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REMEDIAL INVESTIGATION AND FEASIBILITY STUDY DATA ASSESSMENT BARIN NAS WHITING FIELD FL

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ABB ENVIRONMENTAL

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REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

DATA ASSESSMENT

OUTLYING LANDING FIELD BARIN
FOLEY, ALABAMA

UNIT IDENTIFICATION CODE: N60508
CONTRACT NO. N62467-89-D-0317/031

AUGUST 1996

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORTH CHARLESTON, SOUTH CAROLINA
29419-9010

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

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OUTLYING LANDING FIELD BARIN
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Contract No. N62467-89-D-0317/031

Prepared by:

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August 1996

CERTIFICATION OF TECHNICAL
DATA CONFORMITY (MAY 1987)

The Contractor, ABB Environmental Services, Inc., hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0317/031 are complete and accurate and comply with all requirements of this contract.

DATE: August 26, 1996

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Project Technical Lead

(DFAR 252.227-7036)

FOREWORD

The Department of the Navy developed the Installation Restoration (IR) program to locate, identify, and remediate environmental contamination from the past disposal of hazardous materials at Navy and Marine Corps installations. The Navy IR program follows the Department of Defense Environmental Restoration program mandated by the Superfund Amendments and Reauthorization Act of 1986 to address waste sites that may pose a threat to human health or the environment.

The IR program consists of Preliminary Assessment and Site Inspection, Remedial Investigation and Feasibility Study (RI/FS), and Remedial Design and Remedial Action at sites where chemicals were allegedly disposed of. The Preliminary Assessment and Site Inspection identify the presence of pollutants. The RI/FS analyzes the nature and extent of contamination and determines the optimum remedial solution. The Remedial Design and Remedial Action complete the implementation of the solution.

Previous investigations have determined that Outlying Landing Field Barin has 10 waste sites that may pose a threat to human health or the environment. Therefore, an RI/FS will be performed to address the extent, magnitude, and impact of possible contamination at these waste sites.

This Data Assessment report presents field methods, transmits data, and summarizes results for the additional fieldwork completed for the RI.

Questions regarding this report should be addressed to the Commanding Officer, Naval Air Station Whiting Field, or to Southern Division, Naval Facilities Engineering Command, Code 1854, at AUTOVON 563-0357 or (803) 743-0357.

EXECUTIVE SUMMARY

A Remedial Investigation and Feasibility Study (RI/FS) is being conducted at the Outlying Landing Field (OLF) Barin facility in Foley, Alabama. The RI/FS is being conducted for the Department of the Navy, Southern Division, Naval Facilities Engineering Command as part of its Installation Restoration program. The Installation Restoration program was designed to identify and abate, or control, contaminant migration resulting from past operations at naval installations.

This Data Assessment report provides supplemental information to six preceding Technical Memoranda, which were prepared to summarize the RI data at OLF Barin. It serves to summarize analytical data that were collected during the May 1995 and January 1996 RI field program.

The May 1995 field program was conducted to collect additional data in order to investigate the areal and vertical extent of lead contamination at Site 22B; investigate the presence or absence of lead contamination at Site 25B; investigate the presence and vertical extent of contamination in the soil at Site 26B, as well as the presence of contamination in groundwater downgradient of Site 26B; confirm the presence or absence of inorganic contamination at Site 19B; and confirm groundwater flow patterns. The soil assessment field effort included completion of soil borings at Sites 22B and 26B and collection of surface soil samples from the Machine Gun Butt soil pile at Site 25B and at Sites 22B and 26B. The groundwater assessment field effort included installation, development, and sampling of three monitoring wells at Site 19B and a single temporary monitoring well at Site 26B.

The May 1995 field program revealed that additional data were needed for Site 22B and Site 24B. In January 1996, additional surface soil samples were collected to investigate the areal extent of lead contamination at Site 22B and to characterize contamination at Site 24B.

Based on the results of the field program, the following conclusions for Sites 19B, 22B, 24B, 25B, and 26B can be made.

Soil.

- The analytical results from additional surface soil samples indicate that the lead contamination at Site 22B has been delineated on the north, east, and south sides of the sampling grid. Contaminant delineation on the west side of the grid was not completed, and it is recommended that lead contamination in this area be delineated during remedial activities.

- Analytical results from Site 22B surface soil samples indicated that lead contamination exceeding the Office of Solid Waste and Emergency Response (OSWER) directive screening level of 400 mg/kg has not migrated past 1 foot below land surface.

- Analytical results from surface soil samples collected at Site 24B show that no contamination other than petroleum is present. Remedial action is recommended at the firefighting training pit.

- Analytical results from surface soil samples collected at Site 25B indicate that lead concentrations detected did not exceed the OSWER directive screening level of 400 milligrams per kilogram (mg/kg).

- Based upon the analytical results of surface and subsurface soil, there is no indication that the detected analytes at Site 26B are present at concentrations that pose a risk of adverse effects to human health or the environment for current and potential future land uses (ABB-ES, 1995b).

Groundwater.

- Concentrations of four inorganic analytes (aluminum, iron, lead, and manganese) detected in Site 19B groundwater samples exceeded Federal and Alabama MCLs. These data will be incorporated into the risk assessment addendum and used in future risk-based decisions.

- Manganese was the only inorganic analyte detected in the Site 26B groundwater sample that exceeded Federal and Alabama MCLs. These data will be incorporated into the risk assessment addendum and used in future risk-based decisions.

- Groundwater flow patterns across OLF Barin were determined to be comparable to those previously reported.

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GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
ARARs	applicable or relevant and appropriate requirements
bls	below land surface
CCV	continuing calibration verification
CRDL	contract-required detection limit
CRQL	contract-required quantitation limit
DQOs	data quality objectives
ft/ft	feet per foot
GFAA	graphite furnace atomic adsorption
ICP	inductively coupled plasma
ICV	initial calibration verification
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
mg/kg	milligrams per kilogram
MSA	method and standard additions
MS/MSD	matrix spike and matrix spike duplicate
µg/kg	micrograms per kilogram
µg/ℓ	micrograms per liter
NAS	Naval Air Station
NEESA	Naval Energy and Environmental Support Activity
NTU	nephelometric turbidity units
OLF	Outlying Landing Field
OSWER	Office of Solid Waste and Emergency Response
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCBs	polychlorinated biphenyls
ppm	parts per million
%R	percent recovery
QC	quality control
RI	Remedial Investigation
RI/FS	Remedial Investigation and Feasibility Study
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SDG	sample delivery group
SOPs	standard operating procedures
SOUTHNAV-FACENGCOM	Southern Division, Naval Facilities Engineering Command
SVOCs	semivolatile organic compounds

GLOSSARY (Continued)

TAL	target analyte list
TCL	target compound list
TIC	tentatively identified compound
TPH	total petroleum hydrocarbons
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

1.0 INTRODUCTION

ABB Environmental Services, Inc. (ABB-ES), under contract to the Department of Navy, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), is submitting this Data Assessment report for the Remedial Investigation and Feasibility Study (RI/FS) at Outlying Landing Field (OLF) Barin located in Foley, Alabama. The RI/FS is being conducted under Contract No. N62467-89-D-0317/031.

The May 1995 and January 1996 sampling activities were conducted to fill data gaps identified in the initial Remedial Investigation (RI) field program. This Data Assessment report provides results of the sampling activities to fill data gaps identified in the following six Technical Memoranda:

No. 1, Surface Water and Sediment Assessment
No. 2, Geologic and Hydrogeologic Assessment
No. 3, Soil Assessment
No. 4, Groundwater Assessment
No. 5, Remedial Investigation Data Summary and Workplan for Additional Investigation
No. 6, Technical Memoranda Addendum

OLF Barin is located 40 miles southeast of Mobile, Alabama, in Baldwin County, Alabama. It is approximately 2 miles east of Foley and 35 miles west of Pensacola, Florida (Figure 1-1). Currently, OLF Barin consists of approximately 490 acres, reduced from a maximum size of 1,000 acres. The major part of the facility is presently used for a single air field with two active aircraft landing strips. Figure 1-2 presents the current installation layout.

OLF Barin, under the command of Naval Air Station (NAS) Whiting Field in Milton, Florida, is used as an outlying landing strip for airplane pilots training at NAS Whiting Field. A single onsite building is used for base operations and training. Several smaller buildings are used for equipment storage. The only current activity at OLF Barin is a small contingent of firefighters stationed at the facility to respond to aircraft accidents. The remaining undeveloped acreage consists primarily of maintained recreational areas, open grasslands, and pine tree plantations.

1.1 RATIONALE FOR SUPPLEMENTAL SAMPLING. To fill data gaps previously identified for Sites 19B, 22B, 24B, 25B, and 26B, surface soil, subsurface soil, and groundwater samples were collected during the 1995 and 1996 supplemental assessment. The rationale for each site and medium sampled was as follows. Site locations are shown on Figure 1-3.

Soil.

- Surface soil samples were collected in May 1995 from the northwestern and southwestern parts of Site 22B to determine the areal extent of lead contamination outside the sampling grid established in the previous RI field programs.

