standards containing the analyte(s) of interest. The standard is prepared at the concentration defined in the appropriate method SOPs. The working standard is used to directly prepare instrument calibration or sample fortification. These may be prepared in-house from primary or stock standards, or purchased from a supplier.

8.1.3 Preparation of Standards

Standard solutions are prepared by experienced analysts and documented in the appropriate standards logbooks. How a standard solution is prepared depends upon the amount required, the concentration required, and the solution's intended application. New standards are prepared as needed.

All standards are assigned an expiration date. If provided, the supplier's assigned expiration date is used for standard or stock standards, otherwise, the expiration date is assigned based on the date of preparation and the known stability of the analyte. Analytes known to be highly volatile or subject to rapid degradation or reaction are assigned shorter expiration dates. A standard mixture is assigned an expiration date no later than that of its shortest-lived component.

The expiration date is a latest use date. Standards are examined for deterioration and evaluated for their contribution to analytical problems during each analytical sequence. The QC parameters for each analysis are designed to monitor the working standards. Standard solutions showing signs of deterioration or with uncertain integrity are replaced immediately, prior to their expiration date.

ICV
initial calibration verification

The initial calibration verification (ICV) are prepared with reference material that is independent of the associated calibration standards. Continuing calibration verifications are from the same source as the calibrations standards.

Laboratory Control Samples (LCS) may be prepared from the same source as calibration solutions or they may be from a second source except where not allowed by specific clients.

8.1.4 Inventory and Storage

Documentation for all standards is carefully kept in relevant standards logbooks. Certificates from the manufacturer are taped in the bound logbook or placed in a ring binder. Each certificate includes the code number for the standard. The manner of storage for a standard is determined by its type, expiration date, shelf life, or manufacturer's specifications. All light sensitive standards are stored in amber vials or bottles in designated refrigerators, freezers, or chemical shelves. Analytical standards are never stored together with samples, extracts, or digestates.

8.2 Calibration Procedures and Frequencies

All equipment used for measurement and testing meets the specific requirements of pertinent analytical methods and applicable certification agencies. Calibration procedures and frequencies for specific types of equipment are briefly summarized below. Section 8.3 describes major instruments such as GC/MSs, GCs, HPLCs, and ICPs. Section 8.4 describes support equipment, such as thermometers, analytical balances, pH meters, autopipettors, and volumetric glassware. The specific calibration procedure and frequency are specified in separate SOPs for support equipment or the SOP for the test method using the instrument. Calibration criteria are listed in the method SOP. Except in the rarest of circumstances, the ASC does not report data for any samples unless the performance criteria for initial calibrations are satisfied. If it is necessary to report data, it is appropriately qualified or discussed in the report narrative after approval from the project manager.

Most instrumentation software indicates for the calibration curve the test method, date, time, analyte, and standard concentrations used and corresponding instrument responses. The time stamp is set to the network time by the System Administrator. Access is password protected. The software reports the equation of the calibration curve and the correlation coefficient. When the curve is prepared manually, the analyst records these. When the curve is recorded manually, the analyst records the equation of curve and the correlation coefficient.

The instrumental performance requirements of the published methods and/or manufacturer specifications are followed unless otherwise specified for a project. Other performance tests may also be executed to further demonstrate proper functioning of instrumentation. Any instrument not functioning properly will be tagged out-of-service until proper operation is restored. The SOPs for the operation of measurement equipment on the test method contain the following information, as applicable:

- Equipment used in the procedure;
- Calibration procedure, including all formulas and calculations;
- Acceptance criteria for the calibrations, including the accuracy and precision required;
- Corrective action for failed acceptance criteria, including assessment of previous calibration results;
- List of calibration standards;
- Frequency with which the equipment is calibrated, adjusted, and checked; and
- Maintenance of the equipment and record keeping to track performance before and after maintenance.

8.3 Instrumentation

8.3.1 Gas Chromatography/Mass Spectrometry

The GC/MS is hardware tuned prior to performing the initial and continuing calibrations and all sample analyses. Results are required to meet the peak ratio specifications of the analytical methods. For volatiles analyses, bromofluorobenzene (BFB) is used, and for semivolatliles analyses, decafluorotriphenylphosphine (DFTPP) is used.

BFB
bromofluorobenzene

DFTPP
decafluorotriphenylphosphine

The GC/MS is calibrated using internal standard techniques by analyzing a set of five or more initial calibration solutions, using procedures specified in the method and SOP.

Calibration criteria are listed in the method SOP. The initial calibration is verified by analysis of a second source standard.

Each day the initial calibration is verified through the analysis of a continuing calibration standard at the start of each analytical batch. The concentration of the continuing calibration standard is dependent on the requirements of the specific method and SOP.

8.3.2 Gas Chromatography and High Performance Liquid Chromatography

External standard calibration is utilized for analysis by GC and HPLC. The method-specified number of calibration standards are used (e.g., generally 5 points) and specified in the SOP. For multiple response components (e.g., polychlorinated biphenyls, toxaphene) the quantitation consists of an average of the quantitated values for selected peaks. Calibration criteria are listed in the method SOP. The initial calibration is verified by analysis of a second source standard (ICV).

Each day the initial calibration is verified through the analysis of a continuing calibration standard (CCV) at the beginning of the analytical sequence at least every 20 samples. The concentration of the continuing calibration standard is dependent on the requirements of the specific method and SOP.

Other standard checks may be required for a specified reference method. Instrument performance checks specified in the reference method must be performed and within the acceptance limits stated in the reference method.

8.3.3 Atomic Absorption Spectrophotometry

An initial calibration is performed daily with standards as specified in the SOP. The initial calibration is verified at the beginning of the run sequence and every 10 analyses. Continuing calibration blanks are run at the same frequency.

The continuing calibration must be within the range specified in the analytical method SOP utilized. Analysis of samples cannot begin until an initial calibration verification has been performed and is found to be within the specified range of the true value.

8.3.4 Inductively Coupled Plasma Emission Spectrophotometry

Initial calibration is performed daily and continuing calibrations are performed every 10 analyses. The number of initial calibration standards used depends on the method employed. Samples are not analyzed until an initial calibration verification has been performed and is found to be within specified range of the true value, depending on the method. Continuing calibration is required to meet the criteria of the analytical method.

8.3.5 Ion Chromatography

Initial calibration is performed daily using five calibration standards. Continuing calibration verification is performed every 10 analyses. Specifications for acceptable quality control are dependent on the method citation under which the samples are analyzed.

8.3.6 Spectrophotometers

Initial calibration is performed at least every six months using five calibration standards. Continuing calibration standards are analyzed every 10 analyses. Analyses are repeated for quality control standard failures.

8.3.7 Flow Injection Analysis

Initial calibration is performed daily using five calibration standards. Continuing calibration verification is performed every 10 analyses. Specifications for the quality control samples are dependent upon the analyte measured.

8.3.8 Total Organic Carbon Analyzer

Initial calibration is performed daily using five calibration standards. Continuing calibration verification is performed every 10 analyses. Specifications for the quality control samples are dependent upon the method chosen for analysis.

8.3.9 Total Organic Halogen Analyzer

The titration cell is verified to be within specification for the method at the start and after every 10 sample analyses.

8.4 Support Equipment

All equipment is calibrated according to the SOP used for the analysis. The most common support equipment used in the laboratory are thermometers, balances, pH meters, and conductivity meters. This section provides a general summary of the procedure used for calibration and measurement controls. Other equipment calibration is defined in the test method SOP.

8.4.1 Thermometers

Laboratory thermometers are routinely checked for accuracy against certified, NIST-traceable thermometers following the thermometer calibration procedure. These calibrations are performed annually (SOP A.38). Correction factors derived from the annual calibrations are applied to temperature readings. NIST-traceable thermometers are professionally calibrated and recertified every five years. Records of thermometer calibrations are retained in a logbook in the general analytical chemistry laboratory area. All thermometers are tagged with the thermometer ID number, correction factor to be applied to the measurement, and the expiration date of the calibration check. Thermometers past the calibration expiration date or thermometers not reading properly are not used. Replacement thermometers are calibrated, and the maintenance logbook is updated when a change in the thermometer is required due to breakage, damage, or expired calibration.

8.4.2 Balances

Calibration checks are performed for each day of use, for each balance. The calibration consists of a minimum of two weights which bracket the weight to be measured. The balance calibration procedure defines the acceptance criteria and performance criteria for the various balances used in the laboratory. Calibration weight measurements must meet the acceptance criteria listed in the SOP A.19 and balance calibration logbook. Each balance is serviced and calibrated by a certified professional annually. The accuracy of the calibration weights used by ASC is verified each year by an accredited calibration service. Balances are labeled with the balance number, date of service, and the expiration date for the annual service check. The balance number used for any measurements requiring traceability is recorded with the measurement data. Balances with expired calibrations or that fail the weight check are not used.

8.4.3 pH Meters

Each day pH meters are calibrated prior to use. The meter is calibrated following the procedure for pH analysis (SOP GAC.34). Records of the calibration are documented in an instrument logbook or in the raw data for the analysis being performed. At least two buffer solutions that bracket the measurement range of the analysis are used for calibration. A check standard is used at the end of the analysis run to verify meter stability.

8.4.4 Conductivity Meters

KCl
potassium chloride

A five-point calibration curve using potassium chloride (KCl) solutions is analyzed annually. The calibration curve is used to determine the cell constant for the meter. The cell constant from the annual calibration curve is compared to the acceptance criteria defined by the manufacturer. If performance is unacceptable, the cell is cleaned and rechecked. The cell is not used until satisfactory performance is achieved.

A single KCl standard solution is used as a check standard each day the meter is used. The meter is labeled with the expiration date for the annual calibration.

9

Test Methods and SOPs

The ASC is a full service analytical laboratory. Products include the preparation and analysis of a wide variety of sample matrices using standard, approved methods. The draft methods in the reference SW-846 below fall in the category of "any reliable method" and may be used with the understanding of the client. In addition, ASC develops and validates non-routine analytical methods. The ASC's standard tests are listed in Table E-1 in Appendix E. The ASC's procedures for validation of new methods are described below.

9.1 Routine Analytical Methods

The ASC utilizes a variety of in-house analytical methods that are based on the most recent versions of EPA or other published methods. In some cases, minor modifications of the reference methodology may be employed. Such modifications are listed in the corresponding SOP. Accuracy, precision, and sensitivity must be within the acceptance criteria of the reference method. Compounds, elements, or parameters to be measured are chosen from the reference methods. Additional compounds, elements, or parameters may be added based on client or project specific requests. Reference methods are utilized from the following references:

- *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, EPA SW-846, Updates III, IIIA, Drafts IVA and IVB, USEPA, November 2000;
- *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association [APHA]/American Water Works Association [AWWA]), 18th edition, 1992;
- *Methods for the Determination of Metals in Environmental Samples*, USEPA, EPA-600/4-91/010, June 1991.

APHA
American Public Health Association

AWWA
American Water Works Association

CFR
Code of Federal Regulations

- *Methods for the Determination of Metals in Environmental Samples*, Supplement I, USEPA, EPA-600/R-94/111, May 1994.
- *Methods for the Determination of Inorganic Substances in Environmental Samples,* USEPA, EPA-600/R-93/100, August 1993.
- *Methods for Chemical Analysis of Water and Wastes,* USEPA, EPA-600/4-79-020, March 1983;
- Wastewater testing references cited in 40 Code of Federal Regulations (CFR) Part 136;
- EPA Contract Laboratory Program Statements of Work for Organic (OLM04.2) and Inorganic (ILM04.1) Analyses;
- Drinking water testing references cited in 40 CFR Part 141;
- *Methods for the Determination of Organic Compounds in Drinking Water,* USEPA, EPA/600/4-88/039, December 1988, revised July 1991.
- *Methods for the Determination of Organic Compounds in Drinking Water-Supplement I,* USEPA, EPA-600-4-90/020, July 1990.
- *Methods for the Determination of Organic Compounds in Drinking Water-Supplement II,* USEPA, EPA-600/R-92/129, August 1992.
- Environmental Monitoring Systems Laboratory, USEPA, Cincinnati, Ohio 45268.
- *NIOSH Manual of Analytical Methods*, 4th edition, U.S. Department of Health and Human Services, August 7, 1994; January 1998.
- ASTM guidelines; and
- Specialty testing references cited by state regulatory programs.

The test methodologies are listed in Table E-1. An inventory of the ASC SOPs is provided in Appendix F.

SOPs are written for each analytical method as described in the SOP QA.18, Standard Operating Procedures, Use and Administration. Analytical SOPs include a method summary; health and safety concerns; references; interferences; instrumentation and equipment; reagents and materials; preservation and container handling; a detailed description of the procedure including all calculations; data reduction and reporting; QA/QC procedures; and sample disposal. Any special client requirements are listed in a separate section. SOPs are developed, reviewed, and revised according to document control procedures described in Section 11. All SOPs must reflect actual laboratory practice and are used as a training tool for new and existing analysts. SOPs are reviewed annually or biannually according to SOP QA.18, or when the method is revised. All analysts receive training on the major revisions prior to the actual implementation date.

9.2 Target Compounds

Most of the organic analytical methods can be used to analyze multiple parameters that are either listed in the method or considered potentially detectable by the analytical technique. The target compounds for the method depend on the specific application or project. For each method, the laboratory maintains a standard target compound list as identified in the individual method SOPs. The standard compound list is made up of the compounds that are analyzed routinely, included in all standards, and used to generate internal control limits and method performance data. The laboratory may add or delete compounds from the method and will generate the QC data for the compound as required for the specific application or project. In some cases, the method SOPs list compounds that ASC has historical data demonstrating the use of the method for that compound.

9.3 Non-routine Analytical Methods

The process of development of non-routine analytical methods includes a literature search and review, development and approval of an experimental approach, testing of analytical techniques, and generation of method performance data such as an MDL or Initial Precision and Recovery (IPR) studies. Method development studies are conducted under Good Laboratory Practice procedures. Methods are documented in an SOP.

IPR
Initial Precision and Recovery

10

Sample Management

10.1 Sample Receipt and Chain-of-Custody

The sample custodian or designee receives all samples. A work order number is assigned to each shipment of samples received from a client. In-house records for a new work order are initiated with a cooler receipt form. The sample custody form is signed by the client and sample custodian when the samples are received at the laboratory. Samples received via overnight courier are signed on the bill of lading. The bill of lading, cooler receipt form, and the sample receipt log are completed for samples delivered by courier (see examples in Appendix B).

The shipping containers, their contents, and accompanying client documentation are examined by the sample custodian. Information about the presence and condition of custody seals, the state of preservation of the samples, and other required information is noted on the cooler receipt form and/or package receipt log (SOP SM.1, SM.2). The USEPA form DC-1 is used for USEPA CLP samples (SOP SM.11). The cooler temperature, along with the presence or absence of ice, is recorded on the cooler receipt form and chain-of-custody (COC), if applicable. The ASC recommends clients include a temperature blank in all coolers. Any discrepancies in documentation or problems with sample condition are noted and immediately brought to the attention of the client via the project manager notification form. The project manager provides the sample custodian with instructions on the processing of samples that are incomplete or missing required information.

COC
chain-of-custody

The sample custodian logs the samples into the LIMS, and a label for each container is printed. The custodian attaches each barcode label to the appropriate sample container. The following information is recorded for tracking samples: laboratory sample ID, client sample ID, sample matrix, and storage location. The sample receipt and handling SOPs describe procedures for sample receipt and log-in, COC, and handling of sample shipment containers provided by clients. All log-in information is reviewed by a project manager before a sample can be released for analysis.

10.1.1 Sample Acceptance Policy

The ASC only accepts samples that are appropriate for the requested tests, that are accompanied by sufficient documentation, and that pose no abnormal health and safety threats to facilities or employees.

Samples are appropriate for the requested tests if:

- they are in the proper containers,
- the matrix is compatible with the test,
- there is sufficient volume,
- they are properly preserved, and
- they are within hold times.

Documentation is sufficient if:

- the sample is identified correctly;
- the sample location, date, time of collection, and sampler's name are noted;
- labeling is durable (water resistant);
- preservatives added are noted;
- sample type is noted;
- information is legible;
- a COC form or equivalent documentation is used; and
- container contents match the documentation.

A sample is acceptable from a health and safety perspective if:

- it is not from a site with known radioactivity ≥2 times background (a counter may be used on suspect samples);

- it is not from a site that contains dioxin or furan compounds in concentrations that will cause health, safety, or disposal problems;
- it is not explosive, shock sensitive, air or water reactive; and
- the outside of the sample container is clean.

It is the responsibility of the sample management staff to note when samples are unacceptable. It is the responsibility of project managers to make final determinations regarding samples, to notify clients, and to make appropriate comments in laboratory reports.

10.2 Sample Preservation and Security

Samples are stored in a secure manner to ensure their integrity. Samples are stored at temperatures that meet the specifications of the methodology, regulatory agencies, and client. Refrigerator temperatures are maintained at required temperatures (2° - 6°C) and monitored regularly. Preservatives, temperatures, holding times, and container storage requirements are listed in Appendix E. Client QAPPs may list preservation requirements differing from the laboratory's. This information is provided to the sample custodians for project-specific handling.

Chemical preservatives are normally added to sample containers in the field at the time of sampling. Acid or base preservation and temperature preservation are checked upon receipt with the exception of preservation for volatile organic compounds, which is checked after analysis. Any differences from laboratory or client-specific requirements are recorded on project manager notification forms, and the client is contacted by the project manager.

Sample storage facilities are located within the sample management area, which is secured by locked doors. Extracts and digestates are stored in designated freezer units or storage cabinets, respectively, in the laboratory analytical areas. Internal procedures and documentation pertaining to sample possession, removal from storage, and transfer are outlined in the sample custody procedure SOP SM.4. Samples are returned to the sample management area after the required sample portion is removed for analysis.

Precautions are taken to ensure that cross-contamination does not occur during sample storage. The volatile storage refrigerator is monitored weekly for volatile compounds via storage blanks. Storage blanks from the volatiles sample storage refrigerator are replaced weekly and the previous blanks removed and analyzed. The storage blank information helps ASC personnel assess potential cross-contamination in the sample storage refrigerator. Additional project-specific storage blanks are used as required.

Temperatures of cold storage areas are monitored using thermometers calibrated to NIST-traceable thermometers and recorded each working day. Min/max or recording thermometers are used to verify cold storage temperatures on non-working days. Walk-in coolers in the Sample Management area are monitored on off-hours electronically by a security company. Corrective action is taken as necessary when temperatures are not within the control criteria. Details regarding sample storage and preservation are provided in the Sample Management SOPs SM.2 and SM.4, and in the temperature check SOP A.43.

10.3 Sample Preparation and Analysis

All sample preparation and analysis procedures employed at the ASC are covered by appropriate SOPs. Samples are prepared and analyzed following the method specified by client requirements and the matrix to be analyzed. Most samples must be prepared and/or analyzed within a method-specified holding time after sampling (see Appendix E). Any exceptions to the specified holding times are subject to the corrective action process and noted in the case narrative.

Holding times listed in the applicable project-specific documents are followed as required. Samples are occasionally received after holding times have expired. A project manager notification form is completed whenever holding times are exceeded. The project manager notifies the client, and the client decides to continue with the analysis or suspend the testing.

The LIMS tracks holding times and applicable analytical methods and helps ensure that all method and client requirements are met.

10.4 Sample, Extract, and Digestates Archiving

The sample custodian and other authorized personnel are responsible for archiving and disposing of raw samples, extracts, and digestates. Raw and prepared samples are not archived or disposed of until all of the designated analyses are complete and resultant analytical data is sent to clients. Samples in storage are retained for at least 30 days after reporting of the results; any samples requiring longer storage are archived. Longer retainage is available on a project-specific basis.

Archive samples are placed in boxes, labeled with the project numbers and disposal date, and retained in a sample archive area for any additional length of time specified by the client prior to disposal. The archive samples may be stored in the refrigerator or at ambient temperature, as specified by the client. Archived samples are disposed of at any time after the predetermined date in accordance with all applicable rules, regulations, and SOPs. Clients are informed of sample disposal procedures and given an opportunity to request exceptions to the routine practices as part of the contract or task order.

10.5 Sample Disposal

It is the policy of ASC to dispose of all samples and waste in accordance with all applicable rules and regulations. The following lists the primary regulations regarding disposal.

RCRA
Resource Conservation and Recovery Act

HMTA
Hazardous Materials Transportation Act

DOT
Department of Transportation

OSH
Occupational Safety and Health Act

NYCRR
New York Code of Rules and Regulations

Resource Conservation and Recovery Act (RCRA): Regulations pertaining to the Resource Conservation and Recovery Act (RCRA) and its amending legislation are published in 40 CFR 260-299. The regulations pertaining to satellite accumulation are found in 40 CFR 262. Regulations for generators are found in 40 CFR 265. Solid and hazardous waste definitions are located in 40 CFR 260 and 261.

Hazardous Materials Transportation Act (HMTA): The U.S. Department of Transportation (DOT) promulgates regulations under the HMTA in 49 CFR. HMTA regulations cover all hazardous materials (including both hazardous substances and hazardous wastes) and all aspects of their packaging, preparation, identification, and segregation during transportation.

Occupational Safety and Health Act: The Occupational Safety and Health Act (OSH) authorizes OSHA to provide and enforce regulations governing worker safety. OSHA regulations are found in 29 CFR, with many of the sections pertaining to the laboratory found in part 1910 including 1910.120 *Hazardous Waste Operations and Emergency Response*, 1910.1200 *Hazard Communication*, and 1910.1450 *Occupational Exposure to Hazardous Chemicals in Laboratories*.

New York State Requirements: The State of New York has primacy in the area of environmental enforcement under RCRA. The regulations governing generators and storage of hazardous waste are found in Title 6, Conservation, of the State of New York Code of Rules and Regulations (NYCRR).

10.6 Sample Return to Clients

When a client has requested the return of samples, the sample custodian prepares and ships the samples according to the same custody procedures used to originally send the samples, and following any client-specified requirements. Special packaging procedures are implemented to protect the samples during delivery. Packages are delivered by a commercial carrier whose procedures for protecting the samples are beyond the control of the ASC. Clients are informed that a commercial carrier will deliver their samples.

10.7 Sample Loss, Damage, or Unsuitability

Samples or sample containers can be lost, damaged, or deemed unsuitable, for whatever reason, after initial receipt at the ASC. Whenever this happens, the event is recorded by the observer on the project manager notification form. The problem is reported to the project manager who informs the client. Plans for disposition of the affected sample(s) or containers are agreed upon with the client, carried out, and recorded on a corrective action form.

11

Document Control and Records

11.1 Document Control

The ASC controls all documents that directly impact data quality as specified in the document control SOP A.27. This includes, but is not limited to, the QAM, SOPs, checklists, and forms. Electronic copies of controlled documents are available to all laboratory personnel. Also a hard copy of each document is stamped in green as the control copy and maintained by the Document Control Officer. The document control form (see Appendix B for example) provides a hard copy record of all review and approval signatures, and applicable training and implementation dates.

Uncontrolled copies may be made from the control copy for training and operational review or for external use. The procedure for version document control allows for the retention of a previous version for historical information purposes and includes the status of each active or archived document. Archived documents are procedures not currently requested that may be required in the future or are of old procedures that have been revised. Each document and any subsequent revisions must be reviewed and approved by authorized personnel prior to issue.

Every document is assigned a unique identification number that is present on each page of the document and entered on a master list of documents. The revision number, approval date, and page number are also listed on each control copy. All version-controlled documents are assigned an implementation date to clearly indicate when a new version is applicable.

11.2 Records

The laboratory maintains an extensive series of records related to sample tracking, analytical results and support information. Records management encompasses document control, software management, analytical reports, and the LIMS. The types of records the laboratory manages include SOPs, forms and checklists, letters and memos, project files, analytical reports, electronic media, QA files, LIMS data, accounting data, instrument maintenance and other logbooks, programs, spreadsheets, and electronic data deliverables. The general procedures for managing records are outlined in the document control SOP A.27, but additional records management information is presented in individual administrative, QA, reports, and computer SOPs. The following sections summarize policy and procedures on some of the major records retained at the laboratory. All records are required to unequivocally reproduce the analytical results reported and provide evidentiary chain of custody. Records are maintained in retrieval format at the laboratory for at least five years. Drinking water records are maintained for at least 10 years.

11.2.1 Standard Operating Procedures

SOPs are documents detailing every repetitive or standard operation performed by the laboratory. The author of each SOP is generally the person most familiar with the topic being addressed. Each SOP is peer reviewed and authorized by management and the QA department prior to distribution and implementation.

The content of each SOP conforms with applicable requirements of analytical methods and certification agencies and is consistent with the good laboratory practice standards. Within these constraints, the content of an SOP may be customized to meet the needs of a particular area of the laboratory. The performance of laboratory operations is subject to audit for compliance with written SOPs. If an SOP is impractical, difficult to follow, or no longer meets laboratory needs, it is revised or replaced.

The process for developing new or revising existing SOPs is documented in the SOP on SOP Administration (QA.18). At a minimum, SOPs are reviewed biannually to ensure they reflect current procedures. Revisions are made to SOPs as necessary to reflect changes in procedures. Interim changes may be made to operations based on the implementation of a corrective action, provided that the corrective action is authorized. Finally, all personnel involved in the process affected by the change must be notified of the SOP change. Training is required for all major revisions and new SOPs.

The Laboratory QA Coordinator administers the SOP program, and the Document Control Officer is responsible for clerical preparation and distribution of new or revised SOPs, record keeping, and archiving of replaced and retired SOPs under his/her direction.

11.2.2 Laboratory Notebooks

The Document Control Officer issues all logbooks and assigns and records logbook numbers in numerical order (SOP A.27). Completed logbooks are returned to the Document Control Officer within one year of completion of use of the logbooks. The logbooks are archived in locked cabinets in the warehouse. The Document Control Officer records the logbook's name, inclusive dates of use, disposition (to warehouse), and date of final disposition in the master logbooks. Logbooks may be destroyed after five years (10 years for drinking water records) unless specifically required by the client.

The Document Control Officer maintains a logbook of all personnel with their signature and initials as a reference (traceability purposes) for other laboratory logbooks.

11.2.3 Laboratory Data

Laboratory report records are maintained in a file to prove that adequate QC procedures are being implemented, accountability of the data is maintained, and traceability of analytical results is completed. Accountability means that reported data reflect the sample as it was received, that sample mix-up was avoided, and that the sample was found properly preserved upon receipt. Traceability means that reported data may be reconstructed at a later date. Through proper documentation, the laboratory is able to demonstrate to clients or government agencies that the data quality is what the laboratory reports it to be. Records contain sufficient information to permit the reconstruction of calibrations, sample preparations, and sample analyses. Raw data information includes method identification, sample identification, instrument identification, and reference to operating conditions, date of analysis and analyst signature.

