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REMEDIAL INVESTIGATION FEASIBILITY STUDY SAMPLING AND ANALYSIS PLAN FOR OUTLYING LANDING FIELD BARIN VOLUME 2 OF 3 PART B CONTINUED NAS WHITING FIELD FL

4/1/1993

ABB ENVIRONMENTAL

FINAL DRAFT

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY WORKPLAN

OUTLYING LANDING FIELD (OLF) BARIN
FOLEY, ALABAMA

VOLUME II PART B: QUALITY ASSURANCE PROJECT PLAN

CTO: 031

Navy CLEAN - District I

Contract No. N62467-89-D-0317

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August 1992

FINAL DRAFT

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY WORKPLAN

VOLUME II PART B: QUALITY ASSURANCE PROJECT PLAN

OUTLYING LANDING FIELD (OLF) BARIN
FOLEY, ALABAMA

APPROVED FOR:

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OLF Barin, Foley Alabama

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GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
ADEM	Alabama Department of Environmental Management
ARARs	Applicable or Relevant and Appropriate Requirements
CAS	Chemical Abstract Service
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action, Navy
CLP-RAS	Contract Laboratory Program-Route Analytical Services
COC	chain-of-custody
DOD	Department of Defense
DOT	Department of Transportation
DQOs	data quality objectives
°C	degrees centigrade
EIC	Engineer-in-Charge
FICCDC	Federal Interagency Coordinating Committee for Digital Cartography
FSP	field sampling plan
GC/MS	gas chromatography/mass spectroscopy
GCs	gas chromatographs
GPR	ground-penetrating radar
HASP	Health and Safety Plan
IR	Installation Restoration
IRC	Internal Review Committee
mg/ℓ	milligrams per liter
mℓ	milliliters
μg/ℓ	micrograms per liter
μg/kg	micrograms per kilogram
NAS	Naval Air Station
NBS	National Bureau of Standards
NCR	NEESA Contract Representative
NEESA	Naval Energy and Environmental Support Activity
OLF	Outlying Land Field
OVA	organic vapor analyzer
PAHs	polynuclear aromatic hydrocarbons
PARCC	Precision, Accuracy, Reproducibility, Completeness and Comparability
PCBs	polychlorinated biphenyls
PID	photoionization detector

GLOSSARY (Continued)

PVC	polyvinyl chrloride
QA	Quality Assurance
QAM	Quality Assurance Manager
QAPP	Quality Assurance Program Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SOPs	standard operating procedures
SOUTHNAV-FACENGCOM	Southern Division, Naval Facilities Engineering Command
SVOCs	semivolatile organic compounds
TAL	target analyte list
TCL	target compound list
TOM	Task Order Manager
TPHs	total petroleum hydrocarbons
USEPA	U.S. Environmental Protection Agency
VOAs	volatile organic analytes
VOCs	volatile organic compounds

1.0 INTRODUCTION

The purpose of this Quality Assurance Project Plan (QAPP) is to indicate prime responsibilities and prescribe requirements for assuring that the investigations undertaken by ABB Environmental Services, Inc. (ABB-ES), for the Navy Installation Restoration (IR) program are planned and executed in a manner consistent with quality assurance objectives. This QAPP provides guidance and specifications to assure that:

- field determinations and analytical results are valid through preventive maintenance, calibration, and analytical protocols;
- samples are identified and controlled through sample tracking systems and chain-of-custody (COC) protocols;
- records are retained as documentary evidence of the quality of samples, applied processes, equipment, and results;
- generated data are validated and their use in calculations is documented;
- calculations and evaluations are accurate, appropriate, and consistent throughout the projects; and
- safety is maintained by requiring inclusion of the Health and Safety staff function in the project organization.

The requirements of this QAPP apply to all ABB-ES and subcontractor activities being undertaken at Outlying Landing Field (OLF) Barin, Foley, Alabama. The content and format of the QAPP is based on *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans - QAMS-005/80* prepared by U.S. Environmental Protection Agency's (USEPA) Office of Research and Development, or applicable Navy Energy and Environmental Support Activity (NEESA) and USEPA Region IV manuals.

2.0 PROJECT DESCRIPTION

In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1986, amended by the 1986 Superfund Amendments and Reauthorization Act (SARA), and as directed in Executive Order 12580 of January 1987, the Department of Defense (DOD) conducts an IR program for evaluating and remediating problems related to releases and disposal of toxic and hazardous materials at DOD facilities.

As part of the IR program, a Remedial Investigation and Feasibility Study (RI/FS) will be conducted at OLF Barin. The purpose of the OLF Barin RI/FS is to identify a range of remedial alternatives to address any identified risks to public health and the environment posed by contaminants present due to past waste disposal or spill sites. To achieve this objective, sufficient data must be collected during the RI to assess the nature and extent of contaminants associated with each site. The FS will use the data collected in the RI to screen, evaluate, and select remedial alternatives, to provide permanent, feasible solutions to environmental contamination problems at OLF Barin.

Descriptions and histories of each site to be addressed during the RI are presented in both the Workplan (Section 4.0) and the Sampling and Analysis Plan (SAP) (Section 3.0). Table 2-1 summarizes the site descriptions and provides historical operational information. Figure 2-1 presents the location of all sites at OLF Barin.

2.1 SCOPE OF WORK. Site-specific field investigations proposed for the RI include soil, surface water, sediment, groundwater, and soil gas sampling; test pitting; monitoring well installation; geophysical surveying; and aquifer characterization. A summary of field investigations on a site-by-site basis is presented in Table 2-2. Subsurface exploratory methods are described in the Workplan (Section 5.4) and the SAP (Section 2.0). Sampling procedures of the various media are detailed in Section 3.2 of the Field Sampling Plan (FSP).

Laboratory analysis of environmental samples collected during the RI field investigation will include polynuclear aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPHs), target compound list (TCL) volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides and polychlorinated biphenyls (PCBs), target analyte list (TAL) metals, total cyanide, and the Resource Conservation and Recovery Act (RCRA) toxicity characteristic leaching procedure (TCLP). The sampling and analysis schedule proposed for the various types of samples to be collected at OLF Barin during the RI is summarized in Table 2-3. Laboratory analytical methods for the above analyses are shown in Table 2-4. All samples will be analyzed in accordance to USEPA Level III and IV (10 percent of samples) data quality objectives ([DQOs], Section 4.0).

NEESA has adopted three of these levels as Quality Assurance (QA) requirements, Levels C, D, and E, which correspond with USEPA Levels III, IV, and V (NEESA, 1988). For the purposes of this document, the USEPA nomenclature (Levels I through V) will be used.

Table 2-1
Summary of Site Descriptions and Histories

RI/FS Quality Assurance Project Plan
OLF Barin, Foley, Alabama

Site No.	Name	Waste Type/Spill	Date of Operation
19B	Former Hangar Maintenance Area	Solvents, oils, fuels, and electrolytes.	1942 to 1959
20B	Abandoned Underground Storage Tanks and Fuel Pit Area	AVGAS and jet fuel	1942 to 1959
21B	Rubble Landfill	Waste debris from dismantled buildings.	1959
22B	Old Firefighting Demonstration Area	Fuels, oils, and solvents	1942 to 1945
23B	Drainage Ditch Leading to Sandy Creek	Fuel spill; kerosene	1942 to 1959
24B	Abandoned Firefighting Training Area	Diesel fuel	1989 to 1991
25B	Machine Gun Butt and Displaced Soils	Lead, copper bullets, and shells	Unknown
26B	Abandoned Wastewater Treatment Plant	Sewage and chemicals	1942 to 1959
27B	Uncontrolled Dumpsite	Municipal waste	Unknown
28B	Fuel Pit Drainage Ditch	AVGAS and jet fuel	Mid 1940's to present

Note: AVGAS = aviation gasoline.

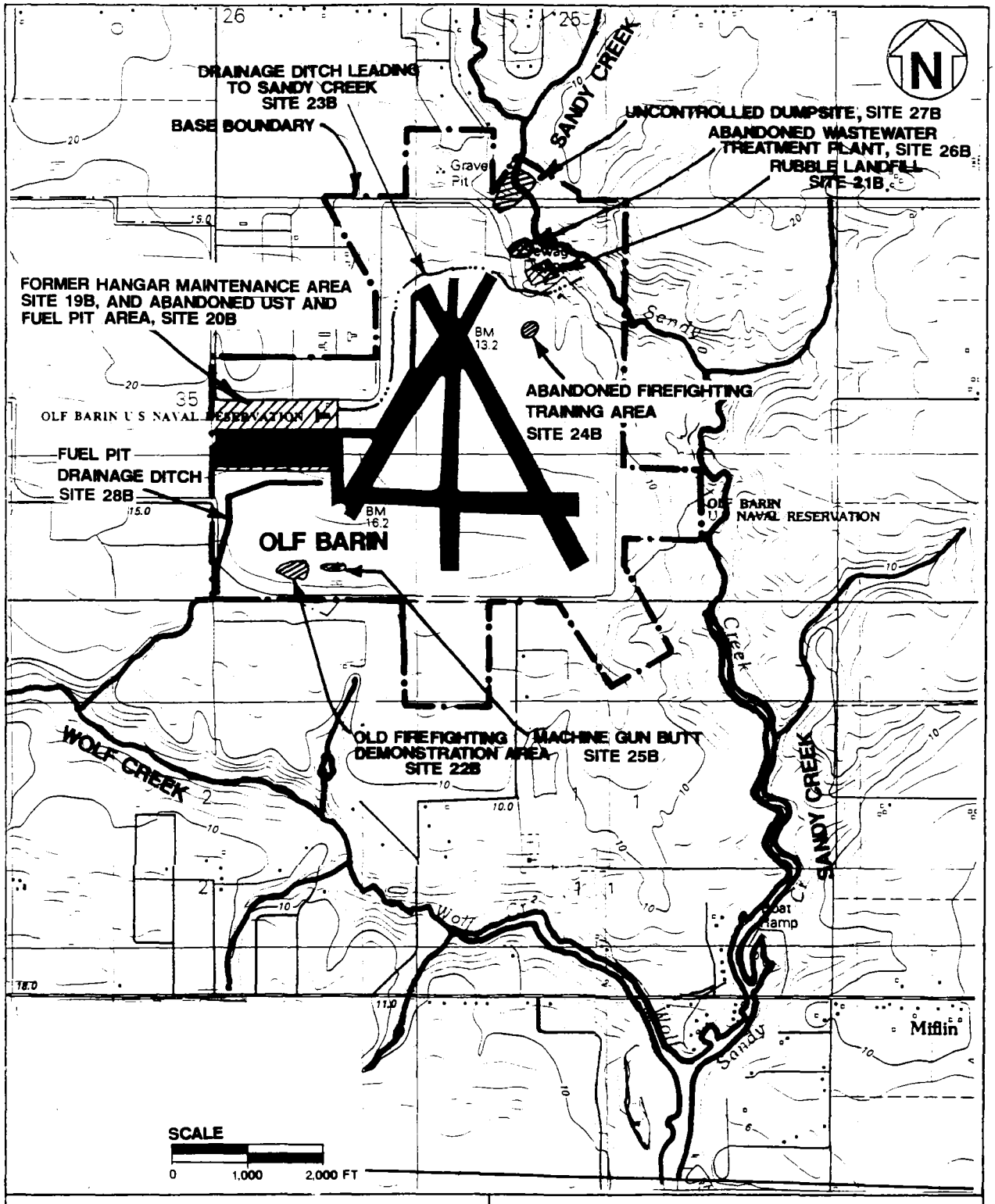

FIGURE 2-1
SITE LOCATIONS

SOURCE: MODIFIED FROM USGS 7.5' QUADRANGLE MAP, FOLEY AL, (1980 a)

RI/FS
QUALITY ASSURANCE PROJECT PLAN

OLF BARIN
FOLEY, ALABAMA

Table 2-2
Summary of Proposed Field Exploration and Sampling Program

RI/FS Quality Assurance Project Plan
OLF Barin, Foley, Alabama

Site	Geophysics EM/GPR	Soil Gas	Monitoring Well Installation		Groundwater Sampling	Exploratory Soil Borings	Test Pits	Surface Soil Samples	Subsurface Soil Samples	Surface Water and Sediment Samples
			Production Zone	Water Table						
Site wide background	0	0	(see Sites 19B/20B)	(see Site 21B and Sites 19B/20B)	0	0	0	8	0	(see Sandy Creek)
Supply well (full scan)	0	0	0	0	1	0	0	0	0	0
During pumping test	0	0	0	0	3	0	0	0	0	0
Former Hangar Maintenance Area, Abandoned USTs, and Fuel Pits Area, Sites 19B and 20B	0	100 points	3	11	22	0	40	0	[1]20	0
Pumping test (VOC only)	0	0	0	0	15	0	0	0	0	0
Rubble Landfill, Site 21B	3.1 acres	0	0	3	3	0	[2]3	0	3	0
Old Firefighting Demonstration Area, Site 22B	0	0	0	0	0	1	0	22	4	0
Displaced Machine Gun Butt Soils	0	0	0	0	0	0	0	2	0	0
Drainage Ditch leading to Sandy Creek, Site 23B					0					
Upper Ditch at Guadalcanal Road	0	0	0	0	0	1	0	0	3	0
Southern Ditch Outfall	0	0	0	0	0	0	0	1	0	0
North Area Ditch Outfall	0	0	0	0	0	0	0	1	0	0
18-inch Storm Sewer Outfall	0	0	0	0	0	0	0	3	0	
Sandy Creek	0	0	0	0	0	0	0	10	0	10
Firefighting Training Area, Site 24B	0	0	0	5	5	0	0	0	4	0

See notes at end of table.

Table 2-2 (Continued)
Summary of Proposed Field Exploration and Sampling Program

RI/FS Quality Assurance Project Plan
OLF Barin, Foley, Alabama

Site	Geophysics EM/GPR	Soil Gas	Monitoring Well Installation		Groundwater Sampling	Exploratory Soil Borings	Test Pits	Surface Soil Samples	Subsurface Soil Samples	Surface Water and Sediment Samples
			Production Zone	Water Table						
Machine Gun Butt, Site 25B	0	0	0	0	0	1	0	14	4	0
Abandoned Wastewater Treatment Plant, Site 26B	0	0	0	0	0	0	0	3	0	0
Uncontrolled Dumpsite, Site 27B	0	0	0	0	0	0	0	5	0	0
Fuel Pit Drainage Ditch, Site 28B	0	0	0	0	0	0	0	2	0	0
Wolf Creek	0	0	0	0	0	0	0	0	0	3
Total Installation	3.1 acres	100 points	3	18	48	3	43	67	38	13

[1]From test pits.
[2]Depends on geophysics.

Notes: EM = electromagnetic induction.
GPR = ground penetrating radar.
USTs = underground storage tanks.
VOC = volatile organic compound.

Table 2-3
Summary of Sampling and Analysis Schedule

RI/FS Quality Assurance Project Plan
OLF Barin, Foley, Alabama

Environmental Samples (Level III DQOs)

Site	Type of Sample	VOC by GC (including xylenes and MTBE)	VOC by GC/MS	SVOCs by GC/MS	Pesticides/ PCBs	PAHs by HPLC	Total Petroleum Hydrocarbons	Metals			Total Cyanide
								TAL	Lead Only	Copper Only	
Site wide background (Groundwater background included with upgradient wells for Sites 19B/20B and 21B; surface water and sediment with Sandy Creek)	SO	0	0	0	8	8	0	8	0	0	8
Former Hangar Maintenance Area, Abandoned UST Area and Fuel Pits Area, Sites 19B/20B											
Production well	GW	0	1	1	1	0	0	1	0	0	1
Production well (pumping test)	GW	3	0	0	0	0	0	0	0	0	0
Monitoring wells (29 new and existing wells	GW	0	22	22	22	0	0	22	0	0	22
Monitoring wells (pumping test)	GW	15	0	0	0	0	0	0	0	0	0
Rubble Landfill, Site 21B											
Monitoring wells (3 wells)	GW	0	3	3	3	0	0	3	0	0	3
Surface soil	SO	0	3	3	3	0	0	3	0	0	3
Test pits	SO	0	3	3	3	0	0	3	0	0	3

See notes at end of table.