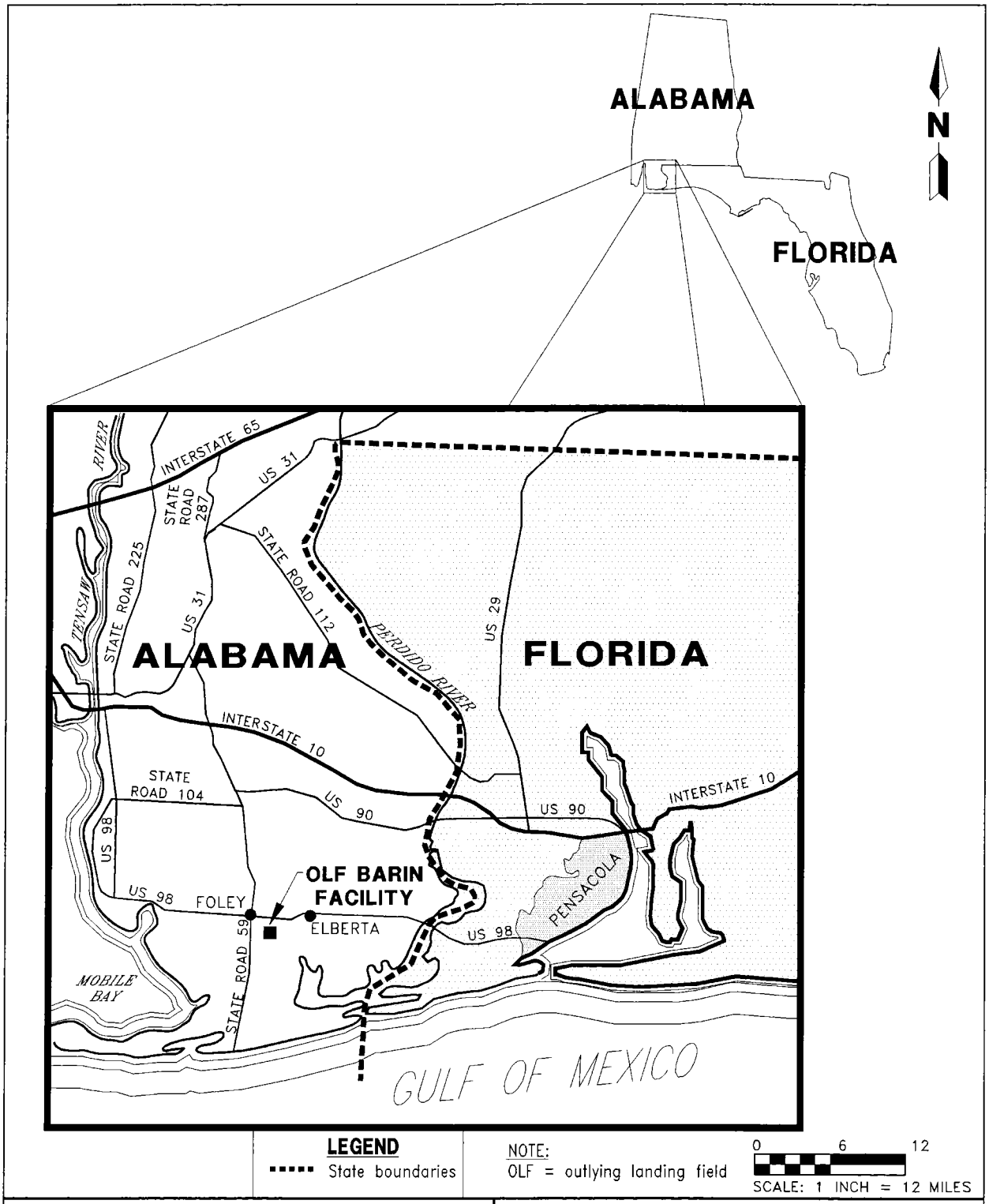

FIGURE 1-1
FACILITY LOCATION MAP

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DATA ASSESSMENT

OLF BARIN
FOLEY, ALABAMA

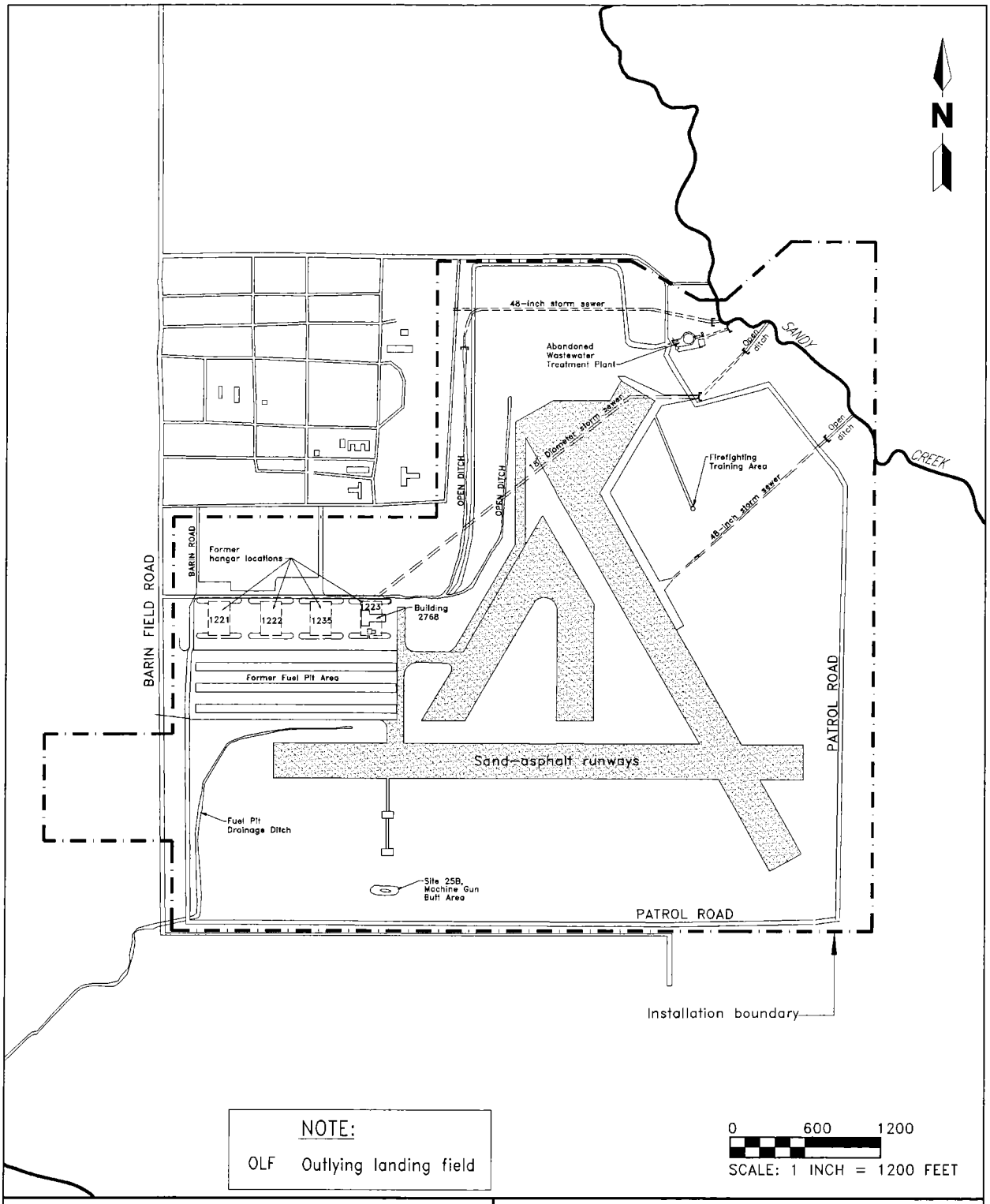

FIGURE 1-2
OLF BARIN FACILITY LAYOUT

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DATA ASSESSMENT

OLF BARIN
FOLEY, FLORIDA

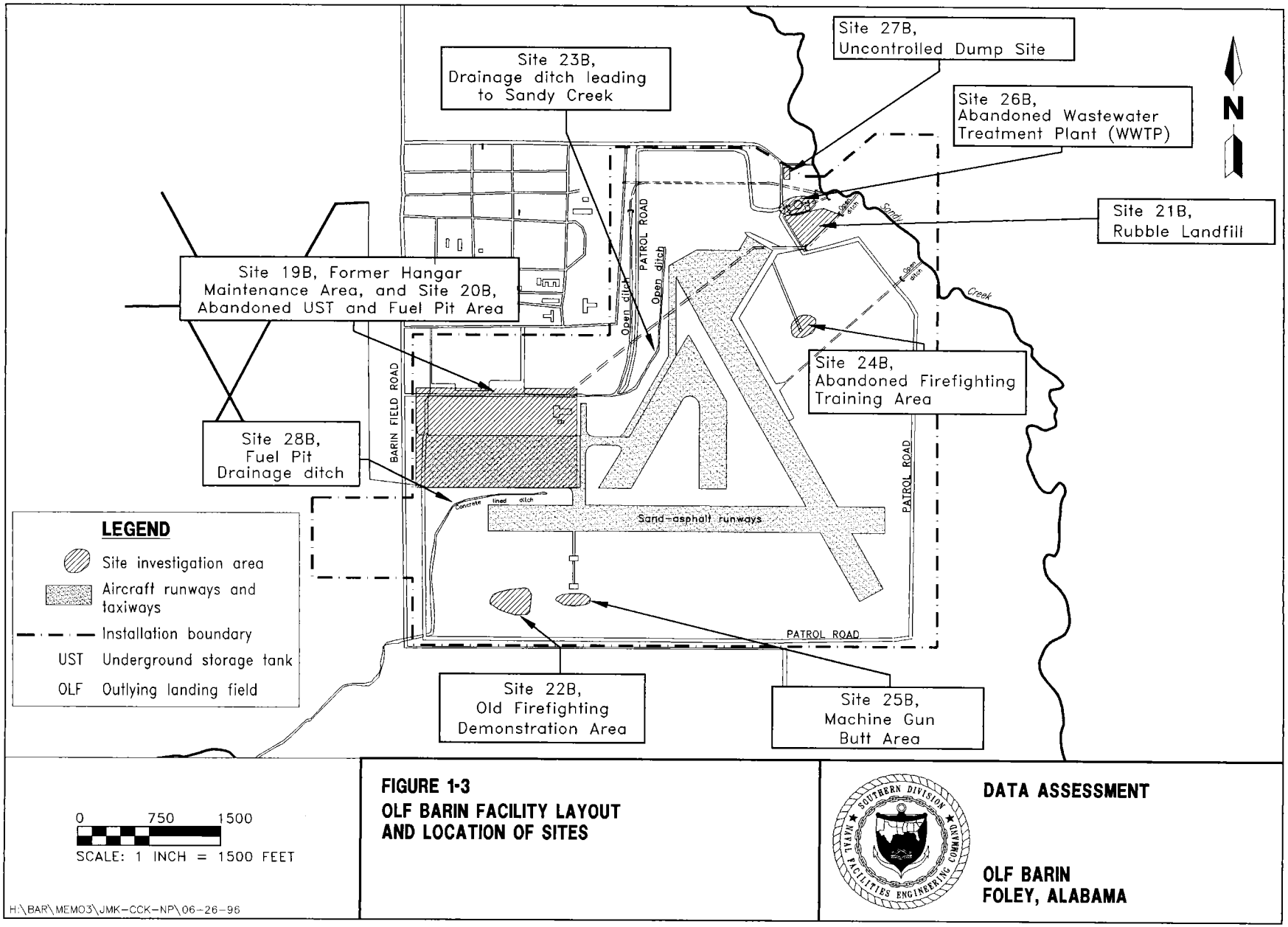


FIGURE 1-3
OLF BARIN FACILITY LAYOUT AND LOCATION OF SITES

DATA ASSESSMENT

OLF BARIN
FOLEY, ALABAMA

- Soil samples from each of the four sludge drying beds were collected and composited into a single surface soil sample from Site 26B, Abandoned Wastewater Treatment Plant, to assess the presence of contamination.

- Soil samples were collected from the soil pile at Site 25B to evaluate the extent of lead contamination within the Machine Gun Butt soil mound.

- Surface soil samples were collected in January 1996 from Site 22B to determine the areal extent of lead contamination outside the sampling grid established in the previous RI field programs.

- One surface soil sample was collected in January 1996 from Site 24B to characterize contamination within the firefighting training pit.

- Two soil borings were completed at Site 22B to determine the vertical extent of lead contamination in the soil.

- Subsurface soil samples from four soil borings, one in each sludge drying bed, were composited at Site 26B; soil from the boring was analyzed to determine the vertical extent of target analyte list (TAL) metals and/or cyanide contamination in the soil.

Groundwater.

- Three monitoring wells were installed and sampled for TAL metals and cyanide to determine the presence of inorganic contamination in groundwater at Site 19B, to investigate groundwater flow patterns, and to assess upgradient groundwater quality.

- A temporary well was installed and sampled downgradient of Site 26B to determine the presence of TAL metals and cyanide contamination in the groundwater.

- Groundwater surface elevations were recorded in all facility monitoring wells to determine groundwater flow patterns across OLF Barin and to compare groundwater flow directions to the three previous water-level surveys.

2.0 SUPPLEMENTAL FIELD PROGRAM SUMMARY

Chapter 2.0 presents the summaries of the hydrogeologic assessment and the surface and subsurface soil and groundwater sampling programs, which were conducted in May 1995 and January 1996.

2.1 HYDROGEOLOGIC ASSESSMENT. A groundwater elevation survey was completed during the 1995 field program to aid in the analysis of groundwater flow directions at the facility. The survey included measurements in 34 monitoring wells previously installed during the RI field program and the 3 monitoring wells installed at Site 19B during the 1995 field program. Figure 2-1 provides the locations of all of the wells used in the groundwater elevation survey.

2.2 SOIL SAMPLING SUMMARY. Surface soil and subsurface soil samples were collected at four sites during the 1995 and 1996 field programs to address data gaps and reduce uncertainties identified in the risk assessment.

2.2.1 Surface Soil Twenty-three surface soil samples (plus two duplicates) were collected and analyzed in May 1995 at the facility. Thirty-two surface soil samples (plus four duplicates) were collected and analyzed for lead and a single sample for target compound list (TCL) organic and TAL inorganics in January 1996. Table 2-1 summarizes the number of samples collected and the analyses completed for each of the soil samples collected. The surface soil sampling locations for Sites 22B and 25B and Sites 24B and 26B are shown on Figures 2-2 and 2-3, respectively.

May 1995. Fifteen surface soil samples (designated WHF-22B-SS-37 through WHF-22B-SS-51) were collected at the northwestern and western areas of Site 22B to delineate the extent of lead contamination. Two surface soil samples (designated WHF-22B-SS-52 and WHF-22B-SS-53) were collected at the southwestern edge of Site 22B to assess the extent of offsite lead contamination.

One composite soil sample was collected at Site 26B, the waste water treatment plant, from the centers of the four sludge drying beds. Five soil penetrations were made into the soil mound at Site 25B, the Machine Gun Butt area.

January 1996. Thirty-two surface soil samples (designated 22S05401 through 22S08601, excluding 22S06801) were collected at the north, west, and south areas of Site 22B. A single surface soil sample was collected from Site 24B.