11.2.4 Quality Assurance Records

Quality records at ASC are maintained to prove that the QA system is being effectively applied. Specific procedures for the identification, collection, indexing, filing, storage, maintenance, and disposition of various quality records at ASC are described in the document control SOP A.27. All quality records are recorded in permanent (indelible) ink, legible, attributable to those personnel who created them, and protected so they are not adversely affected by an unsuitable environment. They are stored and maintained in a manner that facilitates retrieval for a period of at least five years after completion. Project-specific quality records are available for evaluation by the client or a client representative during the five-year archive period.

11.2.5 Project Files

Project managers maintain project files for all projects with specific requirements that deviate from routine SOPs. Project files may include an SOW, proposal or quotation, contract, client communications, or permit/regulatory requirements. The project documentation provided to specify analytical and QA requirements may be in the form of a QAPP.

QAPPs provide an overview of the way a project, group of projects, or specific analytical program is to be conducted. When provided, a copy of client QAPPs to be used by the laboratory are available in the QA area. Historical copies of outdated QAPPs are retained in the archives by the Document Control Officer to aid historical interpretation of the data.

11.2.6 Archives

The archives are contained in a separate building, locked at all times, with access limited to the Laboratory QA Coordinator, Document Control Officer, and their designees. The person retrieving the records must sign and date a logbook held by the Document Control Officer. All materials removed from and returned to the archive building must be signed, dated, and remain intact.

State and federal agencies and clients have access to applicable archived documentation as laboratory policy.

All magnetic and hard copies of data, calibrations, equipment maintenance records, calculations, records of original observations, final test results, and any other miscellaneous quality records directly associated with sample analyses are stored in the archives for a minimum of five years after completion of a project.

11.3 Quality Assurance Manual

The Laboratory QA Coordinator is responsible for the publication and distribution of the QAM. The QAM is submitted to management for review and authorization annually. As major changes are implemented in the QA system, the QAM is revised and submitted to management for authorization. The QAM is published and revised with the assistance of laboratory management.

The authorization signatures found on the authorization page signify management review and approval of the QAM. The authorization section is kept current to reflect any organizational changes affecting the authorizing positions. The revision number and date of each section is always the same as the revision number and date for the authorization section, indicating that all major revisions have passed through management review. Minor revisions are authorized by the Laboratory QA Coordinator as specified in the revision table. The revision table is updated to reflect major or minor revisions to sections.

Distribution of the QAM is regulated through document control procedures. Controlled copies of the manual may be distributed to an individual, client, or certifying agency. Uncontrolled copies distinctly marked as "Uncontrolled Copies" may be issued to persons or organizations outside the ASC. A distribution list is maintained for all controlled copies of the manual. Updates are provided to all parties listed on the distribution list. All other copies marked as "Uncontrolled Copies" are not subject to updates upon revision of the manual.

Appendices of the QAM are controlled separately from the major text of the document and are not subject to the same training requirements as the policies in the QAM. Resumes are not part of the QAM proper since personnel requirements are often client dependent and the list of designated personnel will vary. Resumes are sent with the QAM to clients as designated in the document control SOP. A.27.

11.4 Software Management

The goals of the software development methodology, existing system validations, and the change control system are to ensure that the software systems perform the required functions accurately, that the users understand how to use the system. This in turn ensures the delivery of accurate, timely analyses to the client.

The computer systems used at ASC are either procured from E & E's Corporate Computer Services Center or purchased with a specific instrument system. The ASC has a formal process for management of its computer systems that ensures that data transmitted, reported, or manipulated by electronic means are correct and free from errors. The process includes SOPs, hardware/software redundancy and backup, and related ethics policies for computer usage and data handling.

Firstly, new software is developed according to the computer SOP Comp.5, Data Management. New software includes the development of spreadsheets for use as electronic laboratory notebooks, functionality added/reporting tools for LIMS systems, and other tools using commercial software packages.

Requests for changes to these software systems are identified through flaws in existing documentation or the need to improve system processes. Through the use of the corrective action process (SOP QA.1), final implementation of the change is documented with the software. This documentation provides a complete record of all software and electronic data reporting problems.

Secondly, system integrity is verified through programs for routine maintenance, protection from unauthorized access, and electronic verification. Routine maintenance, including system backups, is performed on a scheduled basis. The backup process, password system, and access protection are defined in the computer area SOPs. This includes virus checking of all network operations as defined by the Corporate Computer Systems Guidelines using industry-leading virus checking software tools. Documentation of all server backups and maintenance operations are retained in the server logbook for the ASC computer network and is retained by the site Regional Computer Coordinator (RCC).

Lastly, data integrity relies on all users of computer systems and software to follow ethical practices when entering, manipulating, or reviewing data. These policies are outlined in the laboratory ethics policy (SOP A.34).

12

Reports

12.1 Data Collection and Reduction

Data collection is performed by the analyst, and data reduction is performed by the analyst and data reporting personnel. Data collection and reduction procedures for specific types of analytical methods are described in the Method SOPs. These procedures vary depending on whether data are acquired manually or electronically.

12.1.1 Manually Acquired Data

Manually acquired data may be recorded on data sheets, logbooks, or entered directly into the computer system. All data are immediately recorded in permanent ink by the analyst, and each page is signed and dated. Corrections are made by drawing one line through the error, dating, initialing, and, where appropriate, noting reasons for the correction in the margin. Unused portions of logbook page intentionally left blank are marked with a large "Z," then initialed and dated on the "Z." All logbooks are signed by a peer or supervisory reviewer.

Data sheets are standardized, preprinted forms which are subject to document control and bound in a book. Notebooks are bound, consecutively numbered, and subject to document control.

Either the analyst or data entry personnel enter all manually acquired data directly into LIMS for reporting. Hand-entered data are checked for transcription errors as part of the data review process. Data processed in the LIMS may be corrected for dilution factor, percent solids, and the correct significant figures.

12.1.2 Electronically Produced Data

Electronically produced data may consist of chromatograms, spectra, data printouts, and raw quantitation reports. The analyst is identified on raw data with signature there or in a run sequence logbook. Any alterations to the raw data hard copies and computer files are fully documented and clearly attributable to the person making such alterations. All manual integrations are identified and approved according to SOP A.46 and hard-copied for inclusion in full data packages, with area changes fully documented on the data printouts. No ambiguity is allowed in data system printouts with regard to correspondence between peaks on a chromatogram and analytes of interest. Computer-collected data is reduced to hard copy as soon as possible. The electronic files are safeguarded by a system of backup media to protect against loss of data and programs. Software used for data acquisition and quantitation reports is tested according to written procedures to assure that no data anomalies are present.

Electronically produced data are transferred directly to the LIMS through an instrument interface program, or the data may be hand entered from the instrument printout. All data are checked for accuracy and transcription errors as part of the data review process. Electronically produced data may be corrected for percent solids, dilutions, and significant figures in the LIMS.

12.2 Data Review

Data review is performed by the analyst, the peer reviewer, project manager, and Laboratory QA Coordinator as defined in the data review SOP A.25. At each stage of the analytical process, data are reviewed for completeness, adherence to protocol requirements and project-specific requirements, and documented on appropriate checklists. Results are fully validated; possible compromises of data quality are evaluated; and deviations from protocol requirements are documented. To the greatest extent possible, computer programs are utilized for data reduction. Where manual data manipulation procedures are required, data review includes additional steps to check for transcription errors. If any nonconformances are noted during data review, corrective actions are initiated at the earliest possible opportunity and documented according to the corrective action procedure.

12.2.1 QC Review

The main purpose of the QC review is to determine the extent to which the method and final data meet established requirements. Checklists for appropriate test methods and project requirements reference the QC criteria to be reviewed along with the acceptance criteria. The review is conducted by initial and peer reviewers. All nonconformances are documented as defined in the corrective action procedure. All exceptions are noted in the case narrative for client review. Checklists or benchsheets are signed and dated to indicate that the QC review is complete. After initial and peer review, the project manager reviews the reported information for consistency with project requirements.

12.2.2 QA Review

Data reviews are performed by the Laboratory QA Coordinator or designee on a random sampling of ASC data reports. The goal is to perform an evaluation of approximately 10% of sample reports. A data report is carefully evaluated for technical, clerical, and administrative accuracy. Primary emphasis is placed on the ability of the data report to meet current SOP requirements. Data audits are comprehensive assessments of the data review process as defined in Section 4.4. Data audits are conducted annually and allow upper level management to identify opportunities for process improvement, evaluate the efficiency of the system, detect inadequate execution of QC procedures, detect potential system deficiencies, and recommend corrective actions.

12.2.3 Data Qualification and Validation

As part of the data review process, ASC may qualify data prior to reporting. For CLP or CLP-equivalent reports, data qualifiers consistent with the CLP SOW are used. For routine reports, the laboratory uses the following qualifiers:

- "ND" – Not detected at the reporting limit or the MDL, dependent upon report requested.
- "J" – Analyte detected below the reporting limit, but above the current method detection limit.
- "B" – Analyte detected in the associated method blank.
- "H" – Value exceeds Maximum Contaminant Level.
- "M" – Matrix spike recovery outside limits.
- "A" – Result by Method of Standard Additions.
- "E" – Value above quantitation limit (extended analyte).
- "D" – Value from dilution due to matrix or extended target compound.
- "N" – Single column analysis.
- "X" – See case narrative.

- "*" – Recovery outside limits.
- "R" – RPD outside limits.
- "P" – Post spike recovery outside limits.

After the laboratory releases the data, an E & E corporate or client data validation chemist may review the data package. The data validation chemist will evaluate the package for completeness, and the results against the project-specific DQOs and determine the usability of the results. The data validation chemist may add or remove qualifiers from the data as required for the project.

12.3 Data Reporting

Data are reported by analytical method, target analytes identified, and the quantities present. The content of the final report is dependent on the project-specific requirements. At a minimum, all reports include a cover letter, a case narrative, analytical results, signature of the responsible laboratory project manager, the test methods used, dates of sampling and analysis, data qualifiers, and any QC results associated with the samples.

Full data packages may be presented in the latest CLP format or equivalent. CLP format includes a case narrative, standard report forms, and all associated raw data. Customized data packages following RCRA program QC requirements are also prepared. The project-specific checklists for reporting are developed at the start of the project if customized reporting is required that is substantially different than standard report forms. Project-specific acceptance criteria are placed in an electronic file in the LIMS and are used to check the final reported data. All flags or data anomalies are presented in the case narrative. The data are retained through the laboratory network back-up process.

Clients requiring electronic data deliverables (EDD) receive data in the electronic format standard developed by the ASC. If client requirements differ from the ASC standard formats, EDDs may be compiled based on the criteria defined at the start of the project. Details regarding EDD generation are presented in SOP COMP.10, Electronic Data Deliverable Generation.

12.3.1 Data Package Delivery

Data packages (reports) are prepared for delivery by each laboratory and compiled in the respective lab project manager's area according to the reporting SOP Rep.20 and related electronic reporting SOPs. Several different means of reporting are available depending on client needs. In addition to or in place of a paper copy of the report, an exact electronic copy (.pdf file) can be sent via email or on a CD. EDDs can also be burned on the same CD or sent via email. Unless otherwise requested by the client, a paper copy of the data is shipped while the original is retained in the laboratory archive facility to guard against possible loss of original data. Reports are fully paginated prior to copying. The total number of pages in a report is identified. The method of delivery of the data package is specified in the project or contract. Should the shipped data package be lost or damaged during delivery, a copy will be prepared from the original as a replacement. Copies of any electronic submissions are stored on the network should the original files be corrupted or lost during transmission. Results also may be faxed, emailed, or placed on CD-ROM per client requirements.

12.4 Corrections and Additions to Documentation

Additions or corrections to reports already issued are handled according to the following policy. The project manager can request an addition or correction in writing using a "Report Correction Request" form (SOP A.33). The form is given to the appropriate data reporting personnel. The requested change is made in a timely manner and may need to be internally verified with the analyst and peer reviewer and must be approved by the Technical Director, General Manager, or Laboratory QA Coordinator. After the change is reviewed by the responsible parties, the reporting area issues the new report to the customer. The case narrative is changed to record the amended report and the reason for the change from the original. The amended report is stored with the original data package for a minimum of five years.

13

Contracting

13.1 Contract Review

For all analytical services provided by ASC, contract review is accomplished through the generation of a written quote or contract. A written quote is utilized for short-term contracts, usually consisting of one analytical project. A written contract is utilized for long-term contracts consisting of multiple analytical projects.

Project managers are responsible for implementing and documenting contract review. Client requirements, including special needs that are not documented in the current SOPs, are defined and documented in the written quote or contract. Section supervisors having expertise in specific analytical services are consulted to ensure that the laboratory can meet special requirements. If it is decided that the special requirements cannot be met, this is discussed with the client, and alternatives may be offered. Information about ASC's capacity and availability is made available to project managers on a regular basis to enable them to make informed decisions regarding contracted delivery times.

Long-term project requirements are added to the affected SOPs in the section "Client Specific Requirements." Short-term project requirements such as one-time task order requirements or purchase orders are communicated by the project manager to the appropriate personnel by the use of work order comment or project comment in the LIMS, project memo, or a data review checklist. This documentation contains the project-specific requirements used by the analyst, peer reviewer, and project reviewer to ensure that all the requirements are met.

13.2 Subcontracted Analyses

The ASC has established procedures for subcontracting any analyses they cannot perform. The client may be referred directly to another laboratory if no part of the work is to be performed by ASC, or work may be subcontracted. Subcontracting follows corporate procedures and the laboratory SOP A.32 on subcontracting. All subcontracted laboratories must be reviewed as outlined in SOP A.32. The review process ensures that the subcontracting laboratory meets all requirements of the contract including appropriate certifications. For areas that ASC routinely subcontracts, laboratories are audited either on-site or by a data audit at the beginning of the use of the laboratory. The ASC subcontracts to laboratories that continue to meet quality objectives for the projects.

Subcontracting also may take place when ASC is able to perform only part of the requested analyses, testing capacity is exceeded, instrument failure occurs, analysis is not possible within the required hold times, or when a specific client request is made. Clients are notified in advance of any work being subcontracted. Notification may be in the form of e-mail, fax memo, proposal, or contract. When the subcontracted analysis is one that ASC has been certified or approved to perform by the client or regulatory agency, the subcontracting lab must have an equivalent certification or approval such as NELAP, ACE, AFCEE, et al.

Incoming samples that will be subcontracted are subjected to normal sample receipt procedures. The samples are prepared and shipped to the subcontracting laboratory following the appropriate COC procedures. Results are received at ASC and reviewed before the report is sent to the client.

14

Laboratory Procurement

14.1 Purchasing, Receiving, Inspection, Inventory, and Storage

The purchase, receipt, inspection, inventorying, and storage of laboratory materials are described in several SOPs. A completed purchase request form provides a clear description of the material to be ordered. The specification for the materials used in testing are listed in the test method SOP. This includes, where applicable, a precise identification and reference to any specifications that must be met. Purchase requisitions are prepared by section supervisors or designee and approved by the Business Manager. The corporate purchasing department orders the material from an approved supplier (see Section 14.3). Upon receipt of the goods, receiving personnel examine them for damage before signing the bill of lading. Materials and quantities in all shipments are compared with what was ordered, and this information is communicated to purchasing.

All stocked items are stored in the warehouse. Non-stocked inventory is forwarded to the requisitioning person. Reagent materials are recorded in a material receipt log, marked with the date received, and placed in storage so that the older materials will be used first.

14.2 Sample Container Purchase

Sample containers are purchased from vendors using generally accepted glass cleaning procedures. Vendors are qualified approximately every one to two years. The vendor selection process includes a pre-selection review of qualifications, preparation of a request for quotation, and receipt and review of proposals. The competitive bidders are required to send a series of bottles for testing. The ASC tests a representative subset of containers to ensure product quality prior to awarding contracts. Once a vendor is awarded the contract, the vendor secures large lots of bottles required by the laboratory. Bottles are shipped to ASC or directly to sampling sites from the lots allocated to E & E.

14.3 Vendor Qualification

The ASC personnel select vendors for all materials and supplies impacting data quality. The corporate purchasing department selects vendors for office items and non-critical supplies. The vendor selection process is similar to that used for sample containers. Vendors are qualified for approximately one to two years based on historical quality and service. The ASC develops a list of materials as part of a request for quotation, and vendors prepare a proposal based on these materials. The competitive bidders are selected for a long-term contract. Critical reagents and standards are pre-tested prior to award. For high use solvents and reagents, vendors are required to maintain large lots allocated for ASC's use. The ASC tests all new lots before the existing lot is expended.

The purchase of standards is somewhat different from the purchase of other supplies. In most cases, the laboratory has a reliable source of high quality standards and will continue to use that vendor for long periods. Many standards are ordered as custom mixes. All new lots of standards are checked during testing against the existing lot to ensure consistent quality. Where possible, standards are traceable to NIST or a NELAP-approved vendor, or other approved certification.

15

Client Service

The Project Management Unit is the primary group responsible for providing client service. Other laboratory personnel may handle projects when they are uniquely qualified or technical experts in the area of concern for the project. Project managers are independent of laboratory production and function as the on-site representative for the customer. Project managers are responsible for all client interactions from the quotation or proposal to the final report and invoice. The project manager will usually represent the laboratory in all face-to-face meetings with the client. All project managers are experienced in laboratory analyses and possess the technical expertise to review, interpret, and report client-specific chemistry requirements. Project managers work closely with the Business Manager to maintain schedules and forecast sales. As a group, they are responsible for ensuring that ASC has adequate capacity for each project they manage and the analytical results are reported in a timely manner.

15.1 Project Documentation

The documentation used to specify client requirements may include the initial contract or SOW; project requirements from manuals, meeting notes, or other sources; the original laboratory proposal; contract negotiation notes; a QAPP developed by either the client or the laboratory; or a client audit report. Contracts from the client are reviewed as described in Section 13.1. A process similar to the contract review process is used to review other project documentation. The project manager is responsible for communicating project requirements to the appropriate staff and reviewing all final reports to ensure that the reports meet the client requirements.

Client requirements are communicated to the laboratory staff in many ways, depending on the type of project. Examples of incorporating project-specific requirements into the laboratory process are as follows:

- A project-specific QAPP is developed as an addendum to the QAM or provided by the client. The QAPP is distributed and the staff trained in its use.
- Client-specific requirements are added to administrative or method SOPs.
- Client-specific requirements are incorporated into method data review checklists.
- The project manager notes project specific requirements in the LIMS.
- The project manager holds a kick-off meeting to review requirements of the project.
- Project-specific requirements are incorporated into custom test codes and results checked electronically by the LIMS. The LIMS validator report of outside specification QC results are reviewed by analyst and peer reviewers.

15.2 Client Concern Resolution

All problems or non-conformance with client requirements are handled through the corrective action process described in Section 4.5. The corrective action process requires the project manager to be notified immediately of any non-conformance with the samples or data. The project manager is responsible for informing the client. Depending on the situation and the client, the project manager will document the problem in the case narrative, or notify the client immediately and document the problem in the narrative.

If the client raises concerns after receiving the analytical report, those concerns are addressed as part of the corrective action process. All client inquiries should be addressed within 48 hours of receipt. If follow-up reports or analysis is required, the laboratory will proceed to complete the tasks with the highest possible priority. Long-term client concerns will be tracked as part of the corrective action process. The status of client concerns are reported to laboratory management by the QA Coordinator. A record of all inquiries and their resolution is maintained with the corrective action form in the QA files or in the project files.

16

References

40 CFR Part 136, Appendix A, paragraphs 8.1.1 and 8.2 and Appendix B.

American National Standards Specification and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs (ANSI/ASQC E-4), 1994.

APHA/AWWA/WEF, 1992, *Standard Methods for the Examination of Water and Wastewater*, 18th ed.

International vocabulary of basic and general terms in metrology (VIM): 1984, issued by BIPM. IEC. ISO. and OIML.

ISO Guide 8402: 1986. Quality – Vocabulary.

ISO/IEC Guide 2: 1986. General terms and their definitions concerning standardization and related activities.

ISO/IEC Guide 17025: 1999 (E). General requirements for the competence of testing and calibration laboratories.

NELAC, July 1, 1999, *Quality Systems Manual*, Revision 12.

NELAC, June 29, 2000, *Quality Systems Manual*, Revision 13.

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846 3rd ed., Update III, June 1997.

United States Environmental Protection Agency (EPA), August 1992, *Methods for the Determination of Organic Compounds in Drinking Water – Supplement II*, EPA-600/R-92/129.

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__________, July 1990, *Methods for the Determination of Organic Compounds in Drinking Water – Supplement I*, EPA-600/4-90/020.

__________, revised March 1983 and 1979, *Methods for the Chemical Analysis of Water and Wastes*, EMSL, Cincinnati, EPA-600/4-79-020.

__________, *Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*, Appendix A to Part 136.

__________, *Environmental Monitoring Systems Laboratory, Office of Research and Development*, Cincinnati, OH 45268.

__________, Glossary of Quality Assurance Terms and Acronyms, Quality Assurance Division, Office of Research and Development.

A

Definitions

The following definitions are used in the QAM or related SOPs. The following references were used: ISO 8402, ANSI/ASQC E-4, EPA's Quality Assurance Division Glossary of Terms, EPA SW-46, New York State Department of Health Environmental Laboratory Approval Program, definitions developed by NELAC and/or the ASC QA Unit. The source of each definition is noted.

Acceptable Criteria: specified limits placed on characteristics of an item, process, or service defined in requirement documents. (ASQC)

Accreditation: the process by which an agency or organization evaluates and recognizes a program of study or an institution as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. (NELAC)

Accuracy: the degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. (Glossary of Quality Assurance Terms, QAMS, 8/31/92)

Batch: a group of samples which behave similarly with respect to the sampling or testing procedures being employed which are processed as a unit, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 of the same matrix which are prepared together. An **analytical batch** is composed of prepared samples (extracts, digestates or concentrates) which are analyzed together as a group. (EPA SW846, ASC)

Blank: a sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage, or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results. (ASQC, Definitions of Environmental Quality Assurance Terms, 1996)

Blind Sample: a subsample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its concentration. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process. (NELAC)

Calibrate: to determine, by measurement or comparison with a standard, the correct value of each scale reading on a meter or other device, or the correct value for each setting of a control knob. The levels of the applied calibration standard should bracket the range of planned or expected sample measurements. (NELAC)

Calibration: the set of operations which establishes, under specified conditions, the relationship between values indicated by a measuring instrument or measuring system, or values represented by a material measure, and the corresponding known values of a measurement. (VIM - 6.13)

Calibration Curve: the graphical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response. (NELAC)

Calibration Method: defined technical procedure for performing a calibration such as internal standard or external standard. Internal standard calibration is typically used for GCMS methods. External calibration is used for most other methods. (NELAC, ASC)

Calibration Standard: a solution prepared from the primary dilution standard solution or stock standard solutions and the internal standards and surrogate analytes. The calibration solutions are used to calibrate the instrument response with respect to analyte concentration. (Glossary of Quality Assurance Terms, QAMS, 8/31/92)

Certified Reference Material (CRM): a reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body. (ISO Guide 30 - 2.2)

Chain of Custody: an unbroken trail of accountability that documents the physical security of samples, data, and records. (Glossary of Quality Assurance Terms, QAMS, 8/31/92)

Confirmation: verification of the presence of a component through the use of an analytical technique that differs from the original method. These may include:
Second column confirmation,
Alternate wavelength,
Derivatization,
Mass spectral interpretation,
Alternative detectors, or
Additional cleanup procedures. (NELAC)

Continuing Calibration Verification: analysis of a calibration standard to verify the validity of the daily calibration during and at the end for each analytical batch or sequence. (ASC)

Corrective Action: action taken to eliminate the causes of an existing nonconformity, defect, or other undesirable situation in order to prevent recurrence. (ISO 8402)

Data Audit: a qualitative and quantitative evaluation of the documentation and procedures associated with measurements to verify that the resulting data are of acceptable quality (i.e., that they meet specified acceptance criteria). (NELAC)

Data Quality Objectives: A statement of the overall level of uncertainty that a decision-maker is willing to accept in results derived from environmental data. (EPA/QAMS)

Data Reduction: the process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collating the data into a more useful form. (NELAC)

Data Validation: The process of evaluating the available data against the project DQOs to make sure that the objectives are met. (EPA SW-846)

Document Control: the act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly, and controlled to ensure use of the correct version at the location where the prescribed activity is performed. (ASQC, Definitions of Environmental Quality Assurance Terms, 1996)

Double Blind Sample: a sample submitted to evaluate performance with concentration and identity unknown to the analyst. (NELAC)

Holding Times (Maximum Allowable Holding Times): the maximum times that samples may be held prior to preparation and analysis and still be considered valid. (40 CFR Part 136)

Initial Calibration Verification: analysis of an independent calibration standard to verify the validity of the initial calibration curve for each analytical batch. (ASC)

Initial Demonstration of Analytical Capability: procedure to establish the ability of the laboratory to generate acceptable accuracy and precision which is included in many of EPA's analytical methods. In general, the procedure includes the addition of a specified concentration of each analyte into each of four separate aliquots of laboratory pure water or analyte-free solid matrix. These are carried through the entire analytical procedure, and the percentage recovery and the standard deviation are determined and compared to specified limits. (40 CFR Part 136, EPA SW-846)

Initial Precision and Recovery: same as Initial Demonstration of Analytical Capability. (ASC)

Instrument Blank: a clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination. (Glossary of Quality Assurance Terms, QAMS, 8/31/92)

Internal Standard: a known amount of standard added to a test portion of a sample and carried through the entire measurement process as a reference for evaluating and controlling the precision and bias of the applied analytical method. (NELAC)

Laboratory Control Sample: a sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes. It is generally used to establish intra-laboratory or analyst-specific precision and bias or to assess the performance of all or a portion of the measurement system. (NELAC)

Matrix: the component or substrate that contains the analyte of interest. For purposes of batch determination, the following matrix types shall be used:

- Aqueous: Any aqueous sample excluded from the definition of a drinking water matrix or Saline/Estuarine source. Includes surface water, groundwater and effluents.
- Drinking water: Any aqueous sample that has been designated a potable or potential potable water source.
- Saline/Estuarine: Any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake.
- Non-aqueous liquid: Any organic liquid with <15% settleable solids.
- Biological Tissue: Any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.
- Solids: Includes soils, sediments, sludges, and other matrices with >15% settleable solids.
- Chemical Waste: A product or by-product of a industrial process that results in a matrix not previously defined.
- Air Samples: Media used to retain the analyte of interest from an air sample such as sorbent tubes or summa canisters. Each medium shall be considered as a distinct matrix.
- Wipes: gauze. (Quality Systems)

Matrix Duplicate: an intralaboratory split sample which is used to document the precision of a method in a given sample matrix. (EPA SW-846)

Matrix Spike (spiked sample, fortified sample): prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency. (Glossary of Quality Assurance Terms, QAMS, 8/31/92)

Matrix Spike Duplicate (spiked sample, fortified sample duplicate): a second replicate matrix spike is prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte. (Glossary of Quality Assurance Terms, QAMS, 8/31/92)

May: permitted, but not required. (TRADE)

Method Blank: a clean sample processed simultaneously with and under the same conditions as samples containing an analyte of interest through all steps of the analytical procedures. (Glossary of Quality Assurance Terms, QAMS, 8/31/92)

Method Detection Limit (Analytical Detection Limit): the minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. (40 CFR Part 136 Appendix B)

Must: denotes a requirement that must be met. (Random House College Dictionary)

NELAC: National Environmental Laboratory Accreditation Conference. A voluntary organization of state and federal environmental officials and interest groups purposed primarily to establish mutually acceptable standards for accrediting environmental laboratories. A subset of NELAP. (NELAC)

NELAP: the overall National Environmental Laboratory Accreditation Program of which NELAC is a part. (NELAC)

Performance Audit: the routine comparison of independently obtained quantitative measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory. (NELAC)

Performance Based Measurement System (PBMS): a set of processes wherein the data quality needs, mandates, or limitations of a program or project are specified and serve as criteria for selecting appropriate methods to meet those needs in a cost-effective manner. (NELAC)

Practical Quantitation Limit (PQL): the limit typically reported for the method that is above the MDL. The ability to reach the PQL should be documented with each analytical batch, typically by using the lowest standard of a verified calibration curve at the PQL. (ASC)

Precision: the degree to which a set of observations or measurements of the same property, usually obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance, or range, in either absolute or relative terms. (Glossary of Quality Assurance Terms, QAMS, 8/31/92)

Preservation: refrigeration and/or reagents added at the time of sample collection to maintain the chemical and/or biological integrity of the sample. (NELAC)

Proficiency Test Sample (PT): a sample, the composition of which is unknown to the analyst and is provided to test whether the analyst/laboratory can produce analytical results within specified performance limits. (Glossary of Quality Assurance Terms, QAMS, 8/31/92)

Proficiency Testing: Determination of the laboratory calibration or testing performance by means of interlaboratory comparisons. (ISO/IEC Guide 2 - 12.6, amended)

Pure Reagent Water: shall be ASTM Type I or Type II water in which no target analytes or interferences are detected as required by the analytical method.