Table 2-3 (Continued)
Summary of Sampling and Analysis Schedule

RI/FS Quality Assurance Project Plan
OLF Barin, Foley, Alabama

Environmental Samples (Level III DQOs)

Site	Type of Sample	VOC by GC (including xylenes and MTBE)	VOC by GC/MS	SVOCs by GC/MS	Pesticides/ PCBs	PAHs by HPLC	Total Petroleum Hydrocarbons	Metals			Total Cyanide
								TAL	Lead Only	Copper Only	
Old Firefighting Demonstration Area, Site 22B											
Surface soil	SO	0	0	0	0	0	0	0	22	22	0
1 soil boring (4 samples - 0, 3, 10 & WT)	SO	0	0	0	0	4	0	0	4	4	0
Displaced Machine Gun Butt soil	SO	0	0	0	0	0	0	0	2	2	0
Drainage Ditch Leading to Sandy Creek, Site 23B											
Upper ditch at Guadalcanal Road (soil boring, 3 samples)	SO	0	3	3	3	0	0	3	0	0	3
Northern ditch outfall	SO/SD	0	1	1	1	0	0	1	0	0	1
Southern ditch outfall	SO/SD	0	1	1	1	0	0	1	0	0	1
18-inch storm sewer outfall	SO/SD	0	3	3	3	0	0	3	0	0	3
Sandy Creek	SW	0	10	10	10	0	0	10	0	0	10
	SD	0	10	10	10	0	0	10			10
Firefighting Training Area, Site 24B											
Monitoring wells (4 wells)	GW	0	5	5	5	0	0	5	0	0	5
Surface soil	SO	0	6	0	0	6	6	6	0	0	6
Soil boring (4 samples - 0, 5, 10, WT)	SO	0	4	0	0	4	4	4	0	0	4

See notes at end of table.

Table 2-3 (Continued)
Summary of Sampling and Analysis Schedule

RI/FS Quality Assurance Project Plan
OLF Barin, Foley, Alabama

Environmental Samples (Level III DQOs)

Site	Type of Sample	VOC by GC (including xylenes and MTBE)	VOC by GC/MS	SVOCs by GC/MS	Pesticides/ PCBs	PAHs by HPLC	Total Petroleum Hydrocarbons	Metals			Total Cyanide
								TAL	Lead Only	Copper Only	
Machine Gun Butt, Site 25B Surface soil	SO	0	0	0	0	0	0	0	0	14	14
1 soil boring (4 samples - 0, 3, 10 & WT)	0	0	0	0	0	0	0	0	0	4	4
Abandoned Wastewater Treatment Plant, Site 26B	SO	0	0	3	3	0	0	3	0	0	3
Uncontrolled Dumpsite, Site 27B	SO	0	5	5	5	0	0	5	0	0	5
Fuel pit drainage ditch, Site 28B, Wolf Creek	SO	0	2	2	2	0	0	2	0	0	2
	SW	0	3	3	3	0	0	3	0	0	3
		0	3	3	3	0	0	3	0	0	3
Test pits		0	20	0	0	0	0	0	0	0	0

See notes at end of table.

Table 2-3 (Continued)
Summary of Sampling and Analysis Schedule

RI/FS Quality Assurance Project Plan
OLF Barin, Foley, Alabama

QC Samples (Level IV)

Site	Type of Sample	VOC by GC (including xylenes and MTBE)	VOC by GC/MS	SVOCs by GC/MS	Pesticides/ PCBs	PAHs by HPLC	Total Petroleum Hydrocarbons	Metals			Total Cyanide
								TAL	Lead Only	Copper Only	
Matrix spike/matrix spike duplicates	GW	2	8	8	8	0	0	8	0	0	10
	SW	0	2	2	2	0	0	2	0	0	2
	SD	0	2	2	2	0	0	2	0	0	2
	SO	0	12	12	14	8	2	16	6	6	16
Field duplicates	GW	2	5	5	5	--	--	5	--	--	5
	SW	--	1	1	1	--	--	1	--	--	1
	SD	--	1	1	1	--	--	1	--	--	1
	SO	--	7	5	4	4	1	6	5	5	6
Field Blanks		1	10	9	10	4	1	11	2	2	11
Rinsate Blanks		6	44	38	39	7	2	41	5	5	41
Trip Blanks		6	33	0	0	0	0	0	0	0	0

Notes: VOC = volatile organic compound.
GC = gas chromatography.
MTBE = methyl tert-butyl ether.
GC/MS = gas chromatography/mass spectroscopy.
SVOC = semivolatile organic compounds.
PCB = polychlorinated biphenyls.
PAH = polynuclear aromatic hydrocarbons.
HPLC = high performance liquid chromatography.
TAL = target analyte list.
SO = soil
UST = underground storage tanks.
GW = groundwater
SO/SD = soil/sediment
WT = water table

Table 2-4
Laboratory Analytical Procedures

RI/FS Quality Assurance Project Plan
OLF Barin, Foley, Alabama

Parameter	USEPA Analytical Method	
	Water	Soil
VOCs	TCL CLP-COP	8010/8020
TCL VOCs	TCL CLP-COP	8240
TCL SVOCs	TCL CLP-COP	8270
TCL Pesticides/PCBs	TCL CLP-COP	8080
PAHs	CLP (8100 or equivalent)	8100
Petroleum Hydrocarbons	418.1	418.1
TAL Metals		
- ICP Metals	200.7	6010
- Arsenic	206.3	7060
- Lead	239.1	7420
- Selenium	270.3	7740
- Thallium	279.1	7840
- Mercury	245.1	7471
- Cyanide	335.2/335.3	9010
Copper Only	220.1	7410
TCLP		
- Arsenic	206.2	7061
- Barium	208.2	7081
- Cadmium	213.2	7131
- Chromium	218.2	7191
- Lead	239.2	7421
- Mercury	245.2	7470
- Selenium	270.2	7741
- Silver	272.1	7761

Notes: USEPA = U.S. Environmental Protection Agency.
VOCs = volatile organic compounds.
GC = gas chromatography.
TCL = target compound list.
SVOCs = semivolatile organic compounds.
PCBs = polychlorinated biphenyls.
PAHs = polynuclear aromatic hydrocarbons.
TAL = target analyte list.
ICP = inductively coupled argon plasma.
TCLP = Toxicity Characteristic Leaching Procedure.

3.0 ORGANIZATION AND RESPONSIBILITIES

This section identifies key roles in the project organization, project deliverables, and the proposed project schedule included in the project Site Management Plan.

3.1 PROJECT ORGANIZATION AND RESPONSIBILITIES. These RI/FS planning documents have been prepared under the Comprehensive Long-Term Environmental Action, Navy (CLEAN) contract with the Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM). Key individuals in the project structure are described below and the project organization is depicted in Figure 3-1.

Southern Division, Naval Facilities Engineering Command. SOUTHNAVFACENGCOM is responsible for establishing policy and guidance for the CLEAN program. SOUTHNAVFACENGCOM awards contracts, approves funding, and has primary control of report release and interagency communication.

SOUTHNAVFACENGCOM Engineer-in-Charge (EIC). The SOUTHNAVFACENGCOM Engineer-in-Charge (EIC), Ms. Kim Queen, is responsible for the technical and financial management of the RI/FS and design activities at OLF Barin. Ms. Queen is the primary project contact. She prepares the project statement of work; develops the project Site Management Plan; manages project scope, schedule, and budget; and provides technical review and approval of all deliverables. Ms. Queen will be responsible for changes in the scope of work determined during Project Managers' Meetings.

Naval Air Station (NAS) Whiting Field/OLF Barin Environmental Coordinator. The NAS Whiting Field environmental coordinator, Mr. Jim Holland, will coordinate and monitor RI/FS activities at OLF Barin. Mr. Holland maintains a working relationship with local, State, and Federal regulatory agencies.

Task Order Manager. The ABB-ES Task Order Manager for the OLF Barin RI/FS is Mr. Rao Angara. Mr. Angara is responsible for evaluating the appropriateness and adequacy of the technical and engineering services provided. He is responsible for financial and schedule management and for ensuring that the project fulfills and remains within the contracted scope of work. He will be responsible for changes in the scope of work determined during Project Managers' Meetings. Mr. Angara is also responsible for the daily conduct of work, including integration of input from supporting disciplines and subcontractors. Mr. Angara is the primary ABB-ES project contact.

G Walker

RI Technical Leader. Mr. Eric Blomberg will be the technical activity leader for RI field studies and the development of the RI report. He will also be responsible for the quality and completeness of data gathered during the RI field program, including management and coordination of field work and supervision and scheduling of work.

Field Operations Leader. The Field Operations Leader will be responsible for ensuring that field activities performed are consistent with the project workplan and supporting documents. This will include appropriate logging and documenta-

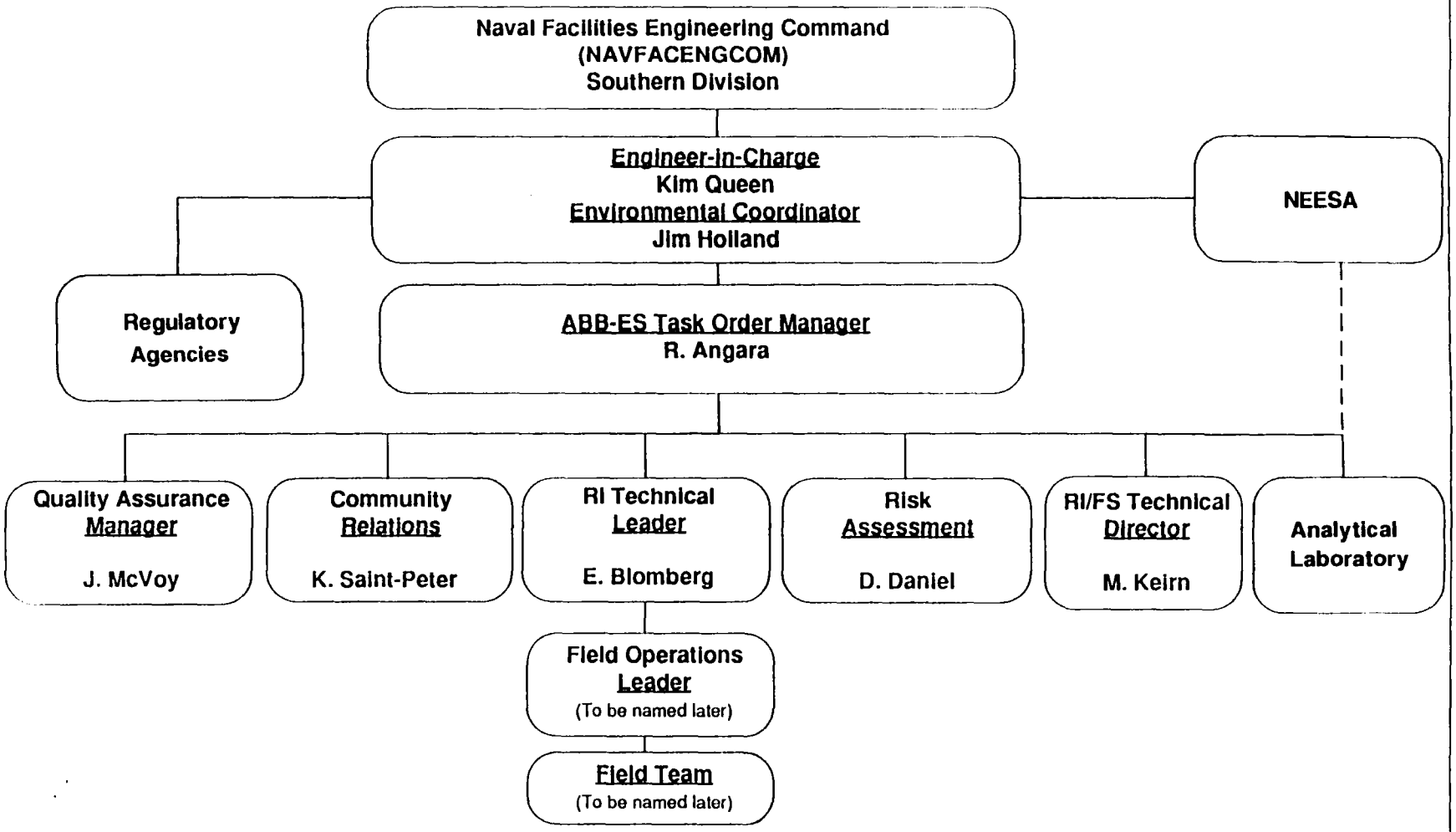

FIGURE 3-1
PROJECT ORGANIZATION

REMEDIAL INVESTIGATION
QUALITY ASSURANCE
PROJECT PLAN
OLF BARIN
FOLEY, ALABAMA

tion of standard and approved drilling and monitoring well installation methods to ensure that pertinent drilling and testing information is obtained during the exploration program. Other responsibilities include oversight of sampling activities and site characterization studies and communication with the RI Technical Leader.

Risk Assessment. Mr. David Daniel will be responsible for the public health and the ecological assessment. Mr. Daniel will plan and perform the risk assessment supported by RI data. He will identify potential exposure pathways, evaluate available data, and propose compound target levels within acceptable risk ranges.

Quality Assurance Manager. As the Quality Assurance Manager, Mr. John McVoy will be responsible for ensuring that field and laboratory activities support DQOs and conform with the project workplan. Mr. McVoy will perform periodic field and laboratory audits to monitor conformance with requirements.

Community Relations. Ms. Kathy Saint-Peter will be responsible for providing community relation support activities, if so requested by OLF Barin. Support may include activities such as the Community Relations Plan (CRP) development, development of fact sheets and press releases, or community interviews.

Internal Review Committee. An Internal Review Committee (IRC), consisting of senior technical staff from the ABB-ES team, support the Task Order Manager by reviewing technical aspects of the project so that services (1) reflect the accumulated experience of the firm, (2) are produced according to corporate policy, and (3) meet the intended needs of the project. The primary function of the committee is to support the application of technically sound methodologies and the development of defensible data, interpretations, and conclusions. Michael Keirn, Ph.D., will serve as the Project Technical Director and the other members of the IRC committee will be Gregory Brown, P.E., and Willard Murray, Ph.D., P.E.

Willard Murray

3.2 PROGRAM ORGANIZATION AND RESPONSIBILITIES. The following paragraphs describe key individuals in the ABB-ES CLEAN program. The program organization is depicted in Figure 3-2.

Naval Facilities Engineering Command Southern Division. SOUTHNAVFACENGCOM is responsible for establishing policy and guidance for the CLEAN program. SOUTHNAVFACENGCOM awards contracts, approves funding, and has primary control of report release and interagency communication.

Corporate Officer. The Corporate Officer and Vice-President of Southeastern Regional Operations for ABB-ES is ~~Mr. R A. Allen~~. Mr. Allen is responsible for committing the corporate resources necessary to conduct the program work activities, supplying corporate-level input for problem resolution, and assisting the Task Order Manager as needed in project implementation.

Navy Energy and Environmental Support Activity (NEESA). NEESA is responsible for ensuring that the quality of laboratory analyses performed during the various phases of the IR program are acceptable. NEESA is also responsible for managing the NEESA contract representative (NCR).