Surface soil samples were collected from 0 to 6 inches below land surface (bls) using a decontaminated stainless-steel spoon and were mixed in a glass bowl. Soil samples from the Machine Gun Butt at Site 25B were collected using a decontaminated stainless-steel auger bucket and spoon. All soil samples were collected in accordance with the U.S. Environmental Protection Agency (USEPA) Region IV standard operating procedures (SOPs) (USEPA, 1991a) and the RI/FS Sampling and Analysis Plan (SAP) (ABB-ES, 1993c). The soil samples from 1995 were sent to CompuChem Environmental Corporation in Research Triangle Park, North Carolina, for analyses, and soil samples from 1996 were sent to Quality Analytic Laboratories in Redding, California. Soil samples were analyzed for lead or TAL metals and cyanide, according to sample origin. Soil chemical analyses were

Figure 2-1 Monitoring Well Locations, May 1995

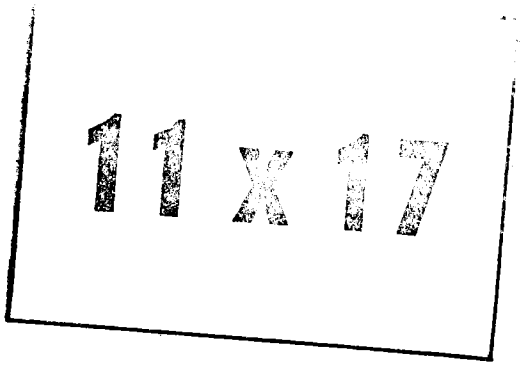


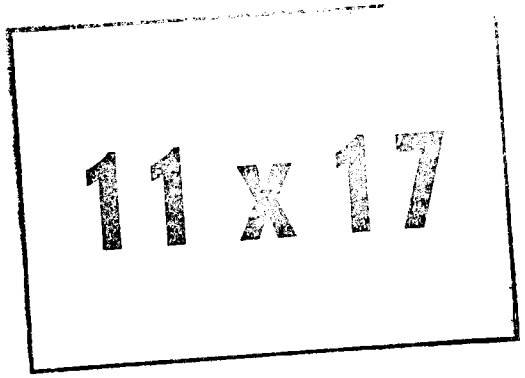
Table 2-1
Surface Soil Sampling Summary

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

Number of Surface Soil Samples	Rationale	Sample Designation	Laboratory Analysis Completed
Site 22B			
17	To investigate the areal extent of lead contamination at Site 22B.	WHF-22B-SS-37 to WHF-22B-SS-53	Lead
32	To investigate the areal extent of lead contamination at Site 22B.	22S05401 to 22S08601	Lead
Site 24B			
1	To characterize contamination within the firefighting training pit.	24S00101	TCL VOCs, SVOCs, pesticides, and PCBs/TRPH/TAL inorganics
Site 25B			
5	To determine if the soil pile is a source of inorganic contamination at Sites 22B or 25B.	WHF-22B-SP-01 to WHF-22B-SP-05	Lead
Site 26B			
1	To determine if TAL metals and cyanide are present in the surface soils at Site 26B.	WHF-26B-SS-01	TAL inorganics and cyanide

Notes: TCL = target compound list.
VOCs = volatile organic compounds.
SVOCs = semivolatile organic compounds.
PCBs = polychlorinated biphenyls.
TRPH = total recoverable petroleum hydrocarbons.
TAL = target analyte list.

Figure 2-2 Surface Soil Sampling Locations, May 1995 and January 1996



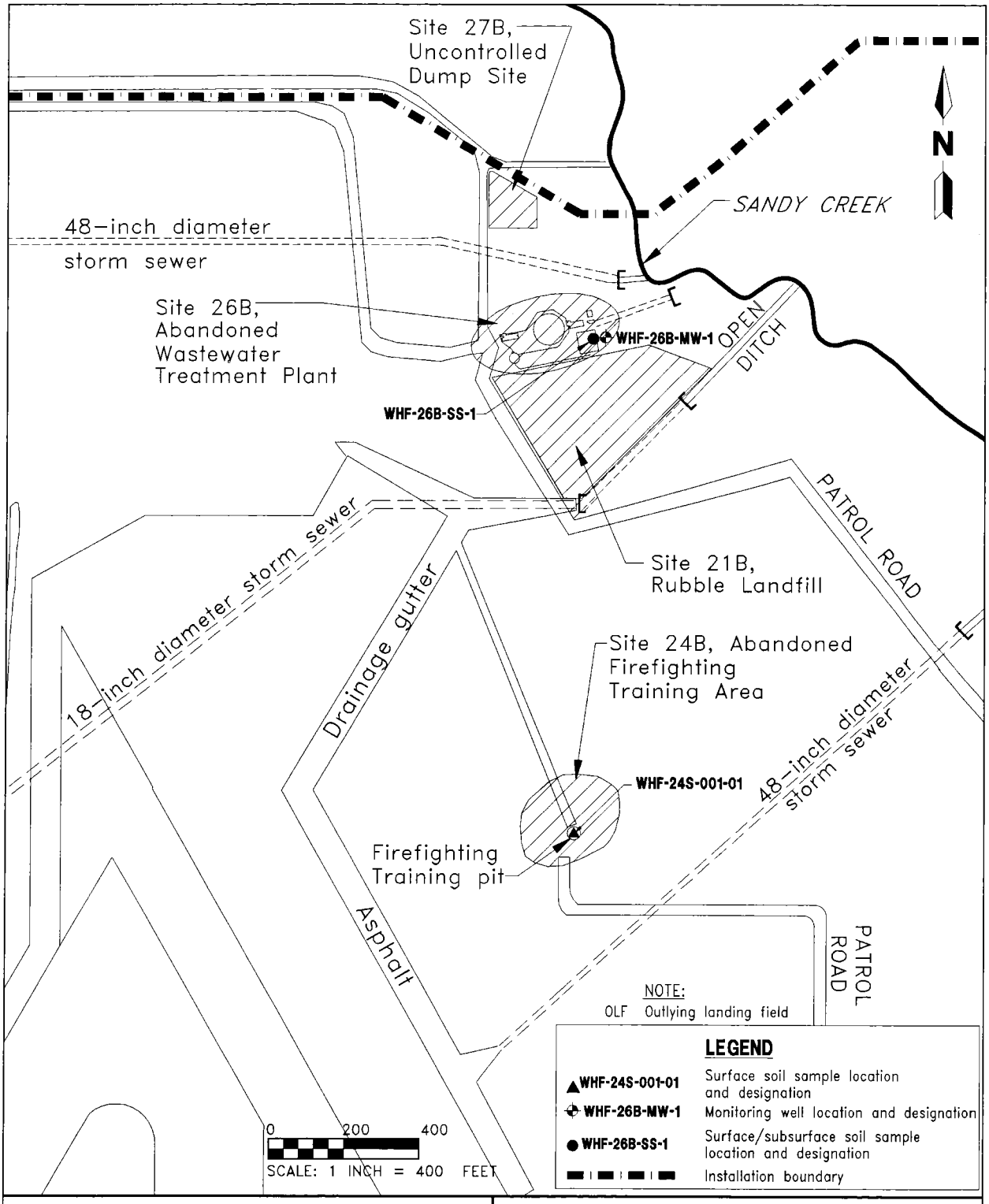


FIGURE 2-3
SAMPLE LOCATIONS
MAY 1995 AND JANUARY 1996

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DATA ASSESSMENT

OLF BARIN
FOLEY, ALABAMA

performed in accordance with Naval Energy and Environmental Support Activity (NEESA) level C quality control (QC) with 10 percent (including all field QC samples) analyzed at NEESA level D QC. All analytical data generated by the project in May 1995 were subject to validation. The data validation was completed by Heartland Environmental Services of St. Peters, Missouri. Analytical data from January 1996 were validated by ABB-ES.

2.2.2 Subsurface Soil Three subsurface soil borings were completed and sampled to investigate the vertical migration of contaminants at Sites 22B and 26B. Two soil borings were completed at Site 22B, the Old Firefighting Training Area (Figure 2-4). These samples were collected at previous surface soil sample locations known to have elevated lead concentrations. One subsurface soil sample was composited from four borings at Site 26B, the Abandoned Wastewater Treatment Plant (Figure 2-3). The soil sample was composited from four locations, one each at the center of the four sludge drying beds.

The subsurface soil samples were each identified with a letter suffix indicating the relative depth ("A" corresponding to the shallowest sample at a location, "B" to the next shallowest, etc.). One to three soil samples were collected from each of the three soil borings (plus duplicate, matrix spike, and matrix spike duplicate samples, WHF-26B-SB-01D, WHF-26B-SB-01M, and WHF-26B-SB-01S). Table 2-2 summarizes the subsurface soil sampling program.

Table 2-2
Subsurface Soil Sampling Summary

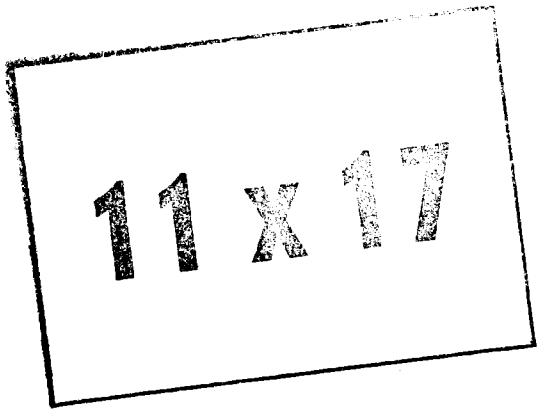
Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

Number of Subsurface Soil Samples	Rationale	Sample Designation	Sample Depth (ft bls)	Laboratory Analysis Completed
Site 22B				
6	To investigate the vertical extent of lead contamination at previously sampled locations having lead contamination at Site 22B.	WHF-22B-SB-14A	0 - 0.5	Lead
		WHF-22B-SB-14B	1 - 2	Lead
		WHF-22B-SB-14C	2 - 3	Lead
		WHF-22B-SB-34A	0 - 0.5	Lead
		WHF-22B-SB-34B	1 - 2	Lead
		WHF-22B-SB-34C	2 - 3	Lead
Site 26B				
2	To determine if TAL metals and cyanide are present in the subsurface soil at Site 26B.	WHF-26B-SB-01, 01D	2 - 3	TAL inorganics and cyanide

Notes: ft bls = feet below land surface.
TAL = target analyte list.

Soil samples from hand auger soil borings were collected directly from the stainless-steel hand auger. The soil samples were collected with a decontaminated stainless-steel spoon and mixed in a glass bowl prior to placement in sample containers. All soil samples were collected in accordance with the USEPA Region

Figure 2-4 Subsurface Soil Sample Locations



IV SOP (USEPA, 1991) and the RI/FS SAP (ABB-ES, 1993c). Detailed lithologic descriptions for the soil borings are presented in Appendix A.

2.3 GROUNDWATER SAMPLING SUMMARY. The 1995 groundwater assessment field effort included the installation and sampling of three new monitoring wells at Site 19B (Figure 2-2) and the installation and sampling of one temporary monitoring well at Site 26B. The methods used during this part of the field program are summarized below.

Three monitoring wells at Site 19B (WHF-19B-MW-12S, WHF-19B-MW-13S, and WHF-19B-MW-14S) were installed and developed along the northern perimeter of the site. Well construction details for these monitoring wells are summarized in Table 2-3. One groundwater sample was collected from each monitoring well and analyzed for total TAL inorganics, cyanide, and total dissolved and suspended solids. A portion of the sample was filtered onsite and analyzed for TAL inorganics. Duplicates and matrix spike and matrix spike duplicate (MS/MSD) samples were also collected.

Table 2-3
Sites 19B and 26B Monitoring Well Construction Details

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

Monitoring Well Designation	Installation Method	Land Surface Elevation (above msl)	Well Elevation (top of casing, above msl)	Well Depth (ft bls)	Screen Interval (ft bls)
WHF-19B-MW-12S	HSA	62.11	64.55	32.5	22.5 to 32.5
WHF-19B-MW-13S	HSA	57.96	60.11	28	18 to 28
WHF-19B-MW-14S	HSA	53.35	55.97	24.5	14.5 to 24.5
WHF-26B-MW-1S	HSA	20.16	20.16	15	5 to 15

Notes: msl = elevation relative to mean sea level.
ft bls = feet below land surface.
HSA = hollow-stem auger.

One temporary monitoring well was installed and developed downgradient of Site 26B (WHF-26B-MW-01S) to investigate possible groundwater contamination at the site. One sample was collected and analyzed for total TAL metals, cyanide, and total suspended solids and total dissolved solids. The sample was filtered offsite and analyzed for total TAL metals and cyanide. A duplicate was also collected. Table 2-4 summarizes the number of groundwater samples collected at each site and the analyses conducted.

Prior to sampling, water-level measurements were recorded, well volumes were calculated, and well purging was completed using either a 2-inch submersible pump or a peristaltic pump. Physical parameters, including conductivity, turbidity, temperature, and pH, were monitored during purging, and purging was suspended once these parameters stabilized to within 5 percent on three subsequent well volumes. Otherwise, purging continued until five well volumes were removed. Samples were obtained from each well using either a Teflon™ bailer or the peristaltic pump.

All groundwater samples were collected following procedures outlined in the OLF Barin RI/FS Workplan, Volume 2 of 3, SAP (ABB-ES, 1993c), and USEPA Region IV SOPs (USEPA, 1991). All samples were sent to CompuChem Environmental Corporation, Research Triangle Park, North Carolina, for analyses. The samples were analyzed in conformance with NEESA Level C with 10 percent Level D requirements. The analytical results were validated by Heartland Environmental Services, Inc., of St. Peters, Missouri.

Table 2-4
Groundwater Sampling and Analytical Program Summary

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

Site Number	Site Name	Number of Groundwater Samples	Analyses Completed
19B	Former Hangar Maintenance Area	3	TAL inorganics (total and dissolved), TSS, TDS, CN
26B	Abandoned Wastewater Treatment Plant	1	TAL inorganics (total and dissolved), TSS, TDS, CN

Notes: TAL = target analyte list.
TSS = total suspended solids.
TDS = total dissolved solids.
CN = cyanide.