Quality Assurance: an integrated system of activities involving planning, quality control, quality assessment, reporting, and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence. (Glossary of Quality Assurance Terms, QAMS, 8/31/92)

Quality Control: the overall system of technical activities whose purpose is to measure and control the quality of a product or service so that it meets the needs of users. (Glossary of Quality Assurance Terms, QAMS, 8/31/92)

Quality Control Sample: an uncontaminated sample matrix spiked with known amounts of analytes from a source independent from the calibration standards. It is generally used to establish intra-laboratory or analyst-specific precision and bias or to assess the performance of all or a portion of the measurement system. (Glossary of Quality Assurance Terms, QAMS, 8/31/92)

Quality Manual: A document stating the quality policy, quality system and quality practices of an organization. This may also be called a Quality Assurance Plan or a Quality Plan. (NELAC)

Quality System: a structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC. (ANSI/ASQC E-41994)

Range: the difference between the minimum and the maximum of a set of values. (NELAC)

Raw Data: any original factual information from a measurement activity or study recorded in a laboratory notebook, worksheets, records, memoranda, notes, or exact copies thereof that are necessary for the reconstruction and evaluation of the report of the activity or study. Raw data may include photography, microfilm or microfiche copies, computer printouts, magnetic media (including dictated observations), and recorded data from automated instruments. If exact copies of raw data have been prepared (e.g., tapes which have been transcribed verbatim, data, and verified accurate by signature), the exact copy or exact transcript may be submitted. (NELAC)

Reagent Blank (method reagent blank): a sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps. (Glossary of Quality Assurance Terms, QAMS, 8/31/92)

Reagent Grade: Analytical reagent grade or related terms which conform to the specifications of the Committee on Analytical Reagents for the American Chemical Society. (EPA SW-846)

Reference Material: a material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or the assignment of values to materials. (ISO Guide 30 - 2.1)

Reference Sample: prepared by spiking a known amount of analyte into an appropriate solvent. The concentrate or quality control sample preferably should be obtained from an independent source. A sample prepared in-house may be used if it is prepared independently of the calibration standard. (NYSDOH ELAP)

Replicate Analyses: the measurements of the variable of interest performed identically on two or more subsamples of the same sample within a short time interval. (NELAC)

Sample Delivery Group (SDG): a group of samples received for the same project, site, and/or client within a maximum two-week period that are reported together in a single data package. An SDG typically consists of multiple work orders or sample log-ins and is often designated by the client. (ASC)

Sample Duplicate: two samples taken from and representative of the same population and carried through all steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variance of the total method, including sampling and analysis. (Glossary of Quality Assurance Terms, QAMS, 8/31/92)

Secure Storage Area: an area of the laboratory with access limited to essential personnel, trained in the function of retrieving samples or information from the area. (ASC)

Selectivity: the capability of a method or instrument to respond to a target substance or constituent in the presence of nontarget substances. (Analytical chemistry)

Sensitivity: the capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. (NELAC)

Shall: denotes a requirement that is mandatory whenever the criterion for conformance with the specification requires that there be no deviation. This does not prohibit the use of alternative approaches or methods for implementing the specification as long as the requirement is fulfilled. (Style Manual for Preparation of Proposed American National Standards, American National Standards Institute, eighth edition, March 1991)

Should: denotes a guideline or recommendation whenever noncompliance with the specification is permissible. (Style Manual for Preparation of Proposed American National Standards, American National Standards Institute, eighth edition, March 1991)

Standard Additions: The practice of adding a known amount of an analyte to a sample immediately prior to analysis. It is typically used to evaluate interferences. (EPA SW-846)

Standard Operating Procedures (SOPs): a written document which details the method of an operation, analysis, or action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks. (Glossary of Quality Assurance Terms, QAMS, 8/31/92)

Spike: a known mass of target analyte added to a blank sample or subsample; used to determine recovery efficiency or for other quality control purposes. (NELAC)

Split Sample: aliquots of sample taken from the same container and analyzed independently. In cases where aliquots of samples are impossible to obtain, field duplicates samples should be taken for the matrix duplicate analysis. These are usually taken after mixing or compositing and are used to document intra- or interlaboratory precision. (EPA SW-846)

Standard Reference Material (SRM): a certified reference material produced by the U.S. National Institute of Standards and Technology and characterized for absolute content, independent of analytical method. (NELAC)

Surrogate: a substance with properties that mimic the analyte of interest. It is unlikely to be found in environment samples and is added to them for quality control purposes. (Glossary of Quality Assurance Terms, QAMS, 8/31/92)

Systems Audit: a thorough, systematic, on-site qualitative review of the facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a total measurement system. (NELAC)

Temperature Blank: usually a 40-mL VOA vial filled with water sent with a shipment that is clearly marked “Temp Blank.” The temperature blank is used to establish the temperature of the samples when the cooler is open. The packaging and placement of the vial should be representative of the samples in the container. (ASC)

Test: a technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process or service according to a specified procedure.

NOTE: The result of a test is normally recorded in a document sometimes called a test report or a test certificate. (ISO/IEC Guide 2 - 12.1, amended)

Test Method: defined technical procedure for performing a test. (NELAC)

Testing Laboratory: laboratory that performs tests. (ISO/IEC Guide 2 - 12.4)

Traceability: the property of a result of a measurement whereby it can be related to appropriate standards (generally international or national), through an unbroken chain of comparisons. (VIM - 6.12)

Verified Time of Sample Receipt (VSTR): the time the cooler is delivered to the laboratory by the client or independent courier as recorded in the package receipt log. (ASC from EPA CLP)

Work Order: the number assigned to a shipment of samples delivered on the same day for the same project, site, or client. The job file contains all data associated with the samples in the work order. (ASC)

B

ASC Commonly Used Forms

ANALYTICAL SERVICES CENTER DOCUMENT CONTROL FORM

Document Title:

Assigned Reviewer:	**SOP, Checklist, Form, Spreadsheet:**	**Current Revision No.:**
Peer Reviewer:	**Method**	**Final Revision No.:**
QA Review	**Notes: (i.e., reactivated)**	
Management Review		

REVIEW SCHEDULE

	Draft Reviewed	Date Reviewed	Final Approved	Date Final
Reviewer				
Peer Reviewer				
QA Review				
Management Review				

MINOR REVISION APPROVALS

Comment	QA Authorization/Date	Date Revision Issued	Comment	QA Authorization/Date	Date Revision Issued

PRODUCTION INFORMATION (To Be Completed by Document Control Officer)

Training Required: Yes No	**Date Training Complete:**	**Assigned Implementation Date:**
Date Archived:	**Date Destroy:**	**Special Instructions:**

Corrective Action Form

Tracking Number

Total Pages

SECTION 1 INITIATION

Originator

Start Date

SOP No.

Instrument

Work Order No.

Sample Nos.

Source of Non-Conformance?

[ ] Data Review
[ ] Internal Audit
[ ] External Audit
[ ] PE
[ ] Client Review
[ ] SOP
[ ] Analysis
[ ] Other __________

Client

Section

Non-Conformance Description

Person to Complete Corrective Action:

Person Assigned to Review Corrective Action:

Additional Routing:

Projected Closure Date:

SECTION 2 CORRECTIVE ACTION

Corrective Action Description

Person Completing or Overseeing Corrective Action:

Actual Closure Date:

SECTION 3 REVIEW

Additional Corrective Actions/Follow-up Comments

Person Reviewing & Approving:

Date:

New Form Tracking Numbers:

SECTION 4 QA

Additional Corrective Actions/Follow-up Comments

QA Approval:

Date:

QA Classification

[ ] Hold Times
[ ] Equip/Materials
[ ] Blank
[ ] Surr. Recovery
[ ] Spike Recovery
[ ] LCS Recovery
[ ] Sample
[ ] Personnel
[ ] Reporting
[ ] Documentation
[ ] Calibration, initial
[ ] Calibration, continuing
[ ] Technique/Process
[ ] LIMS
[ ] Field
[ ] Other __________

L:\Forms & Lists\Final\F_004.ene\\Revision 3\\Approval Date 12/23/98\Last Update: 7-18-00

PROJECT MANAGER NOTIFICATION

Originator: ______________________ Date: ______________

ASC Project Manager: ______________________ Client: ______________

Job Nos: ______________________________________

Sample Nos.: ______________________________________

Nature of Concern:

☐ Samples warm @ ________C

☐ Containers broken. List: ______________________________________

____

☐ Discrepancy between sample containers and COC form
☐ Incorrect or insufficient preservation
☐ Headspace in volatile vials (waters samples only)

☐ Lost shipment: ______________________________________

☐ Other (e.g., leaking container, unreadable label, COC form): ______________

Further Description: ______________________________________

____

____

PROJECT MANAGER FOLLOW-UP

Notified Client: ______________________ on ______________
(date)

Notification attempted:

Means: ______________________ on ______________
(date)

Notification unnecessary

Notify Sample Management

Action: ______________________________________

____

____

______________________ ______________________
Project Manager Signature Date

C

Laboratory Certifications and Accreditations

Laboratory Certifications and Accreditations

Source	Issuing Agency	Description of License, Registration or Certification	License, Registration, Certification Number	Scope of Evaluation	Renewal Date
United States Army Corps of Engineers	HTRW Center of Expertise, Omaha District	Solid and hazardous waste and water for organics and inorganics by EPA RCRA methods.	N/A	PT Samples Audit QA Manual	11/2/02
United States Army	Army Environmental Center	Soil and water for organics, and metals by validated methods.	Lab EL	PT Samples Audit QA Manual	Updated by project
United States Air Force	Air Force Center for Environmental Excellence (AFCEE)	Solid and hazardous waste for organics and inorganics based on AFCEE requirements.	N/A	Subcontract Audit	Updated by project
Alaska	Department of Environmental Conservation	Soil and water for organics, and inorganics for UST projects.	UST-024	PT Samples QA Manual	3/18/02
Arkansas	Department of Environmental Quality Laboratory Certification Program	Soils and waters for organics and inorganics.	N/A	PT Samples Audit QA Manual	3/9/02
California	Department of Health Services	Solid and hazardous waste for organics and inorganics; waste extraction test.	1766	PT Samples Audit	6/30/02
Florida	Department of Health and Rehabilitative Services	Wastewater and solid and hazardous waste for organics and inorganics.	E87037	NELAP (PT Samples, Audit)	6/30/02

Laboratory Certifications and Accreditations

Source	Issuing Agency	Description of License, Registration or Certification	License, Registration, Certification Number	Scope of Evaluation	Renewal Date
Florida	Department of Environmental Protection	Approved comprehensive QA plan pursuant to statewide environmental chemistry laboratory QA programs.	860165G	QA Manual	1/01
Illinois	Environmental Protection Agency	Hazardous wastes analysis for organics and inorganics.	000243	NELAP	12/31/02
Kansas	Department of Health and Environment	Solid and hazardous waste for organics and inorganics.	E-10157	NELAP	1/31/02
Kentucky	Natural Resources and Environmental Protection Cabinet	Drinking water for organics and inorganics.	90083	PT Samples	12/31/01
Maryland	Department of Health and Mental Hygiene	Drinking water for metals and volatile organics.	290	PT Samples	9/30/02
Massachusetts	Department of Environmental Protection	Potable water for select parameters and nonpotable water for organics and inorganics.	M-NY050	PT Samples	6/30/02
New Jersey	Department of Environmental Protection	Nonpotable water for organics and inorganics.	73792	NELAP	6/30/02

Laboratory Certifications and Accreditations

Source	Issuing Agency	Description of License, Registration or Certification	License, Registration, Certification Number	Scope of Evaluation	Renewal Date
New York	State Department of Health Environmental Laboratory Approval Program	CLP for organics and inorganics by NYSDEC Analytical Services Protocol. Potable/nonpotable water, solid/hazardous waste, and air and emissions for organics and inorganics.	10486	NELAP Primary Accrediting Authority (PT Sample and Audit)	4/01/02
North Carolina	Department of the Environment and Natural Resources	Wastewater and groundwater for select parameters.	382	PT Samples Audit	12/31/03
Pennsylvania	Department of Environ-mental Protection	Drinking water for volatile organics.	68-519	PT Samples Audit QA Manual	7/11/02
South Carolina	Department of Health and Environmental Control	Wastewater and solid and hazardous waste for organics and inorganics.	91001	PT Samples	6/30/02

Laboratory Certifications and Accreditations

Source	Issuing Agency	Description of License, Registration or Certification	License, Registration, Certification Number	Scope of Evaluation	Renewal Date
Virginia	Department of General Services	Drinking water for organics and inorganics.	00124	PT Samples	6/30/02

Notes:

Audit = Successful completion of on-site audit and response to audit report.
PE Sample = Successful analysis of a performance evaluation sample.
QA Manual = Review of Quality Assurance Manual and related documentation by off-site agency.

Key:

CLP = Contract Laboratory Program (EPA).
HTRW = Hazardous, toxic, and radioactive waste.
N/A = Not applicable.
NELAP = National Environment Accreditation Program.
NYSDEC = New York State Department of Environmental Conservation.
PE = Performance evaluation.
QA = Quality assurance.
NNNN UST = Underground storage tank.

D

ASC Equipment List

MAJOR LABORATORY EQUIPMENT FOR ANALYTICAL SERVICES CENTER

Description	Make and Model Number	Designation	Serial Number	Put-in-Use Condition	Year Purchased
Gas Chromatography Mass Spectrometry (GCMS) Sections					
Gas Chromatography/Mass Spectrometer	Hewlett Packard (HP) 5970	Bonnie	2413A00782	New	1985
	HP 5970	Ethyl	2716A10138	New	1987
	HP 5970	Gloria	3004A12528	New	1989
	HP 5971	Hank	3304A04338	New	1993
	HP 5972	Iris	3418A01537	New	1994
	HP 5972	Jake	3418A01504	New	1994
	HP 5972	Kim	US81221491	New	1998
	HP 5973	Linus	US81221500	New	1998
	HP 5973	Molly	US94223198	New	2001
	Agilent 5973N	Niles	US03950358	New	2001
	Agilent 5973N	Perry	US10142103	New	2002
	Agilent 5973N	Robert	US10142077	New	2002
Unix Operating Systems for GCMS	HP 9000/735	Unix	6433A00214	New	1994
Liquid Sample Concentrators for Volatile Organic Compounds (VOCs)	Tekmar LSC-2000	Jake	89138002	New	1989
	Tekmar LSC-2000	NA	89133001	New	1989
	Tekmar LSC-2000	NA	89138003	New	1989
	Tekmar LSC-2000	NA	90088007	New	1990
	Tekmar LSC-2000	NA	91207008	New	1991
	Tekmar LSC-2000	NA	90344013	New	1990
Sampler for VOCs in Water	Tekmar ALS-2032	NA	90344015	New	1991
Samplers for VOCs in Water and Soil	Tekmar ALS-2016	NA	89158004	New	1989
	Tekmar ALS-2016	NA	89158005	New	1989
	Tekmar ALS-2016	NA	90100039	New	1990
	Tekmar ALS-2016	NA	91189011	New	1991
Purge-and-Trap Unit with Closed System Vial Autosampler and SIM/Spiker for VOCs in Water	O.I. Analytical 4560	Linus	J426460278	New	1994
	O.I. Analytical 4551	NA	B431451947	New	1994
	O.I. Analytical 4560	Niles	M08460554	New	2001
	O.I. Analytical 4560	Perry	M147460423	New	2002
	O.I. Analytical 4560	Robert	M016460749	New	2002

MAJOR LABORATORY EQUIPMENT FOR ANALYTICAL SERVICES CENTER

Description	Make and Model Number	Designation	Serial Number	Put-in-Use Condition	Year Purchased
Purge-and-Trap Unit with Closed System Vial Autosampler and SIM/Spiker for VOCs in Water and Soil	O.I. Analytical 4552 Archon Autosampler	Jake	DY505220-11	New	1998
	O.I. Analytical 4552 Archon Autosampler	Linus	12267	New	1998
	O.I. Analytical 4552 Archon Autosampler	Niles	13446	New	2001
	O.I. Analytical 4552 Archon Autosampler	Perry	13352	New	2002
	O.I. Analytical 4552 Archon Autosampler	Robert	13628	New	2002
Single Tower Automatic Samplers	HP 7673A		2546A02530	New	1987
	HP 7673A		2704A05933	New	1987
	HP 7673A		3120A27075	New	1993
	HP 7673A		3423A39004	New	1994
	HP 7683A		U581501027	New	1998
	HP 7683A		U501112172	New	2000
Air System for Automated Method TO14 Analysis	Nutech 3550A		JK0025222	New	1994
Automated Closed Loop Purge-and-Trap Unit for VOCs in Water and Soil	Dynatech Dynatrap		11192-593	New	1993
SUMMA® Canister Cleaning Apparatus	Custom			New	1992
Purge-and-Trap Closed Loop Autosampler for VOCs in Water	Dynatech Precision PTA 30		10413-791D	New	1992
Gas Chromatography (GC) Semivolatile Section					
GC with Dual Electron Capture Detector (ECD) and HP7673B Twin Autoinjector Towers	HP 6890	#1	US00009536	New	1997
	HP 6890	#2	US00009637	New	1997
GC with Dual FID Detectors and HP 7673A Twin Autoinjector Towers	HP 5890 II	#3	2950A26659	New	1990
GC with Dual Flame Ionization Detectors (FID)	HP 6890	#4	US00002531	Used	2001
GC with Dual ECD Detectors and HP 7673A Single Autoinjector Tower	HP 5890 II	#1	2443A04154	New	1991
	HP 5890 II	#2	3126A36948	New	1991
GC with Photoionization Detector (PID)/Hall Detectors	Varian 3600	#1	2006	New	1994
GC with Dual ECDs and LEAP A200SE Autosamplers	Varian 3400	#4	3249	New	1989
	Varian 3400	#2	1852	New	1989

MAJOR LABORATORY EQUIPMENT FOR ANALYTICAL SERVICES CENTER

Description	Make and Model Number	Designation	Serial Number	Put-in-Use Condition	Year Purchased
GC with FID	Varian 3400	#5	3547	New	1990
GC with FID/PID	Varian 3400	#8	8245	New	1990
Chromatographic Analysis Data System running on HP Netserver LH Pro 200 with seven HP Vectra Pentium 133 PC Stations	Perkin Elmer (PE) Turbochrom Client Server	NA	NA	New	1997
Gas Chromatography (GC) Volatile Section					
Liquid Sample Concentrators for VOCs	Tekmar LSC-2000		91207008	New	1989
	Tekmar LSC-2000		90135009	New	1990
	Tekmar LSC-2000		91214006	New	1991
	Tekmar LSC-2000		89138001	New	
Samplers for VOCs in Water and Soil	Tekmar ALS-2016		90115035	New	1989
	Tekmar ALS-2016		92006008	New	1990
	Tekmar ALS-2016		91203007	New	1991
	Tekmar ALS-2016		90115033	New	
GC	HP5890 II	#4	3336A54343		
	HP-6890	#3	US00020223		
	Varian 3400	#5	3547		
	Varian 3400	#8	8245		
	Varian 3600	#7	1117		
Autosampler	Varian 8200			New	1994
Autosampler Heater			91221014 89144008	New	1994
PE Nelson 900 Series Interface	Model 941A		3341210154		
	Model 970A		7102273184		
	Model 970A		7102273182		
	Model 970A		7102273186		
	Model 941		7102273187		
	Model 941		1119513262		
O.I. Analytical Detector Controllers (2)	Model 5300		B817553423		
			B306553137		
Lamp Power Supply (2)	Model 4430		C809530576 C813530364		

MAJOR LABORATORY EQUIPMENT FOR ANALYTICAL SERVICES CENTER

Description	Make and Model Number	Designation	Serial Number	Put-in-Use Condition	Year Purchased
Trematrics 1000 Hall Detector			ELCO-1117		
Hydrogen Generators	Whatman Model 75-34NA			New	1994
	Whatman Model 75-34NA			New	1996
	Whatman Model 75-34NA			New	1996
High Performance Liquid Chromatography (HPLC) Section					
HPLCs with Variable Ultraviolet Detectors and one Fluorescence Detector	HP Series 1050	LC-1	3405A02859	New	1990
	HP Series 1050	LC-2	3019A00502	New	1990
	HP Series 1050	LC-3	3317A02137	New	1992
	HP Series 1050	LC-5	3405A02859	New	1995
Chemstation Operating Systems	HP Vectra	NA	NA	New	1990
	HP Vectra	NA	NA	New	1990
Organic Sample Preparation Section					
8-Position Extractor with Soxhlet Extractor Glassware	Organomation ROT-X-TRACT-HP			New	1994
Glassware Washer	National Model NLW-66			New	1994
Gel Permeation/Autoevaporation Concentrator	ABC AS 2000			New	1992
Dual Column Injection/Filtration System for Gel Permeation	Zymark BenchMate			New	1995
	Zymark BenchMate			New	1995
Fraction Collectors	ISCO Foxy 200			New	1999
	ISCO Foxy 200			New	1999
	ISCO Foxy 200			New	1999
General Analytical Chemistry (GAC) Section					
Ion Chromatograph with Anion Conductivity Detector	Dionex 2000I	IC	3019A00490 Pump: 2840A00181 Cell: 00090186	New	1987
Electrochemical Anion Conductivity Detector	Dioex ED-40		95010365	New	1996
Spectrophotometer	Milton Roy Spectronic Genesys 5		3V05145005	New	1994
	Milton Roy Spectronic 601		3612105018	New	1990
FT-IR Spectrophotometer (helium laser)	PE Model 1600 Epson-LQ-850 Printer for IR	IR	142283 OTF1011417	New New	1990 1990
COD B k Digestor	Hach 16500-10		860808219		

MAJOR LABORATORY EQUIPMENT FOR ANALYTICAL SERVICES CENTER

Description	Make and Model Number	Designation	Serial Number	Put-in-Use Condition	Year Purchased
Balance – Analytical	Mettler H10T		338858		
Balance – Top Loader	OHAUS Adventurer		E2381200 321686	New	2000
Balance – Analytical	Sartorius LA-1205		11404590	New	2000
Soxhlet Distillation Unit	ROT-X-TRACT-HP #136		13563		
Automated Analyzer with Flow Injection Random Sampler and Heat Block	Lachat QuickChem FIA 8000 Series	Lachat	Pump: A82030-125 Autosampler: A81010-223 Main Unit: A83000-1450	New	1999
Total Organic Carbon Analyzer and Solid Sample Module/Autosampler	Shimadzu SSM 5000/5050A/ASI-5000A	TOC	35517410 35801034 37302774	New	1997/2000
Total Organic Halogen Analyzer	Tekmar-Dohrman DX-2000	TOX		Used	2001
BOD Meter	YSI Model 5000		00K0500	New	2000
Turbidity Meter	HF Scientific DRT15C		20873	Field	1992
Cyanide Distillation System, Easy Dist Jr.	Westco Scientific		1157 1153	New New	2001 2001
Distillation Unit	Büchi 316		685642	New	1994
pH Meter	Accumet 925		477	New	1997
pH Meter	Denver Instrument Model 225			New	1999
Metals Analysis Section					
Inductively Coupled Argon Plasma (ICP) Spectrometer with Stand-alone Data System	PE Optima 3000 XL	XL	069N4060802 Pump: 7012504 AS-90/AS-91 Controller #3404	New	1994
Zeeman Atonic Absorption Spectrophotometer (AAS) with Graphite Atomizer, Background Correction System, and Autosampler	PE 4100ZL	ZL	6126 EDL System 2: 661623	New	1993
Mercury Analyzer	Leeman Labs PS 200 II	Leeman	HG-8004	New	1999
Balance	OHAUS Adventurer		E2641200 350125	New	2000

MAJOR LABORATORY EQUIPMENT FOR ANALYTICAL SERVICES CENTER

Description	Make and Model Number	Designation	Serial Number	Put-in-Use Condition	Year Purchased
ICP Spectrometer with Dual View Graphics and Stand-alone Data System	PE Optima 3380 DV	DV	069N9122 AS-91 #4184 Neslab chiller CFT-33 #199315047 Dell Optiplex GXI Computer #B9E3W Nokia 4472A Plus monitor #A947023607 Pump: #	New	1999