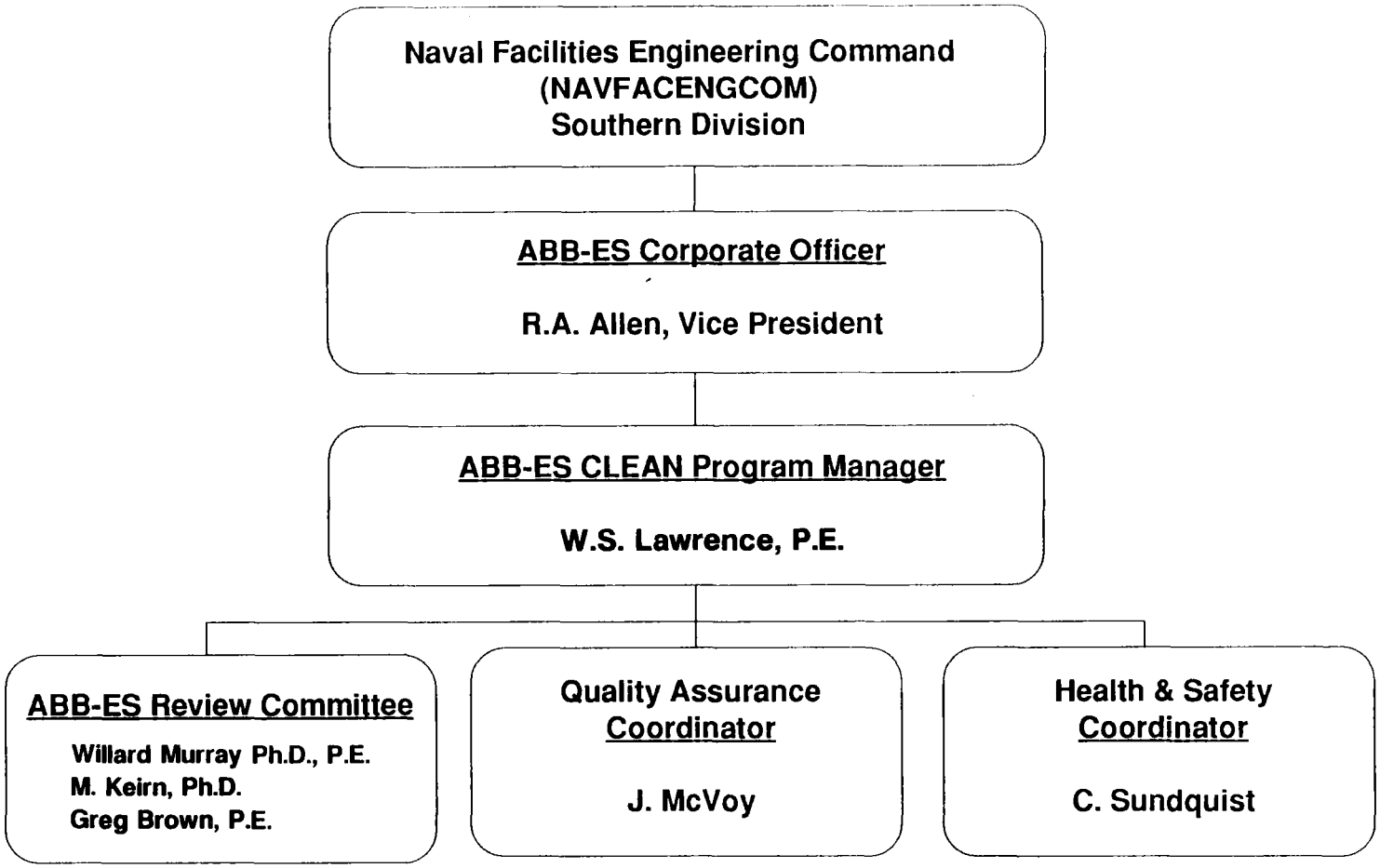

FIGURE 3-2
PROGRAM ORGANIZATION

RI/FS
QUALITY ASSURANCE
PROJECT PLAN

OLF BARIN
FOLEY, ALABAMA

Program Manager. As Program Manager, ~~Mr. William Lawrence~~ Charles Nunes, P.E., is responsible for administration and management of the ABB-ES SOUTHNAVFACENGCOM CLEAN contract. In this position, Mr. Lawrence is able to perceive program needs, promote technology and other information transfers between various CLEAN projects, and direct resources as appropriate for effective and timely completion of program activities.

QA Coordinator. The Task Order Manager is supported by a QA Coordinator who will report to the Program Manager. The QA Coordinator, ~~Mr. John McVoy~~ Ben Green, will oversee the implementation of appropriate NEESA, USEPA, and Alabama Department of Environmental Management (ADEM) protocols. The QA Coordinator will also work with the Task Order Manager to establish Quality Control (QC) procedures.

Health and Safety Coordinator. The Health and Safety Coordinator, Ms. Cynthia Sundquist, is responsible for project team compliance with ABB-ES corporate health and safety requirements and the CLEAN Program Health and Safety Program (HASP). Conformance with safety protocols will be assessed through periodic site visits and daily supervision by the site leaders.

Analytical Laboratory. A NEESA approved laboratory will be subcontracted to analyze all samples collected at OLF Barin during the RI field program. The subcontract laboratory will meet all requirements discussed in NEESA 20.2-047B (*Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program*).

4.0 DATA QUALITY OBJECTIVES (DQOs)

The intended use of data and the required DQOs are best defined during the planning stages to ensure that collection, decontamination, containerization, shipping, and analytical methods are consistent with the degree of confidence required of the resultant data. The following sections provide a brief description of USEPA DQO levels and identifies the levels associated with each RI/FS field task. DQOs are requirements needed to support decisions relative to the various stages of remedial actions.

4.1 DATA QUALITY OBJECTIVES (DQOs), GENERAL DESCRIPTION. DQOs refer to standards for analytical precision, accuracy, reproducibility, completeness, and comparability. Five DQO levels have been defined by the USEPA: Level I, Field Screening; Level II, Field Analysis; Level III, Laboratory Analysis; Level IV, Contract Laboratory Program-Routine Analytical Services (CLP-RAS); and Level V, Non-Conventional Parameter Analysis (USEPA, 1991c).

NEESA has adopted three of these levels as QA requirements, Levels C, D, and E, which correspond with USEPA Levels III, IV, and V (NEESA, 1988). For the purposes of this document, the USEPA nomenclature (Levels I through V) will be used.

The DQO level needed for a specific task is generally based on the intended use of the data and on the limitations of the analytical instrumentation. The five broad categories of data quality used in the RI/FS process are described below.

Level I, Field Screening. Field screening provides rapid real-time results that can be used to determine optimal placement of sampling locations and for health and safety support. Data generated provide information concerning the presence or absence of certain constituents or groups of constituents. The data are generally qualitative rather than quantitative.

Level I sampling requirements include the use of equipment and sampling containers that are clean, visibly free of contamination, and free of analytes detectable by the screening method employed (USEPA, 1991c).

Level II, Field Analysis. Field analysis includes the use of more sophisticated analytical instruments in the field, including onsite gas chromatographs (GCs) and mobile laboratories. The data generated may be both qualitative and quantitative, but the degree of quality assurance and quality control (QA/QC) achievable may be more variable than with laboratory analysis.

Level II sampling and equipment requirements include the use of sampling equipment constructed of material that is compatible with the parameters being analyzed (e.g., polyvinyl chloride [PVC] for inorganic parameter analyses, or stainless-steel material for organic parameter analyses) and field cleaning procedures that include a potable water and soap scrub followed by a potable water rinse (or steam cleaning or high pressure washing). Sampling equipment to be used at OLF Barin is described in Section 2.2 of the FSP.

The use of potable water is limited only by the parameters being analyzed for and the minimum quantitation limits of the analytical method; water containing up to 1/2 the minimum quantitation limit of the parameters of concern may be used. These samples must be representative of all samples analyzed in the field (USEPA, 1991c).

Level III, Laboratory Analysis. Laboratory analytical data is generated using USEPA-approved methods to achieve a level of confidence set by specified QA/QC protocols. Level III DQOs are appropriate for data collected for most activities including site characterization (i.e., qualitative and quantitative identification of contaminants and contaminant source(s) and extent of migration) and treatability studies.

Level III field methods, decontamination procedures, and sampling equipment construction materials are as specified in the *USEPA Standard Operating Procedures and Quality Assurance Manual* (USEPA Standard Operating Procedures [SOPs] [USEPA, 1991c]). Cleaning of down-hole drilling or excavation equipment must be performed as with Level IV requirements with the exclusion of the deionized water rinse, the double rinse with pesticide grade isopropanol, and the rinse with organic-free water. All other cleaning and decontamination guidance discussed in Section 2.1 of the FSP must be followed.

When wells are constructed using materials that are not inert with respect to the contaminants being analyzed, data collected from those wells are DQO Level III or lower for those incompatible analytes, even if DQO Level IV analytical procedures are used.

Level III QA/QC sampling blank requirements include the following.

- A minimum of one equipment rinsate blank per day for sampling equipment that is field cleaned will be collected and analyzed every other day.
- If samples are preserved, a preservative blank will be collected and analyzed at the beginning and end of the study.
- A blank of the rinse water will be collected and analyzed prior to beginning the study and at the end of each week that sampling equipment is field cleaned.
- One trip blank per sample cooler containing VOC samples will be analyzed.

A minimum of 10 percent of samples collected for DQO Level III analysis should be split for DQO Level IV analysis. These samples must be representative of all samples submitted for Level III analysis (USEPA, 1991c).

Level IV, Contract Laboratory Program (CLP). Level IV DQOs are the most stringent and are defined as data collected in accordance with USEPA Standard Operating Procedures (USEPA, 1991c) and analyzed in accordance with the USEPA Contract Laboratory Program (USEPA, 1991a; 1991b). Data collected for charac-

terization and confirmation during an RI/FS, during remedial action, for compliance monitoring, or for enforcement often require Level IV for DQOs.

The types of QC samples remain the same regardless of the level of QC implemented. The field QC samples collected per sampling event remain the same for Level III and Level IV QC level. Level IV analysis is very specific concerning documentation provided with every data package. The deliverable package contains information on initial continuing calibration, gas chromatography/mass spectroscopy (GC/MS) timing, surrogate percent recovery, and matrix spike duplicates. In addition, hard copies are provided of reconstruction ion chromatograms, GC chromatograms, and spectra for every sample and every blank, standard, or spike run with a particular set of samples. Documentation is also provided for blank analyses, chain-of-custody, and holding times.

Level V, Non-Conventional Parameter Analysis. Individual site or remedial design characteristics may require the analysis of contaminants or conditions for which USEPA-approved methods do not exist; these fall into the category of non-conventional parameter analyses. The level V DQOs associated with these types of analysis must, by definition, be defined on an individual basis. The DQOs identified will be dependent on the specific collection method, decontamination procedures, and analysis to be used.

Level V methods are available through CLP Special Analytical Services (SAS), university laboratories, commercial laboratories, the National Enforcement Investigation Center, and Environmental Services Division. Not all SAS analyses are non-standard; they may just not be part of CLP protocols.

Level V poses limitations to implementation because the amount of lead time for start-up may be significant, and the analyses may be "one-of-a-kind" applications of the method, resulting in a lack of comparability of the data.

4.2 PROJECT SPECIFIC DATA QUALITY OBJECTIVES (DQOS). Tasks for the RI/FS at the OLF Barin will involve data collection with DQOs ranging from Level I through Level IV. The following discusses the primary RI/FS tasks for the OLF Barin and the associated DQO level. Table 4-1 lists the objectives, rationale, and DQO level for each of the tasks to be conducted at OLF Barin. These RI/FS data will be used, as applicable, for health and safety monitoring, site characterization, public health and ecological risk assessment, evaluating remedial alternatives, treatability studies, remedial action, and monitoring.

4.3 PRECISION, ACCURACY, REPRESENTATIVENESS, COMPLETENESS, AND COMPARABILITY (PARCC) DEFINITION. Parameters used within the data validation process to evaluate data quality include measurement of precision, accuracy, representativeness, completeness, and comparability (PARCC). The achievable limits for these parameters vary with the DQO level of the data. The limits used for laboratory analytical data in this RI program will be those set by the CLP for Level IV DQOs. These parameters are defined here. Methods of calculation are discussed in Section 13.0.

Table 4-1
Task Specific Data Quality Objectives

RI/FS Quality Assurance Project Plan
OLF Barin, Foley Alabama

Activity	Objectives	QC Level	Rationale
Geophysical survey (GPR and terrain conductivity)	Define perimeter of disposal area	I	Data will indicate presence or absence of metallic objects relative to subsurface conditions.
Soil sample screening	Determine approximate concentration of volatile compounds.	I	Data will determine presence or absence of volatile organic compounds (VOCs).
Air quality monitoring	Determine if work area is safe	I	Compliance with Health and Safety Plan (HASP).
Field parameter analysis	Screen samples for lab analysis and determine aquifer stabilization prior to sampling.	II	Temperature, pH, and conductivity will aid in screening and determination of aquifer stabilization.
Soil gas survey	Determine presence and distribution of shallow VOC contamination.	II	Data can be plotted on a map to show extent of shallow VOC contamination.
Characterization and confirmation sampling (groundwater and soil)	Characterize and determine extent of groundwater and soil contamination.	III (10% IV)	Data necessary for Risk Assessment and Feasibility Studies.
Surface water and sediment sampling	Identify environmental receptors	III (10% IV)	Data will support Risk Assessment.
Surveying and water level measurements	Determine direction of groundwater flow and locate all sampling locations.	II	Data necessary to determine water table elevations and direction and delineate the area of contamination.
Treatability studies	Determine effectiveness of remedial action alternatives.	III	Data necessary to determine effectiveness of remedial action alternatives.
Remedial monitoring and confirmation sampling	Confirm effectiveness of remedial action.	III	Data necessary to measure the level of contamination.
Receptor study	Establish potential receptors	II	Data mandatory for Risk Assessment.

Notes: QC = quality control.
GPR = ground penetrating radar.
VOCs = volatile organic compounds.

Precision and Accuracy. Precision, the ability to replicate a value, and accuracy, the ability to obtain a true value, are addressed for all generated data. Precision and accuracy requirements vary depending on intended data uses and are selected in accordance with project requirements. DQOs for precision and accuracy are established for each major parameter to be measured at the site based on knowledge of the capabilities of available measurement systems and the analytical detections limits required.

Representativeness. Representativeness expresses the degree to which sample data depict an existing environmental condition. Representativeness is accomplished through proper selection of sampling locations and sampling techniques and collection of a sufficient number of samples.

The sampling locations in this RI will be chosen in a biased approach based on previous analytical data, screening data collected in the field, and apparent and measured flow directions. Sampling and analytical protocols were chosen so that measurements of samples will be as representative of the media and conditions being measured as possible.

Sample collection, handling, and documentation will be performed in accordance with USEPA Region IV SOPs (USEPA, 1991c) to ensure that collection and handling techniques do not alter the sample and to provide an adequate tracking mechanism from the time of collection through laboratory analysis.

Completeness. The characteristic of completeness is a measure of the amount of valid data obtained compared to the amount of data originally intended to be obtained. The completeness goal for DQO Levels III and IV has been chosen as 90 percent (all useable data).

Field activities performed at DQO Levels I and II are onsite measurement techniques that provide information in real-time or after minimal delay. The completeness achieved for these methods may be more variable than those for standard analytical methods. A higher degree of completeness may be achieved because measurements can be readily repeated. However, site conditions may constrain the use of some techniques, resulting in fewer valid analyses than anticipated.

The sampling objectives described in these planning documents allow for a sufficient number of samples to accomplish the project objectives; however, the number of samples presented are estimates that may be revised based on screening data collected in the field. Examples of circumstances that may cause variations might include increasing or decreasing the number of samples needed for adequate delineation or characterization, increasing or decreasing the number of samples required for characterization of investigation-derived waste, and/or decreasing the number of screening samples if site conditions constrain the use of a particular method.

Comparability. The characteristic of comparability reflects the confidence with which one data set can be compared with other measurements and the expression of results consistent with other organizations reporting similar data. This will be accomplished through the use of standard techniques for sample collection and

analysis and the reporting of results in appropriate units. Comparability of analytical procedures also implies using analytical methodologies that produce results comparable in terms of precision, accuracy, and effective range of calibration. Samples collected at OLF Barin will be analyzed at Level III and 10 percent at Level IV analytical support levels. Level IV analyses are typically used for confirmation of lower level data, risk assessment, and to obtain highly documented data. That will allow for comparison of data obtained during this study with the data obtained during earlier and future investigations. Tables 4-2 and 4-3 list the DQOs for field measurements and laboratory analysis.