3.0 QUALITY CONTROL ASSESSMENT

This chapter is an assessment of quality control for field sampling and data collection activities performed for the RI in May 1995 and January 1996. The analytical results were evaluated and validated according to NEESA Level C criteria with 10 percent Level D criteria and QC criteria specified by analytical methods. The data tables included in Appendix B reflect validation according to Level C criteria, with 10 percent Level D criteria. These criteria are described in Subsection 7.3.2 of NEESA Document 20.2-047B (NEESA, 1988) and the USEPA functional guidelines for evaluating organic and inorganic data (USEPA, 1988a; 1988b). Data review and validation for data collected during May 1995 were performed by Heartland Environmental Services, Inc., of St. Peters, Missouri. Data review and validation for data collected during January 1996 were performed by ABB-ES. The data validation reports are presented in Appendix D and are categorized by sample delivery groups (SDGs). A list of the samples included in each of these SDGs is presented in Appendix C.

3.1 FIELD QC ASSESSMENT. Field QC samples (e.g., field blanks, trip blanks, rinsate blanks, and duplicates) were collected, stored, transported, and analyzed per USEPA SOPs (USEPA, 1991a). Blank samples provide a measure of contamination that may have been introduced into a sample set either (1) in the field while samples were being collected or transported to the laboratory or (2) in the laboratory during sample preparation and analysis. Two types of blank samples (field blanks and rinsate blanks) were collected during sample collection at OLF Barin. Field blanks and rinsate blanks are used to determine if certain field sampling or decontamination procedures (e.g., insufficient cleaning of sampling equipment) result in cross-contamination of site samples. The field blank sample is also used to evaluate the quality of the water used in the decontamination procedures. Field duplicate samples are usually two samples collected simultaneously from the same sampling location and are used as measures of either the homogeneity of the medium sampled or the precision in sampling. One field blank, four rinsate blanks, and five duplicate samples were collected and analyzed at OLF Barin in May 1995. One field blank, two rinsate blanks, and three duplicate samples were collected and analyzed at OLF Barin in January 1996.

3.2 DATA QUALITY OBJECTIVES (DQOs) ASSESSMENT. All sample results are evaluated in terms of DQOs. DQOs refer to a set of qualitative and quantitative statements that assess the quality of data generated during the sampling and analysis phases of the project. The DQOs are defined by the parameters of precision, accuracy, representativeness, completeness, and comparability (PARCC). These parameters present an indication of data quality and the confidence that a particular compound may be present or absent in an associated environmental sample. The sampling program DQOs as stated in Chapter 4.0 of Volume IIB of the RI/FS planning document (ABB-ES, 1993c) are NEESA Level C with 10 percent being NEESA Level D. Table 3-1 presents the analytical data used to measure the PARCC criteria. The following paragraphs discuss each of the PARCC criteria, including the PARCC measurements specific to each analysis and an overall assessment of DQOs.

3.2.1 Precision Precision is a measure of the reproducibility of the analytical results under a given set of conditions. It is a quantitative measure of the variability of a group of measurements compared to their average value. Precision is measured as the relative percent difference (RPD) between a sample and its

Table 3-1
Analytical Summary of Field Quality Control Samples, 1995 and 1996 Data

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

ABB-ES Sample No.	WHF-FB-01	WHF-19B-SSRB-1	WHF-19B-SSRB-2	WHF-19B-SSRB-3	WHF-19B-GWRB-1	WHF-22B-SS-40	WHF-22B-SS-40D	WHF-22B-SS-50	WHF-22B-SS-50D
Laboratory No.	714894	714610	714607	714874	714875	714580	7145852	714601	714602
Date Collected	04-MAY-95	04-MAY-95	04-MAY-95	05-MAY-95	05-MAY-95	04-MAY-95	04-MAY-95	04-MAY-95	04-MAY-95
Inorganic Analytes (µg/ℓ)									
Aluminum	80.4 J	NA	NA	77.7 J	87.5 J	NA	NA	NA	NA
Antimony	--	NA	NA	2 J	2.1 J	NA	NA	NA	NA
Arsenic	--	NA	NA	--	--	NA	NA	NA	NA
Barium	0.62 J	NA	NA	0.37 J	0.67 J	NA	NA	NA	NA
Beryllium	--	NA	NA	--	--	NA	NA	NA	NA
Cadmium	--	NA	NA	--	--	NA	NA	NA	NA
Calcium	33.5 J	NA	NA	33.6 J	44.5 J	NA	NA	NA	NA
Chromium	--	NA	NA	--	--	NA	NA	NA	NA
Cobalt	--	NA	NA	--	--	NA	NA	NA	NA
Copper	--	NA	NA	--	--	NA	NA	NA	NA
Iron	--	NA	NA	--	--	NA	NA	NA	NA
Lead	--	--	--	--	--	537	556	30.5	51.9
Magnesium	10.3 J	NA	NA	9.7 J	--	NA	NA	NA	NA
Manganese	--	NA	NA	--	--	NA	NA	NA	NA
Mercury	--	NA	NA	--	--	NA	NA	NA	NA
Nickel	2.3 J	NA	NA	--	--	NA	NA	NA	NA
Potassium	55.7 J	NA	NA	50 J	53.5 J	NA	NA	NA	NA
Silver	--	NA	NA	--	--	NA	NA	NA	NA
Sodium	364 J	NA	NA	329 J	283 J	NA	NA	NA	NA
Thallium	--	NA	NA	--	3.6 UJ	NA	NA	NA	NA
Vanadium	--	NA	NA	--	--	NA	NA	NA	NA
Zinc	3.4 J	NA	NA	2.1 J	--	NA	NA	NA	NA
Total Dissolved Solids (TDS) (mg/ℓ)									
TDS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Suspended Solids (TSS) (mg/ℓ)									
TSS	NA	NA	NA	NA	NA	NA	NA	NA	NA

See notes at end of table.

Table 3-1 (Continued)
Analytical Summary of Field Quality Control Samples, 1995 and 1996 Data

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

ABB-ES Sample No.	WHF-26B-SB-01	WHF-26B-SB-01D	WHF-26B-MW-1	WHF-26B-MW-1D	WHF-19B-MW-13	WHF-19B-MW-13D	22F00101
Laboratory No.	714910	714911	714620	714626	714897	714909	RA872002
Date Collected	06-MAY-95	06-MAY-95	04-MAY-95	04-MAY-95	06-MAY-95	06-MAY-95	09-JAN-96
Inorganic Analytes (mg/kg) (µg/ℓ)							
Aluminum	2,450 J	2,080 J	147 J	NA	395	332	NA
Antimony	0.41 J	0.4 J	--	NA	--	--	NA
Arsenic	0.73 J	14.4 J	--	NA	--	--	NA
Barium	8 J	5.7 J	24.2 J	NA	12.7 J	12.4 J	NA
Beryllium	0.08 J	0.05 J	--	NA	--	--	NA
Cadmium	0.15 J	0.12 J	--	NA	--	--	NA
Calcium	166 J	116 J	1550 J	NA	967 J	971 J	NA
Chromium	4.7	4	--	NA	--	--	NA
Cobalt	--	--	2 J	NA	1.5 J	1.6 J	NA
Copper	13.8	10.4	--	NA	--	--	NA
Iron	2,360	1,890	--	NA	314	256	NA
Lead	8.5	7.2	--	NA	--	--	23.4 J
Magnesium	49.5 J	47 J	1120 J	NA	569 J	561 J	NA
Manganese	8	7.1	66.9	NA	17.4	17.5	NA
Mercury	0.24	0.25	--	NA	--	--	NA
Nickel	--	--	--	NA	--	--	NA
Potassium	--	--	615 J	NA	535 J	547 J	NA
Silver	2.2	1.8 J	--	NA	--	--	NA
Sodium	191 J	180 J	1790 J	NA	3,130 J	3,200 J	NA
Thallium	--	--	--	NA	3.6 UJ	3.6 UJ	NA
Vanadium	6 J	4.7 J	--	NA	1.3 J	1.1 J	NA
Zinc	12	9.4	19 J	NA	10.1 J	11.2 J	NA
Total Dissolved Solids (TDS) (mg/ℓ)							
TDS	NA	NA	35	32	27	26	NA
Total Suspended Solids (TSS) (mg/ℓ)							
TSS	NA	NA	--	--	--	--	NA

See notes at end of table.

Table 3-1 (Continued)
Analytical Summary of Field Quality Control Samples, 1995 and 1996 Data

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

ABB-ES Sample No.	22R00101	22R00201	22S05401	22S05401D	22S06401	22S06401D	22S07401	22S07401D	22S08001	22S08001D
Laboratory No.	RA872001	RA873001	RA872003	RA872004	RA872013	RA872014	RA873016	RA873017	RA873004	RA873005
Date Collected	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96
Inorganic Analytes (mg/kg) (µg/ℓ)										
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	--	25.4 J	--	--	723 J	674 J	--	--	48.9	60.4
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids (TDS) (mg/ℓ)										
TDS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Suspended Solids (TSS) (mg/ℓ)										
SSS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes: ABB-ES = ABB Environmental Services, Inc.
µg/ℓ = micrograms per liter.
J = estimated value.
NA = not analyzed.
-- = not detected.
UJ = all nondetected values were qualified as estimated.
mg/ℓ = milligrams per liter.

duplicate, as is calculated for field duplicate samples, laboratory duplicate samples (inorganics only), and MS/MSD samples. The field duplicate samples are taken from the same source and analyzed under identical conditions to evaluate the precision. The following equation is used to calculate the RPD.

$$RPD = 100 \; X \; \frac{|D_1 - D_2|}{0.5\,(D_1 + D_2)} \qquad (1)$$

where

D_1 and D_2 are the reported concentrations for sample duplicate analyses.

When measuring precision for organic analyses, the RPDs of the MS/MSD samples are compared to established review criteria. MSDs are generally not performed for inorganic analysis; therefore, RPDs are not reported for MS/MSD for inorganics. However, the laboratory does perform analysis of a sample and a laboratory duplicate for inorganics that are used to evaluate precision instead of the MS/MSD comparison. No analytes were outside control limits for the laboratory duplicates (inorganics), and no data required qualification based on the RPDs of laboratory duplicates.

Precision is also evaluated by comparison of field duplicates. The RPDs of the field duplicate samples are compared to the acceptance criteria of 35 percent RPD for soil matrices and 20 percent RPD for water matrices (USEPA, 1991a). Field duplicate analyses measure both field and laboratory precision, resulting in more variability than laboratory duplicates that measure only laboratory performance. Qualification of data-based field duplicates alone is generally not performed. Instead, the data are evaluated in conjunction with other QC data to evaluate the overall quality of the data. Table 3-2 summarizes the RPDs of the field duplicate results that exceeded the control criteria. The criteria for RPDs for organic compounds in field duplicates did not apply in cases where (1) the result in the sample is less than the contract-required quantitation limit (CRQL) and the duplicate result is below detection limits and (2) the compounds detected are common laboratory contaminants. The acceptance criteria for inorganic analysis for field duplicate samples only applies to analytes that are greater than five times the contract-required detection limit (CRDL) (USEPA, 1988b).

Table 3-2
Analytical Results for Field Duplicate
Samples Outside Control Limits, 1995 and 1996 Data

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

SDG	Matrix	Sample ID	Compound	Sample Concentration (mg/kg)	Duplicate Concentration (mg/kg)	RPD	Control Limits
306601	Soil	WHF-22B-SS-50, 50D	Lead	30.5	51.9	52	< 35

Notes: SDG = sample delivery group.
ID = identification.
mg/kg = milligrams per kilogram.
RPD = relative percent difference.
< = less than.

The precision criteria for selected inorganic analytes were exceeded in one soil sample as indicated in Table 3-2. The variability in inorganic analytes in soil is most likely due to sample heterogeneity. The precision criteria for all other soil and aqueous samples were met.

All data, based on RPDs, are acceptable for use in site characterization and risk assessment.

3.2.2 **Accuracy** Accuracy is a quantitative parameter that determines the nearness of a result to its true value. Accuracy measures the bias in a measurement system. The accuracy of each analytical method is evaluated based on percent recoveries for MS/MSD samples, surrogate recoveries, and initial and continuing calibration standard results. For inorganics, serial dilutions are performed for analytes determined by inductively coupled plasma (ICP) and method standard additions (MSA) are performed for analytes determined by graphite furnace atomic adsorption (GFAA). These two QC parameters performed for inorganics provide an indication of accuracy bias for matrix-related effects. Each of these criteria were evaluated and are discussed below.

3.2.2.1 **Percent Recovery** Percent recovery is calculated using the equation:

$$100 \; X \; \frac{A-B}{C} \qquad (2)$$

where

A = measured concentration in the spiked samples,
B = measured concentration in the spike compound in the unspiked sample, and
C = concentration of the spike.

MS/MSD Samples. Table 3-3 summarizes the MS/MSD samples and the analytes that were outside control limits for samples collected at OLF Barin. The required control limits have been identified for each analyte. MSD samples are generally not performed for inorganics; therefore, percent recoveries were based solely on the MS sample.