E

ASC Tests List

Ecology Environment, Inc.
ASC Analytical Test List

Test Name	Method No.	Matrix	Holding Time (d)	Bottle Type	Reference
Acids, Inorganic by NIOSH Method 7903	N7903	Air	2	1-L HDPE, Cool 4°C	NIOSH 4th Ed., August 1994
Alkalinity, Total by Method 2320B	SM2320B	Water	14	1-L HDPE, Cool 4°C	Standard Methods, 18th ed., 1992
Ammonia (Nessler) by Method 4500-NH3 C	SM4500-NH3 C	Water	28	1-L HDPE, H2SO4 to pH <2, Cool 4°C	Standard Methods, 18th ed., 1992
Ammonia, Nitrogen by method 4500-NH3,B,E	SM4500-NH3 BE	Water	28	1-L HDPE, H2SO4 to pH <2, Cool 4°C	Standard Methods, 18th ed., 1992
Anions by Ion Chromatography by Method 300.0	EPA300.0	Water	2	1-L HDPE, Cool 4°C	EPA 600/R-93/100, August 1993
Anions by Ion Chromatography Method 9056	SW9056	Water	2	1-L HDPE, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Anions in Drinking Water by Ion Chromatography	EPA300.0	Drinking Water	2	1-L HDPE, Cool 4°C	EPA 600/R-93/100, August 1993
Biochemical Oxygen Demand, 5-Day	SM5210B	Water	2	1-L HDPE, Cool 4°C	Standard Methods, 18th ed., 1992
California WET, Extraction for Metals	CWET	Waste	180	250-ml Clear widemouth glass, Cool 4°C	California Title 22 Section 66700
Carbonaceous Biochemical Oxygen Demand, 5-Day	SM5210B	Water	2	1-L HDPE, Cool 4°C	Standard Methods, 18th ed., 1992
Cation Exchange Capacity of Soils by Method 9081	SW9081	Soil	180	125-mL Clear Widemouth, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
CEC Preparation of Soils by Method 9081	SW9081	Soil	180	125-mL Clear Widemouth, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Chemical Oxygen Demand by Method 410.4	EPA410.4	Water	28	1-L HDPE, H2SO4 to pH <2, Cool 4°C	EPA- 600/R-94/111, May 1994
Chemical Oxygen Demand by Method SM5220 C	SM5220 C	Water	28	1-L HDPE, H2SO4 to pH <2, Cool 4°C	Standard Methods, 18th ed., 1992
Chloride by Method 325.2	EPA325.2	Water	28	1-L HDPE, Cool 4°C	EPA 600/4-79-020, March 1993
Chlorinated Herbicides by Method 8151A	SW8151A	Solid, water	40		SW-846 3rd Ed., Update III, June 1997
Herbicide Separatory Funnel Extraction of Waters by 8151A	SW8151A	Water	7	1-L Amber glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Herbicide Sonication of Soils by 8151A	SW8151A	Solid	14	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Chlorinated Phenolics by Method 1653	EPA1653	Water	30		EPA Method 1653 Rev. A, August 1997
Chlorinated Phenolics Separatory Funnel Extraction of Waters by 1653	EPA1653	Water	30	1-L Amber glass, H2SO4 to pH <2, Cool 4°C, Na2S2O3*	EPA Method 1653 Rev. A, August 1997
CLP Mercury Analysis by ILM04 1	ILM04 1	Solid, water	28		EPA CLP ILM04.1
CLP Mercury Preparation of Soils by ILM04.1	ILM04 1	Soil	28	250-ml Clear widemouth glass, Cool 4°C	EPA CLP ILM04.1
CLP Mercury Preparation of Waters by ILM04 1	ILM04.1	Water	28	1-L HDPE, HNO3 to pH <2	EPA CLP ILM04.1
CLP Pesticides/PCB by Method OLM04.2	OLM04.2	Solid, water	40		EPA CLP OLM04.2
CLP Pesticides/PCB Separatory Funnel Extraction of Waters by OLM04.2	OLM04.2	Water	5	1-L Amber glass, Cool 4°C	EPA CLP OLM04.2
CLP Pesticides/PCB Sonication of Soils by OLM04.2	OLM04.2	Solid	10	8-oz. clear widemouth glass, Cool 4°C	EPA CLP OLM04.2
CLP Semivolatile Organics by Method OLM04.2	OLM04.2	Solid, water	40		EPA CLP OLM04.2
CLP Liquid/Liquid Extraction of Waters for SV compounds by OLM04.2	OLM04.2	Water	5	1-L Amber glass, Cool 4°C	EPA CLP OLM04.2
CLP Sonication of Soils for SV compounds by OLM04.2	OLM04.2	Solid	10	8-oz. clear widemouth glass, Cool 4°C	EPA CLP OLM04.2
CLP TAL Metals by Method ILM04 1	ILM04.1	Solid, water	180		EPA CLP ILM04.1
CLP TAL Metals ICP Digestion of Soils by ILM04.1	ILM04.1	Solid	180	250-ml Clear widemouth glass, Cool 4°C	EPA CLP ILM04.1
CLP TAL Metals ICP Digestion of Waters by ILM04.1	ILM04.1	Water	180	1-L HDPE, HNO3 to pH <2	EPA CLP ILM04.1
CLP Volatile Organic Compounds in Soils by Method OLM04.2	OLM04.2	Solid	10	40-mL VOA vial, Cool 4°C	EPA CLP OLM04.2
CLP Volatile Organic Compounds in Waters by Method OLM04.2	OLM04.2	Water	10	40-mL VOA vial, HCl to pH <2, Cool 4°C	EPA CLP OLM04.2
CLP Volatile Organic Compounds Medium Level by Method OLM04.2	OLM04.2	Solid	10	40-mL VOA vial, Cool 4°C	EPA CLP OLM04.2
Color, Platinum-Cobalt by Method 110.2	EPA110.2	Water	7	1-L HDPE, Cool 4°C	EPA 600/4-79-020, March 1993
Corrosivity Toward Steel by Method SW1110	SW1110	Waste	28	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Cyanide, Total by Method 335.4	EPA335.4	Drinking Water	14	1-L HDPE, NaOH to pH >12, Cool 4°C	EPA 600/R-93/100, August 1993
Cyanide, Total by Method 335.3	EPA335.3	Water	14	1-L HDPE, NaOH to pH >12, Cool 4°C	EPA 600/4-79-020, March 1993
Cyanide Preparation, Amenable to Chlorination by 335 1	EPA335 1	Water	14	1-L HDPE, NaOH to pH >12, Cool 4°C	EPA- 600/R-94/111, May 1994
Cyanide Preparation, Total by Method 335.3	EPA335.3	Water	14	1-L HDPE, NaOH to pH >12, Cool 4°C	EPA- 600/R-94/111, May 1994
Cyanide Analysis by ILM04.1	ILM04.1	Solid, water	12		EPA SOW ILM04.1
Cyanide Preparation, Total for Soil by ILM04 1	ILM04 1	Soil	12	250-ml Clear widemouth glass, Cool 4°C	EPA SOW ILM04.1
Cyanide Preparation, Total for Water by ILM04.1	ILM04.1	Water	12	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Cyanide Analysis by Method 9012A	SW9012A	Solid, water	14		SW-846 3rd Ed., Update III, June 1997
Cyanide Preparation, Amenable for Soil by Method 9012A	SW9012A	Solid	14	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Cyanide Preparation, Amenable for Water by Method 9012A	SW9012A	Water	14	1-L HDPE, NaOH to pH >12, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Cyanide Preparation, Total for Soil by Method 9012A	SW9012A	Solid	14	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Cyanide Preparation, Total for Water by Method 9012A	SW9012A	Water	14	1-L HDPE, NaOH to pH >12, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Cyanide, Amenable to Chlorination by Method 9012A	SW9012A	Solid	14	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Diesel Range Organics (DRO) Analysis by AK102	AK102	Solid, water	40		ADEC UST Proc. Manual App. D Version 3-1-99
DRO Separatory Funnel Extraction of Waters by AK102	AK102	Water	7	1-L Amber glass, Cool 4°C	ADEC UST Proc. Manual App. D Version 3-1-99
DRO Sonication of Soils by AK102	AK102	Solid	14	250-ml Clear widemouth glass, Cool 4°C	ADEC UST Proc. Manual App. D Version 3-1-99
DRO Analysis by Method 8015B	SW8015B	Water	40	1-L Amber glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
DRO Separatory Funnel Extraction of Waters by Method 3510C	SW3510C	Water	7	1-L Amber glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
DRO Sonication of Soils by Method 3550B	SW3550B	Solid	14	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Florida Petroleum Products	FL-PRO	Solid, water	40		FDEP M for Det. of Pet. Range Organics Nov. 1995
Florida Petroleum Products Separatory Funnel Extraction of Waters by FL-PRO	FL-PRO	Water	7	1-L Amber glass, Cool 4°C	FDEP M for Det. of Pet. Range Organics Nov. 1995
Florida Petroleum Products Sonication of Soils by FL-PRO	FL-PRO	Solid	14	250-ml Clear widemouth glass, Cool 4°C	FDEP M for Det. of Pet. Range Organics Nov. 1995
Dissolved Organic Carbon by method 5310B	SM5310B	Water	28	125ml HDPE, Filtered, H2SO4 to pH<2, Cool 4°C	Standard Methods, 18th ed., 1992
Gasoline Range Organics (GRO) in Soils by AK101	AK101	Solid	28	40-mL VOA vial, Cool 4°C	ADEC UST Proc. Manual App. D Version 3-1-99
Gasoline Range Organics (GRO) in Waters by AK101	AK101	Water	14	40-mL VOA vial, HCl to pH <2, Cool 4°C	ADEC UST Proc. Manual App. D Version 3-1-99
GRO in Soils by Method 8015B	SW8015B	Solid	14	40-mL VOA vial, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
GRO in Waters by Method 8015B	SW8015B	Water	14	40-mL VOA vial, Cool 4°C	SW-846 3rd Ed., Update III, June 1997

Test Name	Method No.	Matrix	Holding Time (d)	Bottle Type	Reference
Hardness by Method 2340B (Calculation Only)	SM2340 B	Water	7	1-L HDPE, HNO3 to pH <2	Standard Methods, 18th ed., 1992
Hardness, Total by Method EPA 130.2	EPA130.2	Water	180	1-L HDPE, HNO3 to pH <2	EPA 600/4-79-020, March 1993
Hexavalent Chromium by 7196A/3060A	SW7196A	Soil	14	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Hexavalent Chromium by Method 3500-Cr D	SM3500-Cr D	Water	1	125-mL HDPE, Cool 4°C	Standard Methods, 18th Edition
Hexavalent Chromium by Method 7196A	SW7196A	Water	1	125-mL HDPE, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Hexavalent Chromium by Method NIOSH 7600	N7600	Air	14	High Volume air filter	NIOSH 4th Ed., August 1994
Ignitability (Flashpoint), Liquids by Method 1010	SW1010	Organic	40	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Mercury Analysis in Soil by Method 7471A	SW7471A	Soil	28		SW-846 3rd Ed., Update III, June 1997
Mercury Analysis in Water by Method 7470A	SW7470A	Water	28		SW-846 3rd Ed., Update III, June 1997
Mercury Analysis of Wipe by Method 7471A	SW7471A	Wipe	28	125-mL Clear Widemouth, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Mercury by Method 245.1	EPA245.1	Water	28		EPA- 600/R-94/111, May 1994
Mercury by NIOSH Method 6009	NIOSH 6009	Air	30		NIOSH 4th Ed., August 1994
Mercury Preparation by Method 245.1	EPA245.1	Water	28	1-L HDPE, HNO3 to pH <2	EPA- 600/R-94/111, May 1994
Mercury Preparation by NIOSH Method 6009	NIOSH 6009	Air	30	Solid sorbent tube (Hopcalite)	NIOSH 4th Ed., August 1994
Mercury Preparation of Soil by Method 7471A	SW7471A	Soil	28	1-L HDPE, HNO3 to pH <2	SW-846 3rd Ed., Update III, June 1997
Mercury Preparation of Waters by Method 7470A	SW7470A	Water	28	1-L HDPE, HNO3 to pH <2	SW-846 3rd Ed., Update III, June 1997
Mercury Wipe Preparation by Method 7471A	SW7471A	Wipe	28	125-mL Clear Widemouth, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Metals by ICP by 40 CFR Appendix G	EPA 40 CRR App G	Air	180	High Volume air filter	40 CFR Part 50 Appendix G
Digestion of Air Filters by 40 CFR Appendix G	EPA 40 CRR App G	Air	180	37mm Air Cassette	NIOSH 4th Ed., August 1994
Metals by ICP Method 200.7	EPA200.7	Solid, water	180		SW-846 3rd Ed., Update III, June 1997
Digestion for Metals by 200.7	EPA200.7	Water	180	1-L HDPE, HNO3 to pH <2	EPA- 600/R-94/111, May 1994
Digestion for Total Recoverable Metals by 200.7	EPA200.7	Water	180	1-L HDPE, HNO3 to pH <2	EPA- 600/R-94/111, May 1994
Metals by ICP Method 6010B	SW6010B	Solid, water	180		SW-846 3rd Ed., Update III, June 1997
Metals ICP Digestion of Soils by 3050B	SW3050B	Solid	180	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Metals ICP Digestion of Waters by 3010A	SW3010A	Water	180	1-L HDPE, HNO3 to pH <2	SW-846 3rd Ed., Update III, June 1997
Total Recoverable Metals Digestion by 3005A	SW3005A	Water	180	1-L HDPE, HNO3 to pH <2	SW-846 3rd Ed., Update III, June 1997
Metals ICP Digestion of Wipes by 3050B	SW3050B	Wipe	180	125-mL Clear Widemouth, HNO3 to pH<2	SW-846 3rd Ed., Update III, June 1997
Metals by ICP Method 7300	N7300	Air	180	37mm Air Cassette	NIOSH 4th Ed., August 1994
Metals ICP Digestion of Air Filters by Method 7300	N7300	Air	180	37mm Air Cassette	NIOSH 4th Ed., August 1994
Metals in Drinking Water Method 200.9	EPA200.9	Drinking Water	180	1-L HDPE, HNO3 to pH <2	EPA- 600/R-94/111, May 1994
Metals GFAA Digestion of Waters by 200.9	EPA200.9	Water	180	1-L HDPE, HNO3 to pH <2	EPA- 600/R-94/111, May 1994
Metals in Drinking Water bv Method 200.7	EPA200.7	Drinking Water	180	1-L HDPE, HNO3 to pH <2	SW-846 3rd Ed., Update III, June 1997
Methylene Blue Active Substances by Method 5540C	SM5540C	Water	2	1-L HDPE, Cool 4°C	Standard Methods, 18th ed., 1992
Nitrate by method 353.2 (Lachat)	EPA353.2	Water	2	1-L HDPE, Cool 4°C	EPA 600/4-79-020, March 1993
Nitrate/Nitrite by Method 353.2 (Lachat)	EPA353.2	Water	2	1-L HDPE, Cool 4°C	EPA 600/4-79-020, March 1993
Nitrite by method 353.2 (Lachat)	EPA353.2	Water	2	1-L HDPE, Cool 4°C	EPA 600/4-79-020, March 1993
Nitrocellulose in Solids by Method LF03	ULF03	Solid	40	250-ml Clear widemouth glass, Cool 4°C	Proprietary
Nitrocellulose in Waters by Method LF03	ULF03	Water	7	1-L HDPE, Cool 4°C	Proprietary
Nitroglycerine by HPLC	SW8330	Solid	40	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Non-Purgeable Organic Carbon by Method 5310B	SM5310B	Water	28	125ml HDPE, H2SO4 to pH<2, Cool 4°C	Standard Methods, 18th ed., 1992
Oil and Grease by Method 413.1	EPA413.1	Water	28	1-L Amber glass, H2SO4 to pH <2, Cool 4°C	Standard Methods, 18th ed., 1992
Organic Acids Analysis by HPLC	Dietz, Cortellucci, and Singley	Water	40		E.A. Dietz, N.J. Cortellucci, and K.F. Singley, J. Liq. Chromatogr., 16 (15), 3331-3347 (1993)
Organic Acids Preparation	Dietz, Cortellucci, and Singley	Water	14	1-L Amber glass, H2SO4 to pH <2, Cool 4°C	E.A. Dietz, N.J. Cortellucci, and K.F. Singley, J. Liq. Chromatogr., 16 (15), 3331-3347 (1993)
Orthophosphate by Method 365.2	EPA365.2	Water	2	1-L HDPE, Cool 4°C	EPA 600/4-79-020, March 1993
PAH by Method 8310	SW8310	Solid, water	40		SW-846 3rd Ed., Update III, June 1997
PAH Liquid/Liquid Extraction of Waters by Method 3520C	SW3520C	Water	7	1-L Amber glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
PAH Separatory Funnel Extraction of Waters by Method 3510C	SW3510C	Water	7	1-L Amber glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
PAH Sonication of Soils by Method 3550B	SW3550B	Solid	14	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Paint Filter Test for Free Liquids by Method 9095A	SW9095A	Waste	28	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
PCB Analysis by Method 8082	SW8082	Solid, water	40		SW-846 3rd Ed., Update III, June 1997
PCB Separatory Funnel Extraction of Waters by Method 3510C	SW3510C	Water	7	1-L Amber glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
PCB Sonication of Soils by Method 3550B	SW3550B	Solid	14	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Percent Moisture	ASTM_D2216	Solid	28	125-mL Clear Widemouth, Cool 4°C	ASTM
Perchlorate by Ion Chromatography	EPA 314.0	Water	28	250-mL HDPE or glass, Ambient	EPA NERL ORD November 1999
Pesticide Analysis by Method 8081A	SW8081A	Solid, water	40		SW-846 3rd Ed., Update III, June 1997
Pesticides Separatory Funnel Extraction of Waters by Method 3510C	SW3510C	Water	7	1-L Amber glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Pesticides Sonication of Soils by Method 3550B	SW3550B	Solid	14	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Pesticide and PCB Analysis by Method 608	EPA608	Water	30		Method 608, 40 CFR, Part 136, Appendix A
Pesticides/PCB Separatory Funnel Extraction of Waters by 608	EPA608	Water	7	1-L Amber glass, Cool 4°C	40 CFR Part 136 Appendix A
Petroleum Products by Method 310-13	ASP310-13	Water	40	1-L Amber glass, Cool 4°C	NYSDEC Analytical Services Protocol 10/95 Edition
Petroleum Products ID by Method 310-14	ASP310-14	Organic	40	40-mL VOA vial, Cool 4°C	NYSDEC Analytical Services Protocol 10/95 Edition
pH by Method 9040B	SW9040B	Water	0	125-mL HDPE, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
pH by method EPA 150.1	EPA150.1	Water	0	125-mL HDPE, Cool 4°C	EPA 600/4-79-020, March 1993
pH by Method EPA 9045C	SW9045C	Solid	0	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Phenols by Method 420 1 (4AAP)	EPA420.1	Water	28	1-L Amber glass, H2SO4 to pH <2, Cool 4°C	EPA 600/4-79-020, March 1993
Phenols by Method 9065 (4AAP)	SW9065	Water	28	1-L Amber glass, H2SO4 to pH <2, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Phosphorus, Total by Method 365.2	EPA365.2	Water	28	1-L HDPE, H2SO4 to pH <2, Cool 4°C	EPA 600/4-79-020, March 1993
Physical Appearance by Method SM2110	SM2110	Solid	28	250-ml Clear widemouth glass, Cool 4°C	Standard Methods, 18th ed., 1992
Reactive Cyanide by Method 9012A-7.3.3	SW7.3.3.2	Solid	28	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Reactive Sulfide by Method 9034-7.3.4	SW7.3.4.2	Solid	28	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Residual Range Organics (RRO) by Method AK103	AK103	Solid	40	250-ml Clear widemouth glass, Cool 4°C	ADEC UST Proc. Manual App. D Version 3-1-99
RRO Sonication of Soils by AK103	AK103	Solid	14	250-ml Clear widemouth glass, Cool 4°C	ADEC UST Proc. Manual App. D Version 3-1-99

Test Name	Method No.	Matrix	Holding Time (d)	Bottle Type	Reference
Semivolatile Organics by Method 1625	EPA1625	Water	40		USEPA Office of Water 1625 Rev. C, June 1989
Liquid/Liquid Extraction of Waters for Semivolatile Compounds by 1625	EPA1625	Water	7	1-L Amber glass, Cool 4°C, Na2S2O3*	USEPA Office of Water 1625 Rev. C, June 1989
Semivolatile Organics by Method 625	EPA625	Water	40		40 CFR Part 136 Appendix A
Liquid/Liquid Extraction of Waters for Semivolatile Compounds by 625	EPA625	Water	7	1-L Amber glass, Cool 4°C, Na2S2O3*	40 CFR Part 136 Appendix A
Semivolatile Organic Compound Analysis by Method 8270C	SW8270C	Solid, water	40		SW-846 3rd Ed., Update III, June 1997
Liquid/Liquid Extraction of Waters for Semivolatile Compounds by Method 3520C	SW3520C	Water	7	1-L Amber glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Sonication of Soils for Semivolatile Compounds by Method 3550B	SW3550B	Solid	14	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Solids, Settleable by Method 160.5	EPA160.5	Water	2	1-L HDPE, Cool 4°C	EPA 600/4-79-020, March 1993
Solids, Total by Method 160.3	EPA160.3	Water	7	1-L HDPE, Cool 4°C	EPA 600/4-79-020, March 1993
Specific Conductance by Method 120.1	EPA120.1	Water	28	1-L HDPE, Cool 4°C	EPA 600/4-79-020, March 1993
Specific Gravity by Method 2710F	SM2710F	Water	40	1-L HDPE, Cool 4°C	Standard Methods, 18th ed., 1992
SPLP Extraction for Metals And Organics by Method 1312	SW1312	Waste	14	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Sulfate by Method 375 4 (Turbidimetric)	EPA375 4	Water	28	1-L HDPE, Cool 4°C	EPA 600/4-79-020, March 1993
Sulfide by Method 376.1	EPA376.1	Water	7	1-L HDPE, 10N NaOH to pH 9 / ZnAc	EPA 600/4-79-020, March 1993
Sulfide, Soluble by Method 4500-S2-D-B	SM4500-S2-D-B	Water	7	1-L HDPE, 10N NaOH to pH 9 / ZnAc	EPA 600/4-79-020, March 1993
Suspended Particulate Matter by 40 CFR Appendix B	EPA 40 CRR App B	Air	28	High Volume air filter	40 CFR Part 50 Appendix B
TCLP Extraction for Metals and Semivolatile and Volatile Compounds by Method 1311	SW1311	Waste	14	250-ml Clear widemouth glass, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Total Dissolved Solids (TDS) by method EPA 160.1	EPA160.1	Water	7	1-L HDPE, Cool 4°C	EPA 600/4-79-020, March 1993
Total Inorganic Carbon by method 5310B	SM5310B	Water	28	125ml HDPE, H2SO4 to pH<2, Cool 4°C	Standard Methods, 18th ed., 1992
Total Kjeldahl Nitrogen (TKN) by Method 351.3	EPA351.3	Water	28	250-ml Clear widemouth glass, Cool 4°C	EPA 600/4-79-020, March 1993
Total Organic Carbon by method 5310B	SM5310B	Water	28	125ml HDPE, H2SO4 to pH<2, Cool 4°C	Standard Methods, 18th ed., 1992
Total Organic Carbon by Method 9060	SW9060	Water	28	125ml HDPE, H2SO4 to pH<2, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Total Organic Carbon by Method Lloyd Kahn	Lloyd Kahn	Solid	14	250-ml Clear widemouth glass, Cool 4°C	EPA Attachment 6, July 1998
Total Organic Halogens by Method 9020B	SW9020B	Water	28	1-L Amber glass, H2SO4 to pH <2, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Total Suspended Solids, Non-filterable Residue	EPA160.2	Water	7	250-mL HDPE	EPA 600/4-79-020, March 1993
TPH by TNRCC, Method TX1005	TX1005	Solid	14	250-ml Clear widemouth glass, Cool 4°C	TNRCC Method 1005 (revised 4/13/98)
TPH by TNRCC, Method TX1005	TX1005	Water	14	40-mL VOA vial, NaHSO4 to pH <2, Cool 4°C	TNRCC Method 1005 (revised 4/13/98)
Turbidity (Nephelometric) by Method 180.1	EPA180.1	Water	2	125-mL HDPE, Cool 4°C	EPA 600/4-79-020, March 1993
Volatile Organic Aromatic Compounds by GC Method 602	EPA602	Water	14	40-mL VOA vial, HCl to pH <2, Cool 4°C, Na2S2O3*	40 CFR Part 136 Appendix A
Volatile Organic Compounds by GC Method 502.2	EPA502.2	Drinking Water	14	40-mL VOA vial, 1:1 HCl to pH <2, Cool 4°C, Na2S2O3*	502.2 Rev 2.0 (1989), EPA-600/4-88-039, December 1988, Revised, July 1991
Volatile Organic Compounds by GCMS Method 1624C	EPA1624	Water	14	40-mL VOA vial, HCl to pH <2, Cool 4°C, Na2S2O3*	40 CFR Part 136 Appendix A
Volatile Organic Compounds by GCMS Method 524.2	EPA524.2	Drinking Water	14	40-mL VOA vial, HCl to pH <2, Cool 4°C, ascorbic acid*	524.2 Rev 4.0 (1992), EPA-600/R-92-129, August 1992
Volatile Organic Compounds by GCMS Method 624	EPA624	Water	14	40-mL VOA vial, HCl to pH <2, Cool 4°C, Na2S2O3*	SW-846 3rd Ed., Update III, June 1997
Volatile Organic Compounds in Air by GCMS Method TO-1	EPATO1	Air	14	Sorbent Tube for Volatile Organic Compounds, Tennax	EPA-625/R-96/010B, January 1997
Volatile Organic Compounds in Air by GCMS Method TO-14A	EPATO14	Air	14	SUMMA Canister	EPA-625/R-96/010B, January 1997
Volatile Organic Compounds in Air by GCMS Method TO-2	EPATO2	Air	14	Sorbent Tube for Volatile Organic Compounds, Spherocarb	EPA-625/R-96/010B, January 1997
Volatile Organic Compounds in Soils by GC Method 8021B	SW8021B	Solid	14	40-mL VOA vial, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Volatile Organic Compounds in Soils by GCMS Method 8260B	SW8260B	Solid	14	40-mL VOA vial, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Volatile Organic Compounds in Waters by GC Method 8021B	SW8021B	Water	14	40-mL VOA vial, HCl to pH <2, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Volatile Organic Compounds in Waters by GCMS Method 8260B	SW8260B	Water	14	40-mL VOA vial, HCl to pH <2, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Volatile Organic Compounds, Encore Samples by GCMS Method 8260B	SW8260B	Solid	14	Encore Sampler	SW-846 3rd Ed., Update III, June 1997
Volatile Organic Compounds, MeOH Extract by GCMS Method 8260B	SW8260B	Solid	14	40-mL VOA vial, Cool 4°C	SW-846 3rd Ed., Update III, June 1997
Volatile Organic Halocarbon Compounds by GC Method 601	EPA601	Water	14	40-mL VOA vial, Cool 4°C, Na2S2O3*	40 CFR Part 136 Appendix A
Water Content by Method D95	ASTM_D95	Organic	28	125-mL Clear Widemouth, Cool 4°C	ASTM
Water Miscibility by Method D1722	ASTM_D1722	Organic	28	250-ml Clear widemouth glass, Cool 4°C	ASTM
			Holding time to preparation is from collection except CLP from VTSR	* should only be used in the presence of residual chlorine and should be added in the field	