Table 4-2
Field Measurement Data Quality Objectives

RI/FS Quality Assurance Project Plan
OLF Barin, Foley Alabama

Parameter	USEPA Analyses Method	Precision	Accuracy (Recovery)	Completeness Percent
pH	150.1	0.05 standard units	±0.2 units	95
Conductivity	120.1	7.6 umhos/cm	±2%	95
Temperature	170.1	0.1 C	±0.2 °C	95
Volatile organic halocarbons	8021	30% RPD	±40%	90
Volatile organic aromatics	8020	30% RPD	±40%	90
Geophysical measurements				
Magnetic	–	NA	NA	NA
Electromagnetic	–	NA	NA	NA
Resistivity	–	NA	NA	NA
Water levels	–	–	0.01	95

Notes: USEPA = U.S. Environmental Protection Agency.
umhos/cm = micromhos per centimeter.
°C = centigrade.
RPD = relative percent difference.
NA = not available.

Table 4-3
Laboratory Analysis Data Quality Objectives

RI/FS Quality Assurance Project Plan
OLF Barin, Foley Alabama

Parameter	Method Detection Limit (water) (µg/ℓ)	Method Detection Limit (soil) (µg/kg)	Precision	Accuracy (Recovery)
Purgeable Halocarbons				
Chloromethane	1.0	1.0	0-72	0-199
Bromomethane	1.0	1.0	0-35	26-174
Vinyl chloride	1.0	1.0	0-43	19-174
Chloroethane	1.0	1.0	0-43	18-180
Trichlorofluoromethane	1.0	1.0	NA	NA
1,1-Dichloromethane	1.0	1.0	0-30	21-143
Dichloromethane	1.0	1.0	0-33	26-135
trans-1,2-Dichloroethane	1.0	1.0	0-27	51-135
1,1-Dichloroethane	1.0	1.0	0-22	55-168
Chloroform	1.0	1.0	0-19	74-125
1,1,1-Trichloroethane	1.0	1.0	0-19	69-131
Carbon tetrachloride	1.0	1.0	0-29	75-135
1,2-Dichloroethane	1.0	1.0	0-24	61-131
Trichloroethane	1.0	1.0	0-19	59-149
1,2-Dichloropropane	1.0	1.0	0-22	75-125
Dichlorobromomethane	1.0	1.0	0-26	72-131
cis-1,3-Dichloropropene	1.0	1.0	0-20	72-124
trans-1,3-Dichloropropene	1.0	1.0	0-19	75-123
1,1,2-Trichloroethane	1.0	1.0	0-23	77-127
Tetrachloroethane	1.0	1.0	0-18	77-142
Dibromochloromethane	1.0	1.0	0-15	70-136
Bromoform	1.0	1.0	0-15	71-132
1,1,2,2-Tetrachloroethane	1.0	1.0	0-27	63-141

See notes at end of table.

Table 4-3 (Continued)
Laboratory Analysis Data Quality Objectives

RI/FS Quality Assurance Project Plan
OLF Barin, Foley Alabama

Parameter	Method Detection Limit (water) (µg/ℓ)	Method Detection Limit (soil) (µg/kg)	Precision	Accuracy (Recovery)
Purgeable Aromatics				
Tert butyl methyl ether	1.0	1.0	0-30	0-239
Benzene	1.0	1.0	0-13	74-126
Toluene	1.0	1.0	0-11	82-125
Chlorobenzene	1.0	1.0	0-11	86-122
Ethyl benzene	1.0	1.0	0-14	86-127
Total xylenes	1.0	1.0	0-11	84-132
1,3-Dichlorobenzene	1.0	1.0	0-12	86-123
1,4-Dichlorobenzene	1.0	1.0	0-12	84-123
1,2-Dichlorobenzene	1.0	1.0	0-10	80-125
Volatile Organics				
Chloromethane	10	10	0-12	57-121
Bromomethane	10	10	0-4	141-175
Vinyl chloride	10	10	0-8	69-109
Chloroethane	10	10	0-5	111-154
Dichloromethane	NA	10	NA	NA
Acetone	10	10	0-16	61-175
Carbon disulfide	5	10	0-3	88-107
Trichlorofluoromethane	5	10	0-5	100-139
1,1-Dichloroethene	5	10	0-5	91-121
1,1-Dichloroethane	5	10	0-3	93-110
1,2-Dichloroethene	5	10	0-4	94-119
Chloroform	5	10	0-3	106-124
1,2-Dichloroethane	5	10	0-3	95-115

See notes at end of table.

Table 4-3 (Continued)
Laboratory Analysis Data Quality Objectives

RI/FS Quality Assurance Project Plan
OLF Barin, Foley Alabama

Parameter	Method Detection Limit (water) (µg/ℓ)	Method Detection Limit (soil) (µg/kg)	Precision	Accuracy (Recovery)
Volatile Organics (continued)				
2-Butanone	10	10	0-5	91-127
1,1,1-Trichloroethane	5	10	0-7	85-126
Carbon tetrachloride	5	10	0-3	91-108
Vinyl acetate	10	10	0-11	37-72
Bromodichloromethane	5	10	0-3	100-116
1,2-Dichloropropane	5	10	0-1	102-111
Cis-1,3-Dichloropropene	5	10	0-2	124-139
Trichloroethene	5	10	0-2	99-114
Benzene	5	10	0-2	95-107
Dibromochloromethane	5	10	0-3	98-118
1,1,2-Trichloroethane	5	10	0-4	97-121
1-1,3-Dichloropropene	5	10	0-6	62-86
2-Chlorovinylether	10	10	0-24	23-141
Bromoform	5	10	0-4	92-119
MIBK	NA	10	NA	NA
2-Hexanone	10	10	0-12	69-143
1,1,2,2-Tetrachloroethane	5	10	0-5	88-122
Toluene	5	10	0-3	95-110
Chlorobenzene	5	10	0-2	98-108
Ethyl benzene	5	10	0-2	100-110
Styrene	5	10	0-2	97-108
Total xylenes	5	10	0-2	96-109
Methylene chloride	5	10	0-3	99-122
4-Methyl-2-pentanone	10	10	0-13	65-145
1,3-Dichlorobenzene	5	10	0-1	100-107
1,4-Dichlorobenzene	5	10	0-2	99-108
1-2-Dichlorobenzene	5	10	0-2	100-110

See notes at end of table.

Table 4-3 (Continued)
Laboratory Analysis Data Quality Objectives

RI/FS Quality Assurance Project Plan
OLF Barin, Foley Alabama

Parameter	Method Detection Limit (water) (µg/ℓ)	Method Detection Limit (soil) (µg/kg)	Precision	Accuracy (Recovery)
Volatile Organics (continued)				
Dichlorofluoromethane	10	10	0-17	35-106
Iodomethane	5	10	0-3	77-94
Dibromomethane	5	10	0-11	66-132
Ethyl methylacrylate	5	10	0-5	90-118
1,2,3-Trichloropropane	5	10	0-8	85-135
trans-1,4-Dichloro-2-butene	5	10	0-4	88-112
Acrylonitrile	100	10	0-11	76-148
Acrolein	100	10	0-5	85-114
Acetonitrile	100	10	0-4	82-106
3-Chloropropene	5	10	0-13	64-145
Propionitrile	100	10	0-5	79-106
Methacrylonitrile	5	10	0-14	49-117
1,4-dioxane	200	10	0-11	52-107
Methyl methacrylate	10	10	0-6	80-114
1,2-dibromomethane	5	10	0-11	67-129
1,1,2,2-Tetrachloroethane	5	10	0-13	61-142
1,2-Dibrome-3-chloropropane	10	10	0-5	78-103
Pentachloroethane	10	10	0-12	64-133
Isobutyl alcohol	200	10	0-6	77-111
Acid Extractables				
Phenol	10	330	0-16	46-131
2-Chlorophenol	10	330	0-15	49-132
2-Methylphenol	10	330	0-7	74-113
4-Methylphenol	10	330	0-10	69-125
2-Nitrophenol	10	330	0-20	30-117
2,4-Dimethylphenol	10	330	0-2	58-71
2,4-Dichlorophenol	10	330	0-12	59-128

See notes at end of table.

Table 4-3 (Continued)
Laboratory Analysis Data Quality Objectives

RI/FS Quality Assurance Project Plan
OLF Barin, Foley Alabama

Parameter	Method Detection Limit (water) (µg/ℓ)	Method Detection Limit (soil) (µg/kg)	Precision	Accuracy (Recovery)
Acid Extractables (continued)				
4-Chloro-3-methylphenol	10	330	0-12	60-128
2,4,6-Trichlorophenol	10	330	0-9	75-128
2,4,5-Trichlorophenol	50	1,600	0-7	79-123
2,4-Dinitrophenol	50	1,600	0-34	D-132
4-Nitrophenol	50	1,600	0-18	49-167
2-Methyl-4,6-dinitrophenol	50	1,600	0-19	36-137
Pentachlorophenol	50	1,600	0-6	69-100
Benzoic acid	50	1,600	0-36	0-18
Base Neutral Compounds				
1,3-Dichlorobenzene	10	330	0-2	83-91
1,4-Dichlorobenzene	10	330	0-2	84-93
1,2-Dichlorobenzene	10	330	0-3	82-96
Hexachloroethane	10	330	0-1	83-88
1,2,4-Trichlorobenzene	10	330	0-3	85-101
Naphthalene	10	330	0-25	30-198
Hexachlorobutadiene	10	330	0-4	78-99
2-Methylnaphthalene	10	330	0-5	84-116
Hexachlorocyclopentadiene	10	330	0-10	40-72
2-Chloronaphthalene	10	330	0-6	79-112
Acenaphthylene	10	330	0-5	87-121
Acenaphthene	10	330	0-6	85-124
Dibenzofuran	10	330	0-6	83-117
Fluorene	10	330	0-5	86-113
4-Chlorophenyl-phenylether	10	330	0-6	84-117
1,2-Diphenylhydrazine	10	330	0-6	107-152
4-Bromophenyl-phenylether	10	330	0-4	80-104
Hexachlorobenzene	10	330	0-4	87-108

See notes at end of table.

Table 4-3 (Continued)
Laboratory Analysis Data Quality Objectives

RI/FS Quality Assurance Project Plan
OLF Barin, Foley Alabama

Parameter	Method Detection Limit (water) (µg/ℓ)	Method Detection Limit (soil) (µg/kg)	Precision	Accuracy (Recovery)
Base-Neutral Compounds (continued)				
Phenanthrene	10	330	0-9	72-128
Anthracene	10	330	0-7	81-120
Fluroanthene	10	330	0-8	86-137
Pyrene	10	330	0-8	74-120
Benzo(a)anthracene	10	330	0-9	64-112
Chrysene	10	330	0-9	63-106
Benzo(b)fluoranthene	10	330	0-3	90-108
Benzo(k)fluoranthene	10	330	0-9	65-109
Benzo(a)pyrene	10	330	0-6	77-110
Indeno(1,2,3-cd)pyrene	10	330	0-7	80-126
Dibenzo(a,h)anthracene	10	330	0-6	77-113
Benzo(g,h,i)perylene	10	330	0-6	73-106
Aniline	10	330	0-2	88-101
bis(2-Chloroethyl)ether	10	330	0-5	75-99
Benzyl alcohol	10	330	0-4	82-106
bis(2-Chloroisopropyl)ether	10	330	0-4	99-122
n-Nitroso-di-n-propylamine	10	330	0-2	97-108
Nitrobenzene	10	330	0-4	90-117
Isophorone	10	330	0-5	86-115
bis(2-Chloroethaxy)methane	10	330	0-5	90-122
4-Chloroaniline	10	330	0-21	53-221
3-Nitroaniline	50	1,600	0-7	156-245
Dimethyl phthalate	10	330	0-12	56-120
2,6-Dinitrotoluene	10	330	0-11	64-125
2-Nitroaniline	50	1,600	0-7	111-165
2,4-Dinitrotoluene	10	330	0-16	45-126
4-Nitroaniline	50	1,600	--	--
Dimethyl phthalate	10	330	0-5	85-112

See notes at end of table.

Table 4-3 (Continued)
Laboratory Analysis Data Quality Objectives

RI/FS Quality Assurance Project Plan
OLF Barin, Foley Alabama

Parameter	Method Detection Limit (water) (µg/ℓ)	Method Detection Limit (soil) (µg/kg)	Precision	Accuracy (Recovery)
Base-Neutral Compounds (continued)				
n-Nitrosodiphenylamine	10	330	0-9	64-111
di-n-Butylphthalate	10	330	0-7	85-129
Benzidine	50	1,600	–	–
Butylbenzylphthalate	10	330	0-7	73-115
3,3'-Dichlorobenzidine	20	660	0-8	192-304
bis(2-Ethylhexyl)phthalate	10	330	0-15	58-149
di-n-Octylphthalate	10	330	0-7	80-124
n-Nitrosodimethylamine	10	330	–	–
Pesticides and PCBs				
alpha-BHC	0.01	0.4	0-14	36-86
beta-BHC	0.02	0.8	0-8	72-116
Lindane	0.01	0.4	0-10	49-91
delta-BHC	0.01	0.4	0-8	57-95
Heptachlor	0.01	0.4	0-17	36-111
Aldrin	0.01	0.4	0-11	63-127
Heptachlor epoxide	0.01	0.4	0-6	85-123
Endosulfan I	0.02	0.8	0-7	70-108
Dieldrin	0.02	0.8	0-10	58-109
4,4-DDE	0.02	0.8	0-9	64-109
Endrin	0.02	0.8	0-23	21-112
Endosulfan II	0.02	0.8	0-8	75-127
4,4'-DDD	0.02	0.8	0-4	78-96
Endrin aldehyde	0.02	0.8	0-20	5-18
Endosulfan sulfate	0.02	0.8	0-13	41-97
4,4'-DDT	0.02	0.8	0-9	65-113
Endrin ketone	–	–	0-10	52-94
Methoxychlor	0.04	1.6	0-6	37-51

See notes at end of table.

Table 4-3 (Continued)
Laboratory Analysis Data Quality Objectives

RI/FS Quality Assurance Project Plan
OLF Barin, Foley Alabama

Parameter	Method Detection Limit (water) (µg/ℓ)	Method Detection Limit (soil) (µg/kg)	Precision	Accuracy (Recovery)
Pesticides and PCBs (continued)				
Chlordane	0.1	4	0-11	60-119
Toxaphene	0.5	20	0-5	76-104
PCB 1016	0.8	32	0-7	67-99
PCB 1221	2	80	0-15	54-139
PCB 1232	2	80	0-6	87-122
PCB 1242	0.8	32	0-3	84-103
PCB 1248	0.4	16	0-7	110-171
PCB 1254	0.2	8	0-4	70-90
PCB 1260	0.2	8	0-17	66-205
PNA				
Acenaphthene	10	330	0-7	80-122
Acenaphthylene	10	330	0-12	59-125
Anthracene	10	330	0-12	63-133
Benzo(a)anthracene	10	330	0-6	85-123
Benzo(b)fluoranthene	10	330	0-15	52-136
Benzo(k)fluoranthene	10	330	0-14	54-132
Benzo(a)pyrene	10	330	0-10	78-146
Benzo(g,h,i)perylene	10	330	0-30	9-162
Chrysene	10	330	0-16	48-138
Dibenzo(a,h)anthracene	10	330	0-7	D-213
Fluoranthene	10	330	0-20	37-147
Fluorene	10	330	0-14	57-139
Indeno(1,2,3-CD)pyrene	10	330	0-10	71-131
Naphthalene	10	330	0-4	73-93
Phenanthrene	10	330	0-12	65-137
Pyrene	10	330	0-20	38-152
Raban	10	330	0-5	90-118

See notes at end of table.