For those analytes having high recoveries, the results for the associated samples may be biased high, and false positives may be reported. The analytes having low recoveries indicate that the reported results may be biased low, and there is a possibility of false negatives being reported. The qualification of data required because of these deficiencies is shown in Table 3-3. Qualification of data is limited to samples associated with the particular MS/MSD not in compliance. All data, based on percentage recoveries, are acceptable for use in site characterization and risk assessment.

Serial Dilutions. Serial dilutions are performed for inorganic analytes determined using ICP instrumentation. The samples are diluted and reanalyzed again to determine if there are any matrix-related interferences. The results from the undiluted and diluted sample analyses must agree within 10 percent. One serial dilution is performed per matrix per SDG. The analytes that exceeded the control limits for serial dilutions in soil samples were aluminum and magnesium

Table 3-3
Percent Recoveries for Matrix Spike and Matrix Spike Duplicate (MS/MSD) Samples Outside Control Limits, 1995 and 1996 Data

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

SDG	MS/MSD Sample	Analyte	% Recovery MS/MSD[1]	Control Limits	Qualification[2]
Inorganics					
06602T	WHF-19B-MW-13 (Water)	Thallium	47.1	75-125	+J/-UJ
06602D	WHF-19B-MW-13F (Water)	Thallium	61.2	75-125	+J/-UJ
6603TS	WHF-26B-SB-01 (Soil)	Antimony	57.8	75-125	+J/-UJ

[1] MSD performed for organics only.
[2] Qualification of inorganic data applies to all samples of the same matrix within the SDG in which the MS was performed, and to all other associated samples. Qualification of organic data applies to the corresponding unspiked sample only.

Notes: SDG = sample delivery group.
% = percent.
+J = all positive values were qualified as estimated (flagged with a "J").
-UJ = all nondetected values were qualified as estimated (flagged with a "UJ").

and in water samples were barium and magnesium. All positive results associated with these serial dilutions were qualified as estimated and are considered acceptable for use.

MSA. An MSA is performed for inorganic analytes measured by GFAA. The standard is added to the sample immediately prior to analysis and is used to measure interferences. The analyte thallium in some MSAs had recoveries below the control limits. For samples associated with these MSA results, all positive and nondetected results were qualified as estimated (J or UJ).

3.2.2.2 **Initial and Continuing Calibrations** Initial calibrations are performed to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for compounds. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run and of producing a linear standard curve. Continuing calibrations are performed to ensure that the instrument is capable of producing acceptable qualitative and quantitative data. Continuing calibration standards are run every 12 hours to check satisfactory performance of the instrument on a day-to-day basis.

For inorganic analysis, the initial calibration verification (ICV) and continuing calibration verification (CCV) are measured, and the percent recovery (%R) is calculated. The ICV and the CCV must fall within the control limits of 90 %R to 110 %R of the true value for all analytes except mercury and cyanide. Analysis for mercury must fall within the control limits of 80 %R to 120 %R, and analysis results for cyanide must fall within the control limits of 85 %R to 115 %R. No deficiencies were found with the ICV and CCV for inorganic analysis. All data based on ICV and CCVs are acceptable for site characterization and risk assessment.

3.2.3 **Representativeness** Representativeness is the degree to which the data obtained from a sample collection activity accurately reflect site conditions. Factors such as the proper selection of analytical methodology and sampling strategies establish the degree of representativeness achieved. Methods used during the field sampling activities to confirm sampling representativeness include collection of source water blanks, equipment rinsate blanks, and trip blanks. Methods used during the chemical analyses of environmental samples to confirm analytical representativeness include the analysis of analytical method blanks and the adherence to analytical holding times. The data from all blanks (field and laboratory) and adherence to holding times were evaluated for the data collected at OLF Barin. Compounds detected in blank samples are summarized in Table 3-4.

All samples that exhibited contamination were compared to the associated blank sample results. The samples with detections less than 5 times the blank contamination or with detections less than 10 times the blank contamination for common laboratory contaminants were qualified as "U." For the laboratory preparation blanks with negative results, the results may be biased low. All positive and nondetected results in associated samples that were less than 10 times the concentration detected in the blank were qualified as estimated (J or UJ). All samples were extracted and analyzed within holding times specified by NEESA and USEPA data validation guidelines.

Table 3-4
Detected Analyte Concentration in QA/QC Blank Samples and Evaluation of Holding Times

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

SDG	Rinsate Blank	Field Blank	Laboratory Preparation Blank	Holding Times
06602T	Aluminum (87.5)	NA	Chromium (0.91)	NE
	Antimony (2.1)		Copper (0.97)	
	Barium (0.67)		Nickel (1.74)	
	Calcium (44.5)		Zinc (1.56)	
	Potassium (53.5)			
	Sodium (283.0)			
06602D	Aluminum (87.5)	NA	---	NE
	Antimony (2.1)			
	Barium (0.67)			
	Calcium (44.5)			
	Potassium (53.5)			
	Sodium (283.0)			
306603	Aluminum (77.5)	NA	---	NE
	Antimony (2.0)			
	Barium (0.37)			
	Calcium (33.6)			
	Magnesium (9.7)			
	Potassium (50.0)			
	Sodium (329.0)			
	Zinc (2.1)			
06603T	Aluminum (77.5)	NA	---	NE
	Antimony (2.0)			
	Barium (0.37)			
	Calcium (33.6)			
	Magnesium (9.7)			
	Potassium (50.0)			
	Sodium (329.0)			
	Zinc (2.1)			
06603TS	Aluminum (77.5)		Calcium [6.77]	
	Antimony (2.0)		Cobalt [0.12]	
	Barium (0.37)		Copper [0.25]	
	Calcium (33.6)		Magnesium [3.13]	
	Magnesium (9.7)		Nickel [0.84]	
	Potassium (50.0)		Potassium [11.7]	

See notes at the end of the table.

Table 3-4 (Continued)
Detected Analyte Concentration in QA/QC Blank Samples and Evaluation of Holding Times

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

SDG	Rinsate Blank	Field Blank	Laboratory Preparation Blank	Holding Times
6603TS	Sodium (329.0) Zinc (2.1)	NA	---	NE
OLF01	---	Lead (23.4 J)	---	NE
OLF02	Lead (25.4 J)	Lead (23.4 J)	---	NE

Notes: QA/QC = quality assurance and quality control.
SDG = sample delivery group.
( ) = detected concentration in micrograms per liter ($\mu g/\ell$).
NA = blank not submitted with this SDG.
NE = did not exceed holding time.
--- = no compounds detected.
[ ] = detected concentration in milligrams per kilogram (mg/kg).
J = estimated value.

3.2.4 **Completeness** Analytical completeness is the percentage of usable data reported and validated compared with the total number of samples submitted for analysis. The goal for analytical completeness for the RI is 90 percent usable data. Unusable analytical data are those data with results reported by the laboratory but rejected during the validation process. Completeness is calculated by the following equation:

$$percent\ complete = \frac{(number\ of\ acceptable\ analytes)}{total\ number\ of\ analytes)} \times 100 \qquad (3)$$

Groundwater Samples. Results for groundwater samples were 100 percent valid for inorganics, cyanide, total suspended solids, and total dissolved solids.

Soil Data. Results for surface and subsurface soil samples were 100 percent valid for total lead and inorganics. A summary of the DQO assessment for each matrix is shown in Table 3-5.

3.2.5 **Comparability** Comparability is the confidence with which one data set can be compared with another and the degree to which the data are found to be equivalent. Sample data should be comparable with other measurement data of similar media samples and sample conditions. This goal is achieved through using standard techniques to collect and analyze representative samples and reporting analytical results in appropriate units. Evaluation of these criteria indicates that the data collected from OLF Barin are comparable data.

3.3 **SUMMARY**. Based on the results of the QC sample analyses, the established precision and accuracy goals of the project were achieved. The results from the method, rinsate, and field blank analyses indicate that the data are representative of the environmental conditions at OLF Barin. QC sample results and data validation criteria indicate that the percent completeness for all analytical parameters was 100 percent, thus satisfying the 90 percent completeness goal. Standard methods of analyses and units of measure were used throughout the project; therefore, the QC criteria and the DQOs described in the workplan were met.

Table 3-5
Summary of Data Quality Objective (DQO) Assessment (Precision, Accuracy, Representativeness, Completeness, and Comparability [PARCC] Parameters), 1995 and 1996 Data

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

Media	Precision	Accuracy	Representativeness	Completeness (%)	Comparability
Groundwater					
TAL metals and cyanide	Acceptable	Acceptable	Acceptable	100	Acceptable
Total dissolved solids	Acceptable	Acceptable	Acceptable	100	Acceptable
Total suspended solids	Acceptable	Acceptable	Acceptable	100	Acceptable
Surface Soil					
Total lead	Acceptable	Acceptable	Acceptable	100	Acceptable
Subsurface Soil					
TAL metals and cyanides	Acceptable	Acceptable	Acceptable	100	Acceptable
Total lead	Acceptable	Acceptable	Acceptable	100	Acceptable

Notes: % = percent.
TAL = target analyte list.

4.0 RESULTS AND FINDINGS

Chapter 4.0 presents the analytical summaries for all surface and subsurface soil, and groundwater, samples collected at OLF Barin in May 1995 and January 1996. Each subsection gives the analytical results for a specific medium and compares the results to the relevant background levels or applicable or relevant and appropriate requirements (ARARs). Further evaluation of the analytical results will be included in a future human health and ecological risk assessment addendum.

4.1 HYDROGEOLOGIC RESULTS. Table 4-1 summarizes the water-level measurements collected in May 1995. Based upon the results of the water-level measurements, a facilitywide shallow groundwater contour map (Figure 4-1) and a facilitywide deep groundwater contour map (Figure 4-2) were constructed. Both shallow and deep groundwater flow patterns constructed from the May 1994 data are similar to previous groundwater flow patterns presented in Technical Memorandum No. 2 (ABB-ES, 1993d) and the Technical Memorandum Addendum (ABB-ES, 1995a).

Recharge to the shallow aquifer appears to take place west of the facility. Groundwater flow at the facility is generally in an easterly direction with additional flow components in the northeast and southeast directions toward Sandy and Wolf Creeks, respectively. Figure 4-2 shows the groundwater flow patterns determined from the 90- to 100-foot-depth monitoring wells installed at the facility. As shown on the figure, similar flow patterns exist between shallow and deeper flow zones.

Table 4-2 presents the vertical hydraulic gradients using monitoring well pairs completed in the shallow zone (less than 25 feet bls) and the deeper zone (greater than 85 feet bls). All vertical gradients indicate the potential for downward groundwater flow at the site. The vertical hydraulic gradients ranged from 0.0009 feet per foot (ft/ft) (monitoring well pair WHF-19B-MW-4S and WHF-19B-MW-4D) to 0.0634 ft/ft (monitoring well pair WHF-22B-MW-3S and WHF-22B-MW-3D).

4.2 SOIL ANALYTICAL RESULTS. The following sections present the analytical data from surface soil samples collected at Sites 22B, 24B, 25B, and 26B, and from subsurface soil samples collected at Sites 22B and 26B. The analytical results of these soil samples are compared to the background screening criterion, which is two times the average background concentration. All reported background concentrations for inorganic analytes are based upon an average obtained from the samples presented in Technical Memorandum No. 3. These values are based upon surface soil samples; however, the same values were also used for comparison with subsurface soil data in Technical Memorandum No. 3 (ABB-ES, 1994a), the Human Health and Ecological Risk Assessment (ABB-ES, 1994d), and the Technical Memorandum Addendum (ABB-ES, 1995a). To maintain comparability and consistency among documents, the same values will also be used in the Data Assessment report for both surface and subsurface soil data.