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ASC SOP Inventory

SOP INVENTORY

Method	SOP No.	SOP Name
	A.04	Sample Container, Blank Preparation, and Shipment Procedures
	A.06	pH Control/Pump System Calibration Procedure
	A.07	Security for the ASC
	A.08	Purchasing and Storing Materials for the ASC
	A.10	Waste Disposal
	A.15	Quality Control Testing of Sample Containers
	A.18	Determination of Method Detection Limits
	A.19	Balance Check Procedure
	A.21	Laboratory Water Quality
	A.22	Batch Identification
	A.23	Initial Demonstration of Method Capability for the Laboratory; Continuing Demonstration of Method Performance for the Analyst
	A.24	Micropipette Use
	A.25	Data Review Procedure
	A.27	Document Control
	A.28	Traceability of Reagents and Standards
	A.30	Oven Calibration and Use
	A.31	Glassware Cleaning
	A.32	Subcontracting Procedure
	A.33	Project Management
	A.34	Confidentiality/Proprietary/Ethics
	A.36	Electrical Power Outage
	A.37	Laboratory Logbooks
	A.38	Thermometer Calibration
	A.39	Sonic Disrupter Tuning
	A.40	Project Management, Hudson Chromate Project
	A.41	Sample and Laboratory Contamination Minimization Procedure
	A.42	Procedure for Requesting Permission to Dispose State Samples
	A.43	Refrigerator, Freezer, and Oven Unit Temperature Check
	A.44	Evidentiary Chain of Custody Procedures
	A.45	External Proficiency Test Program
	A.46	Manual Integration
	A.47	Laboratory Hood Use
	A.48	Internal Chain of Custody
3580A	A.49	Waste Dilution
	A.51	Case Narratives
	Comp.05	Data Management

SOP INVENTORY

Method	SOP No.	SOP Name
	Comp.06	PC Backup, Security, and Recovery
	Comp.10	Electronic Disk Deliverable Generation
8081A, 8082/3510C/3520C	Ext.04	Extraction and Concentration of Pesticides and PCB from Water Samples
8151A	Ext.07	Extraction of Soil and Solid Waste for Chlorinated Phenoxy Acid Herbicides
8151A	Ext.08	Extraction of Chlorinated Phenoxy Acid Herbicides from Water Samples
8270C/3550B	Ext.12	High Level BNA Soil Extraction
8310/3520C	Ext.13	Extraction of PAH in Water for Subsequent Analysis by HPLC
8081A, 8082/3550B	Ext.19	Pesticide/PCB Extraction and Concentration of Soil Samples by Method 3550B
8270C/3510C/3520C	Ext.20	Extraction and Concentration of Water Samples for Analysis of Semivolatile Compounds
8310/3550B	Ext.25	Extraction of PAH in Solids for Subsequent Analysis by HPLC
8015B/3510C/3520/3550B/FL-PRO	Ext.30	EPH Extraction and Concentration of Soil and Water Samples
1311/8270C/3510C	Ext.31	Extraction and Concentration of TCLP Extracts for Analysis of Semivolatile Compounds
OLM04.2	Ext.32	Continuous Liquid-Liquid Extraction of Semivolatile Compounds in Water; CLP
OLM04.2	Ext.33	Semivolatile (BNA) Low-Level Extraction of Soils, CLP
OLM04.2	Ext.35	Extraction of Pesticides/PCB from Water Samples; CLP
OLM04.2	Ext.36	Extraction of Pesticides/PCB from Soil Samples; CLP
8270C/3550B	Ext.46	Extraction and Concentration of Soil Samples for Analysis of Semivolatile Compounds
AK102	Ext.48	DRO Extraction/Concentration of Soil or Water Samples – AK102
1311/8081A	Ext.58	Pesticide Extraction and Concentration of TCLP Extracts by Method 3510C or 3520C
8330	Ext.67	Preparation of Water Samples for the Subsequent Determination of Nitroaromatics and Nitramines-Low Level Method
8330	Ext.68	Preparation of Soil Samples for the Subsequent Determination of Nitroaromatics and Nitramines by HPLC
	Ext.70	Extraction Procedure and Special Cleanup for Buffalo Color Samples
OLM04.2	Ext.72	Gel Permeation Chromatography Cleanup for Pest/PCB Soils
OLM04.2	Ext.73	Gel Permeation Chromatography Cleanup for BNA Soils
1625	Ext.80	Extraction of Semivolatile Organics in Water by Method 1625 Isotope Dilution
OLM04.2	Ext.81	CLP Semivolatile Medium Level Extraction
3620B	Ext.85	Florisil Cleanup
3510C	Ext.92	Extraction of Organic Acids in Water for Subsequent Analysis by HPLC
SM4500 NH3 B E	GAC.02	Ammonia-Nitrogen by Method SM4500 NH3 B E
351.3	GAC.04	Total Kjeldahl Nitrogen (TKN)
418.1	GAC.08	Preparation of Water Samples for 418.1 Total Recoverable Petroleum Hydrocarbons - Water
5210B	GAC.11	Biochemical Oxygen Demand (BOD5 and COD5)
5220C	GAC.12	Chemical Oxygen Demand (COD)
	GAC.14	Percent Solids

SOP INVENTORY

Method	SOP No.	SOP Name
120.1	GAC.15	Specific Conductance
2310B	GAC.16	Acidity by Method 2310B
2320B	GAC.17	Alkalinity-Hydroxide, Carbonate, Bicarbonate, and Total By Method 2320B
5310B (9060)	GAC.20	Total Organic Carbon By Method 5310B
110.2	GAC.24	Color, Platinum-Cobalt
2340C	GAC.27	Total Hardness by EPA Method 2340C
9040B,150.1	GAC.34	pH of Water Samples
365.2	GAC.35	Orthophosphate by Method 365.2
365.2	GAC.36	Phosphorous, Total
160.1	GAC.37	Total Dissolved Solids (TDS), Filterable Residue
160.2	GAC.38	Total Suspended Solids, Nonfilterable Residue
160.5	GAC.39	Solids, Settleable by Method 160.5
160.4	GAC.40	Solids, Volatile by Method 160.4
2710F	GAC.41	Specific Gravity by Method 2710F
SM4500-S2-E, B	GAC.43	Sulfide by Method SM4500-S2-E, B
413.1	GAC.48	Oil and Grease; Partition-Gravimetric, Water
9020B	GAC.49	Total Organic Halogens
	GAC.64	Lachat General Startup Procedure
9012A, 335.3	GAC.65	Total Cyanide Analysis
353.2	GAC.66	Nitrate/Nitrite by Lachat
1010	GAC.72	Ignitability (Flashpoint, Liquids Method 1010)
325.2	GAC.75	Chloride by Water Flow Injection
Lloyd Kahn	GAC.76	TOC in Sediment and Soil - Lloyd Kahn
SM3500-CR D	GAC.82	Hexavalent Chromium, Colormetric Analysis by Standard Methods SM3500-CR D
Ch 7 Sec 7.3.3.2	GAC.85	Reactive Cyanide
3060A	GAC.91	Alkaline Digestion of Soils and Subsequent Hexavalent Chromium Colorimetric Analysis
9095A	GAC.92	Paint Filter Liquids Test (Method 9095A)
9045C	GAC.100	Soil pH
9012A, 335.3	GAC.106	Total and Amenable Cyanide in Water and Soil Preparation - MIDI
ILM04.1	GAC.118	Total Cyanide in Water Preparation, CLP
ILM04.1	GAC.119	Total Cyanide in Soil Preparation, CLP
7196A	GAC.121	Hexavalent Chromium in Water, Colormetric Analysis by 7196A
375.4	GAC.125	Sulfate by Method 375.4 (Turbidimetric)
160.3	GAC.126	Total Solids, Dried at 103-105 C, Total Residue
180.1	GAC.127	Turbidity (Nephelometric by Method 180.1)
Ch 7 Sec 7.3.4.2	GAC.130	Reactivity, Sulfide

SOP INVENTORY

Method	SOP No.	SOP Name
9030A	GAC.131	Acid Soluble and Acid Insoluble Sulfides, Samples Amendable to Distillation
1110	GAC.133	Corrosivity Toward Steel
NJDEP Mod 3060A/7196A	GAC.139	NJ Alkaline Digestion of Soils; Hexavalent Chomium Colorimetric Analysis of Water and Digestates
1030	GAC.140	Ignitability of Solids
40 CFR 50 APP B	GAC.142	Suspended Particulate Matter - High Volume Method
NIOSH 7600	GAC.143	Hexavalent Chromium in Air
	GAC.144	Nitrocellulose
300.0,9056A	GAC.145	Anion Analysis by Ion Chromatography
ASTM D2974	GAC.146	Percent Organic Matter
3500-Ca D	GAC.147	Calcium Hardness by Method 3500-Ca D
9065; 420.1	GAC.148	Phenols by 4-AAP (Medium Distillation, Autoanalyzer Analysis)
314	GAC.149	Perchlorate Analysis by Ion Chromatography
DOE/HWP-65/R2	GAC.153	Permanganate Water Test
EPA 530-R-94-036	GAC.154	Neutralization Potential of Solids
1664A	GAC.155	Hexane Extractable Material (HEM; Oil and Grease; Extraction and Gravimetric Water)
9071B	GAC.156	Hexane Extractable Material for Sludge, Sediment, and Solid Samples for Soxhlet Extraction and Gravimetric)
AOAC 955.01	GAC.157	Neutralizing Value for Liming Materials, $CaCO_3$ Equivalence
601	GC.16	Purgeable Halocarbon Analysis by Method 601
1311/8151A	GC.21	Analysis of TCLP Extracts for Chlorinated Herbicides by Method 8151A
8082/3580A	GC.26	Sample Preparation for PCB Oil Sample Analysis
8015B	GC.27	TPH-Gasoline 8015B and California LUFT
OLM04.2	GC.31	Pesticide/PCB by GC by Method OLM04.2
8015B/AK102	GC.37	Diesel Range Organics by Method 8015B or AK102
602	GC.44	Purgeable Aromatic Analysis by Method 602
AK101	GC.46	TPH-Gasoline Range Organics, AK 101 Determination
8021B	GC.59	Volatile Organic Compound Analysis by Method 8021B
8151A	GC.60	Analysis of Soil or Water Samples for Chlorinated Herbicides by Method 8151A
RSK-175	GC.62	Gases by Headspace Analysis--Screening Method
608	GC.64	Pesticide, PCB or Pesticide and PCB Analysis by Method 608
8081A	GC.72	Pesticide Analysis by Method 8081A
8082	GC.73	PCB Analysis by Method 8082
	GC.74	Sample Preparation for PCB Wipe Sample Analysis
FL-PRO	GC.76	FL Petroleum Range Organics
TX1005	GC.78	TPH by TNRCC Method TX 1005 (Revision 2 of the method)
524.2	GCMS.08	EPA Method 524.2 for Volatile Analysis by Purge and Trap GC/MS

SOP INVENTORY

Method	SOP No.	SOP Name
624	GCMS.11	Method 624 Volatile Analysis by Purge and Trap GCMS
8260B	GCMS.17	GCMS Analysis of Samples for Volatile Organic Compounds by Method 8260B
8270C	GCMS.19	GCMS Analysis of Extracts for Semivolatile Organic Compounds by Method 8270C
625	GCMS.20	Semivolatile Analysis of Water Extracts by GC/MS Method 625
OLM04.2	GCMS.23	CLP Analysis for Semivolatile Samples by Method OLM04.2
OLM04.2	GCMS.24	CLP Volatile Analysis by Purge and Trap by Method OLM04.2
TO-14	GCMS.29	Analysis of Volatile Organics in Air Using Summa Polished Canisters
1624C	GCMS.38	GC/MS Analysis of Samples for VOCs by Method 1624C
1625	GCMS.39	Method 1625 Analysis of Semivolatile Organics by GC/MS Isotope Dilution
1311/8270C	GCMS.42	GCMS Analysis of TCLP Extracts for Semivolatile Compounds Method 8270C
	GCMS.44	GC/MS Data Archive, Storage, and Security
PAH_SIM_3520C_W	GCMS.45	Analysis of PAH by SIM
8310	LC.7	Determination of PAH by HPLC
8330	LC.8	Determination of Nitroaromatics and Nitramines by HPLC Method 8330
Organic Acids	LC.26	Organic Acids by 3510C
NIOSH 7300,40 CFR 50 APPG	Metals.04	Digestion Process for Cassette Air Filters
1311	Metals.08	Toxicity Characteristic Leaching Procedure
CA WET	Metals.15	California WET
6010B	Metals.18	ICP Metals Analysis by Method 6010B
ILM04.1	Metals.21	Preparation for Mercury in Water Samples by CLP Protocol
ILM04.1	Metals.30	ICP Metals by CLP Protocol
ILM04.1	Metals.36	GFAA and ICP Digestion of Solids by CLP Protocol
ILM04.1	Metals.37	GFAA and ICP Digestion of Waters by CLP Protocol
7000	Metals.41	Metals Analysis by GFAA SW-846
200.7, Rev.4.4	Metals.54	Digestion and Analysis of Drinking Water Samples by Method 200.7, Rev. 4.4
	Metals.59	Interelement Correction Factor Determination
ILM04.1	Metals.60	Preparation for Mercury in Soil Samples by CLP Protocol
200.9	Metals.63	Preparation and Analysis for Trace Metal Elements by GFAA
NIOSH 6009	Metals.66	Preparation for Mercury in Air from Solid Sorbent Tubes by NIOSH 6009--Block Digestion
7470A, 7471A	Metals.67	Mercury Analysis
9081	Metals.68	Cation Exchange Capacity of Soils (Sodium Acetate) by Method 9081
	Metals.69	Preparation for Mercury in Wipes
7470A	Metals.70	Preparation for Mercury in Water Samples by Method 7470A Using Block Digestor
7471A	Metals.71	Preparation for Mercury in Soil Samples by Method 7471A Using Block Digestor

SOP INVENTORY

Method	SOP No.	SOP Name
3010A	Metals.72	Digestion of Waters by Method 3010A Using Block Digestion for ICP Analysis
3050B	Metals.73	Digestion of Soil Samples By Method 3050B - Block Digestion
40 CFR Part 136 Method 200.7	Metals.74	Total Digestion of Wastewaters by 40 CFR Part 136 Method 200.7 Using Block Digestion
40 CFR Part 136 Method 200.7	Metals.75	Total Recoverable Digestion of Wastewaters by 40 CFR Part 136 Method 200.7 Using Block Digestion
1312	Metals.76	Synthetic Precipitation Leaching Procedure
3005A	Metals.77	Method 3005A, SW-846 Total Recoverable Metals-Block Digestion
200.7, Rev.4.4	Metals.78	Analysis of Drinking Water by Method 200.7, Rev.4.4
3020A	Metals.79	Digestion of Waters by 3020A Using Block Digestion for GFAA Analysis
3050B	Metals.80	Digestion of Soils by 3050B Using Block Digestion for GFAA Analysis
	QA.01	Corrective Action Process
	QA.05	Training Program
	QA.18	Standard Operating Procedures, Use and Administration
	QA.19	Internal Audits
	QA.20	Control Charting
	Rep.06	CLP Data Deliverables for Organics Analysis
	Rep.07	CLP Data Deliverables for Inorganics Analysis
	Rep.08	Job Case Filing
	Rep.12	Data Entry and Changes to CLP Data and Deliverables
	Rep.20	Standard Data Package Deliverables
	SM.1	Sample Receipt
	SM.02	Sample Log In
	SM.04	Sample Custody Procedure
	SM.10	Sample Splitting
	SM.11	Completion of USEPA CLP Sample Log-in (Form DC-1)
	SM.12	New Jersey Chain of Custody Procedures
	SM.13	Radiation Monitoring of Coolers and Samples

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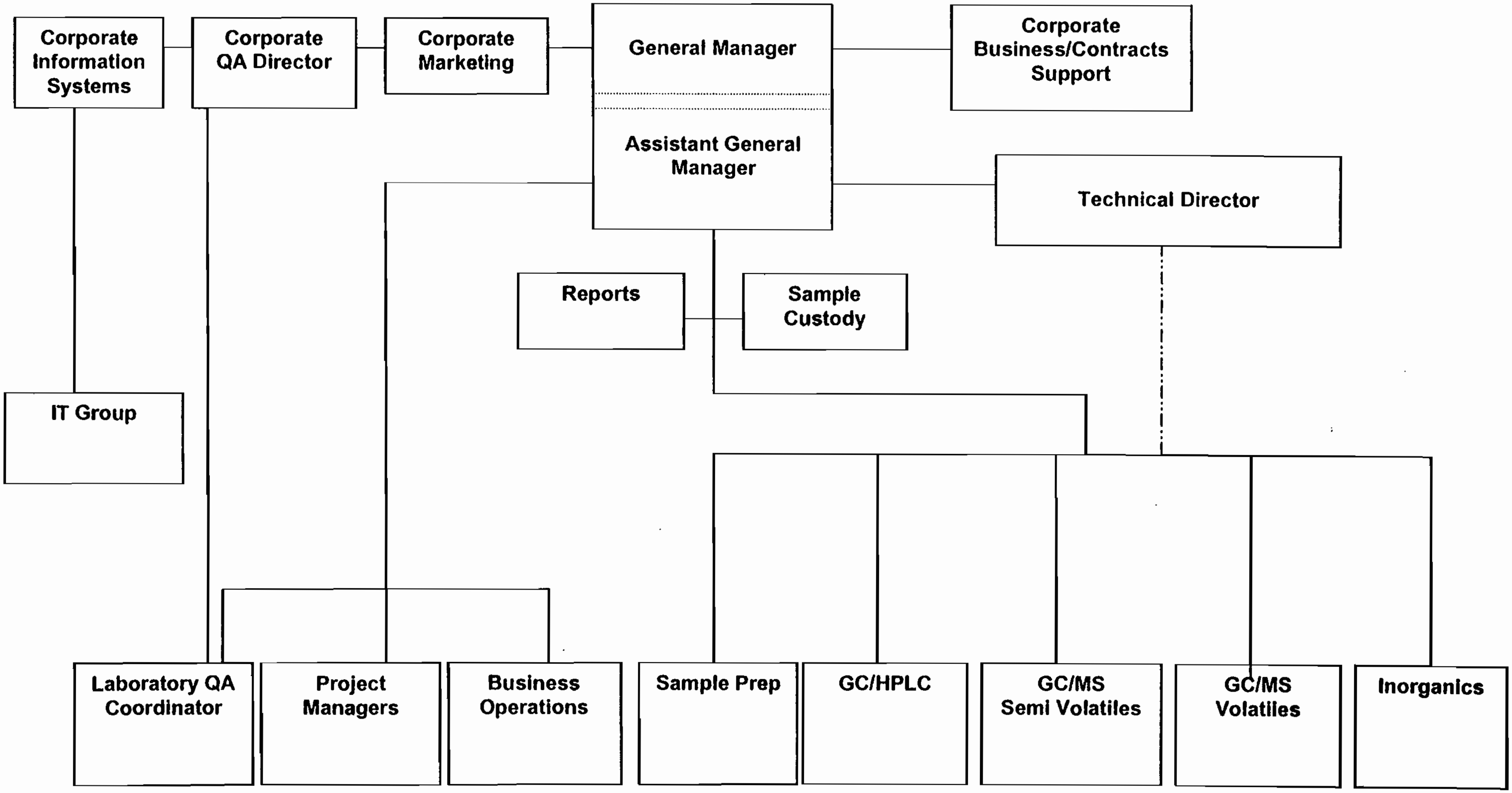
Organization Chart with Current Staffing



ASC ORGANIZATIONAL PLAN

- ·· - Technical Supervision of Operations

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B-3 Summary of Internal Quality Control Procedures and QC Acceptance Criteria

Ecology and Environment, Inc.

Date: 03-Apr-02

TEST SPECIFICATIONS LIMITS REPORT

Test Code: C_8260B_5030B_LL_W_013
Test Number: SW8260B
Test Name: COE Ft Worth VOCs, Low Level by GCMS Method 8260B
Matrix: Water **Units:** µg/L **Created:** 02-Nov-01

Type Analyte **Updated:** 28-Feb-02 **Updated by:** piccioner

SampType: LCS

Type	Analyte	SpkVal	LowLimit	HighLimit	RPDLimit
A	1,1,1,2-Tetrachloroethane	10	80	120	0
A	1,1,1-Trichloroethane	10	80	120	0
A	1,1,2,2-Tetrachloroethane	10	80	120	0
A	1,1,2-Trichloroethane	10	80	120	0
A	1,1-Dichloroethane	10	80	120	0
A	1,1-Dichloroethene	10	80	120	0
A	1,1-Dichloropropene	10	80	120	0
A	1,2,3-Trichlorobenzene	10	80	120	0
A	1,2,3-Trichloropropane	10	80	120	0
A	1,2,4-Trichlorobenzene	10	80	120	0
A	1,2,4-Trimethylbenzene	10	80	120	0
A	1,2-Dibromo-3-chloropropane	10	80	120	0
A	1,2-Dibromoethane	10	80	120	0
A	1,2-Dichlorobenzene	10	80	120	0
A	1,2-Dichloroethane	10	80	120	0
A	1,2-Dichloroethene, Total	20	80	120	0
A	1,2-Dichloropropane	10	80	120	0
A	1,3,5-Trimethylbenzene	10	80	120	0
A	1,3-Dichlorobenzene	10	80	120	0
A	1,3-Dichloropropane	10	80	120	0
A	1,4-Dichlorobenzene	10	80	120	0
A	2,2-Dichloropropane	10	80	120	0
A	2-Butanone	10	80	120	0
A	2-Chlorotoluene	10	80	120	0
A	2-Hexanone	10	80	120	0
A	4-Chlorotoluene	10	80	120	0
A	4-Isopropyltoluene	10	80	120	0
A	4-Methyl-2-pentanone	10	80	120	0
A	Acetone	10	80	120	0
A	Acrylonitrile	10	80	120	0
A	Benzene	10	80	120	0
A	Bromobenzene	10	80	120	0
A	Bromochloromethane	10	80	120	0
A	Bromodichloromethane	10	80	120	0
A	Bromoform	10	80	120	0
A	Bromomethane	10	80	120	0
A	Carbon disulfide	10	80	120	0
A	Carbon tetrachloride	10	80	120	0
A	Chlorobenzene	10	80	120	0

Date: 03-Apr-02

TEST SPECIFICATIONS LIMITS REPORT

Test Code: C_8260B_5030B_LL_W_013
Test Number: SW8260B
Test Name: COE Ft Worth VOCs, Low Level by GCMS Method 8260B
Matrix: Water **Units:** µg/L **Created:** 02-Nov-01

Updated: 28-Feb-02 **Updated by:** piccioner

Type	Analyte				
A	Chloroethane	10	80	120	0
A	Chloroform	10	80	120	0
A	Chloromethane	10	80	120	0
A	cis-1,2-Dichloroethene	10	80	120	0
A	cis-1,3-Dichloropropene	10	80	120	0
A	Dibromochloromethane	10	80	120	0
A	Dibromomethane	10	80	120	0
A	Dichlorodifluoromethane	10	80	120	0
A	Ethylbenzene	10	80	120	0
A	Hexachlorobutadiene	10	80	120	0
A	Iodomethane	10	80	120	0
A	Isopropylbenzene	10	80	120	0
A	m,p-Xylene	20	80	120	0
A	Methyl tert-butyl ether	10	80	120	0
A	Methylene chloride	10	80	120	0
A	n-Butylbenzene	10	80	120	0
A	n-Propylbenzene	10	80	120	0
A	Naphthalene	10	80	120	0
A	o-Xylene	10	80	120	0
A	sec-Butylbenzene	10	80	120	0
A	Styrene	10	80	120	0
A	tert-Butylbenzene	10	80	120	0
A	Tetrachloroethene	10	80	120	0
A	Toluene	10	80	120	0
A	trans-1,2-Dichloroethene	10	80	120	0
A	trans-1,3-Dichloropropene	10	80	120	0
A	Trichloroethene	10	80	120	0
A	Trichlorofluoromethane	10	80	120	0
A	Vinyl acetate	10	80	120	0
A	Vinyl chloride	10	80	120	0
A	Xylenes, Total	30	80	120	0
I	1,4-Dichlorobenzene-d4	0	0	0	0
I	Chlorobenzene-d5	0	0	0	0
I	Fluorobenzene	0	0	0	0
S	1,2-Dichloroethane-d4	10	80	120	0
S	4-Bromofluorobenzene	10	80	120	0
S	Dibromofluoromethane	10	80	120	0
S	Toluene-d8	10	80	120	0

Ecology and Environment, Inc. **Date:** 03-Apr-02

Test Code: C_8270C_3520C_W_006
Test Number: SW8270C
Test Name: ACE Semivolatile Organics by Method 8270C
Matrix: Water **Units:** µg/L **Created:** 01-Dec-00

TEST SPECIFICATIONS LIMITS REPORT

Type Analyte **Updated:** 07-Nov-01 **Updated by:** piccioner

SampType: LCS

Type	Analyte	SpkVal	LowLimit	HighLimit	RPDLimit
A	1,2,4-Trichlorobenzene	30	34	119	0
A	1,2-Dichlorobenzene	30	20	115	0
A	1,3-Dichlorobenzene	30	20	115	0
A	1,4-Dichlorobenzene	30	31	116	0
A	2,4,5-Trichlorophenol	30	20	115	0
A	2,4,6-Trichlorophenol	30	20	115	0
A	2,4-Dichlorophenol	30	20	115	0
A	2,4-Dimethylphenol	30	20	115	0
A	2,4-Dinitrophenol	30	20	115	0
A	2,4-Dinitrotoluene	30	42	111	0
A	2,6-Dinitrotoluene	30	39	105	0
A	2-Chloronaphthalene	30	20	115	0
A	2-Chlorophenol	30	29	130	0
A	2-Methylnaphthalene	30	20	115	0
A	2-Methylphenol	30	20	115	0
A	2-Nitroaniline	30	20	115	0
A	2-Nitrophenol	30	20	115	0
A	3,3′-Dichlorobenzidine	30	20	115	0
A	3-Nitroaniline	30	20	115	0
A	4,6-Dinitro-2-methylphenol	30	20	115	0
A	4-Bromophenyl phenyl ether	30	20	115	0
A	4-Chloro-3-methylphenol	30	34	133	0
A	4-Chloroaniline	30	20	115	0
A	4-Chlorophenyl phenyl ether	30	20	115	0
A	4-Methylphenol	30	20	115	0
A	4-Nitroaniline	30	20	115	0
A	4-Nitrophenol	30	10	115	0
A	Acenaphthene	30	38	130	0
A	Acenaphthylene	30	20	115	0
A	Anthracene	30	20	115	0
A	Benz(a)anthracene	30	20	115	0
A	Benzo(a)pyrene	30	20	115	0
A	Benzo(b)fluoranthene	30	20	115	0
A	Benzo(g,h,i)perylene	30	20	115	0
A	Benzo(k)fluoranthene	30	20	115	0
A	Benzoic acid	30	20	115	0
A	Benzyl alcohol	30	20	115	0
A	Bis(2-chloroethoxy)methane	30	20	115	0
A	Bis(2-chloroethyl)ether	30	20	115	0

Ecology and Environment, Inc.