Table 4-3 (Continued)
Laboratory Analysis Data Quality Objectives

RI/FS Quality Assurance Project Plan
OLF Barin, Foley Alabama

Parameter	Method Detection Limit (water) (µg/ℓ)	Method Detection Limit (soil) (µg/kg)	Precision	Accuracy (Recovery)
Inorganic Analysis				
Cations				
Furnace metals				
Arsenic	10	20	0-7	79-121
Lead	3	0.6	0-6	81-116
Selenium	5	1.0	0-7	77-116
Thallium	10	2.0	0-7	81-121
ICP metals				
Aluminum	200	40	0-5	81-112
Antimony	60	12	0-11	63-125
Barium	200	40	0-4	90-113
Beryllium	5	1.0	0-5	85-114
Calcium	5,000	1,000	0-6	78-112
Cadmium	5	1.0	0-6	78-112
Chromium	10	2.0	0-4	85-110
Cobalt	50	10	0-8	75-123
Copper	25	5.0	0-4	88-111
Iron	100	20	0-7	79-118
Lead	100	2.0	0-7	77-115
Magnesium	5,000	1,000	0-2	93-103
Manganese	15	3.0	0-5	85-111
Nickel	40	8.0	0-4	86-109
Potassium	5,000	1,000	0-4	88-111
Silver	10	2.0	0-8	72-115
Sodium	5,000	1,000	0-6	80-115
Vanadium	50	10	0-3	88-108
Zinc	20	4.0	0-5	83-114
Cold vapor				
Mercury	0.2	0.02	0-10	85-115

See notes at end of table.

Table 4-3 (Continued)
Laboratory Analysis Data Quality Objectives

RI/FS Quality Assurance Project Plan
OLF Barin, Foley Alabama

Parameter	Method Detection Limit (mg/ℓ unless indicated)	Precision	Accuracy (Recovery)
General Inorganic Compounds			
4,AAP Phenol	0.05	0-9	73-129
Acidity as $CaCO_3$	1	0-8	72-135
Alkalinity as $CaCO_3$	1	0-6	89-103
Ammonia-N	0.1	0-10	86-112
BOD 5, day	10	0-6	79-115
Carbon dioxide as $CaCO_3$	1	--	--
COD	5	0-4	65-121
Chloride	1	--	--
Conductivity	1 μmhos/cm	0-1	92-96
Cyanide	5 μg/ℓ	0-5	85-114
Dissolved oxygen	0.2	--	--
Flashpoint	Ambient	--	--
Fluoride	0.1	0-8	102-105
Hardness as $CaCO_3$	1	0-8	83-115
Hexavalent chromium	40 μg/ℓ	--	--
Moisture	0.1%	--	--
Nitrate-N	0.05	0-6	86-112
Nitrate/nitrite-N	0.05	0-4	86-11
Nitrite-N	0.05	--	--
Oil and Grease	0.05	0-1	81-103
Orthophosphate-P	0.05	0-8	85-105
Percent total solids	0.1%	--	--
pH			
Resistivity	1 ohms/cm	--	--
Settleable solids	0.2 m	0-4	84-110
Soluble BOD, 5 day	10	--	--
Soluble COD	5	--	--
Sulfate	1	0-4	87-117
Sulfide	0.1	0-4	83-107

See notes at end of table.

Table 4-3 (Continued)
Laboratory Analysis Data Quality Objectives

RI/FS Quality Assurance Project Plan
OLF Barin, Foley Alabama

Parameter	Method Detection Limit (mg/ℓ unless indicated)	Precision	Accuracy (Recovery)
Sulfite	0.1	--	--
Total dissolved solids	10	0-4	87-107
Total Kjeidhal nitrogen	0.1	0-25	51-155
Total petroleum hydrocarbons	0.6	0-1	96-104
Total phosphate-P	0.6	0-8	75-119
Total residual chlorine	0.1	--	--
Total solids	10	--	--
Total suspended solids	4	--	--
Turbidity	0.1 NTU	0-3	89-99
Volatile solids	10	--	--
Volatile suspended solids	4	--	--

Notes: μg/ℓ = microgram per liter.
μg/kg = microgram per kilogram.
USEPA = U.S. Environmental Protection Agency.
NA = not available.
MIBK = methyl isobutyl ketone.
PCBs = polychlorinated biphenyls.
PNA = polynuclear aromatics.
ICP = Inductivity Coupled Plasma.
mg/ℓ = milligram per liter.
$CaCO_3$ = calcium carbonate.
BOD = biochemical oxygen demand.
COD = chemical oxygen demand.
-- = not applicable.
μmhos/cm = micromhos per centimeter.
m = meters
ohms/cm = ohms per centimeter
NTU = nephelomatric turbidity units

5.0 SAMPLING PROCEDURES AND QUALITY CONTROL SAMPLES

Details of investigation and sampling plans (including the rationale, types, location, and number of samples) for each site are included in Section 3.0 "Site-Specific Technical Approach" of the FSP. Methodology and collection techniques for screening samples are presented in Section 2.0 (FSP). This section focuses on samples collected for laboratory analysis in conformance with Level III DQOs, including collection methods, collection devices, requirements for containers, preservation and holding times, sample identification, sample handling, packaging, shipping, sample records, and a definition of QC samples to be collected. Overall, the following types of samples will be collected for laboratory analysis during the RI program: soil (subsurface, surface, and sediment), groundwater, and surface water.

5.1 SOIL SAMPLE COLLECTION PROCEDURES. Soil samples collected for laboratory analysis will include split-spoon samples from soil borings and surface soil samples. Detailed procedures are presented in Section 2.2.5 of the FSP.

5.2 GROUNDWATER SAMPLE COLLECTION PROCEDURES. Groundwater samples for laboratory analyses will be collected from existing and new permanent monitoring wells. Using the purging and sampling techniques outlined in the FSP will help to ensure the collection of a representative sample.

5.3 SURFACE WATER SAMPLE COLLECTION PROCEDURES. Surface water is defined as water that flows over or rests on the land and is open to the atmosphere. This includes ditches, streams, rivers, lakes, ponds, pools, basins, or any other impoundments that fit this definition. Selection of a surface water sample location is based on many factors including: study objectives, water use, physical characteristics of the water body, flow rate, characteristics of anticipated analytical procedures, and accessibility. Methods for collecting surface water samples for volatile and non-volatile organic analyses as well as inorganic compound analyses are included in the FSP (Section 2.2.8).

5.4 SAMPLING EQUIPMENT CONSTRUCTION MATERIALS. Sampling equipment will be constructed of material appropriate for the matrix to be sampled and parameters to be analyzed for. This should prevent or minimize the chance for contamination of the sample by the equipment itself. Table 5-1 details appropriate construction materials that should be used for selected types of sampling equipment when sampling for specific parameters.

5.5 SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES. For the majority of sampling episodes, ABB-ES obtains sample containers from a NEESA-approved subcontract laboratory. ABB-ES and NEESA require all subcontract laboratories to have a current and comprehensive QAPP and sample container requirements that meet USEPA QA requirements. The subcontract laboratory will provide ABB-ES with certification regarding the sample container cleanliness and the quality of the preservatives (Lot number, purity, etc.). Sample containers for screening samples may, however, be obtained in a pre-cleaned condition from an approved commercial source. Lab

Table 5-1
Sampling Equipment, Restrictions, Materials, and Appropriate Use

RI/FS Quality Assurance Project Plan
OLF Barin, Foley, Alabama

Equipment Type	Use	Permissible Parameter Group	Restrictions and Precautions
		WATER SAMPLING	
		Groundwater	
Pumps			
1. Positive displacement pumps[1]			
a. Submersible (turbine, helical rotor)	Purging	All parameter groups	1,2,3,4,5
	Sampling	[2]Demands, nutrients	None
		Metals	1,2,3,4,6
		Extractable organics	1,2,3,4,6
b. Submersible (gear drive)	Purging	All parameter groups	1,2,3,4,5,6
	Sampling	[2]Demands, nutrients	None
		Metals	1,2,3,4,6
		Extractable organics	1,2,3,4,6
c. Bladder pump (no gas contact)	Purging	All parameter groups	3,4,6
	Sampling	[2]Demands, nutrients	None
		Metals	4,7
		VOCs and extractable organics	3,4,6
2. Suction lift pumps			
a. Centrifugal	Purging	All parameter groups	4,5,6,8
b. Peristaltic	Purging	All parameter groups	5,8
	Sampling	[2]Demands, nutrients	None
		Metals	23
		Extractable organics	9
3. Bailer purging	All parameter groups	10,26	
	Sampling	[2]Demands, nutrients	None
		Metals	11
		VOCs and extractable organics	10
		Surface Water	
1. Automatic sampler	Sampling	[2]Demands, nutrients, metals	23
2. DO dunker	Composited samples of water column	[2]Demands, nutrients	None
		Metals	11
		VOCs and extractable organics	13

[1] Pumps may not be used in sampling for volatile organic components except when pumps are permanently installed as a part of a drinking water system, or if positive displacement stainless steel and Teflon™ bladder pumps are used. If installed as a part of a drinking water system, the material construction of the pump and holding tank must be noted in the field documentation.

[2] Chemical Oxygen Demand (COD) and Biochemical Oxygen Demand (BOD).

See other notes at end of table.

Table 5-1 (Continued)
Sampling Equipment, Restrictions, Materials, and Appropriate Use

RI Quality Assurance Project Plan
OLF Barin, Foley, Alabama

Equipment Type	Use	Permissible Parameter Group	Restrictions and Precautions
3. Kemmerer or Van Dorn	Grab samples at specified depth	[2]Demands, nutrients Metals VOCs and extractable organics	None 11
4. Peristaltic pump	Sampling	See 2b under Groundwater	
5. Field filtration units	Filtration for dissolved components	[2]Demands, nutrients Trace metals	15 16
	SOLID SAMPLING		
	Sediments and Soils		
1. Core barrel	Sampling	[2]Demands, nutrients Metals VOCs Extractable organics	None 17 18,24 24
2. Trowel, scoop, spoon or spatula	Sampling and compositing	[2]Demands, nutrients Trace metals VOCs and extractable organics	None 11 12,19
3. Mixing tray	Compositing or homogenizing	[2]Demands, nutrients Trace metals Extractable organics	None 11 25
4. Shovel	Sampling	[2]Demands, nutrients Trace metals, VOCs, and extractable organics	None 20
5. Hand auger, bucket auger	Sampling	[2]Demands, nutrients Trace metals, VOCs, and extractable organics	None 20
6. Split spoon	Sampling	[2]Demands, nutrients Trace metals, VOCs, and extractable organics	None 18,21 18
7. Shelby tube	Sampling	[2]Demands, nutrients Metals VOCs Extractable organics	None 22 18 None
8. Dredges	Sampling	All parameter groups	19, 20
	Container Sampling		
1. Glass tubing	Sampling	All parameter groups	14
2. Coliwassa tube	Sampling	All parameter groups	13

[2] Chemical Oxygen Demand (COD) and Biochemical Oxygen Demand (BOD).

See other notes at end of table.

Table 5-1 (Continued)
Sampling Equipment, Restrictions, Materials, and Appropriate Use

RI Quality Assurance Project Plan
OLF Barin, Foley, Alabama

Key to Restrictions and Precautions

1. Pump must be equipped with a check valve to prevent backflow of purged water into the well.

2. If purging or sampling for organics or metals, this device may be used when no other pumping device is available, because lines cannot be practically constructed of inert materials.

3. If purging or sampling for organics or metals, pump housing should be of stainless steel and Teflon™ construction.

4. If used as a non-dedicated system, pump must be cleaned between wells. Delivery tubing should be precleaned and precut at the base of operations or laboratory. If the same tubing is used during the sampling event, it must be cleaned and decontaminated between use.

5. When purging for organics or metals, the entire length of tubing (or pipe) or the portion that comes in contact with the formation water should be constructed of Teflon™ or stainless steel. If other materials (i.e., rigid PVC, polyethylene, or polypropylene) are used, the following protocols must be followed: (1) contact with formation waters will be minimized by slowly withdrawing the pump from the water column during the last phase of purging, thus removing from the well any water that has contacted the exterior of the pump and/or tubing; and (2) a single well volume must be removed with the sampling device before sampling begins. Tygon™ must never be used for purging when organics are of interest.

6. If sampling for organics or metals, the entire length of tubing (or pipe) or the portion that will come in contact with the formation water must be constructed of Teflon™ or stainless steel.

7. Pump and delivery tubing must be constructed of stainless steel or suitable non-metallic materials.

8. Must be equipped with foot valve to prevent backflow of purged water into the well.

9. All components of the sample collection system contacting the sample water must be constructed of Teflon™, stainless steel, or glass. The system must be configured such that the sample is collected before the pump head.

10. If purging or sampling for organics or metals, construction must be of stainless steel or Teflon™.

11. Equipment must be constructed of stainless steel or suitable non metallic materials.

12. Must be constructed of stainless steel or coated with Teflon™.

13. Must be constructed of stainless steel or glass.

14. If sampling for volatile organics, no vacuum can be used to draw up sample.

15. Units must use filters with a pore size of 0.45 microns.

16. When sampling groundwater, units must use high capacity filters with a pore size of 0.45 microns and be constructed of materials that will not contaminate the sample with trace metals. The system must be configured so that the sample does not come into contact with ambient air before the sample is filtered.

17. Liners must be constructed of stainless steel or a suitable non metallic material. If a carbon-steel liner is used with the core barrel, the samples for metals shall be taken from the interior part of the core sample.

Table 5-1 (Continued)
Sampling Equipment, Restrictions, Materials, and Appropriate Use

RI Quality Assurance Project Plan
OLF Barin, Foley, Alabama

Key to Restrictions and Precautions–continued

18. If samples are sealed in the liner for transport to the laboratory, the sample for VOC analysis must be taken from the interior part of the core.

19. Samples for volatile organics should not be taken from a composite (mixed) sample.

20. Cannot be constructed of any metal other than stainless steel.

21. If constructed of materials other than stainless steel, then a Teflon™ insert must be used.

22. If constructed of materials other than stainless steel, the sample for metals analysis must be taken from the interior part of the core sample.

23. The flexible tubing used for the peristaltic pump should be medical grade silicone tubing. Delivery tubing must be constructed of suitable non-metallic materials.

24. Liners may be constructed of stainless steel, Teflon™, glass, aluminum, or other inert liner of metallic construction.

25. Must be constructed of stainless steel, Teflon™, glass, or aluminum.

26. Purging by bailer is not recommended.

Source: ABB-ES Comprehensive Quality Assurance Program Plan.

Notes: VOCs = volatile organic compounds.
DO = dissolved oxygen.
PVC = polyvinyl chloride.

Preservatives, controlled holding times, and selected container materials may be required to avoid sample degradation or alteration prior to laboratory analysis. Common preservation techniques include pH control, chemical complexation, and refrigeration or freezing. Holding times are controlled to minimize the time between sample collection and analysis, which in turn minimizes the reaction time for potential mechanisms of analyte loss or alteration. Selected container materials may be required to minimize sorption, leaching, or other interactions between the sample and the container. Amber containers may be required to block the sunlight and reduce photolytic degradation in selected analytes. In general, preservatives, holding times, and container materials are selected to inhibit biological activity, retard degradation or other alteration processes, reduce volatility, and/or reduce sorption, leaching, and complexation. Sufficient sample volumes must be collected to accommodate specified analytical methods and to allow for the analysis of laboratory QA/QC samples, where required.

5.5.1 Sample Containers In general, samples for organic analysis should be stored in glass containers and samples for inorganic analysis should be stored in plastic containers. As container specifications depend on the analyte and sample matrix types (as indicated in Table 5-2), separate samples should be taken when both organic and inorganic analyses are required. Containers should be kept in the dark (to minimize biological or photooxidation/photolysis breakdown of constituents) until they reach the analytical laboratory. The sample container should generally allow approximately 5 to 10 percent air space ("ullage") to allow for expansion and vaporization if the sample is heated during transport (1 liter of water at 4 degrees (°C) expands by 15 milliliters (mℓ) if heated to 55 °C). Important exceptions include volatile organic analysis, chemical oxygen demand, and biological oxygen demand all of which do not allow headspace in the container. When sample containers are stored onsite, the containers should be kept sealed and as far as possible from solvents also being stored. Ideally, solvents should be kept in separate facilities from clean containers and organic-free water.