4.2.1 Surface Soil Analytical Results

Site 22B. The analytical results for all surface soil samples collected at Site 22B are presented in Table 4-3. Lead concentrations ranged from not detected to 47,300 milligrams per kilogram (mg/kg). Lead was not detected at 11 of the sample

Table 4-1
Water-Level Measurements, May 1995 Data

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

Monitoring Well Designation	Well Depth (ft btoc)	Screened Interval (ft bls)	Land Surface Elevation (ft amsl)	Top of Casing Elevation (ft amsl)	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft amsl)
WHF-19B-MW-1S	25.00	15 to 25	55.91	58.70	20.14	38.56
WHF-19B-MW-2S	24.50	14.5 to 24.5	54.79	57.74	19.23	38.51
WHF-19B-MW-3S	24.00	14 to 24	54.06	56.75	18.30	38.45
WHF-19B-MW-4S	23.00	13 to 23	52.90	55.55	17.32	38.23
WHF-19B-MW-4D	100.00	90 to 100	52.85	55.72	17.56	38.16
WHF-19B-MW-5S	22.00	12 to 22	53.07	56.96	17.62	39.34
WHF-19B-MW-6S	24.00	14 to 24	52.51	55.57	17.52	38.05
WHF-19B-MW-6D	100.00	90 to 100	52.61	55.55	17.75	37.80
WHF-19B-MW-7S	24.00	14 to 24	50.95	54.03	16.36	37.67
WHF-19B-MW-8S	22.00	12 to 22	51.61	54.72	16.64	38.08
WHF-19B-MW-9S	24.00	14 to 24	53.29	56.89	18.76	38.13
WHF-19B-MW-9D	100.00	90 to 100	53.70	56.33	18.51	37.82
WHF-19B-MW-10S	22.00	12 to 22	48.74	51.77	18.76	33.01
WHF-19B-MW-10D	100.00	90 to 100	48.59	51.92	19.11	32.81
WHF-19B-MW-12S	35.20	22.5 to 32.5	62.11	64.55	26.05	38.50
WHF-19B-MW-13S	30.40	18 to 28	57.96	60.11	22.01	38.10
WHF-19B-MW-14S	27.00	14.5 to 24.5	53.35	55.97	18.48	37.49
WHF-20B-MW-1S	24.30	14 to 24	53.75	56.51	18.09	38.42
WHF-20B-MW-2S	24.00	14 to 24	52.89	55.90	17.54	38.36
WHF-20B-MW-3S	17.70	8 to 18	48.02	47.93	9.39	38.54
WHF-20B-MW-4S	18.30	8 to 18	48.61	48.26	NR	NR
WHF-20B-MW-4D	100.00	90 to 100	48.49	48.52	9.59	38.93
WHF-20B-MW-5S	19.20	10 to 20	50.32	50.26	11.59	38.67
WHF-20B-MW-6S	21.60	12 to 21.6	49.90	49.37	NR	NR
WHF-20B-MW-7D	97.89	90 to 100	47.77	47.62	9.78	37.84
WHF-21B-MW-1S	28.00	18 to 28	37.71	41.97	21.37	20.60
WHF-21B-MW-2S	15.00	5 to 15	19.84	22.86	10.66	12.20
WHF-21B-MW-3S	13.00	3 to 13	22.49	25.77	6.76	19.01
WHF-22B-MW-1S	19.00	9 to 19	45.83	48.86	9.28	39.58
WHF-22B-MW-2S	16.00	6 to 16	39.81	42.48	5.98	36.50
WHF-22B-MW-3S	13.00	3 to 13	39.27	41.97	5.21	36.76
WHF-22B-MW-3D	100.00	90 to 100	39.81	42.76	11.52	31.24
WHF-22B-MW-4D	100.00	90 to 100	46.33	49.26	20.54	28.72
WHF-24B-MW-1S	21.00	11 to 21	40.43	40.35	NR	NR
WHF-24B-MW-2S	18.00	8 to 18	37.82	40.87	11.81	29.06
WHF-24B-MW-3S	18.00	8 to 18	37.11	40.10	10.70	29.40
WHF-24B-MW-4S	18.00	8 to 18	37.71	40.65	9.96	30.69
WHF-25B-MW-1S	18.11	4.5 to 14.5	44.38	46.99	10.40	36.59

Notes: ft btoc = feet below top of well casing.
ft bls = feet below land surface.
ft amsl = feet above mean sea level.
NR = not recorded.

Figure 4-1 Shallow Groundwater Contour Map, May 1995.

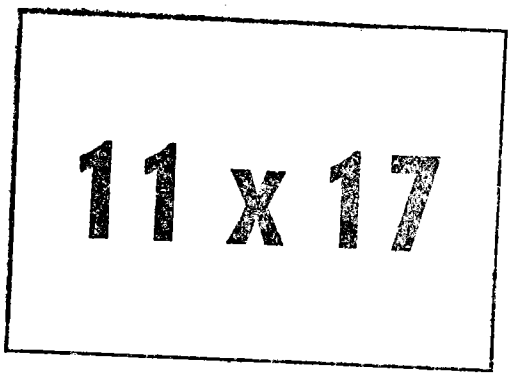


Figure 4-2 Deep Groundwater Contour Map, May 1995.

Table 4-2
Summary of Vertical Hydraulic Gradients, May 1995 Data

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

Monitoring Well Designation	Well Depth (ft bls)	Screened Interval (ft bls)	Groundwater Elevation (ft amsl)	Vertical Flow Direction	Groundwater Vertical Gradient (ft/ft)
WHF-19B-MW4S	23	14 to 24	38.23	Downward	0.0009
WHF-19B-MW4D	100	90 to 100	38.16		
WHF-19B-MW6S	24	14 to 24	38.05	Downward	0.0033
WHF-19B-MW6D	100	90 to 100	37.80		
WHF-19B-MW9S	24	14 to 24	38.13	Downward	0.0041
WHF-19B-MW9D	100	90 to 100	37.82		
WHF-19B-MW10S	22	12 to 22	33.01	Downward	0.0026
WHF-19B-MW10D	100	90 to 100	32.81		
WHF-22B-MW3S	13	3 to 13	36.76	Downward	0.0634
WHF-22B-MW3D	100	90 to 100	31.24		

Notes: ft bls = feet below land surface.
ft amsl = feet above mean sea level.
ft/ft = feet per foot.

Table 4-3
Analytical Summary of Surface Soil Samples Collected at Site 22B, 1995 and 1996 Data

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

ABB-ES Sample No.	WHF-22B-SS-37	WHF-22B-SS-38	WHF-22B-SS-39	WHF-22B-SS-40	WHF-22B-SS-40D	WHF-22B-SS-41	Background Screening Criterion
Laboratory No.	714573	714577	714578	714580	714582	714586	
Date Collected	04-MAY-95	04-MAY-95	04-MAY-95	04-MAY-95	04-MAY-95	04-MAY-95	
Lead (mg/kg)	422	710	555	537	556	386	8.6
ABB-ES Sample No.	WHF-22B-SS-42	WHF-22B-SS-43	WHF-22B-SS-44	WHF-22B-SS-45	WHF-22B-SS-46	WHF-22B-SS-47	Background Screening Criterion
Laboratory No.	714586	714590	714591	714592	714594	714565	
Date Collected	04-MAY-95	04-MAY-95	04-MAY-95	04-MAY-95	04-MAY-95	04-MAY-95	
Lead (mg/kg)	545	219	293	224	127	233	8.6
ABB-ES Sample No.	WHF-22B-SS-48	WHF-22B-SS-49	WHF-22B-SS-50	WHF-22B-SS-50D	WHF-22B-SS-51	WHF-22B-SS-52	Background Screening Criterion
Laboratory No.	714563	714562	714601	714602	714598	714595	
Date Collected	04-MAY-95	04-MAY-95	04-MAY-95	04-MAY-95	04-MAY-95	04-MAY-95	
Lead (mg/kg)	165	61.5	30.5	51.9	9.2	24.8	8.6
ABB-ES Sample No.	WHF-22B-SS-53	22S05401	22S05401D	22S05501	22S05601	22S05701	Background Screening Criterion
Laboratory No.	714597	RA872003	RA872004	RA872005	RA872006	RA872009	
Date collected	04-MAY-95	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	
Lead (mg/kg)	10.3	--	--	--	--	24.8 J	8.6

See notes at end of table.

Table 4-3 (Continued)
Analytical Summary of Surface Soil Samples Collected at Site 22B, 1995 and 1996 Data

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

ABB-ES Sample No.	22S05801	22S05901D	22S06001	22S06101	22S06201	22S06301	Background Screening Criterion
Laboratory No.	RA872008	RA872007	RA872010	RA872011	RA872012	RA872022	
Date collected	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	
Lead (mg/kg)	23.5 J	--	23.8 J	145 J	291 J	--	8.6
ABB-ES Sample No.	22S06401	22S06401D	22S06501	22S06601	22S06701	22S06901	Background Screening Criterion
Laboratory No.	RA872013	RA872014	RA872021	RA872015	RA872016	RA872020	
Date collected	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	
Lead (mg/kg)	723 J	674 J	--	893 J	2000 J	--	8.6
ABB-ES Sample No.	22S07001	22S07101	22S07201	22S07301	22S07401	22S07401D	Background Screening Criterion
Laboratory No.	RA872017	RA872018	RA872019	RA873013	RA873016	RA873017	
Date Collected	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	
Lead (mg/kg)	1070 J	500 J	566 J	184	--	--	8.6
ABB-ES Sample No.	22S07501	22S07601	22S07701	22S07801	22S07901	22S08001	Background Screening Criterion
Laboratory No.	RA873002	RA873003	RA873008	RA873011	RA873015	RA873004	
Date Collected	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	
Lead (mg/kg)	64.5	847	148	339	--	48.9	8.6

See notes at the end of the table.

Table 4-3 (Continued)
Analytical Summary of Surface Soil Samples Collected at Site 22B, 1995 and 1996 Data

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

ABB-ES Sample No.	22S08001D	22S08101	22S08201	22S08301	22S08401	22S08501	Background Screening Criterion
Laboratory No.	RA873005	RA873009	RA873010	RA873014	RA873006	RA873007	
Date Collected	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	09-JAN-96	
Lead (mg/kg)	60.4	246	156	127	--	--	8.6

ABB-ES Sample No.	22S08601	Background Screening Concentration
Laboratory No.	RA873012	
Date collected	09-JAN-96	
Lead (mg/kg)	47300	8.6

Notes: ABB-ES = ABB Environmental Services, Inc.
mg/kg = milligrams per kilogram.
-- = not detected.
J = estimated value.

locations. All other lead detections exceeded the background screening concentration of 8.6 mg/kg. However, only 14 of the 47 lead detections exceeded the Office of Solid Waste and Emergency Response (OSWER) Directive #9355.4-12 screening level for lead in soil for residential land use of 400 parts per million (ppm). Figure 4-3 presents the detected lead concentrations associated with the sample locations and shows the areas exceeding the OSWER directive.

Lead concentrations have been delineated on the north, east, and south sides of the grid established for sampling across Site 22B. Sample 22S06601, located on the western edge of the grid, had a lead concentration of 893 mg/kg. Postremedial activities at Site 22B should include delineation of the boundary west of 22S06601. Sample 22S08601, located in the south-central portion of the site, had a lead concentration of 47,300 mg/kg. The laboratory inspected the sample for lead shot but none was found.

As part of the RI investigation, a aerial photo investigation was completed. It was discovered during the investigation that a skeet or trap range for firearms was located in the vicinity of the surface soil investigation at Site 22B. Based on the photo interpretation, the origin of the skeet range was projected to lie at the proposed surface soil sample location 22S08101 prior to sampling. During the January 1996 sampling episode, fragments of clay pigeons, common targets for shotguns, were found near sample locations 22S08101 and 22S08201. This supports the aerial photo investigation, although the center of the skeet range may lie further south of 22S08101. The majority of the lead contamination at Site 22B is most likely from the lead shot that was used in shotgun shells at the skeet range.

Site 24B. The analytical results for the single surface soil sample collected at Site 24B are presented in Table 4-4. No volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides or polychlorinated biphenyls (PCBs) were detected in the surface soil sample. However, due to the abundance of tentatively identified compounds (TICs) in both the VOC and SVOC fractions, dilution was required, which increased the reported detection limits. The detection limit for the VOCs was 5,900 micrograms per kilogram (μg/kg), and for SVOCs the detection limit ranged from 16,000 to 41,000 μg/kg. The TICs identified are indicative of long-chain hydrocarbons typically associated with weathered diesel or jet fuel products. The total petroleum hydrocarbons (TPH) concentration of 17,400 mg/kg detected in the sample supports the presence of the weathered petroleum products.

Concentrations of 11 inorganic parameters (barium, cadmium, chromium, cobalt, copper, iron, lead, nickel, silver, zinc, and cyanide) exceeded the background screening concentrations. The background screening concentrations are two times the average background concentrations from monitoring wells WHF-20B-MW-3S and WHF-20B-MW-7D.

Site 25B. The analytical results for the five surface soil samples collected from the soil pile at Site 25B are summarized in Table 4-5. Lead concentrations ranged from 3.7 mg/kg to 21.7 mg/kg and exceeded two times the average background screening concentration (8.6 mg/kg) in samples WHF-25B-SP-01 (21.7 mg/kg) and WHF-25B-SP-04 (21.2 mg/kg); however, none of these samples exceeded the OSWER directive of 400 ppm. These two samples were collected at the eastern end of the Machine Gun Butt Area.