Date: 03-Apr-02

TEST SPECIFICATIONS LIMITS REPORT

Test Code: C_8270C_3520C_W_006
Test Number: SW8270C
Test Name: ACE Semivolatile Organics by Method 8270C
Matrix: Water **Units:** µg/L **Created:** 01-Dec-00

Updated: 07-Nov-01 **Updated by:** piccioner

Type	Analyte				
A	Bis(2-chloroisopropyl)ether	30	4	124	0
A	Bis(2-ethylhexyl)phthalate	30	37	147	0
A	Butyl benzyl phthalate	30	20	115	0
A	Carbazole	30	20	115	0
A	Chrysene	30	20	115	0
A	Di-n-butyl phthalate	30	20	115	0
A	Di-n-octyl phthalate	30	20	115	0
A	Dibenz(a,h)anthracene	30	20	115	0
A	Dibenzofuran	30	20	115	0
A	Diethyl phthalate	30	20	115	0
A	Dimethyl phthalate	30	20	115	0
A	Fluoranthene	30	20	115	0
A	Fluorene	30	20	115	0
A	Hexachlorobenzene	30	20	115	0
A	Hexachlorobutadiene	30	20	115	0
A	Hexachlorocyclopentadiene	30	20	115	0
A	Hexachloroethane	30	20	115	0
A	Indeno(1,2,3-cd)pyrene	30	20	115	0
A	Isophorone	30	20	115	0
A	N-Nitrosodi-n-propylamine	30	34	117	0
A	N-Nitrosodimethylamine	30	20	115	0
A	N-Nitrosodiphenylamine	30	20	115	0
A	Naphthalene	30	20	115	0
A	Nitrobenzene	30	20	115	0
A	Pentachlorophenol	30	43	129	0
A	Phenanthrene	30	20	115	0
A	Phenol	30	27	131	0
A	Pyrene	30	27	130	0
I	1,4-Dichlorobenzene-d4	0	0	0	0
I	Acenaphthene-d10	0	0	0	0
I	Chrysene-d12	0	0	0	0
I	Naphthalene-d8	0	0	0	0
I	Perylene-d12	0	0	0	0
I	Phenanthrene-d10	0	0	0	0
S	2,4,6-Tribromophenol	60	32	162	0
S	2-Fluorobiphenyl	50	38	129	0
S	2-Fluorophenol	60	15	142	0
S	Nitrobenzene-d5	50	45	118	0
S	Phenol-d5	60	18	136	0
S	Terphenyl-d14	50	10	154	0

Ecology and Environment, Inc.

Date: 03-Apr-02

Test Code: 1_8081A_3510C_W
Test Number: SW8081A
Test Name: Pesticides by Method 8081A
Matrix: Water **Units:** µg/L

TEST SPECIFICATIONS LIMITS REPORT

Created: 28-Apr-99

Type Analyte **Updated:** 12-Nov-01 **Updated by:** drosd

SampType: LCS

Type	Analyte	SpkVal	LowLimit	HighLimit	RPDLimit
A	4,4′-DDD	0.1	64	133	0
A	4,4′-DDE	0.1	49	143	0
A	4,4′-DDT	0.1	61	148	0
A	Aldrin	0.1	22	168	0
A	alpha-BHC	0.1	51	130	0
A	alpha-Chlordane	0.1	33	129	0
A	beta-BHC	0.1	58	127	0
A	delta-BHC	0.1	10	146	0
A	Dieldrin	0.1	55	165	0
A	Endosulfan I	0.1	62	114	0
A	Endosulfan II	0.1	48	128	0
A	Endosulfan sulfate	0.1	54	126	0
A	Endrin	0.1	56	161	0
A	Endrin aldehyde	0.1	33	129	0
A	Endrin ketone	0.1	47	118	0
A	gamma-BHC	0.1	56	144	0
A	gamma-Chlordane	0.1	38	124	0
A	Heptachlor	0.1	44	155	0
A	Heptachlor epoxide	0.1	46	127	0
A	Methoxychlor	1	67	135	0
A	Toxaphene	0	0	0	0
S	Decachlorobiphenyl	0.2	12	132	0
S	Tetrachloro-m-xylene	0.2	31	122	0

TEST SPECIFICATIONS LIMITS REPORT

Test Code: 1_8082_3510C_W

Test Number: SW8082

Test Name: PCBs by Method 8082

Matrix: Water **Units:** µg/L **Created:** 26-Mar-99

Type Analyte **Updated:** **Updated by:**

SampType: LCS

Type	Analyte	SpkVal	LowLimit	HighLimit	RPDLimit
A	Aroclor 1016	5	50	124	0
A	Aroclor 1221	0	0	0	0
A	Aroclor 1232	0	0	0	0
A	Aroclor 1242	0	0	0	0
A	Aroclor 1248	0	0	0	0
A	Aroclor 1254	0	0	0	0
A	Aroclor 1260	5	52	127	0
S	Decachlorobiphenyl	0.2	18	112	0
S	Tetrachloro-m-xylene	0.2	32	110	0

Ecology and Environment, Inc.

Date: 03-Apr-02

TEST SPECIFICATIONS LIMITS REPORT

Test Code: 1_8015B_GRO_W
Test Number: SW8015B
Test Name: TPH-Gasoline Range Organics by Method 8015B
Matrix: Water **Units:** mg/L **Created:**

Type Analyte **Updated:** **Updated by:**

SampType: LCS

Type	Analyte	SpkVal	LowLimit	HighLimit	RPDLimit
A	Gasoline Range Organics	0.5	70	130	0
S	1,2-Dichlorobenzene	0.1	70	130	0

Ecology and Environment, Inc. **Date:** 03-Apr-02

TEST SPECIFICATIONS LIMITS REPORT

Test Code: 1_8015B_3520C_DRO_W
Test Number: SW8015B
Test Name: TPH-Diesel Range Organics by Method 8015B
Matrix: Water **Units:** mg/L **Created:** 08-Nov-01

Type Analyte **Updated:** **Updated by:** howardw

SampType: LCS

Type	Analyte	SpkVal	LowLimit	HighLimit	RPDLimit
A	Diesel Range Organics	1	47	125	0
S	o-Terphenyl	0.02	48	147	0

Ecology and Environment, Inc.

Date: 03-Apr-02

TEST SPECIFICATIONS LIMITS REPORT

Test Code: C_8260B_S_005
Test Number: SW8260B
Test Name: VOCs + EDB by Method 8260B
Matrix: Solid **Units:** µg/Kg **Created:** 17-Sep-99

Type Analyte **Updated:** **Updated by:**

SampType: LCS

Type	Analyte	SpkVal	LowLimit	HighLimit	RPDLimit
A	1,1,1-Trichloroethane	50	61	133	0
A	1,1,2,2-Tetrachloroethane	50	62	135	0
A	1,1,2-Trichloroethane	50	77	117	0
A	1,1-Dichloroethane	50	68	132	0
A	1,1-Dichloroethene	50	70	131	0
A	1,2-Dibromoethane	50	62	127	0
A	1,2-Dichlorobenzene	50	73	122	0
A	1,2-Dichloroethane	50	71	121	0
A	1,2-Dichloroethene, Total	100	70	129	0
A	1,2-Dichloropropane	50	71	127	0
A	1,3-Dichlorobenzene	50	77	114	0
A	1,4-Dichlorobenzene	50	75	117	0
A	2-Butanone	50	62	146	0
A	2-Chloroethyl vinyl ether	50	55	145	0
A	2-Hexanone	50	45	148	0
A	4-Methyl-2-pentanone	50	56	141	0
A	Acetone	50	31	153	0
A	Benzene	50	82	120	0
A	Bromodichloromethane	50	77	118	0
A	Bromoform	50	74	131	0
A	Bromomethane	50	72	134	0
A	Carbon disulfide	50	68	128	0
A	Carbon tetrachloride	50	62	131	0
A	Chlorobenzene	50	84	115	0
A	Chloroethane	50	71	145	0
A	Chloroform	50	74	120	0
A	Chloromethane	50	55	135	0
A	cis-1,2-Dichloroethene	50	71	131	0
A	cis-1,3-Dichloropropene	50	78	125	0
A	Dibromochloromethane	50	77	123	0
A	Ethylbenzene	50	80	117	0
A	m,p-Xylene	100	70	130	0
A	Methylene chloride	50	63	132	0
A	o-Xylene	50	80	111	0
A	Styrene	50	79	117	0
A	Tetrachloroethene	50	57	128	0
A	Toluene	50	80	119	0
A	trans-1,2-Dichloroethene	50	70	129	0
A	trans-1,3-Dichloropropene	50	77	132	0

Ecology and Environment, Inc.

Date: 03-Apr-02

TEST SPECIFICATIONS LIMITS REPORT

Test Code: C_8260B_S_005
Test Number: SW8260B
Test Name: VOCs + EDB by Method 8260B
Matrix: Solid **Units:** μg/Kg **Created:** 17-Sep-99

Type	Analyte	Updated:		Updated by:	
A	Trichloroethene	50	75	120	0
A	Trichlorofluoromethane	50	51	142	0
A	Vinyl acetate	50	30	152	0
A	Vinyl chloride	50	63	139	0
A	Xylenes, Total	150	77	117	0
I	1,4-Dichlorobenzene-d4	0	0	0	0
I	Chlorobenzene-d5	0	0	0	0
I	Fluorobenzene	0	0	0	0
S	1,2-Dichloroethane-d4	50	77	119	0
S	4-Bromofluorobenzene	50	88	124	0
S	Dibromofluoromethane	50	83	117	0
S	Toluene-d8	50	84	119	0

Ecology and Environment, Inc.

Date: 03-Apr-02

TEST SPECIFICATIONS LIMITS REPORT

Test Code: C_8270C_3550B_S_006
Test Number: SW8270C
Test Name: ACE Semivolatile Organics by Method 8270C
Matrix: Solid **Units:** µg/Kg **Created:** 22-Mar-00

Type Analyte **Updated:** 22-Mar-00 **Updated by:** howardw

SampType: LCS

Type	Analyte	SpkVal	LowLimit	HighLimit	RPDLimit
A	1,2,4-Trichlorobenzene	1000	39	110	0
A	1,2-Dichlorobenzene	1000	33	114	0
A	1,3-Dichlorobenzene	1000	30	112	0
A	1,4-Dichlorobenzene	1000	33	108	0
A	2,4,5-Trichlorophenol	1000	38	116	0
A	2,4,6-Trichlorophenol	1000	38	116	0
A	2,4-Dichlorophenol	1000	39	117	0
A	2,4-Dimethylphenol	1000	10	115	0
A	2,4-Dinitrophenol	1000	10	115	0
A	2,4-Dinitrotoluene	1000	46	111	0
A	2,6-Dinitrotoluene	1000	44	117	0
A	2-Chloronaphthalene	1000	36	118	0
A	2-Chlorophenol	1000	48	121	0
A	2-Methylnaphthalene	1000	34	118	0
A	2-Methylphenol	1000	40	113	0
A	2-Nitroaniline	1000	37	126	0
A	2-Nitrophenol	1000	34	116	0
A	3,3′-Dichlorobenzidine	1000	10	115	0
A	3-Nitroaniline	1000	31	100	0
A	4,6-Dinitro-2-methylphenol	1000	36	116	0
A	4-Bromophenyl phenyl ether	1000	40	116	0
A	4-Chloro-3-methylphenol	1000	52	118	0
A	4-Chloroaniline	1000	12	100	0
A	4-Chlorophenyl phenyl ether	1000	46	108	0
A	4-Methylphenol	1000	46	122	0
A	4-Nitroaniline	1000	47	108	0
A	4-Nitrophenol	1000	54	124	0
A	Acenaphthene	1000	39	111	0
A	Acenaphthylene	1000	41	118	0
A	Anthracene	1000	46	108	0
A	Benz(a)anthracene	1000	44	116	0
A	Benzo(a)pyrene	1000	44	110	0
A	Benzo(b)fluoranthene	1000	37	121	0
A	Benzo(g,h,i)perylene	1000	36	123	0
A	Benzo(k)fluoranthene	1000	52	114	0
A	Benzoic acid	1000	10	115	0
A	Benzyl alcohol	1000	35	135	0
A	Bis(2-chloroethoxy)methane	1000	33	118	0
A	Bis(2-chloroethyl)ether	1000	36	111	0

Ecology and Environment, Inc. **Date:** 03-Apr-02

TEST SPECIFICATIONS LIMITS REPORT

Test Code: C_8270C_3550B_S_006
Test Number: SW8270C
Test Name: ACE Semivolatile Organics by Method 8270C
Matrix: Solid **Units:** µg/Kg **Created:** 22-Mar-00

Type	Analyte	Updated: 22-Mar-00		Updated by: howardw	
A	Bis(2-chloroisopropyl)ether	1000	24	131	0
A	Bis(2-ethylhexyl)phthalate	1000	41	120	0
A	Butyl benzyl phthalate	1000	40	123	0
A	Carbazole	1000	61	112	0
A	Chrysene	1000	49	115	0
A	Di-n-butyl phthalate	1000	48	112	0
A	Di-n-octyl phthalate	1000	37	124	0
A	Dibenz(a,h)anthracene	1000	39	121	0
A	Dibenzofuran	1000	39	116	0
A	Diethyl phthalate	1000	52	108	0
A	Dimethyl phthalate	1000	46	110	0
A	Fluoranthene	1000	48	111	0
A	Fluorene	1000	47	111	0
A	Hexachlorobenzene	1000	41	115	0
A	Hexachlorobutadiene	1000	30	118	0
A	Hexachlorocyclopentadiene	1000	10	115	0
A	Hexachloroethane	1000	25	117	0
A	Indeno(1,2,3-cd)pyrene	1000	33	130	0
A	Isophorone	1000	33	116	0
A	N-Nitrosodi-n-propylamine	1000	34	107	0
A	N-Nitrosodimethylamine	1000	48	105	0
A	N-Nitrosodiphenylamine	1000	47	120	0
A	Naphthalene	1000	35	114	0
A	Nitrobenzene	1000	33	121	0
A	Pentachlorophenol	1000	37	115	0
A	Phenanthrene	1000	46	112	0
A	Phenol	1000	43	125	0
A	Pyrene	1000	36	125	0
I	1,4-Dichlorobenzene-d4	0	0	0	0
I	Acenaphthene-d10	0	0	0	0
I	Chrysene-d12	0	0	0	0
I	Naphthalene-d8	0	0	0	0
I	Perylene-d12	0	0	0	0
I	Phenanthrene-d10	0	0	0	0
S	2,4,6-Tribromophenol	2000	32	130	0
S	2-Fluorobiphenyl	1667	27	123	0
S	2-Fluorophenol	2000	36	135	0
S	Nitrobenzene-d5	1667	25	122	0
S	Phenol-d5	2000	36	128	0
S	Terphenyl-d14	1667	51	116	0

Ecology and Environment, Inc. **Date:** 03-Apr-02

TEST SPECIFICATIONS LIMITS REPORT

Test Code: 1_8081A_3550B_S
Test Number: SW8081A
Test Name: Pesticides by Method 8081A
Matrix: Solid **Units:** µg/Kg **Created:** 28-Apr-99

Type Analyte **Updated:** **Updated by:**

SampType: LCS

Type	Analyte	SpkVal	LowLimit	HighLimit	RPDLimit
A	4,4´-DDD	3.33	73	119	0
A	4,4´-DDE	3.33	74	124	0
A	4,4´-DDT	3.33	67	140	0
A	Aldrin	3.33	67	152	0
A	alpha-BHC	3.33	65	134	0
A	alpha-Chlordane	3.33	63	136	0
A	beta-BHC	3.33	48	135	0
A	delta-BHC	3.33	44	144	0
A	Dieldrin	3.33	63	149	0
A	Endosulfan I	3.33	65	127	0
A	Endosulfan II	3.33	54	132	0
A	Endosulfan sulfate	3.33	69	130	0
A	Endrin	3.33	67	142	0
A	Endrin aldehyde	3.33	15	142	0
A	Endrin ketone	3.33	50	139	0
A	gamma-BHC	3.33	71	135	0
A	gamma-Chlordane	3.33	67	139	0
A	Heptachlor	3.33	75	143	0
A	Heptachlor epoxide	3.33	54	132	0
A	Methoxychlor	33.3	74	147	0
A	Toxaphene	0	0	0	0
S	Decachlorobiphenyl	6.67	39	135	0
S	Tetrachloro-m-xylene	6.67	47	140	0

TEST SPECIFICATIONS LIMITS REPORT

Test Code: 1_8082_3550B_S

Test Number: SW8082

Test Name: PCBs by Method 8082

Matrix: Solid **Units:** µg/Kg **Created:**

Type **Analyte** **Updated:** 09-Mar-00 **Updated by:** howardw

SampType: LCS

Type	Analyte	SpkVal	LowLimit	HighLimit	RPDLimit
A	Aroclor 1016	167	59	119	0
A	Aroclor 1221	0	0	0	0
A	Aroclor 1232	0	0	0	0
A	Aroclor 1242	0	0	0	0
A	Aroclor 1248	0	0	0	0
A	Aroclor 1254	0	0	0	0
A	Aroclor 1260	167	50	150	0
S	Decachlorobiphenyl	6.67	52	115	0
S	Tetrachloro-m-xylene	6.67	39	125	0

Ecology and Environment, Inc.

Date: 03-Apr-02

TEST SPECIFICATIONS LIMITS REPORT

Test Code: 1_8015B_GRO_S

Test Number: SW8015B

Test Name: TPH-Gasoline Range Organics by Method 8015B

Matrix: Solid **Units:** mg/Kg **Created:** 01-Apr-99

Type	Analyte	Updated:		Updated by:	
SampType:	LCS	**SpkVal**	**LowLimit**	**HighLimit**	**RPDLimit**
A	Gasoline Range Organics	28.6	56	135	0
S	1,2-Dichlorobenzene	7.14	22	162	0

Ecology and Environment, Inc. **Date:** 03-Apr-02

TEST SPECIFICATIONS LIMITS REPORT

Test Code: 1_8015B_DRO_S
Test Number: SW8015B
Test Name: TPH-Diesel Range Organics by Method 8015B
Matrix: Solid **Units:** mg/Kg **Created:**

Type Analyte **Updated:** 28-Nov-00 **Updated by:** drosd

SampType: LCS

Type	Analyte	SpkVal	LowLimit	HighLimit	RPDLimit
A	Diesel Range Organics	40	57	133	0
S	o-Terphenyl	0.8	63	133	0

Ecology and Environment, Inc. **Date:** 03-Apr-02

TEST SPECIFICATIONS LIMITS REPORT

Test Code: 1_6010B_TAL_S
Test Number: SW6010B
Test Name: Metals, TAL by ICP Method 6010B
Matrix: Solid **Units:** mg/Kg **Created:** 03-Feb-00

Type Analyte **Updated:** 03-Feb-00 **Updated by:** howardw

SampType: LCS

Type	Analyte	SpkVal	LowLimit	HighLimit	RPDLimit
A	Aluminum	100	80	120	0
A	Antimony	100	80	120	0
A	Arsenic	100	80	120	0
A	Barium	100	80	120	0
A	Beryllium	100	80	120	0
A	Cadmium	100	80	120	0
A	Calcium	1000	80	120	0
A	Chromium	100	80	120	0
A	Cobalt	100	80	120	0
A	Copper	100	80	120	0
A	Iron	100	80	120	0
A	Lead	100	80	120	0
A	Magnesium	1000	80	120	0
A	Manganese	100	80	120	0
A	Nickel	100	80	120	0
A	Potassium	1000	80	120	0
A	Selenium	100	80	120	0
A	Silver	5	80	120	0
A	Sodium	1000	80	120	0
A	Thallium	100	80	120	0
A	Vanadium	100	80	120	0
A	Zinc	100	80	120	0

Ecology and Environment, Inc. **Date:** 03-Apr-02

TEST SPECIFICATIONS LIMITS REPORT

Test Code: 1_7471A_HG_S
Test Number: SW7471A
Test Name: Mercury Analysis in Soil by Method 7471A
Matrix: Soil **Units:** mg/Kg **Created:** 08-Jan-99

Type Analyte **Updated:** 01-Oct-01 **Updated by:** drosd

SampType: LCS

Type	Analyte	SpkVal	LowLimit	HighLimit	RPDLimit
A	Mercury	0.333	68	151	0

Ecology and Environment, Inc.

Date: 03-Apr-02

TEST SPECIFICATIONS LIMITS REPORT

Test Code: 1_6010B_TAL_W
Test Number: SW6010B
Test Name: Metals, TAL by ICP Method 6010B
Matrix: Water **Units:** µg/L **Created:** 03-Feb-00

Type Analyte **Updated:** 03-Feb-00 **Updated by:** howardw

SampType: LCS

Type	Analyte	SpkVal	LowLimit	HighLimit	RPDLimit
A	Aluminum	1000	80	120	0
A	Antimony	1000	80	120	0
A	Arsenic	1000	80	120	0
A	Barium	1000	80	120	0
A	Beryllium	1000	80	120	0
A	Cadmium	1000	80	120	0
A	Calcium	10000	80	120	0
A	Chromium	1000	80	120	0
A	Cobalt	1000	80	120	0
A	Copper	1000	80	120	0
A	Iron	1000	80	120	0
A	Lead	1000	80	120	0
A	Magnesium	10000	80	120	0
A	Manganese	1000	80	120	0
A	Nickel	1000	80	120	0
A	Potassium	10000	80	120	0
A	Selenium	1000	80	120	0
A	Silver	50	80	120	0
A	Sodium	10000	80	120	0
A	Thallium	1000	80	120	0
A	Vanadium	1000	80	120	0
A	Zinc	1000	80	120	0

Ecology and Environment, Inc. **Date:** 03-Apr-02

TEST SPECIFICATIONS LIMITS REPORT

Test Code: 1_7470A_HG_W
Test Number: SW7470A
Test Name: Mercury Analysis in Water by Method 7470A
Matrix: Water **Units:** µg/L **Created:** 07-Jan-99

Type Analyte **Updated:** 11-Jan-01 **Updated by:** howardw

SampType: LCS

		SpkVal	LowLimit	HighLimit	RPDLimit
A	Mercury	1	80	120	0

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List of Analytes of Interest and Detection Limits - Updates

Ecology and Environment, Inc.