5.5.2 Preservation Techniques Preservation techniques for selected analytes are presented in Table 5-2. Reagents required for sample preservation will generally be added to the sample containers by the subcontract laboratory prior to shipment. In some instances, preservatives may be added in the field by ABB-ES personnel. Samples will be preserved immediately upon collection in the field. In general, aqueous samples of low concentration organics (or soil samples of low or medium concentration organics) are cooled to 4 °C with ice. Low concentration aqueous samples for metals are preserved with nitric acid, whereas low or medium concentration soil samples for metals are cooled to 4 °C. Samples that should not be immediately preserved in the field include the following.

- Samples collected within a hazardous waste site that are known or thought to be highly contaminated with toxic materials will not be preserved. Barrel, drum, closed container, spillage, or other source samples from hazardous waste sites are not to be preserved with any chemical. These samples may be preserved with ice, if necessary.

- Samples that have extremely low or high pH or samples that may generate potentially dangerous gases will not be preserved.

Table 5-2
Sample Container and Preservation Requirements

RI/FS Quality Assurance Project Plan
OLF Barin, Foley, Alabama

Parameter	Matrix	Holding time (from time of collection)	Container	Preservative	Minimum[1] sample size
Volatile organic aromatics	Water	14 days	Two 40 mℓ vials with Teflon™-lined caps	4 drops concentrated HCl, 4 °C	40 mℓ
	Soil	14 days	Glass with Teflon™-lined septum	4 °C	10 g
Volatile organic halogenated compounds	Water	14 days	Two 40 mℓ vials with Teflon™-lined caps	4 drops concentrated HCl, 4 °C	40 mℓ
	Soil	14 days	Glass with Teflon™-lined septum	4 °C	10 g
Extractable organics	Water	7 days extraction 40 days analytical	1 ℓ amber glass with Teflon™ liner,	4 °C	1,000 mℓ
	Soil	14 days extraction 40 days analytical	Amber glass jar with Teflon™ liner or core tube	4 °C	50 g
Acrolein	Water	14 days	Glass with Teflon™-lined septum	0.008% $Na_2S_2O_3$[2] adjust pH to 4 to 5, 4 °C	40 mℓ
	Soil	14 days	Glass with Teflon™-lined septum	4 °C	enough to fill 2 40-mℓ vials
Organo-phosphorus pesticides	Water	7 days extraction 40 days analysis	1 ℓ borosilicate glass	Adjust pH to 5.0 to 9.0 with H_2SO_4 or 10 N NaOH, 4 °C	1,000 mℓ
	Soil	7 days extraction 40 days analysis	1 ℓ borosilicate glass	4 °C	100 g
Chlorinated herbicides	Water	7 days extraction 40 days analysis	1 ℓ borosilicate glass	4 °C	1,000 mℓ
	Soil	7 days extraction 40 days analysis	1 ℓ borosilicate glass	4 °C	100 g
Organochlorine pesticides and PCB	Water	7 days extraction 40 days analysis	1 ℓ borosilicate glass	Adjust pH to 5.0-9.0 with 1:1 H_2SO_4 or NaOH, 4 °C	1,000 mℓ
	Soil	7 days extraction 40 days analysis	1 ℓ borosilicate glass	4 °C	100 g
Metals (other than chromium VI and mercury)	Water	180 days	Polyethylene or glass	HNO_3 to pH <2[3]	100 mℓ
	Soil	180 days	Polyethylene or glass	4 °C	10 g
Chromium VI	Water	24 hours	Polyethylene or glass	4 °C	100 mℓ
	Soil	24 hours	Polyethylene or glass	4 °C	10 g
Mercury	Water	28 days	Polyethylene or glass	HNO_3 to pH <2[3]	100 mℓ
	Soil	28 days	Polyethylene or glass	4 °C	10 g
Cyanide	Water	14 days[4] 24 hours[5]	Polyethylene or glass	0.6 g ascorbic[2] acid, NaOH to pH >12, 4 °C	100 mℓ
	Soil	14 days	Polyethylene or glass	4 °C	10 g
Dioxins/ furans	Water	7 days extraction 40 days analytical	1 ℓ glass	4 °C	1,000 mℓ
	Soil/waste	14 days extraction 40 days analytical	Core tube	4 °C	50 g

See notes at end of table.

Table 5-2 (Continued)
Sample Container and Preservation Requirements

RI/FS Quality Assurance Project Plan
OLF Barin, Foley, Alabama

Parameter	Matrix	Holding time (from time of collection)	Container	Preservative	Minimum[1] sample size
Petroleum hydrocarbons as gasoline	Water	14 days	Two 40 mℓ vials with Teflon™ liners	4 °C, HCl to pH <2	40 mℓ
	Soil/waste	14 days	Core tube	4 °C	50 g
Petroleum hydrocarbons as diesel	Water	14 days extraction 40 days analytical	1 ℓ glass	4 °C	500 mℓ
	Soil/waste	14 days extraction 40 days analytical	Core tube	4 °C	50 g
Petroleum hydrocarbons (TPH)	Water	28 days	1 ℓ glass	4 °C, HCl to pH <2	1,000 mℓ
	Soil	28 days	Glass jar with Teflon™ liner or core tube	4 °C	50 g
Oil and grease	Water	28 days	Glass bottle	Adjust pH to <2.0 with H_2SO_4, 4 °C	1,000 mℓ
	Soil	28 days	Glass jar with Teflon™ liner	4 °C	50 g
Residue, settleable	Water	48 hours	Polyethylene or glass bottle	4 °C	1,000 mℓ
Residue, all others (TSS, VSS, TDS)	Water	7 days	Polyethylene or glass bottle	4 °C	500 mℓ
Biochemical oxygen demand	Water	48 hours	Polyethylene or glass bottle	4 °C	1,000 mℓ
Chemical oxygen demand	Water	28 days	Polyethylene or glass bottle	Adjust pH to <2.0 with H_2SO_4, 4 °C	1,000 mℓ
Metals (ICP)	Water	6 months	Polyethylene	HNO_3 to pH <2	100 mℓ
	Soil/waste	6 months	Core tube or glass jar	4 °C	10 g
Arsenic (GFAA)	Water	6 months	Polyethylene	HNO_3 to pH <2	100 mℓ
	Soil/waste	6 months	Core tube or glass jar	4 °C	10 g
Mercury (CVAA)	Water	28 days	Polyethylene	HNO_3 to pH <2	100 mℓ
	Soil/waste	28 days	Core tube or glass jar	4 °C	10 g
Selenium (GFAA)	Water	6 months	Polyethylene	HNO_3 to pH <2	100 mℓ
	Soil/waste	6 months	Core tube or glass jar	4 °C	10 g
Thallium (GFAA)	Water	6 months	Polyethylene	HNO_3 to pH <2	100 mℓ
	Soil/waste	6 months	Core tube or glass jar	4 °C	10 g
Lead (GFAA)	Water	6 months	Polyethylene	HNO_3 to pH <2	100 mℓ
	Soil/waste	6 months	Core tube or glass jar	4 °C	10 g
Chromium (VI)	Water	24 hours	Polyethylene	4 °C	100 mℓ
	Soil/waste	24 hours	Core tube or glass jar	4 °C	10 g
Cyanide	Water	14 days	Polyethylene or glass	0.6 g ascorbic acid, NaOH to pH ≥12, 4 °C	100 mℓ
	Soil/waste	14 days	Polyethylene or glass bottle	4 °C	10 g
Coliform, fecal and total	Water	6 hours	Polyethylene or glass bottle	0.08 % $Na_2S_2O_3$[2] 4 °C	500 mℓ

See notes at end of table.

Table 5-2 (Continued)
Sample Container and Preservation Requirements

RI/FS Quality Assurance Project Plan
OLF Barin, Foley, Alabama

Parameter	Matrix	Holding time (from time of collection)	Container	Preservative	Minimum[1] sample size
Fecal streptococci	Water	6 hours	Polyethylene or glass bottle	0.08 % $Na_2S_2O_3$[2] 4 °C	500 mℓ
Nitrogen, organic and Kjeldahl	Water	28 days	Polyethylene or glass bottle	Adjust pH to <2.0 with H_2SO_4, 4 °C	500 mℓ
Nitrate	Water	48 hours	Polyethylene or glass bottle	4 °C	125 mℓ
Nitrate-nitrite	Water	28 days	Polyethylene or glass bottle	Adjust pH to <2.0 with H_2SO_4	125 mℓ
Phosphorus, total	Water	28 days	Polyethylene or glass bottle	Adjust pH to <2.0 with H_2SO_4	125 mℓ
Sulfate	Water	28 days	Polyethylene or glass bottle	4 °C	125 mℓ
Sulfide	Water	7 days	Polyethylene or glass bottle	Adjust pH to >9.0 with zinc acetate plus NaOH, 4 °C	500 mℓ
Surfactants	Water	48 hours	Polyethylene or glass bottle	4 °C	1,000 mℓ
Radiological tests: alpha, beta, radium	Water	6 months	Polyethylene or glass bottle	Adjust pH to <2.0	
Total organic halogens	Water	28 days	Glass with Teflon™-lined cap	Adjust pH to <2.0 4 °C	40 mℓ

[1] Additional sample must be collected for matrix spike or matrix spike duplicate samples.
[2] Only used in the presence of residnal chlorine.
[3] Dissolved metals require filtration before pH adjustment.
[4] Holding time (14 days) applies to samples that do not contain sulfide.
[5] Sulfides are determined with lead acetate paper, if detected a 24-hour holding time applies.

Notes:
mℓ = milliliter.
g = gram.
$Na_2S_2O_3$ = sodium thiosulfate
HCl = hydrochloric acid.
ℓ = liter.
NaOH = sodium hydroxide.
°C = degrees centigrade
HNO_3 = nitric acid.
H_2SO_4 = sulfuric acid.
GFAA = gas furnace atomic asdsorption

- Water samples with a considerable solids content may require filtering prior to preservation with nitric acid. These samples can be preserved with ice and returned to the laboratory for filtering and preservation.

- All samples preserved with chemicals shall be clearly labelled.

- If containers are preserved by the subcontract laboratory, additional preservatives will be from the same source.

The following subsections describe the procedures for preparing and adding chemical preservatives. Table 5-2 indicates specific analytes for which these preservatives are recommended.

Addition of Acid (H_2SO_4, HCl, or HNO_3) or Base (NaOH). Addition of the following acids or bases may be specified for sample preservation:

Acid or base	Concentration	Normality	Amount for acidification[1]
HCl	1:1 dilution of concentrated HCl	6N	5-10 mℓ
H_2SO_4	1:1 dilution of concentrated H_2SO_4	18N	2-5 mℓ
✓ HNO_3	Undiluted concentrated HNO_3	16N	2-5 mℓ
✓ NaOH	400 grams solid NaOH in 870 mℓ water	10N	2 mℓ[2]

[1]Amount of acid to add (at the specified strength) per liter of water to reduce the sample pH to less than 2, assuming that the water is initially at pH 7, is poorly buffered, and does not contain particulate matter.
[2]To raise pH of 1 liter of water to 12.

HCl, H_2SO_4, and NaOH should be analytical reagent (AR) grade and should be diluted to the required concentration with double-distilled, deionized water in the laboratory performing the analyses or by field personnel. This procedure should be followed prior to conducting field sampling. Nitric acid (HNO_3) for metals preservation must be ultra purified metals grade HNO_3.

The approximate volumes needed to acidify one liter of neutral water to a pH of less than 2 (or raise the pH to 12) are shown in the last column of the above table. These volumes are only approximate; if the water is more alkaline, contains inorganic or organic buffers, or contains suspended particles, more acid may be required. The final pH must be checked using narrow-range pH paper. Never dip pH paper into the sample; apply a drop of sample to the pH paper using the stirring rod.

Sample acidification or base addition should proceed as follows.

1. Check initial pH of sample with wide range (0-14) pH paper.

2. Fill sample bottle to within 5 to 10 mℓ of final desired volume and add about 1/2 of estimated acid or base required, stir gently and check pH with medium range pH paper (pH 0-6 or pH 7.5-14, respectively).

3. Add acid or base a few drops at a time while stirring gently. Check for final pH using narrow range (0-2.5 or 11-13, respectively) pH paper; when desired pH is reached, cap sample bottle and seal.

Cyanide Preservation. Pre-sample preservation is required to prevent oxidizing agents such as chlorine from decomposing cyanide compounds. To test for oxidizing agents, place a drop of the sample on potassium iodide-starch test paper (KI-starch paper); a blue color indicates the need for treatment. Add ascorbic acid to the sample, a few crystals at a time, until a drop of sample produces no color on the KI-starch paper. Then add an additional 0.6 gram of ascorbic acid for each liter of sample volume. Add NaOH solution to raise pH to greater than 12 as described above.

Sulfide can also adversely affect cyanide analyses. To test for sulfide, place a drop of the sample on lead acetate test paper previously moistened with acetic acid buffer solution (pH 4). Darkening of the paper indicates the presence of sulfide. If sulfide is present, add cadmium nitrate powder (to form a yellow cadmium sulfide precipitate) until the lead acetate test yields negative results. Filter the sample to remove precipitate and add NaOH solution to the filtrate (to raise pH above 12). Avoid a large excess of cadmium and a long contact time in order to minimize a loss by complexation or occlusion of cyanide on the precipitated material.

Sulfide Preservation. Samples for sulfide analysis must be preserved by the addition of 4 drops (0.2 mℓ) of 2N zinc acetate solution per 100 mℓ sample. The sample pH is then raised to 9 using NaOH solution (1 to 2 drops). The 2N zinc acetate solution is made by dissolving 220 grams of zinc acetate in 870 mℓ of distilled water to make 1 liter of solution.

Preservation of Organic Samples Containing Residual Chlorine. Some organic samples containing residual chlorine must be treated to remove this chlorine upon collection. Test the samples for residual chlorine using USEPA Method 330.4 or 330.5 (field test kits are available for this purpose). If residual chlorine is present, add 0.008 percent sodium thiosulfate (80 mg per liter of sample) to the sample vial first, then fill the vial to at least half volume with sample. Add the acid and then fill the remainder of the vial as per the stated procedure.

5.6 SAMPLE IDENTIFICATION. Samples collected for laboratory analysis during the field investigation will be labeled with computer-generated labels. The labels will display a 14-digit sample identification code, which identifies the site sample location, sample type, horizontal and vertical locators, event number, and modifier as described below.

The sample identification system consists of 14 alphanumeric characters in 6 information groups preceded by the three-letter installation code, WHF, for OLF Barin's parent base NAS Whiting Field. The site number is followed by a "B" representing Barin Field.

WHF - 1 2B - 3 4 - 5 6 7 - 8 9 10 - 11 12 - 13 14

- Site _____
- Type _____
- Horizontal Locator _____
- Vertical Locator _____
- Event Number _____
- Modifier _____

These information groups may contain the following entries. If no information is required for the particular sample, the spaces should be filled with an X. If only one character is needed in a multi-character field, the character must be right-justified and the leading spaces filled with an X.

Site. The two-character site code identifies a specific area of investigation. Example:

22B - Site 22B at the OLF Barin installation.

Type. The two-character sample type code identifies the general source type and media of the sample. The physical location coordinates are addressed in the horizontal and vertical codes.

Codes can include:

GW - groundwater
SW - surface water
WW - waste water
DW - drinking water
WS - water supply
LT - leachate
PC - primary clarifier effluent
SC - secondary clarifier effort
RW - raw water
RI - raw influent

FE - final effluent
SS - surface soil
SB - soil boring
TP - test pit
RC - rock core
SL - sludge
SD - sediment
WT - waste
WP - wipe

AA - ambient air, grab sample
LA - ambient air, long-term sample
SG - soil gas
LV - landfill vent gas

BT - blank, trip
BS - blank, sampler
BF - blank, filtration

Horizontal Locator. Also known as the "sampling point", this code locates the sampling/exploration on the surface of the site (x, y coordinates). The horizontal locator allows designation of a variety of samples (AA, headspace, SS, SB, MW) all from the same point onsite. Two approaches may be used.

1. A number sequence for the exploration (e.g., MW-10) may be used. For wells and borings it is important to note that a boring #10 which subsequently has a monitoring well installed has the same horizontal locator, #10.