Figure 4-3 Surface Soil Analytical Results, May 1995 and January 1996

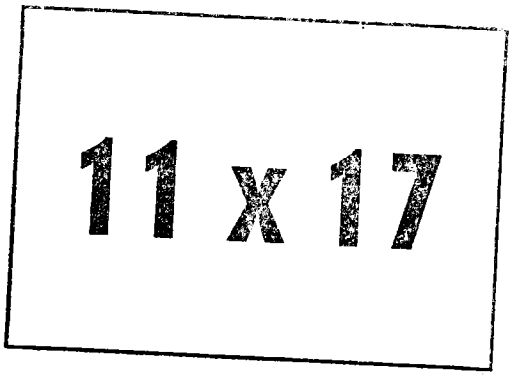


Table 4-4
Analytical Summary of a Surface Soil Sample at Site 24B

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

ABB-ES Sample No.	24S00101	Background Screening Criterion[2]
Laboratory No.	RA871002	
Date Collected	09-JAN-96	
Volatile Organic Compounds (µg/kg)		
None detected[1]		
Semivolatile Organic Compounds (µg/kg)		
None detected[1]		
Pesticides and PCBs (µg/kg)		
None detected		
Inorganics (mg/kg)		
Aluminum	1,300	9,242
Arsenic	1.1 J	1.42
Barium	51.4	23.2
Cadmium	0.62 J	0.3
Calcium	310 J	664
Chromium	42.2	8.4
Cobalt	1.5 J	1.0
Copper	36.7	6.0
Iron	15,200	5,602
Lead	9.8	8.6
Magnesium	54 J	245.8
Manganese	76.5	281
Nickel	28.0	2.0
Potassium	213 J	227.6
Silver	0.41 J	0.26
Sodium	166 J	338
Vanadium	3.3 J	13.8
Zinc	92.8	16.2
Cyanide	0.27 J	0.05
Total Petroleum Hydrocarbons (TPH) (mg/kg)		
TPH	17,400	

[1] Elevated detection limit.
[2] Background screening criterion is two times the average background concentration.

Notes: ABB-ES = ABB Environmental Services, Inc.
µg/kg = micrograms per kilogram.
PCBs = polychlorinated biphenyls.
mg/kg = milligrams per kilogram.
J = estimated concentration.

Table 4-5
Analytical Summary of Surface Soil Samples Collected at Site 25B

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

ABB-ES Sample No.	WHF-25B-SP-01	WHF-25B-SP-02	WHF-25B-SP-03	WHF-25B-SP-04	WHF-25B-SP-05	Background Screening Criterion
Laboratory No.	714869	714870	714871	714872	714873	
Date Collected	05-MAY-95	05-MAY-95	05-MAY-95	05-MAY-95	05-MAY-95	
Lead (mg/kg)	21.7	4.4	3.7	21.2	6.1	8.6

Notes: ABB-ES = ABB Environmental Services, Inc.
mg/kg = milligrams per kilogram.

Site 26B. The analytical results for the surface soil sample collected at Site 26B are presented in Table 4-6. The reported concentrations for nine inorganic parameters are in excess of the background screening concentrations for the given parameters. These parameters include barium, cadmium, calcium, chromium, copper, lead, mercury, silver, and zinc.

Table 4-6
Analytical Summary of a Surface Soil Sample at Site 26B

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

ABB-ES Sample No.	WHF-26B-SS-01	Background Screening Criterion
Laboratory No.	714912	
Date collected	06-MAY-95	
Inorganics (mg/kg)		
Aluminum	1,15 J	9,242
Antimony	0.56 J	ND
Barium	32.2 J	23.2
Beryllium	0.16 J	0.3
Cadmium	2.1	0.3
Calcium	1,080	664
Chromium	8.9	8.4
Copper	50.1	6.0
Iron	2,030	5,602
Lead	84.6	8.6
Magnesium	123 J	245.8
Manganese	43	281
Mercury	2.4	0.04
Silver	20.8	0.26
Sodium	198 J	338
Thallium	0.75 UJ	0.2
Vanadium	2.3 J	13.8
Zinc	84.1	16.2

Notes: ABB-ES = ABB Environmental Services, Inc.
mg/kg = milligrams per kilogram.
J = estimated concentration.
ND = not detected in background samples.

4.2.2 Subsurface Soil Analytical Results

Site 22B. Table 4-7 presents the analytical summary of results for the subsurface samples at Site 22B. All subsurface soil samples at Site 22B exceeded the background screening concentration of 8.6 mg/kg. Results from both soil borings indicate a decrease by an order of magnitude in lead concentration from the surface sample to the 1- to 2-feet-bls sample. Lead concentrations decreased by 70 mg/kg from the 1- to 2-feet-bls sample to the 2- to 3-feet-bls sample at soil boring WHF-22B-SB-14. However, a slight increase in concentration was reported at these depths in soil boring WHF-22B-SB-34. The lead concentration in samples from 1 to 2 feet bls and 2 to 3 feet bls did not exceed the OSWER directive; however, the surface soil samples collected in association with these soil borings did. Subsurface soil concentrations for Site 22B are presented on Figure 4-4 along with analytical results from previous investigations.

Site 26B. Subsurface soil sample results for Site 26B are presented in Table 4-8. Copper, mercury, and silver were reported at concentrations in excess of the background screening concentrations in both the sample and corresponding duplicate.

4.3 GROUNDWATER ANALYTICAL RESULTS. The analytical results for groundwater samples collected at Sites 19B and 26B are presented in Tables 4-9 and 4-10. All chemical analytical results were compared to Federal maximum contaminant levels (MCLs) and maximum contaminant level goals (MCLGs), as well as Alabama primary and secondary MCLs. Inorganic analytes were also compared to the background screening criterion of twice the average background concentration.

Prior to sample collection, the physical parameters of the groundwater, including temperature, conductivity, pH, and turbidity, were measured at each monitoring well. Table 4-11 presents a summary of the groundwater physical parameters recorded prior to sampling.

Site 19B. Only two groundwater samples, WHF-19B-MW-12 and WHF-19B-MW-14, had analyte concentrations exceeding the background screening criterion. The following inorganic analytes exceeded the background screening criterion in WHF-19B-MW-12: aluminum (15,000 micrograms per liter [$\mu g/\ell$]); chromium (24.3 $\mu g/\ell$); lead (6.6 $\mu g/\ell$); and manganese (31.2 $\mu g/\ell$). The following inorganic analytes exceeded the background screening criterion in WHF-19B-MW-14: aluminum (102,000 $\mu g/\ell$); barium (92.4 J $\mu g/\ell$); chromium (90.9 $\mu g/\ell$); iron (52,100 $\mu g/\ell$); magnesium (1,400 J $\mu g/\ell$); manganese (156 $\mu g/\ell$); vanadium (145 $\mu g/\ell$); and zinc (59.8 $\mu g/\ell$). Corresponding filtered groundwater samples did not exceed the background screening criterion.

Four metals (aluminum, iron, lead, and manganese) were detected in Site 19B groundwater samples at concentrations in excess of the Federal and Alabama MCLs. Aluminum and iron were detected in both the filtered and unfiltered samples collected from monitoring well WHF-19B-MW-12 in excess of MCLs. However, the concentrations of the analytes were 15 and 24 times lower in the filtered sample, respectively. The turbidity for the filtered sample was 1,770 nephelometric turbidity units (NTU) and 83 NTU for the unfiltered sample. Federal MCLs have a performance standard for turbidity of 0.5 to 1.0 NTU.

Table 4-7
Analytical Summary of Subsurface Soil Samples Collected at Site 22B, 1995 Data

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

ABB-ES Sample No.	WHF-22B-SB-14A	WHF-22B-SB-14B	WHF-22B-SB-14C	WHF-22B-SB-34A	WHF-22B-SB-34B	WHF-22B-SS-34C	Background Screening Criterion[1]
Laboratory No.	714863	714864	714865	714569	714571	714572	
Date Collected	05-MAY-95	05-MAY-95	05-MAY-95	05-MAY-95	05-MAY-95	05-MAY-95	
Lead (mg/kg)	410	83.7	11.7	690	21.6	38.9	4.3

[1] Background screening criterion is two times the average background concentration.

Notes: ABB-ES = ABB Environmental Services, Inc.
mg/kg = milligrams per kilogram.

Figure 4-4 Subsurface Soil Sample Locations and Analytical Results

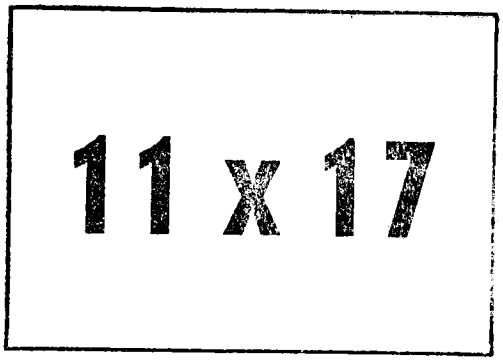


Table 4-8
Analytical Summary for Inorganic Compounds for Subsurface Soil Samples Collected at Site 26B

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

ABB-ES Sample No.	WHF-26B-SB-01	WHF-26B-SB-01D	Background Screening Criterion[1]
Laboratory No.	714910	714911	
Date Collected	06-MAY-95	16-MAY-95	
Inorganic Analytes (mg/kg)			
Aluminum	2,450 J	2,080 J	9,242
Arsenic	0.73 J	0.73 J	1.42
Barium	8 J	5.7 J	23.2
Beryllium	0.08 J	0.05 J	0.3
Cadmium	0.15 J	0.12 J	0.3
Calcium	166 J	116 J	664
Chromium	4.7	4	8.4
Copper	13.8	10.4	6.0
Iron	2,360	1,890	5,602
Lead	8.5	7.2	8.6
Magnesium	49.5 J	47 J	245.8
Manganese	8	7.1	281
Mercury	0.24	0.25	0.04
Silver	2.2	1.8 J	0.026
Sodium	191 J	180 J	338
Vanadium	6 J	4.7 J	13.8
Zinc	12	9.4	16.2

[1] Background screening criterion is two times the average background concentration.

Notes: ABB-ES = ABB Environmental Services, Inc.
mg/kg = milligrams per kilogram.
J = estimated concentration.

Table 4-9
Analytical Summary for Groundwater Samples Collected at Site 19B

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

ABB-ES Sample No.	WHF-19B-MW-12	WHF-19B-MW-12F	WHF-19B-MW-13	WHF-19B-MW-13D	ARARs		
Laboratory No.	714876	714890	714897	714909	Background Screening Criterion[1]	Federal MCL/MCLG[2]	Alabama Primary/ Secondary MCLs[3]
Date Collected	05-MAY-95	05-MAY-95	06-MAY-95	06-MAY-95			
	Unfiltered	Filtered	Unfiltered	Unfiltered			
Inorganic Analytes (µg/ℓ)							
Aluminum	15,000	1,040	395	332	14,330	50 - [4]200	NA/200
Antimony	--	--	--	--	--	6/6	6/NA
Arsenic	5.9 J	--	--	--	--	50/NA	50/NA
Barium	24 J	11.1 J	12.7 J	12.4 J	49.7	2,000/2,000	2,000/NA
Beryllium	--	--	--	--	--	4/4	4/NA
Cadmium	0.42 J	--	--	--	--	5/5	5/NA
Calcium	982 J	638 J	967 J	971 J	6,100	NA/NA	NA/NA
Chromium	24.3	1.2 J	--	--	13.2	100/100	100/NA
Cobalt	4.4 J	2.7 J	1.5 J	1.6 J	--	NA/NA	NA/NA
Copper	8.7 J	1.3 J	--	--	--	[4,5]1,000/1,300	NA/1,000
Iron	16,100 J	668	314	256	19,886	[4]300/NA	NA/300
Lead	6.6	--	--	--	2.7	[5]15/0	15/NA
Magnesium	594 J	494 J	569 J	561 J	1072	NA/NA	NA/NA
Manganese	31.2	15 J	17.4	17.5	23.4	[4]50/NA	NA/50
Mercury	--	--	--	--	--	2/2	2/NA
Nickel	--	1.6 J	--	--	27.4	100/100	NA/NA
Potassium	699 J	403 J	535 J	547 J	9,530	NA/NA	NA/NA
Sodium	2,720 J	2,700 J	3,130 J	3,200 J	5,510	([6]20,000)	NA/NA
Vanadium	31.9 J	2 J	1.3 J	1.1 J	34.6	NA/NA	NA/NA
Zinc	26	10.5 J	10.1 J	11.2 J	38.4	[4]5,000/NA	NA/5,000
Total Suspended Solids (mg/ℓ)							
Total suspended solids	1070	NA	--	--	NA	NA/NA	NA/NA
Total Dissolved Solids (mg/ℓ)							
Total suspended solids	38	NA	27	26	NA	[4]500,000/NA	NA/500,000

See notes at end of table.