Date: 03-Apr-02

METHOD DETECTION / REPORTING LIMITS

Test Code: C_8260B_5030B_LL_W_013
Test Number: SW8260B
Test Name: COE Ft Worth VOCs, Low Level by GCMS Method 8260B
Matrix: Water **Units:** µg/L **Updated:** **Expire:**

Type	Analyte	MDL	PQL	UQL	MCL
A	1,1,1,2-Tetrachloroethane	0.0435	1	50	0
A	1,1,1-Trichloroethane	0.0808	1	50	0
A	1,1,2,2-Tetrachloroethane	0.0649	1	50	0
A	1,1,2-Trichloroethane	0.0736	1	50	0
A	1,1-Dichloroethane	0.0878	1	50	0
A	1,1-Dichloroethene	0.119	1	50	0
A	1,1-Dichloropropene	0.0969	1	50	0
A	1,2,3-Trichlorobenzene	0.0818	1	50	0
A	1,2,3-Trichloropropane	0.113	1	50	0
A	1,2,4-Trichlorobenzene	0.0625	1	50	0
A	1,2,4-Trimethylbenzene	0.0581	1	50	0
A	1,2-Dibromo-3-chloropropane	0.213	1	50	0
A	1,2-Dibromoethane	0.0482	1	50	0
A	1,2-Dichlorobenzene	0.0574	1	50	0
A	1,2-Dichloroethane	0.074	1	50	0
A	1,2-Dichloroethene, Total	0.169	1	100	0
A	1,2-Dichloropropane	0.0611	1	50	0
A	1,3,5-Trimethylbenzene	0.0609	1	50	0
A	1,3-Dichlorobenzene	0.0473	1	50	0
A	1,3-Dichloropropane	0.0492	1	50	0
A	1,4-Dichlorobenzene	0.0545	1	50	0
A	2,2-Dichloropropane	0.133	1	50	0
A	2-Butanone	0.847	5	50	0
A	2-Chlorotoluene	0.0748	1	50	0
A	2-Hexanone	0.773	5	50	0
A	4-Chlorotoluene	0.0614	1	50	0
A	4-Isopropyltoluene	0.0563	1	50	0
A	4-Methyl-2-pentanone	0.0958	5	50	0
A	Acetone	2.64	5	50	0
A	Acrylonitrile	0.212	5	50	0
A	Benzene	0.0957	1	50	0
A	Bromobenzene	0.062	1	50	0
A	Bromochloromethane	0.135	1	50	0
A	Bromodichloromethane	0.0847	1	50	0
A	Bromoform	0.114	1	50	0
A	Bromomethane	0.153	2	50	0
A	Carbon disulfide	0.122	5	50	0
A	Carbon tetrachloride	0.0749	1	50	0
A	Chlorobenzene	0.0494	1	50	0
A	Chloroethane	0.107	2	50	0
A	Chloroform	0.0718	1	50	0
A	Chloromethane	0.0753	2	50	0
A	cis-1,2-Dichloroethene	0.0826	1	50	0
A	cis-1,3-Dichloropropene	0.0764	1	50	0
A	Dibromochloromethane	0.0824	1	50	0
A	Dibromomethane	0.0966	1	50	0

Test Code: C_8260B_5030B_LL_W_013
Test Number: SW8260B
Test Name: COE Ft Worth VOCs, Low Level by GCMS Method 8260B
Matrix: Water **Units:** µg/L **Updated:** **Expire:**

METHOD DETECTION / REPORTING LIMITS

Type	Analyte	MDL	PQL	UQL	MCL
A	Dichlorodifluoromethane	0.168	1	50	0
A	Ethylbenzene	0.0696	1	50	0
A	Hexachlorobutadiene	0.107	1	50	0
A	Iodomethane	0.126	1	50	0
A	Isopropylbenzene	0.0595	1	50	0
A	m,p-Xylene	0.172	1	100	0
A	Methyl tert-butyl ether	0.0621	1	50	0
A	Methylene chloride	0.0953	1	50	0
A	n-Butylbenzene	0.0817	1	50	0
A	n-Propylbenzene	0.0702	1	50	0
A	Naphthalene	0.116	1	50	0
A	o-Xylene	0.063	1	50	0
A	sec-Butylbenzene	0.072	1	50	0
A	Styrene	0.0512	1	50	0
A	tert-Butylbenzene	0.047	1	50	0
A	Tetrachloroethene	0.0714	1	50	0
A	Toluene	0.0661	1	50	0
A	trans-1,2-Dichloroethene	0.0901	1	50	0
A	trans-1,3-Dichloropropene	0.0651	1	50	0
A	Trichloroethene	0.0838	1	50	0
A	Trichlorofluoromethane	0.178	1	50	0
A	Vinyl acetate	0.324	5	50	0
A	Vinyl chloride	0.133	1	50	0
A	Xylenes, Total	0.172	1	150	0
I	1,4-Dichlorobenzene-d4	0	0	0	0
I	Chlorobenzene-d5	0	0	0	0
I	Fluorobenzene	0	0	0	0
S	1,2-Dichloroethane-d4	0	0	0	0
S	4-Bromofluorobenzene	0	0	0	0
S	Dibromofluoromethane	0	0	0	0
S	Toluene-d8	0	0	0	0

Ecology and Environment, Inc. **Date:** 03-Apr-02

Test Code: C_8270C_3520C_W_006
Test Number: SW8270C
Test Name: ACE Semivolatile Organics by Method 8270C
Matrix: Water **Units:** µg/L **Updated:** **Expire:**

METHOD DETECTION / REPORTING LIMITS

Type	Analyte	MDL	PQL	UQL	MCL
A	1,2,4-Trichlorobenzene	3.14	10	120	0
A	1,2-Dichlorobenzene	2.73	10	120	0
A	1,3-Dichlorobenzene	2.43	10	120	0
A	1,4-Dichlorobenzene	2.39	10	120	0
A	2,4,5-Trichlorophenol	8.49	50	120	0
A	2,4,6-Trichlorophenol	7.32	10	120	0
A	2,4-Dichlorophenol	6.49	10	120	0
A	2,4-Dimethylphenol	11.6	10	120	0
A	2,4-Dinitrophenol	10.8	50	120	0
A	2,4-Dinitrotoluene	2.88	10	120	0
A	2,6-Dinitrotoluene	2.18	10	120	0
A	2-Chloronaphthalene	2.78	10	120	0
A	2-Chlorophenol	8.02	10	120	0
A	2-Methylnaphthalene	3.33	10	120	0
A	2-Methylphenol	8.26	10	120	0
A	2-Nitroaniline	4.07	50	120	0
A	2-Nitrophenol	7.49	10	120	0
A	3,3′-Dichlorobenzidine	31.6	20	120	0
A	3-Nitroaniline	7.41	50	120	0
A	4,6-Dinitro-2-methylphenol	7.71	50	120	0
A	4-Bromophenyl phenyl ether	4.08	10	120	0
A	4-Chloro-3-methylphenol	8.43	10	120	0
A	4-Chloroaniline	11	10	120	0
A	4-Chlorophenyl phenyl ether	3.08	10	120	0
A	4-Methylphenol	9.26	10	120	0
A	4-Nitroaniline	6.03	50	120	0
A	4-Nitrophenol	7.62	50	120	0
A	Acenaphthene	2.83	10	120	0
A	Acenaphthylene	2.74	10	120	0
A	Anthracene	4.31	10	120	0
A	Benz(a)anthracene	4.65	10	120	0
A	Benzo(a)pyrene	4.71	10	120	0
A	Benzo(b)fluoranthene	4.99	10	120	0
A	Benzo(g,h,i)perylene	4.94	10	120	0
A	Benzo(k)fluoranthene	4.44	10	120	0
A	Benzoic acid	12.3	150	120	0
A	Benzyl alcohol	4.76	10	120	0
A	Bis(2-chloroethoxy)methane	3.34	10	120	0
A	Bis(2-chloroethyl)ether	2.84	10	120	0
A	Bis(2-chloroisopropyl)ether	5.19	10	120	0
A	Bis(2-ethylhexyl)phthalate	11.9	10	120	0
A	Butyl benzyl phthalate	5.13	10	120	0
A	Carbazole	1.85	10	120	0
A	Chrysene	4.44	10	120	0
A	Di-n-butyl phthalate	4.75	10	120	0
A	Di-n-octyl phthalate	5.07	10	120	0

Test Code: C_8270C_3520C_W_006
Test Number: SW8270C
Test Name: ACE Semivolatile Organics by Method 8270C
Matrix: Water **Units:** µg/L **Updated:** **Expire:**

METHOD DETECTION / REPORTING LIMITS

Type	Analyte	MDL	PQL	UQL	MCL
A	Dibenz(a,h)anthracene	4.18	10	120	0
A	Dibenzofuran	2.55	10	120	0
A	Diethyl phthalate	3.06	10	120	0
A	Dimethyl phthalate	3.83	10	120	0
A	Fluoranthene	4.06	10	120	0
A	Fluorene	3.06	10	120	0
A	Hexachlorobenzene	8.15	10	120	0
A	Hexachlorobutadiene	3.46	10	120	0
A	Hexachlorocyclopentadiene	3.53	50	120	0
A	Hexachloroethane	3.59	10	120	0
A	Indeno(1,2,3-cd)pyrene	4.83	10	120	0
A	Isophorone	2.9	10	120	0
A	N-Nitrosodi-n-propylamine	3.25	10	120	0
A	N-Nitrosodimethylamine	3.06	10	120	0
A	N-Nitrosodiphenylamine	4.66	10	120	0
A	Naphthalene	2.71	10	120	0
A	Nitrobenzene	3.76	10	120	0
A	Pentachlorophenol	10.2	50	120	0
A	Phenanthrene	3.84	10	120	0
A	Phenol	8.27	10	120	0
A	Pyrene	4.18	10	120	0
I	1,4-Dichlorobenzene-d4	0	0	0	0
I	Acenaphthene-d10	0	0	0	0
I	Chrysene-d12	0	0	0	0
I	Naphthalene-d8	0	0	0	0
I	Perylene-d12	0	0	0	0
I	Phenanthrene-d10	0	0	0	0
S	2,4,6-Tribromophenol	0	0	0	0
S	2-Fluorobiphenyl	0	0	0	0
S	2-Fluorophenol	0	0	0	0
S	Nitrobenzene-d5	0	0	0	0
S	Phenol-d5	0	0	0	0
S	Terphenyl-d14	0	0	0	0

Ecology and Environment, Inc.

Date: 03-Apr-02

METHOD DETECTION / REPORTING LIMITS

Test Code: 1_8081A_3510C_W
Test Number: SW8081A
Test Name: Pesticides by Method 8081A
Matrix: Water **Units:** µg/L

Updated: 15-Dec-00 **Expire:** 15-Dec-01

Type	Analyte	MDL	PQL	UQL	MCL
A	4,4′-DDD	0.00949	0.09	0	0
A	4,4′-DDE	0.0155	0.1	0	0
A	4,4′-DDT	0.0125	0.1	0	0
A	Aldrin	0.00728	0.07	0	0
A	alpha-BHC	0.00399	0.04	0	0
A	alpha-Chlordane	0.00566	0.06	0	0
A	beta-BHC	0.00526	0.05	0	0
A	delta-BHC	0.0069	0.06	0	0
A	Dieldrin	0.01	0.1	0	0
A	Endosulfan I	0.00556	0.05	0	0
A	Endosulfan II	0.0183	0.18	0	0
A	Endosulfan sulfate	0.039	0.4	0	0
A	Endrin	0.011	0.1	0	0
A	Endrin aldehyde	0.0263	0.3	0	0
A	Endrin ketone	0.0239	0.2	0	0
A	gamma-BHC	0.00446	0.04	0	0
A	gamma-Chlordane	0.00581	0.05	0	0
A	Heptachlor	0.00964	0.1	0	0
A	Heptachlor epoxide	0.00919	0.1	0	0
A	Methoxychlor	0.11	1	0	0
A	Toxaphene	0.316	3	0	0
S	Decachlorobiphenyl	0	0	0	0
S	Tetrachloro-m-xylene	0	0	0	0

Ecology and Environment, Inc.

Date: 03-Apr-02

Test Code: 1_8082_3510C_W
Test Number: SW8082
Test Name: PCBs by Method 8082
Matrix: Water **Units:** µg/L

METHOD DETECTION / REPORTING LIMITS

Updated: 29-Nov-00 **Expire:** 29-Nov-01

Type	Analyte	MDL	PQL	UQL	MCL
A	Aroclor 1016	0.0997	0.5	0	0
A	Aroclor 1221	0.975	1	0	0
A	Aroclor 1232	0.17	0.5	0	0
A	Aroclor 1242	0.09	0.5	0	0
A	Aroclor 1248	0.476	0.5	0	0
A	Aroclor 1254	0.14	0.5	0	0
A	Aroclor 1260	0.325	0.5	0	0
S	Decachlorobiphenyl	0	0	0	0
S	Tetrachloro-m-xylene	0	0	0	0

Ecology and Environment, Inc.

Date: 03-Apr-02

METHOD DETECTION / REPORTING LIMITS

Test Code: 1_8015B_GRO_W
Test Number: SW8015B
Test Name: TPH-Gasoline Range Organics by Method 8015B
Matrix: Water **Units:** mg/L **Updated:** 27-Feb-01 **Expire:** 27-Feb-02

Type	Analyte	MDL	PQL	UQL	MCL
A	Gasoline Range Organics	0.0368	0.1	0	
S	1,2-Dichlorobenzene	0	0	0	0

Ecology and Environment, Inc. **Date:** 03-Apr-02

Test Code: 1_8015B_3520C_DRO_W
Test Number: SW8015B
Test Name: TPH-Diesel Range Organics by Method 8015B

METHOD DETECTION / REPORTING LIMITS

Matrix: Water **Units:** mg/L **Updated:** **Expire:**

Type	Analyte	MDL	PQL	UQL	MCL
A	Diesel Range Organics	0.0964	0.1	0	0
S	o-Terphenyl	0	0	0	0

Date: 03-Apr-02

Test Code: C_8260B_S_005
Test Number: SW8260B
Test Name: VOCs + EDB by Method 8260B
Matrix: Solid **Units:** µg/Kg **Updated:** **Expire:**

METHOD DETECTION / REPORTING LIMITS

Type	Analyte	MDL	PQL	UQL	MCL
A	1,1,1-Trichloroethane	0.901	5	1000	0
A	1,1,2,2-Tetrachloroethane	0.306	5	1000	0
A	1,1,2-Trichloroethane	0.417	5	1000	0
A	1,1-Dichloroethane	0.533	5	1000	0
A	1,1-Dichloroethene	0.495	5	1000	0
A	1,2-Dibromoethane	0.217	5	1000	0
A	1,2-Dichlorobenzene	0.264	5	1000	0
A	1,2-Dichloroethane	0.196	5	1000	0
A	1,2-Dichloroethene, Total	1.17	5	2000	0
A	1,2-Dichloropropane	0.311	5	1000	0
A	1,3-Dichlorobenzene	0.194	5	1000	0
A	1,4-Dichlorobenzene	0.296	5	1000	0
A	2-Butanone	0.964	10	1000	0
A	2-Chloroethyl vinyl ether	0.942	10	1000	0
A	2-Hexanone	1.71	10	1000	0
A	4-Methyl-2-pentanone	0.245	10	1000	0
A	Acetone	3.75	10	1000	0
A	Benzene	0.596	5	1000	0
A	Bromodichloromethane	0.262	5	1000	0
A	Bromoform	0.659	5	1000	0
A	Bromomethane	3.51	10	1000	0
A	Carbon disulfide	0.893	5	1000	0
A	Carbon tetrachloride	1.09	5	1000	0
A	Chlorobenzene	0.548	5	1000	0
A	Chloroethane	1.11	10	1000	0
A	Chloroform	0.229	5	1000	0
A	Chloromethane	0.866	10	1000	0
A	cis-1,2-Dichloroethene	0.256	5	1000	0
A	cis-1,3-Dichloropropene	0.237	5	1000	0
A	Dibromochloromethane	0.832	5	1000	0
A	Ethylbenzene	0.637	5	1000	0
A	m,p-Xylene	0.625	5	2000	0
A	Methylene chloride	0.346	5	1000	0
A	o-Xylene	0.515	5	1000	0
A	Styrene	0.515	5	1000	0
A	Tetrachloroethene	0.881	5	1000	0
A	Toluene	0.564	5	1000	0
A	trans-1,2-Dichloroethene	0.297	5	1000	0
A	trans-1,3-Dichloropropene	0.219	5	1000	0
A	Trichloroethene	0.863	5	1000	0
A	Trichlorofluoromethane	1.2	5	1000	0
A	Vinyl acetate	0.49	10	1000	0
A	Vinyl chloride	0.938	10	1000	0
A	Xylenes, Total	0.625	5	3000	0
I	1,4-Dichlorobenzene-d4	0	0	0	0
I	Chlorobenzene-d5	0	0	0	0

Test Code: C_8260B_S_005
Test Number: SW8260B
Test Name: VOCs + EDB by Method 8260B

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** µg/Kg **Updated:** **Expire:**

Type	Analyte	MDL	PQL	UQL	MCL
I	Fluorobenzene	0	0	0	0
S	1,2-Dichloroethane-d4	0	0	0	0
S	4-Bromofluorobenzene	0	0	0	0
S	Dibromofluoromethane	0	0	0	0
S	Toluene-d8	0	0	0	0

Ecology and Environment, Inc.

Date: 03-Apr-02

METHOD DETECTION / REPORTING LIMITS

Test Code: C_8270C_3550B_S_006
Test Number: SW8270C
Test Name: ACE Semivolatile Organics by Method 8270C
Matrix: Solid **Units:** µg/Kg **Updated:** **Expire:**

Type	Analyte	MDL	PQL	UQL	MCL
A	1,2,4-Trichlorobenzene	47	330	120	0
A	1,2-Dichlorobenzene	31.6	330	120	0
A	1,3-Dichlorobenzene	36.4	330	120	0
A	1,4-Dichlorobenzene	32.6	330	120	0
A	2,4,5-Trichlorophenol	74.1	830	120	0
A	2,4,6-Trichlorophenol	55.4	330	120	0
A	2,4-Dichlorophenol	59.5	330	120	0
A	2,4-Dimethylphenol	107	330	120	0
A	2,4-Dinitrophenol	103	330	120	0
A	2,4-Dinitrotoluene	43.9	330	120	0
A	2,6-Dinitrotoluene	72.9	330	120	0
A	2-Chloronaphthalene	50	330	120	0
A	2-Chlorophenol	56	330	120	0
A	2-Methylnaphthalene	54	330	120	0
A	2-Methylphenol	77.5	330	120	0
A	2-Nitroaniline	62.6	830	120	0
A	2-Nitrophenol	64.5	330	120	0
A	3,3´-Dichlorobenzidine	349	660	120	0
A	3-Nitroaniline	184	830	120	0
A	4,6-Dinitro-2-methylphenol	90.9	830	120	0
A	4-Bromophenyl phenyl ether	51.7	330	120	0
A	4-Chloro-3-methylphenol	79.1	330	120	0
A	4-Chloroaniline	118	330	120	0
A	4-Chlorophenyl phenyl ether	46.1	330	120	0
A	4-Methylphenol	95.5	330	120	0
A	4-Nitroaniline	204	830	120	0
A	4-Nitrophenol	127	830	120	0
A	Acenaphthene	32.4	330	120	0
A	Acenaphthylene	48.7	330	120	0
A	Anthracene	28.4	330	120	0
A	Benz(a)anthracene	24.5	330	120	0
A	Benzo(a)pyrene	25.5	330	120	0
A	Benzo(b)fluoranthene	50.9	330	120	0
A	Benzo(g,h,i)perylene	32.7	330	120	0
A	Benzo(k)fluoranthene	45.5	330	120	0
A	Benzoic acid	170	830	120	0
A	Benzyl alcohol	81.7	330	120	0
A	Bis(2-chloroethoxy)methane	44.9	330	120	0
A	Bis(2-chloroethyl)ether	43.7	330	120	0
A	Bis(2-chloroisopropyl)ether	74.9	330	120	0
A	Bis(2-ethylhexyl)phthalate	46.8	330	120	0
A	Butyl benzyl phthalate	149	330	120	0
A	Carbazole	52.5	330	120	0
A	Chrysene	27.4	330	120	0
A	Di-n-butyl phthalate	39.5	330	120	0
A	Di-n-octyl phthalate	47	330	120	0

Test Code:	C_8270C_3550B_S_006		
Test Number:	SW8270C		
Test Name:	ACE Semivolatile Organics by Method 8270C		
Matrix:	Solid	**Units:** µg/Kg	**Updated:**

Expire:

METHOD DETECTION / REPORTING LIMITS

Type	Analyte	MDL	PQL	UQL	MCL
A	Dibenz(a,h)anthracene	37.5	330	120	0
A	Dibenzofuran	42.7	330	120	0
A	Diethyl phthalate	48.5	330	120	0
A	Dimethyl phthalate	44	330	120	0
A	Fluoranthene	23.9	330	120	0
A	Fluorene	30.8	330	120	0
A	Hexachlorobenzene	58.6	330	120	0
A	Hexachlorobutadiene	52.1	330	120	0
A	Hexachlorocyclopentadiene	43	830	120	0
A	Hexachloroethane	42.9	330	120	0
A	Indeno(1,2,3-cd)pyrene	33.6	330	120	0
A	Isophorone	47.7	330	120	0
A	N-Nitrosodi-n-propylamine	41.9	330	120	0
A	N-Nitrosodimethylamine	59.5	330	120	0
A	N-Nitrosodiphenylamine	52.5	330	120	0
A	Naphthalene	31	330	120	0
A	Nitrobenzene	36.9	330	120	0
A	Pentachlorophenol	95.4	830	120	0
A	Phenanthrene	31.6	330	120	0
A	Phenol	58.2	330	120	0
A	Pyrene	34.5	330	120	0
I	1,4-Dichlorobenzene-d4	0	0	0	0
I	Acenaphthene-d10	0	0	0	0
I	Chrysene-d12	0	0	0	0
I	Naphthalene-d8	0	0	0	0
I	Perylene-d12	0	0	0	0
I	Phenanthrene-d10	0	0	0	0
S	2,4,6-Tribromophenol	0	0	0	0
S	2-Fluorobiphenyl	0	0	0	0
S	2-Fluorophenol	0	0	0	0
S	Nitrobenzene-d5	0	0	0	0
S	Phenol-d5	0	0	0	0
S	Terphenyl-d14	0	0	0	0

Ecology and Environment, Inc. **Date:** 03-Apr-02

METHOD DETECTION / REPORTING LIMITS

Test Code: 1_8081A_3550B_S
Test Number: SW8081A
Test Name: Pesticides by Method 8081A
Matrix: Solid **Units:** µg/Kg **Updated:** 16-Dec-00 **Expire:** 16-Dec-01

Type	Analyte	MDL	PQL	UQL	MCL
A	4,4´-DDD	0.353	3	0	0
A	4,4´-DDE	0.334	3	0	0
A	4,4´-DDT	0.448	4	0	0
A	Aldrin	0.443	4	0	0
A	alpha-BHC	0.279	3	0	0
A	alpha-Chlordane	0.14	1	0	0
A	beta-BHC	0.398	4	0	0
A	delta-BHC	0.248	2	0	0
A	Dieldrin	1.27	5	0	0
A	Endosulfan I	0.49	5	0	0
A	Endosulfan II	0.324	3	0	0
A	Endosulfan sulfate	0.663	6	0	0
A	Endrin	0.372	4	0	0
A	Endrin aldehyde	0.982	10	0	0
A	Endrin ketone	0.357	3	0	0
A	gamma-BHC	0.179	2	0	0
A	gamma-Chlordane	0.187	2	0	0
A	Heptachlor	0.313	3	0	0
A	Heptachlor epoxide	0.556	5	0	0
A	Methoxychlor	3.93	40	0	0
A	Toxaphene	23.4	100	0	0
S	Decachlorobiphenyl	0	0	0	0
S	Tetrachloro-m-xylene	0	0	0	0

Test Code:	1_8082_3550B_S
Test Number:	SW8082
Test Name:	PCBs by Method 8082

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** µg/Kg **Updated:** 19-Oct-00 **Expire:** 19-Oct-01

Type	Analyte	MDL	PQL	UQL	MCL
A	Aroclor 1016	3.88	20	1	0
A	Aroclor 1221	14.8	40	1	0
A	Aroclor 1232	12.9	20	1	0
A	Aroclor 1242	14.6	20	1	0
A	Aroclor 1248	10.5	20	1	0
A	Aroclor 1254	16.6	20	1	0
A	Aroclor 1260	6.66	20	1	0
S	Decachlorobiphenyl	0	0	0	0
S	Tetrachloro-m-xylene	0	0	0	0

Ecology and Environment, Inc.

Date: 03-Apr-02

METHOD DETECTION / REPORTING LIMITS

Test Code: 1_8015B_GRO_S
Test Number: SW8015B
Test Name: TPH-Gasoline Range Organics by Method 8015B
Matrix: Solid **Units:** mg/Kg **Updated:** 28-Feb-01 **Expire:** 28-Feb-02

Type	Analyte	MDL	PQL	UQL	MCL
A	Gasoline Range Organics	1.53	7.1	0	
S	1,2-Dichlorobenzene	0	0	0	

Ecology and Environment, Inc.

Date: 03-Apr-02

Test Code: 1_8015B_DRO_S
Test Number: SW8015B
Test Name: TPH-Diesel Range Organics by Method 8015B
Matrix: Solid **Units:** mg/Kg **Updated:** 28-Jun-00 **Expire:** 28-Jun-01

METHOD DETECTION / REPORTING LIMITS

Type	Analyte	MDL	PQL	UQL	MCL
A	Diesel Range Organics	3.22	4	0	0
S	o-Terphenyl	0	0	0	0

METHOD DETECTION / REPORTING LIMITS

Test Code: 1_6010B_TAL_S
Test Number: SW6010B
Test Name: Metals, TAL by ICP Method 6010B
Matrix: Solid **Units:** mg/Kg **Updated:** 10-Feb-00 **Expire:** 09-Feb-01

Type	Analyte	MDL	PQL	UQL	MCL
A	Aluminum	1.2	10	500000	
A	Antimony	0.3	1	100000	
A	Arsenic	0.3	1	25000	
A	Barium	0.2	2	25000	
A	Beryllium	0.1	0.5	50000	
A	Cadmium	0.1	0.5	10000	
A	Calcium	16.8	50	500000	
A	Chromium	0.3	1	25000	
A	Cobalt	0.1	2	50000	
A	Copper	0.9	2	50000	
A	Iron	2.9	5	200000	
A	Lead	0.3	0.5	100000	
A	Magnesium	5	50	500000	
A	Manganese	0.2	1	10000	
A	Nickel	0.5	2	50000	
A	Potassium	4.5	100	500000	
A	Selenium	0.8	1	25000	
A	Silver	0.2	1	5000	
A	Sodium	29.1	100	500000	
A	Thallium	0.4	1	50000	
A	Vanadium	0.3	2	50000	
A	Zinc	0.9	1	10000	

METHOD DETECTION / REPORTING LIMITS

Test Code: 1_7471A_HG_S
Test Number: SW7471A
Test Name: Mercury Analysis in Soil by Method 7471A
Matrix: Soil **Units:** mg/Kg **Updated:** 15-Nov-00 **Expire:** 15-Nov-01

Type	Analyte	MDL	PQL	UQL	MCL
A	Mercury	0.00701	0.05		

Date: 03-Apr-02

Test Code: 1_6010B_TAL_W
Test Number: SW6010B
Test Name: Metals, TAL by ICP Method 6010B
Matrix: Water **Units:** µg/L

METHOD DETECTION / REPORTING LIMITS

Updated: 17-Apr-01 **Expire:** 17-Apr-02

Type	Analyte	MDL	PQL	UQL	MCL
A	Aluminum	56.3	200	400000	
A	Antimony	2.5	10	100000	
A	Arsenic	7.6	25	10000	
A	Barium	6	20	25000	
A	Beryllium	1.3	5	6000	
A	Cadmium	1.5	5	10000	
A	Calcium	279	1500	500000	
A	Chromium	3.2	10	25000	
A	Cobalt	3	20	25000	
A	Copper	3.8	20	50000	
A	Iron	52.5	200	400000	
A	Lead	2.9	5	100000	
A	Magnesium	190	1500	500000	
A	Manganese	2.7	10	10000	
A	Nickel	3.6	20	25000	
A	Potassium	17.9	1500	500000	
A	Selenium	6.9	20	50000	
A	Silver	2.1	10	10000	
A	Sodium	391	1500	500000	
A	Thallium	6.9	20	50000	
A	Vanadium	2.9	20	10000	
A	Zinc	4.5	10	8000	

Ecology and Environment, Inc. **Date:** 03-Apr-02

Test Code: 1_7470A_HG_W
Test Number: SW7470A
Test Name: Mercury Analysis in Water by Method 7470A
Matrix: Water **Units:** µg/L **Updated:** 04-Aug-00 **Expire:** 04-Aug-01

METHOD DETECTION / REPORTING LIMITS

Type	Analyte	MDL	PQL	UQL	MCL
A	Mercury	0.104	0.4		

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Control Limits for Analytical Methods - Updates