2. A grid system may be used. If a sampling program uses a grid system, as surface soil sampling often does, it is recommended that the grid system be used for all horizontal locations. A three-character grid system allows about 2600 locations (A00 through Z99). If more locations are needed, the site may be subdivided and the two or more areas designated by the site code.

Vertical Locator. Two approaches may be used to identify the third coordinate of the "sampling point."

1. Soil samples can be numbered from the surface downward corresponding to the boring or test pit log (e.g., S-21). In surface soil sampling programs, the vertical interval between samples may be specified in the workplan or the approach in Number 3 below used.

2. Monitoring well clusters can use letters to designate the relative depth of the screened interval.

3. For surface water investigations or surface soil sampling, it may be feasible to use this space for "feet below surface."

Event. Also known as the "round of sampling", these numbers will identify the sequence of multiple samples at the same location. This applies primarily to water sampling, for example, quarterly monitoring programs that continue over many years. In most cases, soil sampling will be limited at one location to one or two events.

Modifier. Examples of modifiers include:

D - duplicate sample
R - replicate sample
H - headspace portion of a sample
MS - matrix spike
MD - matrix spike duplicate
ER - equipment rinsate
FB - field blank
TB - trip blank

5.7 SAMPLE HANDLING, PACKAGING, AND SHIPPING. Sample packaging and shipping procedures should protect the integrity of the samples and prevent detrimental effects from leakage or breakage. Regulations for packaging, marking, labeling, and shipping hazardous materials and wastes are promulgated by the U.S. Department of Transportation (DOT) and described in the Code of Federal Regulations (49 CFR 171 through 177; in particular 172.402h, Packages Containing Samples). In general, these regulations were not intended to hamper shipment of samples collected at controlled or uncontrolled hazardous waste sites or samples collected during emergency responses. However, the USEPA has agreed through a memorandum of agreement to package, mark, label, and ship samples observing DOT procedures. The information presented here is for general guidance.

Correct packaging, storing, and shipping of environmental samples is necessary to:

- ensure samples remain sealed in original containers,
- prevent breakage,
- prevent cross contamination of individual samples,
- ensure sample characteristics are preserved,
- prevent contamination to receiving personnel, and
- ensure samples are protected against tampering when not in sampler's, possession.

Prior to packaging, each sample container will be inspected to verify correct labeling. Labels will be secured to containers with clear tape. Each container will have a signed and dated chain-of custody (COC) seal over the cap, secured with clear tape. Samples will be shipped to the laboratory via commercial ground or air carrier within 24 hours of sample collection.

All breakable sample containers (glass) will be protected with packing. Bubble-pack bags or strips are acceptable. (Strips should extend 1/2 inch below the base of the container.) Sample containers may be placed in sealable plastic bags such as a zip-lock type. Bottles up to 1 liter can be placed in one gallon bags. Larger bottles will be placed in heavy duty garbage bags and sealed.

Samples will be shipped in durable coolers packed with bubble-pack or vermiculite. Samples will be kept cool with blue ice or with double-bagged clean ice. Bottles with Teflon™ septums (volatile organic analytes [VOAs], ethylene dibromide [EDB]) shall be placed inverted with top of bottle facing downward. Completed COC forms will be placed in a plastic bag and taped to the inside lid of the shipping container. If COC forms refer to multiple containers they will be placed in the lead container.

A signed and dated COC seal will be secured with clear tape over the front of the container lid. The container will be sealed by wrapping it in filament tape. The airbill or manifest number and container sequence (if multiple containers are being shipped with a single COC) will be written on the tape on the container lid. "This Side Up" with a vertical arrow will be written on both sides of the container.

Until relinquished to the carrier, the shipping containers are to remain with ABB-ES personnel or remain in a locked vehicle so as not to be accessible to others. Upon shipping, the laboratory will be contacted and advised of the contents, arrival date and time, carrier, and number of containers.

5.8 SAMPLING RECORDS. Maintaining proper records is a significant aspect of sample collection. At the time samples are obtained, the following should be recorded by the sampler in the field logbook:

- sample site location,
- sample type and depth,
- date and time of sampling,
- project and sample designations,

- sampler identification, and
- analyses requested.

Additionally, the sampler must initiate COC procedures and describe the sample site in adequate detail to allow collection of additional samples from the same sample site, if necessary.

6.0 SAMPLE CUSTODY

The control of a sample is accomplished through a COC record. COC is initiated during bottle preparation by the laboratory, will be maintained through sample collection, shipment, storage, and analysis as a legal record of possession of the sample.

Possession will be traceable by means of a COC form, which will remain with the samples at all times and bears the name of the person responsible for the samples. Procedures for maintaining the appropriate sample custody information will be in accordance with USEPA Region IV SOPs (USEPA, 1991).

Samples other than those collected for in-situ measurement analyses will be identified by using a sample label that is attached to the sample container. The following information is included on the sample container label:

- project number,
- field identification or sample station number (a unique number identifying the sample),
- date and time of sample collection,
- type of sample (water, soil, sediment, etc.) and a brief description of the sampling location,
- the signature(s) of the sampler(s),
- whether the sample is preserved or unpreserved,
- the general types of analyses to be conducted, and
- any relevant comments regarding the sample.

A COC form is used to record the custody of all samples or other physical evidence collected and maintained by ABB-ES personnel. Figure 6-1 shows a blank COC form. The following information will be supplied in the indicated spaces in detail to complete the COC Record.

- project number;
- site name and address;
- project name;
- signature of sampler in the designated signature blank;
- the sampling station number, date, and time of sample collection, and a brief description of the type of sample and the sampling location;

CHAIN OF CUSTODY RECORD

Page ___ of ___

PROJECT NO. | PROJECT NAME

SAMPLERS (SIGNATURE)

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CON-TAINERS	SAMPLE TYPE											REMARKS INDICATE SOIL/WATER/AIR SEDIMENT/SLUDGE

RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)
RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)
RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED FOR DISPOSAL BY: (SIGNATURE)	DATE/TIME	REMARKS	

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ABB Environmental Services, Inc.

FIGURE 6-1
CHAIN OF CUSTODY FORM

RI/FS
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OLF BARIN
FOLEY, ALABAMA

- the sample bottle type (i.e., 40 mℓ G) plus the intended analysis (i.e., VOA-624);
- type and amount of preservative used;
- for each sample the number of containers for each bottle type; and
- field investigator and subsequent transferee(s) signatures. Both the person relinquishing the samples and the person receiving them must sign the form along with the date and time this occurred.

When samples are relinquished to a shipping company for transport, the tracking number from the shipping bill/receipt shall be recorded on the COC form. As necessary, ABB-ES uses carriers (i.e., United Parcel Service, Federal Express, Greyhound, etc.) to ship samples. In these cases the airbill becomes part of the COC.

All samples shall be accompanied by the COC record. The original and one copy of the record will be shipped inside the shipping container if samples are shipped. One copy of the record will be retained by the field investigator. The original record will be transmitted to the field investigator after samples are accepted by the laboratory. This copy will become part of the project records. ABB get original

In the event that a legal COC is required for a project, custody will begin at the time of receipt of the clean sample containers from the contract laboratory. The COC form has appropriate spaces to allow signatures and dates to document the transfer of the cleaned sample containers from the laboratory to the sample team. In addition, use of custody seals will be implemented during shipment of bottles and samples in order to document the integrity of the samples and bottles. The custody seal will be placed on the shipping container so that it cannot be opened without breaking the seal. The seal will be signed, dated, and the time recorded by the field investigator. By using a unique sample identification number for each sample, all ancillary records can be traced to specific sampling events.

7.0 CALIBRATION PROCEDURES

Procedures and documentation required for calibration of laboratory instruments and equipment are contained in USEPA Region IV SOPs (USEPA, 1991a) for organic and inorganic analyses.

Field instruments and equipment will be calibrated and inspected daily before field activities begin, as suggested by the manufacturers. Calibration information will be recorded in a calibration log, which will be kept on file at the field office trailer. Malfunctioning instruments will be repaired or replaced. Monitoring equipment will be protected from contamination during field exploration activities (as much as possible) without hindering operation of the unit. Equipment maintenance will be performed according to manufacturer specifications before field use, or by cycling units out of the field. As appropriate, routine periodic maintenance may be performed as a function of field calibration.

8.0 ANALYTICAL PROCEDURES

ABB-ES will select a NEESA-approved subcontract laboratory to analyze all samples collected during the Phase I RI field program. Per NEESA guidelines, the laboratory will be site approved prior to sample collection. Laboratory analytical procedures will be conducted in conformance with USEPA and NEESA requirements. Laboratory analytical methods for this RI include TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganics. Laboratory analytical samples will be collected and analyzed in conformance with Level III DQOs (10 percent at Level IV DQOs) and USEPA Region IV SOPs (USEPA, 1991a). The subcontract laboratory will have an active internal QA/QC program and will be NEESA approved. The DQOs along with the appropriate analytical methods are listed in Table 4-3 of this document.

The deliverables submitted by the laboratory will include all applicable CLP forms (Forms II through VIII) including extraction logs. For level IV analyses, the data package will also include reconstruction ion chromatograms, GC chromatograms, spectra for every sample and every blank, and standard or spike run with a set of samples.

9.0 DATA REDUCTION, VALIDATION, REPORTING, AND ASSESSMENT

Data collected from investigative activities include survey data, field screening data, and laboratory analytical data. The ultimate data uses include site characterization, the assessment of potential risk to human health and the environment, and the development of effective remedial measures, where necessary.

Field screening data provide real-time qualitative data and Level II quantitative data. This information is useful for site characterization and for determining strategic sampling locations. Laboratory analytical data provides qualitative and quantitative confirmation data concerning the type, quantity, and distribution of contaminants.

Laboratory data must be validated and assessed to determine the validity of the data and to ensure that DQOs are met. Sample results are validated through comparison to QA/QC data to assure that analytical results fall within acceptable accuracy and precision confidence limits, and to eliminate, correct, or flag matrix and other interference effects. Validated data are summarized and organized into formats that facilitate data evaluation. Data evaluation includes site characterization and analysis of contaminants, contaminant distribution, and transport, fate, and risk assessment. Data validation will be performed by Heartland Environmental Services, Inc., St. Peters, Missouri.

9.1 SCREENING DATA. Screening data will include results from geophysical surveys (terrain conductivity and ground-penetrating radar [GPR]), soil sample screening at discrete depths, air quality monitoring, and field parameter (pH, temperature, and specific conductivity) measurement of soil and groundwater samples.

Screening activities allow real-time or rapid analysis of contaminant distribution or of indicator parameters that may correlate with the presence of contamination. Quality control procedures used with qualitative screening instruments (e.g., pH meter, photoionization detector [PID], etc.) include calibration and comparison of results. Analytical quality control procedures used with field GC screening include: reference standard calibration, retention time window control, analytical blanks, field blanks, internal standard recovery control, logbook documentations, and review of calculated results.

9.2 LABORATORY DATA VALIDATION. Laboratory deliverables will be in conformance with USEPA requirements. Upon receipt, analytical data are systematically validated in conformance with USEPA *Functional Guidelines for Evaluating Organic Analyses* (USEPA, 1988b) and *Functional Guidelines for Evaluating Inorganic Analyses* (USEPA, 1988a). These guidelines provide a systematic procedure for evaluating laboratory QA/QC measures such as holding times, blank analyses, surrogate recoveries, matrix spike results, GC/MS tuning, instrument calibration, compound identification, and method performance. PARCC parameters will be evaluated during validation of the laboratory analytical results, as described in Section 13.0.

Validated data will be prepared in three initial formats: raw laboratory data, data marked with validation qualifiers or annotations, and corrected or validated data. The validated data can then be used for site contaminant characterization and assessment. Data validation will be performed by Heartland Environmental Services, Inc., St. Peters, Missouri.

9.3 DATA MANAGEMENT PLAN. Sampling locations and laboratory analytical data will be organized and reported in accordance with USEPA Locational Data Policy and Region IV Environmental Monitoring and Data Reporting Requirements (Workplan, Appendix C). These requirements were developed to provide a standardized reporting system for locating and tracking environmental data.

These policy documents require: (1) the identification of sampling locations in terms of latitude and longitude coordinates in accordance with the Federal Interagency Coordinating Committee for Digital Cartogrpahy (FICCDC) recommendations, and (2) the development of four databases or data files with electronic copies in American Standard Code for Information Interchange (ASCII) file format. To eliminate transcription errors during data, all data entry will be entered into the computer in a double key entry format.

The four data files include the following.

- **STATION.DAT**. This file contains basic information about the type and location of the sampling or monitoring station. Data fields include information concerning the type, location, and elevation of sampling locations.

- **WELL.DAT**. This file contains detailed information about the construction and characteristics of groundwater monitoring stations. Data fields include information concerning well location, construction methods, construction materials, development methods, availability of lithologic logs, and the use of the well (i.e., monitoring, drinking water, irrigation, etc.).

- **SAMPLE.DAT**. This file contains basic information about the collection and characteristics of samples. Data fields include information concerning station status, field parameter measurements, water level, wind speed and direction, sample collection methods, and name of sampling agency.

- **PARM.DAT**. This file contains measured values and reporting units for specific parameters. Data fields include information concerning sampling station type and unique identifier characters, Chemical Abstract Service (CAS) number of the constituent(s) to be analyzed, the reported analytical result, reporting units, name or code of analytical method, date of analysis, detection limit, and the name of the analytical laboratory.

For USEPA computing purposes, the first line of EACH of the four files MUST contain the following text starting in position one: 19901001. USEPA Region IV *Interchange File Format for Electronic Data Reports* (Workplan, Appendix C)

details specific field names, field lengths, data types, and descriptions for each of the four data files.

Each data file will be updated as new stations or sampling locations are created and/or as new samples are collected. Data will be submitted in ASCII format using 5.25-inch flexible disk or nine-track magnetic tape and as a printed hardcopy.

9.4 DATA EVALUATION. Chemical and physical data collected during the RI will be used to characterize the site and to evaluate the potential levels of risk posed to human health and the environment. Physical data (groundwater and surface water elevations and flow, soil composition, hydraulic conductivity, etc.) and chemical data (laboratory analyses and field screening data) will be integrated to form a conceptual overview of the site.

Data will be summarized and plotted on scaled maps to facilitate the analysis of contaminant distribution and potential mechanisms of transport. To identify contaminants of concern, chemical data will be compared to Applicable or Relevant and Appropriate Requirements (ARARs) and site background levels.

Physical and chemical data will be evaluated to determine the distribution of contaminants, contaminant interactions, transport mechanisms, and potential fate. This includes an evaluation of factors such as: groundwater transport, groundwater-surface water interactions, surface water transport, vadose zone transport, volatilization and advection, soil erosion, retardation, degradation, and transformation. The evaluation of the factors listed above will be subject to the availability of sufficient experimental and empirical reference data.

Groundwater, solute transport, geochemical, and/or ecosystem fate and transport modeling may be performed after initial data evaluation. There are currently insufficient data to determine which model(s) may be useful for these sites.

Plausible exposure pathways and exposure scenarios will be evaluated to assess potential levels of risk posed by the contaminants of concern. The risk assessment is based on an evaluation of exposure patterns, available toxicity data, and dose-response relationships.

Ultimately, the data collected will be evaluated to support no further action or remedial action decisions, treatability studies, and remedial design.

9.5 EVALUATION OF DATA GAPS. All data will be constantly assessed as received and sites evaluated to determine: (1) if contamination is present, (2) if it presents a threat, (3) if it has been delineated, and finally (4) what further action is needed (i.e., delineation, interim or early remedial action, or evaluation of remedial alternatives). The goal is to eliminate lengthy interim report development and review times by allowing continual data assessment and rapid decision making.

Data gaps will be addressed in Project Managers' meetings, as described below. This approach allows additional data to be collected when it is needed and minimizes reporting, review, and mobilization costs. Where appropriate, data

gaps may be addressed by integrating data from several sites and viewing the facility, or sections of the facility, on a larger scale. This should simplify addressing sites with overlapping plumes, surface water systems, and/or complex groundwater systems.