Ecology and Environment, Inc Analytical Services Center Current Control Limits

Test Name	Method Number	Matrix	Sample Type	Analyte	Spike Amount	Units	Low Limit [a]	High Limit
Metals, TAL (PE) by ICP	SW6010B	Solid	LCS	Aluminum	100	mg/Kg	80	120
			LCS	Antimony	100	mg/Kg	80	120
			LCS	Arsenic	100	mg/Kg	80	120
			LCS	Barium	100	mg/Kg	80	120
			LCS	Beryllium	100	mg/Kg	80	120
			LCS	Cadmium	100	mg/Kg	80	120
			LCS	Chromium	100	mg/Kg	80	120
			LCS	Cobalt	100	mg/Kg	80	120
			LCS	Copper	100	mg/Kg	80	120
			LCS	Lead	100	mg/Kg	80	120
			LCS	Manganese	100	mg/Kg	80	120
			LCS	Nickel	100	mg/Kg	80	120
			LCS	Selenium	100	mg/Kg	80	120
			LCS	Silver	5	mg/Kg	80	120
			LCS	Thallium	100	mg/Kg	80	120
			LCS	Vanadium	100	mg/Kg	80	120
			LCS	Zinc	100	mg/Kg	80	120
Metals, TAL Cations (JY) by ICP	SW6010B	Solid	LCS	Calcium	10000	mg/Kg	80	120
			LCS	Iron	1000	mg/Kg	80	120
			LCS	Magnesium	10000	mg/Kg	80	120
			LCS	Potassium	10000	mg/Kg	80	120
			LCS	Sodium	10000	mg/Kg	80	120
Mercury Analysis	SW7471A	Solid	LCS	Mercury	1	mg/Kg	61	139
Cyanide, Total	SW9012A	Solid	LCS	Cyanide	0.2	mg/Kg	75	123

Ecology and Environment, Inc Analytical Services Center Current Control Limits

Test Name	Method Number	Matrix	Sample Type	Analyte	Spike Amount	Units	Low Limit [a]	High Limit
Pesticides	SW8081A	Solid	LCS	4,4´-DDD	3.33	µg/Kg	73	119
			LCS	4,4´-DDE	3.33	µg/Kg	74	124
			LCS	4,4´-DDT	3.33	µg/Kg	67	140
			LCS	Aldrin	3.33	µg/Kg	67	152
			LCS	alpha-BHC	3.33	µg/Kg	65	134
			LCS	beta-BHC	3.33	µg/Kg	48	135
			LCS	delta-BHC	3.33	µg/Kg	44	144
			LCS	Dieldrin	3.33	µg/Kg	63	149
			LCS	Endosulfan I	3.33	µg/Kg	65	127
			LCS	Endosulfan II	3.33	µg/Kg	54	132
			LCS	Endosulfan sulfate	3.33	µg/Kg	69	130
			LCS	Endrin	3.33	µg/Kg	67	142
			LCS	Endrin aldehyde	3.33	µg/Kg	15	142
			LCS	gamma-BHC	3.33	µg/Kg	71	135
			LCS	Heptachlor	3.33	µg/Kg	75	143
			LCS	Heptachlor epoxide	3.33	µg/Kg	54	132
			LCS	Methoxychlor	3.33	µg/Kg	74	147
			Surrogate	Decachlorobiphenyl	6.67	µg/Kg	39	135
			Surrogate	Tetrachloro-m-xylene	6.67	µg/Kg	47	140
PCBs	SW8082	Solid	LCS	Aroclor 1016	167	µg/Kg	59	119
			LCS	Aroclor 1260	167	µg/Kg	50	150
			Surrogate	Decachlorobiphenyl	6.67	µg/Kg	52	115
			Surrogate	Tetrachloro-m-xylene	6.67	µg/Kg	39	125
Semivolatile Organics	SW8270C	Solid	LCS	1,2,4-Trichlorobenzene	1667	µg/Kg	39	110
			LCS	1,4-Dichlorobenzene	1667	µg/Kg	33	108
			LCS	2,4-Dinitrotoluene	1667	µg/Kg	46	111
			LCS	2-Chlorophenol	2000	µg/Kg	48	121
			LCS	4-Chloro-3-methylphenol	2000	µg/Kg	52	118
			LCS	4-Nitrophenol	2000	µg/Kg	54	124
			LCS	Acenaphthene	1667	µg/Kg	39	111
			LCS	N-Nitrosodi-n-propylamine	1667	µg/Kg	34	107
			LCS	Pentachlorophenol	2000	µg/Kg	52	116
			LCS	Phenol	2000	µg/Kg	43	125
			LCS	Pyrene	1667	µg/Kg	26	96
			Surrogate	2,4,6-Tribromophenol	2000	µg/Kg	32	130
			Surrogate	2-Fluorobiphenyl	1667	µg/Kg	27	123
			Surrogate	2-Fluorophenol	2000	µg/Kg	36	135
			Surrogate	Nitrobenzene-d5	1667	µg/Kg	25	122
			Surrogate	Phenol-d5	2000	µg/Kg	36	128
			Surrogate	Terphenyl-d14	1667	µg/Kg	51	116

Ecology and Environment, Inc Analytical Services Center Current Control Limits

Test Name	Method Number	Matrix	Sample Type	Analyte	Spike Amount	Units	Low Limit [a]	High Limit
Volatile Organic Compounds	SW8260B	Solid	LCS	1,1,1-Trichloroethane	50	µg/Kg	61	133
			LCS	1,1,2,2-Tetrachloroethane	50	µg/Kg	62	135
			LCS	1,1,2-Trichloroethane	50	µg/Kg	77	117
			LCS	1,1-Dichloroethane	50	µg/Kg	68	132
			LCS	1,1-Dichloroethene	50	µg/Kg	70	131
			LCS	1,2-Dichloroethane	50	µg/Kg	71	121
			LCS	1,2-Dichloropropane	50	µg/Kg	71	127
			LCS	2-Butanone	50	µg/Kg	62	146
			LCS	2-Hexanone	50	µg/Kg	45	148
			LCS	4-Methyl-2-pentanone	50	µg/Kg	56	141
			LCS	Acetone	50	µg/Kg	31	153
			LCS	Benzene	50	µg/Kg	82	120
			LCS	Bromodichloromethane	50	µg/Kg	77	118
			LCS	Bromoform	50	µg/Kg	74	131
			LCS	Bromomethane	50	µg/Kg	72	134
			LCS	Carbon disulfide	50	µg/Kg	68	128
			LCS	Carbon tetrachloride	50	µg/Kg	62	131
			LCS	Chlorobenzene	50	µg/Kg	84	115
			LCS	Chloroethane	50	µg/Kg	71	145
			LCS	Chloroform	50	µg/Kg	74	120
			LCS	Chloromethane	50	µg/Kg	55	135
			LCS	cis-1,2-Dichloroethene	50	µg/Kg	71	131
			LCS	cis-1,3-Dichloropropene	50	µg/Kg	78	125
			LCS	Dibromochloromethane	50	µg/Kg	77	123
			LCS	Ethylbenzene	50	µg/Kg	80	117
			LCS	m,p-Xylene	100	µg/Kg	70	130
			LCS	Methylene chloride	50	µg/Kg	63	132
			LCS	o-Xylene	50	µg/Kg	80	111
			LCS	Styrene	50	µg/Kg	79	117
			LCS	Tetrachloroethene	50	µg/Kg	57	128
			LCS	Toluene	50	µg/Kg	80	119
			LCS	trans-1,2-Dichloroethene	50	µg/Kg	70	129
			LCS	trans-1,3-Dichloropropene	50	µg/Kg	77	132
			LCS	Trichloroethene	50	µg/Kg	75	120
			LCS	Vinyl chloride	50	µg/Kg	63	139
			MS/MSD	1,1-Dichloroethene	50	µg/Kg	70	131
			MS/MSD	Benzene	50	µg/Kg	82	120
			MS/MSD	Chlorobenzene	50	µg/Kg	84	115
			MS/MSD	Toluene	50	µg/Kg	80	119
			MS/MSD	Trichloroethene	50	µg/Kg	75	120

Ecology and Environment, Inc Analytical Services Center Current Control Limits

Test Name	Method Number	Matrix	Sample Type	Analyte	Spike Amount	Units	Low Limit [a]	High Limit
Volatile Organic Compounds	SW8260B	Solid	Surrogate	1,2-Dichloroethane-d4	50	µg/Kg	77	119
			Surrogate	4-Bromofluorobenzene	50	µg/Kg	88	124
			Surrogate	Dibromofluoromethane	50	µg/Kg	83	117
			Surrogate	Toluene-d8	50	µg/Kg	84	119
Nitroaromatics and Nitroamines	SW8330	Solid	LCS	1,3,5-Trinitrobenzene	8	mg/Kg	48	130
			LCS	1,3-Dinitrobenzene	8	mg/Kg	73	107
			LCS	2,4,6-Trinitrotoluene	8	mg/Kg	69	137
			LCS	2,4-Dinitrotoluene	8	mg/Kg	71	135
			LCS	2,6-Dinitrotoluene	8	mg/Kg	67	137
			LCS	2-Amino-4,6-dinitrotoluene	8	mg/Kg	55	149
			LCS	2-Nitrotoluene	8	mg/Kg	66	138
			LCS	3-Nitrotoluene	8	mg/Kg	69	117
			LCS	4-Amino-2,6-dinitrotoluene	8	mg/Kg	39	160
			LCS	4-Nitrotoluene	8	mg/Kg	71	114
			LCS	HMX	8	mg/Kg	59	100
			LCS	Nitrobenzene	8	mg/Kg	74	118
			LCS	RDX	8	mg/Kg	71	117
			LCS	Tetryl	8	mg/Kg	40	160
			Surrogate	3,4-Dinitrotoluene	8	mg/Kg	55	135
Total Organic Carbon	Lloyd Kahn	Solid	LCS	Total Organic Carbon	400000	mg/Kg	71	125
Metals, TAL (PE) by ICP	SW6010B	Water	LCS	Aluminum	1000	µg/L	85	115
			LCS	Antimony	1000	µg/L	85	115
			LCS	Arsenic	1000	µg/L	85	115
			LCS	Barium	1000	µg/L	85	115
			LCS	Beryllium	1000	µg/L	85	115
			LCS	Cadmium	1000	µg/L	85	115
			LCS	Chromium	1000	µg/L	85	115
			LCS	Cobalt	1000	µg/L	85	115
			LCS	Copper	1000	µg/L	85	115
			LCS	Lead	1000	µg/L	85	115
			LCS	Manganese	1000	µg/L	85	115
			LCS	Nickel	1000	µg/L	85	115
			LCS	Selenium	1000	µg/L	85	115
			LCS	Silver	50	µg/L	85	115
			LCS	Thallium	1000	µg/L	85	115
			LCS	Vanadium	1000	µg/L	85	115
			LCS	Zinc	1000	µg/L	85	115

Ecology and Environment, Inc Analytical Services Center Current Control Limits

Test Name	Method Number	Matrix	Sample Type	Analyte	Spike Amount	Units	Low Limit [a]	High Limit
Metals, TAL Cations (JY)	SW6010B	Water	LCS	Calcium	10000	µg/L	84	119
			LCS	Iron	1000	µg/L	85	115
			LCS	Magnesium	10000	µg/L	87	115
			LCS	Potassium	10000	µg/L	77	111
			LCS	Sodium	10000	µg/L	86	109
Mercury Analysis	SW7470	Water	LCS	Mercury	5	µg/L	85	115
Pesticides	SW8081A	Water	LCS	4,4´-DDD	0.1	µg/L	64	133
			LCS	4,4´-DDE	0.1	µg/L	49	143
			LCS	4,4´-DDT	0.1	µg/L	61	148
			LCS	Aldrin	0.1	µg/L	22	168
			LCS	alpha-BHC	0.1	µg/L	51	130
			LCS	beta-BHC	0.1	µg/L	58	127
			LCS	delta-BHC	0.1	µg/L	10	146
			LCS	Dieldrin	0.1	µg/L	55	165
			LCS	Endosulfan I	0.1	µg/L	62	114
			LCS	Endosulfan II	0.1	µg/L	48	128
			LCS	Endosulfan sulfate	0.1	µg/L	54	126
			LCS	Endrin	0.1	µg/L	56	161
			LCS	Endrin aldehyde	0.1	µg/L	33	129
			LCS	Endrin ketone	0.1	µg/L	47	118
			LCS	gamma-BHC	0.1	µg/L	56	144
			LCS	Heptachlor	0.1	µg/L	44	155
			LCS	Heptachlor epoxide	0.1	µg/L	46	127
			LCS	Methoxychlor	1	µg/L	67	135
			Surrogate	Decachlorobiphenyl	0.2	µg/L	12	132
			Surrogate	Tetrachloro-m-xylene	0.2	µg/L	31	122
PCBs	SW8082	Water	LCS	Aroclor 1016	5	µg/L	50	124
			LCS	Aroclor 1260	5	µg/L	52	127
			Surrogate	Decachlorobiphenyl	0.2	µg/L	18	112
			Surrogate	Tetrachloro-m-xylene	0.2	µg/L	32	110

Ecology and Environment, Inc Analytical Services Center Current Control Limits

Test Name	Method Number	Matrix	Sample Type	Analyte	Spike Amount	Units	Low Limit [a]	High Limit
VOCs	SW8260B	Water	LCS	1,1,1-Trichloroethane	50	µg/L	84	133
			LCS	1,1,2,2-Tetrachloroethane	50	µg/L	52	163
			LCS	1,1,2-Trichloroethane	50	µg/L	70	142
			LCS	1,1-Dichloroethane	50	µg/L	78	134
			LCS	1,1-Dichloroethene	50	µg/L	61	135
			LCS	1,2-Dichloroethane	50	µg/L	80	134
			LCS	1,2-Dichloropropane	50	µg/L	77	141
			LCS	2-Butanone	50	µg/L	46	169
			LCS	2-Hexanone	50	µg/L	45	168
			LCS	4-Methyl-2-pentanone	50	µg/L	49	165
			LCS	Acetone	50	µg/L	35	172
			LCS	Benzene	50	µg/L	82	131
			LCS	Bromodichloromethane	50	µg/L	82	137
			LCS	Bromoform	50	µg/L	71	145
			LCS	Bromomethane	50	µg/L	52	152
			LCS	Carbon disulfide	50	µg/L	61	140
			LCS	Carbon tetrachloride	50	µg/L	81	132
			LCS	Chlorobenzene	50	µg/L	77	128
			LCS	Chloroethane	50	µg/L	66	145
			LCS	Chloroform	50	µg/L	81	130
			LCS	Chloromethane	50	µg/L	25	174
			LCS	cis-1,2-Dichloroethene	50	µg/L	84	134
			LCS	cis-1,3-Dichloropropene	50	µg/L	81	142
			LCS	Dibromochloromethane	50	µg/L	82	133
			LCS	Ethylbenzene	50	µg/L	81	129
			LCS	m,p-Xylene	100	µg/L	70	130
			LCS	Methylene chloride	50	µg/L	72	132
			LCS	o-Xylene	50	µg/L	80	127
			LCS	Styrene	50	µg/L	83	130
			LCS	Tetrachloroethene	50	µg/L	76	127
			LCS	Toluene	50	µg/L	80	125
			LCS	trans-1,2-Dichloroethene	50	µg/L	72	131
			LCS	trans-1,3-Dichloropropene	50	µg/L	78	154
			LCS	Trichloroethene	50	µg/L	82	120
			LCS	Vinyl chloride	50	µg/L	43	159
			MS/MSD	1,1-Dichloroethene	50	µg/L	61	135
			MS/MSD	Benzene	50	µg/L	82	131
			MS/MSD	Chlorobenzene	50	µg/L	77	128
			MS/MSD	Toluene	50	µg/L	80	125
			MS/MSD	Trichloroethene	50	µg/L	82	120

Ecology and Environment, Inc Analytical Services Center Current Control Limits

Test Name	Method Number	Matrix	Sample Type	Analyte	Spike Amount	Units	Low Limit [a]	High Limit
VOCs	SW8260B	Water	Surrogate	1,2-Dichloroethane-d4	50	µg/L	82	124
			Surrogate	4-Bromofluorobenzene	50	µg/L	87	115
			Surrogate	Dibromofluoromethane	50	µg/L	89	119
			Surrogate	Toluene-d8	50	µg/L	85	115
Semivolatile Organics	SW8270C	Water	LCS	1,2,4-Trichlorobenzene	100	µg/L	22	108
			LCS	1,4-Dichlorobenzene	100	µg/L	17	115
			LCS	2,4-Dinitrotoluene	100	µg/L	40	121
			LCS	2-Chlorophenol	120	µg/L	25	125
			LCS	4-Chloro-3-methylphenol	120	µg/L	48	122
			LCS	4-Nitrophenol	120	µg/L	10	115
			LCS	Acenaphthene	100	µg/L	26	125
			LCS	Acenaphthylene	100	µg/L	56	90
			LCS	Anthracene	100	µg/L	59	104
			LCS	N-Nitrosodi-n-propylamine	100	µg/L	20	129
			LCS	Pentachlorophenol	120	µg/L	31	139
			LCS	Phenol	120	µg/L	10	115
			LCS	Pyrene	100	µg/L	29	117
			Surrogate	2,4,6-Tribromophenol	120	µg/L	40	153
			Surrogate	2-Fluorobiphenyl	100	µg/L	39	116
			Surrogate	2-Fluorophenol	120	µg/L	10	125
			Surrogate	Nitrobenzene-d5	100	µg/L	33	117
			Surrogate	Phenol-d5	120	µg/L	10	125
			Surrogate	Terphenyl-d14	100	µg/L	27	135
Nitroaromatics and Nitroamines	SW8330	Water	LCS	1,3,5-Trinitrobenzene	10.4	µg/L	59	110
			LCS	1,3-Dinitrobenzene	10.4	µg/L	70	130
			LCS	2,4,6-Trinitrotoluene	10.4	µg/L	80	111
			LCS	2,4-Dinitrotoluene	10.4	µg/L	56	131
			LCS	2,6-Dinitrotoluene	10.4	µg/L	85	110
			LCS	2-Amino-4,6-dinitrotoluene	10.4	µg/L	80	108
			LCS	2-Nitrotoluene	10.4	µg/L	73	113
			LCS	3-Nitrotoluene	10.4	µg/L	70	130
			LCS	4-Amino-2,6-dinitrotoluene	10.4	µg/L	70	130
			LCS	4-Nitrotoluene	10.4	µg/L	70	130
			LCS	HMX	10.4	µg/L	70	130
			LCS	Nitrobenzene	10.4	µg/L	67	95
			LCS	RDX	10.4	µg/L	76	97
			LCS	Tetryl	10.4	µg/L	50	150
			Surrogate	3,4-Dinitrotoluene	10.4	µg/L	47	143
Cyanide, Total	SW9012A	Water	LCS	Cyanide	0.2	mg/L	75	123

Ecology and Environment, Inc Analytical Services Center Current Control Limits

Test Name	Method Number	Matrix	Sample Type	Analyte	Spike Amount	Units	Low Limit [a]	High Limit
Total Recoverable Petroluem Hydrocarbons	EPA 418.1	Water	LCS	Total Recoverable Petroluem Hydrocarbons	194	mg/L	81	119
Total Recoverable Petroluem Hydrocarbons	EPA 418.1M	Soil	LCS	Total Recoverable Petroluem Hydrocarbons	1.94	mg/Kg	70	127
Hardness, Total	EPA 130.2	Water	LCS	Hardness	100	mg/L	90	110
Notes:								
[a] Limits apply to percent recovery								

C Site-specific Quality Control Plan

1 Introduction

1.1 Purpose and Scope

Ecology and Environment, Inc. (E & E), under contract to the United States Army Corps of Engineers (USACE), Kansas City District, Contract DACW41-99-D-0005, Work Authorization Directive (WAD) 10, was tasked to perform additional sampling and remedial actions at Other Miscellaneous Environmental Factors site 305 (OTH-305), Panamerican Consultants Inc. Site 20 (PCI Site 20), Building 211-Pipe Vault, and Area of Interest (AOI) 473-Building 112 Room 10 at the former Griffiss Air Force Base (AFB) in Rome, New York. The specific scope of work (SOW) is defined in Section 1 of the Field Sampling Plan (FSP). This site-specific quality control plan (QCP), in conjunction with the overall QCP (E & E 1999), defines the quality control (QC) practices applicable to the work performed under WAD 10 at the former Griffiss AFB. All work shall be conducted in accordance with these plans. Table C-1 presents a summary of the site-specific Quality Objectives, Standards, and Criteria for the ESI field activities, and Table C-2 presents a summary of the Field Data Documentation Quality Objectives and Standards.

Table C-1

QUALITY OBJECTIVES, STANDARDS, AND CRITERIA FOR FIELD ACTIVITIES

Field Activity	Quality Objectives	Standards[a]	Acceptability/ Performance Criteria[b]	Applicable QC Documentation
Subsurface Logging	To provide a description of the subsurface soils that is consistent and accurate, and to record drilling and sampling procedures and well construction details.	• Work Plan • USACE Engineering Manual EM 1110-1-4000	• Logging conducted in accordance with Standards/Objectives • Accurate, consistent, signed, and legible documentation of: - Subsurface conditions - Sample locations/depths - Water-bearing units - Borehole diameters and depths - Drilling fluid losses - Contamination monitoring results • Unconsolidated materials described according to the Unified Soil Classification System • Rock/soil material described using standard geologic nomenclature	• DQCI Checklist • HTRW Drilling Log • Geotechnical Logbook • Field Logbook • Daily Activity Summary
Near-surface Soil Sampling	To obtain soil samples to allow for the characterization of the shallow subsurface. This will be achieved by collecting soil samples using dedicated sampling equipment where possible.	• Work Plan	• Samples collected in accordance with Standards/Objectives and using dedicated (if possible) or decontaminated equipment • Proper preservation, identification, and handling	• DQCI Checklist • Field Audit Checklist • Field Logbook • Daily Activity Summary
Subsurface Soil Sampling	To obtain representative samples from discrete depths for lithologic description and/or chemical analyses. Samples will be collected at intervals specified in work plan.	• Work Plan	• Samples collected in accordance with Standards/Objectives and using clean/decontaminated equipment • Proper preservation, identification, and handling	• DQCI Checklist • Field Audit Checklist • Field Logbook • Daily Activity Summary
Water Sampling	To collect a sample that is minimally disturbed and represents the natural water conditions. This will be accomplished by using sample jars directly.	• Work Plan	• Samples collected in accordance with Standards/Objectives and using dedicated or decontaminated equipment • Proper preservation, identification, and handling	• DQCI Checklist • Field Audit Checklist • Field Logbook • Daily Activity Summary
Sediment Sampling	To obtain sediment samples representative of the site. To achieve this objective, samples will be minimally disturbed during sample collection.	• Work Plan	• Samples collected in accordance with Standards/Objectives and using dedicated or decontaminated equipment • Proper preservation, identification, and handling	• DQCI Checklist • Field Audit Checklist • Field Logbook • Daily Activity Summary

Table C-1

QUALITY OBJECTIVES, STANDARDS, AND CRITERIA FOR FIELD ACTIVITIES

Field Activity	Quality Objectives	Standards[a]	Acceptability/ Performance Criteria[b]	Applicable QC Documentation
Sample Handling	To provide for sample integrity. To meet this objective, samples will be properly collected, placed in appropriate sample jars, labeled properly, and preserved correctly. Samples will be packaged so that they are not broken and remain preserved (if required) during shipping.	• Work Plan • ERPIMS requirements	• Maintenance of sample integrity via proper containerization, preservation, packaging, transportation, identification, and custody, in accordance with Standards/Objectives	• DQCI Checklist • Field Audit Checklist • Field Logbook • Daily Activity Summary • Chain-of-Custody Record
Decontamination	To provide equipment for the collection of analytical samples that is free of contaminants. To meet this objective, pre-cleaned sample containers and dedicated equipment will be used whenever possible. Non-dedicated sampling equipment will be cleaned prior to and after each use.	• Work Plan	• Maintenance of clean and/or decontaminated sampling equipment in accordance with Standards/Objectives	• DQCI Checklist • Field Audit Checklist • Field Logbook • Daily Activity Summary
Management of Investigation-derived Waste	To ensure that potentially contaminated soil and groundwater are properly handled and disposed of. This will be achieved by drumming only soils and groundwater that exhibit the presence of contamination (e.g., odor, color, instrument readings, etc.) until analytical testing is completed and a determination regarding disposal requirements in accordance with any applicable regulations can be made.	• Work Plan	• Segregation, containerization, characterization, and disposition of project wastes in accordance with Standards/Objectives	• DQCI Checklist • Field Logbook • Daily Activity Summary
Surveying	To relate project work locations (including sample, monitoring well, and test pit locations) to existing Griffiss AFB benchmarks.	• Work Plan • Surveying subcontract	• Relation of sample, well, test pit, geophysical survey grid corner, and soil-gas survey grid corner locations to existing/known benchmarks in accordance with Standards/Objectives • Accurate horizontal coordinates (±0.5 foot) for the above • Accurate vertical elevations (±0.2 foot) for permanent monitoring well and surface water/sediment sampling locations	• DQCI Checklist • Surveyor's Logbook • Field Logbook • Daily Activity Summary

Table C-1

QUALITY OBJECTIVES, STANDARDS, AND CRITERIA FOR FIELD ACTIVITIES

Field Activity	Quality Objectives	Standards[a]	Acceptability/ Performance Criteria[b]	Applicable QC Documentation
Dealing with the Public	To conduct work in a professional manner to prevent adverse public opinion and to direct public inquiries to the appropriate AFBCA/OL-X and USACE personnel.	None	• Public satisfaction with work	• Field Logbook • Daily Activity Summary

[a] Major standards. Refer to the project work plan for full project requirements.
[b] Major or noteworthy acceptability criteria. Refer to the project work plan for full project requirements.

Key:

DQCI = Daily Quality Control Inspection.
USACE = United States Army Corps of Engineers.

Table C-2

FIELD DATA DOCUMENTATION QUALITY OBJECTIVES AND STANDARDS

Document	Related Field Activities	Quality Objectives/Standards for the Documentation
Daily Activity Summary	All	To supply the WAD Manager and USACE Technical Manager with an accurate summary of activities performed each day. Information regarding the work performed, samples collected, visitors to the site, and weather are included. An example of this document is provided in Appendix C.
Field Logbooks	All	To provide written documentation of field activities, including but not limited to daily activities, personnel on site (consultant, subcontractor, agency, and client), problems encountered and results, daily meetings, and safety procedures.
Chain-of-Custody Records	Sampling Sample handling	To provide a legal record of sample collection, transfer of samples, shipping of samples, and receipt by the analytical laboratory. The COC is initiated at the time of sample collection and remains with the sample at all times. A copy of this document is provided in Appendix C.
Daily Safety Meeting Record	All	To ensure that field team and subcontractor personnel are made aware of any safety concerns for activities planned for that day. Topics to be presented at the meeting may include chemical and physical hazards, radiation hazards (if applicable), review of previous monitoring results, any procedure or protective equipment modifications, special equipment procedures, drilling safety issues, emergency procedures, and attendee signatures. A copy of this document is provided in Appendix C.