9.6 PROCEDURES TO ADDRESS DATA GAPS. The RI/FS process will be tailored to allow prioritization of sites according to potential threat to human health and the environment. The process will initially focus on source identification, with delineation of soil and sediment contamination and confirmation of groundwater and surface water contamination.

Decisions concerning data assessment and actions to be taken will be made during Project Management meetings that will include representatives from the Navy, USEPA, Alabama Department of Environmental Management, and ABB-ES. These meetings will provide a forum for discussion of investigative results and proposed actions. Verbal decisions, related to sampling and analysis, to address immediate threats made in these meetings may be final and implemented as documented in the meeting minutes. Such decisions will be properly incorporated into the projects plans as addenda and implemented in accordance with contractual requirements.

If initial data evaluation shows groundwater or surface water contamination to be an immediate threat to human health or the environment, interim or early remedial actions may be performed to mitigate further transport from the site.

If groundwater or surface water contamination is not judged to be an immediate threat, delineation may be performed at a later time and on a facility-wide or area-wide scale, after source data on several sites has been gathered. This allows delineation on a larger scale by viewing local aquifer and surface water systems as an individual operable unit(s) that may be impacted by several sites simultaneously.

10.0 INTERNAL QUALITY CONTROL

An estimate of the number and types of QC samples to be collected for screening and laboratory analyses at OLF Barin is included in Table 2-3. A brief description of QC samples and frequency of collection is presented below. Selected definitions were obtained from USEPA Region IV SOPs (USEPA, 1991a).

Duplicate Samples. Duplicate samples are two or more samples collected simultaneously into separate containers from the same source under identical conditions. One duplicate will be collected for every 10 samples of a single matrix (from a single site). Duplicate samples are intended to assess the homogeneity of the sampled media and the precision of the sampling protocol. 1 per 10, per site

Trip Blanks. Trip blanks are prepared by the laboratory prior to the sampling event and are kept with the investigative samples throughout the sampling event and are packaged and shipped with the investigative samples. These containers should never be opened prior to laboratory analysis. One trip blank will be included with each shipment of samples scheduled for volatile organic analysis. Trip blanks are required for assessing the potential for contaminating samples with volatile organic compounds during sampling or in transit.

Equipment Rinsate Blanks. Equipment rinsate blanks are collected by running organic-free water over and/or through sample collection equipment after it has been decontaminated. Equipment rinsate blanks will be collected at a frequency of one per day per type of sampling tool used. These blanks are used to assess the adequacy of decontamination procedures and to trace potential cross contamination. 1 per day

Matrix Spike and Matrix Spike Duplicates. Matrix spike and matrix spike duplicate samples are additional samples collected in the field from a single sampling location. These samples are spiked in the laboratory with a known compound (or set of compounds) of known concentration. The concentration detected, after analysis, provides an estimate of the amount of compound "lost" (e.g., sorbed to glassware, volatilized, degraded, etc.) during the analytical procedure. A comparison of the original concentration to the final concentration provides data concerning analytical precision and accuracy. One set of MS/MSD samples will be collected per 20 or fewer samples per matrix per day.

Field Water Blanks. Field water blanks include a complete set of samples collected from each water source used in the investigation. One set of samples will be collected from each water source (tap, deionized, and organic-free) used during the program. These samples should account for potential artifacts that could be introduced through decontamination procedures.

Preservative Blanks. Preservative blanks are prepared by filling sample containers with organic-free water and adding the appropriate preservative. One set of preservative blank samples will be collected at the initiation of the field sampling program and one set will be collected at the conclusion of the sampling program. These blanks should identify potential artifacts that may be introduced through the use of preservatives in sample containers.

Background Samples. Background samples are collected from areas upgradient and away from known or suspected contaminated areas. Several background (also called upgradient) samples will be collected from each matrix. The estimated number and location of these samples at each site are presented in Section 3.0 of the FSP. Background samples allow identification of possible upgradient sources and/or confirm upgradient delineation. In addition, background inorganic analyses allow the estimation of concentrations for naturally occurring compounds.

Other internal quality control activities are undertaken during the conduct of work to ensure that the service, designs, and documents produced meet currently accepted professional standards. Small assignments or tasks entail periodic discussions among the technical staff, the Task Leader, and Project Manager. QC on larger assignments may require professional review teams and/or internal audits.

11.0 PERFORMANCE AND SYSTEMS AUDITS

Audits are performed to verify that work being completed within the RI/FS program complies with QA program goals. Internal ABB-ES audits of laboratory subcontractors are routinely conducted and subcontracted laboratories must be NEESA approved.

Systems audits may be conducted on systems components to evaluate appropriate selection and utilization. The project systems audit includes evaluation of field, office, and laboratory procedures. Systems audits may address the following components:

- organization and personnel,
- facilities and equipment,
- analytical methodology,
- sampling and sample handling procedures, and
- data handling.

All primary documents will receive internal technical reviews and a minimum of one internal audit will be scheduled for the RI/FS field program. Technical reviews and internal audits will be performed in accordance with the ABB-ES CLEAN Quality Assurance Program Plan. A minimum of one internal audit will be scheduled by the Quality Assurance Manager (QAM) in coordination with the Task Order Manager (TOM) during the RI/FS activities. All audit records, including audit plans, reports, written responses, and corrective action forms, will be maintained with the project files.

12.0 PREVENTIVE MAINTENANCE

Problem prevention can be applied to all phases of project implementation. The key to preventing and resolving problems is careful advanced planning and close communications between management and technical personnel in both client and contractor organizations. Problems will be anticipated and prevented by undertaking the following measures:

- identifying possible problems that have a high probability of occurrence or a potentially significant negative impact on performance (e.g., quality of services performed, schedules, and costs.);
- identifying events, observations, or other signals possibly indicative of a developing problem;
- identifying the organizational level most likely to recognize a developing problem and the level with authority to react to the problem;
- developing preventive measures for avoiding or reducing the impact of a problem that preferably can be implemented at the same organizational level at which the problem is recognized; and
- communicating the information generated in the preceding steps to appropriate staff.

Preventive maintenance for laboratory equipment and instruments will be performed in accordance with the individual laboratory QA/QC program. Table 12-1 presents the maintenance requirements for all equipment that might be used at OLF Barin, Foley, Alabama. All field equipment will be maintained and operated according to manufacturers specifications.

Table 12-1
Routine Preventive Maintenance Activities

RI/FS Quality Assurance Project Plan
OLF Barin, Foley, Alabama

Instrument	Activity	Frequency
pH and conductivity meters		
LaMotte Chemical Products model HA and Myron L Company model EP11/pH	Check and clean probes, replace as necessary.	After each use
	Check and clean electrodes	After each use
	Check batteries, replace as necessary.	Before each use or monthly.
Trimar Industries model 333 Tripar™	Check probes and batteries, replace as necessary.	After each use
PT DspH-1™	Check probes and batteries, replace as necessary.	After each use
YSI™-Model 33 SCT Meter	Check batteries, replace as necessary.	Before each use or monthly.
	Check and clean conductivity probe.	After each use or monthly.
	Check thermostat	Before each use
Thermometers	No routine maintenance recommended by manufacturer.	
Century™ model 128 organic vapor analyzer	Clean primary filter	Semiannually
	Clean the particle filter	Semiannually
	Clean the sampling fixtures	Semiannually
	Clean the exhaust flame arrestor.	Semiannually
	Leak check, valve stems	Quarterly
ORS™ interface probe	Clean reel and probe	Quarterly, or as needed
	Replace batteries	As needed
ORS™ model EL-200 groundwater monitoring system	Clean transducers	After use in toxic environment.

Note: SCT = Salinity, Conductivity, Temperature.

Table 12-1 (Continued)
Routine Preventive Maintenance Activities

Instrument	Activity	Frequency
Photovac™ TIP	Check batteries and intake filter.	Before each use
	Clean or change lamp and ion cell assembly.	At loss of sensitivity
ISCO™ Sampler	Check batteries, replace as necessary.	Before each use
	Replace silicone pump tubing	Before each use
Photovac™ 10S50 and HNU™ model 311 gas chromatographs	Replace injection septa	Daily when in use
	Replace column	At decreased performance
	Replace pens	At decreased performance
	Clean PID lamp (HNU only).	At loss of sensitivity (approximately biweekly during heavy use).
Dräger multi-gas detector	Leak testing of the bellows pump.	Before each use
	Clean the metal screen	Monthly when in frequent use
	Flush the pump with air	Between each test
HNU™ model PI 101 photoionization analyzer	Clean the light source window.	Quarterly
Industrial Scientific HS2267 hydrogen sulfide meter	Screen replacement	When clogged
MSA™ model E oxygen indicator	Replace electrodes	As necessary
MSA™ model 60 Gascope methane meter	Clean case	Regularly as needed
	Leak checks and flow rate checks.	Weekly when in regular use
Industrial Scientific MX241 explosimeter	Clean case	Regularly as needed
	Recharge batteries	Regularly as needed

13.0 PRECISION, ACCURACY, REPRESENTATIVENESS, COMPLETENESS, AND COMPARABILITY

PARCC parameters will be evaluated during validation of laboratory analytical results. The acceptance criteria for PARCC parameters for Level III and Level IV DQOs are defined by the laboratory analytical methods chosen.

Precision. Laboratory analytical precision is a quantitative measurement of reproducibility. Precision is the variability of a group of measurements compared to their average value, monitored and evaluated for this project through comparison of duplicate samples (including matrix spike duplicates).

Precision and reproducibility can be affected by both sample collection and laboratory analytical techniques. For example, VOA samples may exhibit variability due to improper collection (airspace in the sample) or to variability in purging or injection times. Duplicate samples, when taken from a homogenized sample, are primarily affected by analytical precision.

Precision is a parameter evaluated during the data validation process. Precision will be calculated as Relative Percent Difference (RPD) using the formula:

$$RPD = \frac{D_1 - D_2}{(D_1 + D_2)/2} \times 100 \qquad (1)$$

where

RPD = Relative Percent Difference,
D_1 = first sample value, and
D_2 = duplicate sample value.

Duplicate samples and the comparison between matrix spike and matrix spike duplicate samples, calculated as RPD, will be used to measure analytical precision. Matrix spike and matrix spike duplicates are also used to measure analytical recovery, or accuracy.

Accuracy. Accuracy is the quantitative measurement of the bias of a system, relating a reported sample concentration to its actual value. Analytical accuracy is quantified by calculation of "spike" recovery. In the laboratory an aliquot of either a surrogate or a specific target compound(s) (i.e., spike), at known concentrations, is added to the sample. The concentration of the recovered spike is compared to the original concentration added and expressed as a percent recovery (%R). This measurement provides an estimate of the percent loss of a given compound during analysis (e.g., loss due to sorption to glassware, volatilization, degradation, etc.). The percent recovery is calculated by the formula:

$$\textit{Matrix spike percent recovery} = \frac{SSR - SR \times 100}{SA} \qquad (2)$$

where

SSR = spike sample results,
SR = sample results, and
SA = spike added from spiking mix.

The comparison of matrix spike and matrix spike duplicate samples to the original sample, as well as calculation of surrogate recoveries in original samples, will be used to measure accuracy.

Completeness. Percent completeness (%C) is the number of valid measurements collected, compared to the number of measurements requested. It is calculated by the formula:

$$\%C = \frac{N_a \times 100}{N_1} \tag{3}$$

where

%C = percent completeness,
N_A = actual number of valid measurements, and
N_1 = number of samples collected.

The program goal for completeness is 80 percent.

Comparability. Comparability is qualitatively measured through an evaluation of the consistency of sample collection, handling, analysis, validation and reporting. Sample collection through reporting will be conducted consistent with the DQO requirements outlined in USEPA Region IV SOPs (USEPA, 1991), and USEPA data validation requirements (USEPA, 1988b).

PARCC Parameters for Level I and II DQOs. For Level I and II field measurement data the objective for precision is to achieve and maintain factory equipment specifications. For the pH meter, precision will be tested by multiple readings in the medium of concern. Consecutive readings should agree within ± 0.1 standard pH units after the instrument has been field calibrated with standard buffers before each use. The thermometer will be visually inspected prior to each use. The organic vapor analyzer (OVA) will be calibrated prior to field use. Water level indicator readings will be precise within ± 0.01 foot for duplicate measurements. Because of the nonhomogeneity of soil gas samples, it is not valid to compare duplicate analyses. Precision for soil gas measurements will be assessed on duplicate analyses of a standard gas mixture near the upper quantitation limit. A relative percent recovery of ± 20 percent will be used for the acceptance criteria.

The objective for accuracy of field measurements is to achieve and maintain factory equipment specifications for the field equipment and assessment for accuracy by the response to an independent known standard (such as a calibration standard). The pH meter and conductivity meters are calibrated with solutions traceable to the National Bureau of Standards (NBS).

A calibration check will be made on all water level indicators before the initiation of field work. The calibration check will be made using a surveyor's tape or other standard measuring device. If the calibration check is not within ± 0.01 foot, the instrument will be returned for service. The OVA will be calibrated prior to shipment to the field. During the soil gas survey, the GC will be calibrated according to standard operating procedure a minimum of four times daily with standards for the target analytes.

will be calibrated according to standard operating procedure a minimum of four times daily with standards for the target analytes.

Field activities performed at DQO Levels I and II are onsite measurement techniques that provide information in real-time or after minimal delay. The completeness achieved for these methods may be more variable than those for standard analytical methods. A higher degree of completeness may be achieved because measurements can be readily repeated; however, site conditions may constrain the use of some techniques, resulting in fewer valid analyses than anticipated.

Comparability of Level I and II data will be maintained through consistent sample collection, handling, analysis, data evaluation, record keeping, and reporting.

14.0 CORRECTIVE ACTION

Corrective or preventive actions to improve project quality will be implemented if potential or existing conditions are identified that may have an adverse impact on data quantity or quality. Corrective actions may be immediate or long term. Corrective action identification, implementation, and recording will be conducted in accordance with the ABB-ES CLEAN QAPP.

Any member of the OLF Barin program who identifies a condition adversely affecting quality can initiate corrective action by completing a nonconformance report, or by issuing a memo to the TOM. The written communication must identify the condition and explain how it may affect data quantity or quality.

Immediate corrective action is applied to spontaneous, nonrecurring problems, such as instrument malfunctions. Staff who detect or suspect nonconformance to previously established criteria or protocol in equipment, instruments, data, or methods should immediately notify his or her Task Leader. If the problem is limited in scope, the Task Leader decides on the corrective action measure, documents the solution, and notifies the TOM and the QAM in a memorandum. If the problem has impaired the quality of the project or could re-occur in the future, the TOM will follow procedures outlined in the ABB-ES CLEAN Quality Assurance Program Plan and a Corrective Action form will be placed with the project files.

Corrective actions may also be initiated as a result of performance evaluations; system audits; laboratory/field comparison studies; QA project audits conducted by the Quality Review Team or QAM, or Navy CLEAN QA specialists; or other activities. The QAM is responsible for documenting notifications, recommendations, and final decisions. The TOM is jointly responsible for notifying program staff and implementing the agreed-upon course of action. The QAM is responsible for verifying the efficacy of the implemented actions. To the extent possible, the development and implementation of preventive and corrective actions should be timed to not adversely impact project schedules or subsequent data generation and processing activities. The QAM will also be responsible for developing and implementing routine program controls to minimize the need for corrective actions.

15.0 QUALITY ASSURANCE REPORTS

Management personnel at all levels will receive QA reports appropriate to their level of responsibility. The QAM will receive copies of all QA documentation. QC documentation will be maintained in the project files.

Other types of QA reports may include periodic assessment of measurement data accuracy, precision, and completeness; results of performance audits and/or systems audits; significant QA problems and recommended solutions for future projects; and status of solutions to any problems previously identified. Additionally, incidents requiring corrective action will be fully documented. Procedurally, the QAM will submit the reports to management. These reports will be addressed to the TOM. The summary of findings will be factual, concise, and complete. Required supporting information will be appended to the report.

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