Table 4-9 (Continued)
Analytical Summary for Groundwater Samples Collected at Site 19B

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

ABB-ES Sample No.	WHF-19B-MW-13F	WHF-19B-MW-14	WHF-19B-MW-14F	ARARs		
Laboratory No.	714901	714907	714908	Background Screening Criterion[1]	Federal MCL/MCLG[2]	Alabama Primary/ Secondary MCLs[3]
Date Collected	06-MAY-95	06-MAY-95	06-MAY-95			
	Filtered	Unfiltered	Filtered			
Inorganic Analytes (µg/ℓ)						
Aluminum	--	102,000	100 J	14,330	50 - [4]200/NA	NA/200
Antimony	--	4 J	--	--	6/6	6/NA
Arsenic	--	18.2 J	--	--	50/NA	50/NA
Barium	13.9 J	92.4 J	6 J	49.7	2,000/2,000	2,000/NA
Beryllium	--	0.54 J	0.25	--	4/4	4/NA
Cadmium	--	1.4 J	0.48	--	5/5	5/NA
Calcium	1,020	1,400 J	1,180 J	6,100	NA/NA	NA/NA
Chromium	--	90.9	--	13.2	100/100	100/NA
Cobalt	1.6 J	10 J	3.5 J	--	NA/NA	NA/NA
Copper	--	48.2	2.3 J	--	[4,5]1,000/1,300	NA/1,000
Iron	--	52,100	33.2 J	19,886	[4]300/NA	NA/300
Lead	--	55.5	--	2.7	[5]15/0	15/NA
Magnesium	604 J	1400 J	577 J	1,072	NA/NA	NA/NA
Manganese	16.7	156	43.1	23.4	[4]50/NA	NA/50
Mercury	--	0.26	--	--	2/2	2/NA
Nickel	--	22.7 J	13.3 J	27.4	100/100	100/NA
Potassium	531 J	1,950 J	588 J	9,530	NA/NA	NA/NA
Sodium	3,370 J	2,650 J	2,720 J	5,510	([6]20,000)	NA/NA
Vanadium	0.44 J	145	--	34.6	NA/NA	NA/NA
Zinc	8.5 J	59.8	17 J	38.4	5,000/NA	NA/5,000
Total Suspended Solids (mg/ℓ)						
Total Suspended solids	NA	140	--		NA/NA	NA/NA
Total Dissolved Solids (mg/ℓ)						
Total dissolved solids	NA	76	--		[4]500,000/NA	NA/500,000

See notes at end of table.

Table 4-9 (Continued)
Analytical Summary for Groundwater Samples Collected at Site 19B

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

[1] Background screening criterion equals two times the average background concentration.
[2] MCLs and MCLGs from Drinking Water Regulations and Health Advisories (U.S. Environmental Protection Agency, 1994b).
[3] Alabama Primary Drinking Water Standards and Alabama Secondary Drinking Water Standards (Alabama Department of Environmental Management Administrative Code R 335-7-2, November 1992).
[4] Value is a secondary MCL.
[5] Value is the action level, defined by the available treatment technology limit.
[6] Value is the drinking water equivalent level.

Notes: ABB-ES = ABB Environmental Services, Inc.
ARARs = applicable or relevant and appropriate requirement.
MCL = maximum contaminant level.
MCLG = maximum contaminant limit goal.
$\mu g/\ell$ = micrograms per liter.
-- = analyte not detected above instrument detection limits.
NA = not applicable.
J = estimated.

Table 4-10
Analytical Summary for Groundwater Samples Collected at Site 26B

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

ABB-ES Sample No.	WHF-26B-MW-1	WHF-26B-MW-1F	ARARs		
Laboratory No.	714895	714896	Background Screening Criterion[1]	Federal MCL/MCLG[2]	Alabama Primary/ Secondary MCLs[3]
Date Collected	04-MAY-95	04-MAY-95			
	Unfiltered	Filtered			
Inorganic Analytes (µg/ℓ)					
Aluminum	147 J	93.7 J	14,330	[4]200/NA	NA/200
Barium	24.2 J	23.4 J	49.7	2,000/2,000	2,000/NA
Calcium	1,550 J	1,600 J	--	NA/NA	NA/NA
Cobalt	2 J	1.7 J	--	NA/NA	NA/NA
Magnesium	1,120 J	1,150 J	1072	NA/NA	NA/NA
Manganese	66.9	65.2	23.4	[4]50/NA	NA/50
Potassium	615 J	616 J	9,530	NA/NA	NA/NA
Sodium	1,790 J	1,740 J	5,510	[6]20,000	NA/NA
Zinc	19 J	18.8 J	38.4	[4]5,000	NA/5,000
Total Suspended Solids (mg/ℓ)					
Total suspended solids	--	NA	NA	NA/NA	NA/NA
Total Dissolved Solids (mg/ℓ)					
Total dissolved solids	35	NA	NA	[4]500,000/NA	NA/500,000

[1] Background screening criterion equals two times the average background concentration.
[2] MCLs and MCLGs from Drinking Water Regulations and Health Advisories (U.S. Environmental Protection Agency, 1994b).
[3] Alabama Primary Drinking Water Standards and Alabama Secondary Drinking Water Standards (Alabama Department of Environmental Management Administrative Code R 335-7-2, November 1992).
[4] Value is a secondary MCL.
[5] Value is the action level, defined by the available treatment technology limit.
[6] Value is the drinking water equivalent level.

Notes: ABB-ES = ABB Environmental Services, Inc.
ARARs = applicable or relevant and appropriate requirement.
MCL = maximum contaminant level.
MCLG = maximum contaminant limit goal.
µg/ℓ = micrograms per liter.
J = estimated.
NA = not applicable.
-- = concentration not detected above instrument detection limits.
mg/ℓ = milligrams per liter.

Table 4-11
Groundwater Physical Parameters, 1995 Data

Remedial Investigation and Feasibility Study
Data Assessment
Outlying Landing Field Barin, Foley, Alabama

Sample Designation	Date Measured	pH	Temperature (°C)	Conductivity (μmhos/cm)	Turbidity (NTU) Unfiltered	Turbidity (NTU) Filtered
[1]WHF-19B-MW-12S	05/05/95	5.36	23.6	25	1770	83
[2]WHF-19B-MW-13S	05/06/95	5.53	20.2	28	1.50	NA
[1]WHF-19B-MW-14S	05/06/95	5.65	22.3	76	>200	0.82
[2]WHF-26B-MW-1S	05/04/95	4.98	23.1	118.5	2.20	NA

[1] Monitoring well was purged with submersible pump and sampled with a bailer.
[2] Monitoring well was purged and sampled with peristaltic pump.

Notes: °C = degrees Celsius.
μmhos/cm = micromhos per centimeter.
NTU = nephelometric turbidity units.
NA = not available.
> = greater than.

In the unfiltered groundwater sample collected from monitoring well WHF-19B-MW-13, iron (314 $\mu g/\ell$) and aluminum (395 $\mu g/\ell$) were in excess of the MCLs. In the unfiltered duplicate sample, only aluminum (332 $\mu g/\ell$) was in excess of the MCLs. No analytes from the filtered sample exceeded MCLs. Turbidity for the unfiltered sample was 1.50 NTU, and the turbidity of the filtered sample was not measured since a low turbidity for unfiltered groundwater sample had been obtained.

Aluminum (102,000 $\mu g/\ell$), iron (52,100 $\mu g/\ell$), lead (55.5 $\mu g/\ell$) and manganese (156 $\mu g/\ell$) were all in excess of MCLs in the unfiltered groundwater sample collected from monitoring well WHF-19B-MW-14. No analytes exceeded MCLs in the filtered groundwater sample from the monitoring well. The turbidity for the unfiltered sample was greater than 200 NTU, and the filtered sample had a turbidity of 0.82 NTU.

Site 26B. Nine inorganic analytes (aluminum, barium, calcium, cobalt, magnesium, manganese, potassium, sodium, and zinc) were detected in both the filtered and unfiltered samples. The results indicate only small variations between the unfiltered and filtered groundwater samples. Of the nine analytes detected, magnesium and manganese exceed the background screening criterion, and manganese is the only analyte that exceeds the Federal secondary MCLs and the Alabama secondary MCLs.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Soil.

- Lead contamination at Site 22B has been delineated on the north, east, and south sides of the sampling grid. Contaminant delineation on the west side of the grid was not completed, and it is recommended that lead contamination in this area be delineated during remedial activities.

- Analytical results from Site 22B subsurface soil samples indicated that lead contamination exceeding the OSWER directive screening level had not migrated to 1 foot bls or further.

- Analytical results from surface soil samples collected at Site 24B confirmed that petroleum contamination is present. Remedial action is recommended for the removal of the firefighting training pit.

- Analytical results from soil samples collected at Site 25B indicated that lead contamination did not exceed the OSWER directive screening level of 400 mg/kg.

- Based upon the analytical results of surface and subsurface soil, there is no indication that the detected analytes at Site 26B are present at concentrations that pose a risk of adverse effects to human health or the environment for current and potential future land uses (ABB-ES, 1995b).

Groundwater.

- Concentrations of four inorganic analytes (aluminum, iron, lead, and manganese) detected in Site 19B groundwater samples exceeded Federal and Alabama MCLs. These data will be incorporated into the risk assessment addendum and used in future risk-based decisions.

- Manganese was the only inorganic analyte detected in the Site 26B groundwater sample that exceeded Federal and Alabama MCLs. These data will be incorporated into the risk assessment addendum and used in future risk-based decisions.

- Groundwater flow patterns across OLF Barin were determined to be comparable to those previously reported.

REFERENCES

ABB Environmental Services, Inc. (ABB-ES), 1993a, Final Site Inspection Report, Outlying Landing Field (OLF) Barin, Foley, Alabama: September.

ABB-ES, 1993b, Remedial Investigation and Feasibility Study (RI/FS) Technical Memorandum No. 1, Surface Water and Sediment Assessment for Outlying Landing Field (OLF) Barin, Foley, Alabama: prepared for Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), Charleston, South Carolina.

ABB-ES, 1993c, Remedial Investigation and Feasibility Study (RI/FS) Workplan, Outlying Land Field (OLF) Barin, Foley, Alabama, Volumes I, IIA and IIB, and III: prepared for SOUTHNAVFACENGCOM, Charleston, South Carolina, April.

ABB-ES, 1993d, RI/FS Technical Memorandum No. 2, Geologic and Hydrogeologic Assessment of Outlying Land Field (OLF) Barin, Foley, Alabama: prepared for SOUTHNAVFACENGCOM, Charleston, South Carolina.

ABB-ES, 1994a, Remedial Investigation and Feasibility Study (RI/FS), Technical Memorandum No. 3, Soil Assessment for Outlying Land Field (OLF) Barin, Foley, Alabama: prepared for SOUTHNAVFACENGCOM, Charleston, South Carolina.

ABB-ES, 1994b, Remedial Investigation and Feasibility Study (RI/FS), Technical Memorandum No. 4, Groundwater Assessment for Outlying Land Field (OLF) Barin, Foley, Alabama: prepared for SOUTHNAVFACENGCOM, Charleston, South Carolina.

ABB-ES, 1994c, Remedial Investigation and Feasibility Study (RI/FS), Technical Memorandum No. 5, Remedial Investigation Data Summary and Workplan for Additional Investigation, Outlying Land Field (OLF) Barin, Foley, Alabama: prepared for SOUTHNAVFACENGCOM, Charleston, South Carolina.

ABB-ES, 1994d, Human Health and Ecological Risk Assessment, Outlying Land Field (OLF) Barin, Foley, Alabama: prepared for SOUTHNAVFACENGCOM, Charleston, South Carolina.

ABB-ES, 1995, Remedial Investigation and Feasibility Study (RI/FS), Technical Memorandum Addendum, Outlying Landing Field (OLF) Barin, Foley, Alabama: prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina.

ABB-ES, 1995b, No Further Action Decision Document, Site 26B, Abandoned Wastewater Treatment Plant, Outlying Landing Field Barin (OLF), Foley, Alabama: prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina, December.

Alabama Department of Environmental Management, 1992, Alabama Administrative Code, R 335-6-10 Water Quality Criteria, December.

Chandler, R.V., J.D. Moore, and G. Blakeney, 1985, Groundwater Chemistry and Salt Water Encroachment, Southern Baldwin County, Alabama: Geological Survey of Alabama Bulletin 126.

REFERENCES (Continued)

Naval Energy and Environmental Support Activity (NEESA), 1988, Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program, Second Revision: June.

NEESA, 1989, Preliminary Assessment Report, Outlying Landing Field Barin, Foley, Alabama: NEESA 13-193PA.

O'Neil, P.E., and M.F. Mettee, 1982, Alabama Coastal Region Ecological Characterization, a Synthesis of Environmental Data: Geological Survey of Alabama Information Series 61.

U.S. Environmental Protection Agency (USEPA), 1987, Data Quality Objectives for Remedial Response Activities: March.

USEPA, 1988a, Laboratory Data Validation Functional Guidelines for Evaluating Organics Analysis: February 1.

USEPA, 1988b, Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analysis: July 1.

USEPA, 1991a, Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual: Region IV, Environmental Services Division, Athens, Georgia.

USEPA, 1991b, Water Quality Criteria Summary: Office of Science and Technology, Health and Ecological Criteria Division, Washington, D.C., May 1.

USEPA, 1992, Surface Water Screening Values for Hazardous Waste Sites: Region IV, Waste Management Division.

USEPA, 1994a, Draft, Sediment Screening Values: Draft Region IV, Waste Management Division.

USEPA, 1994b, Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) from Drinking Water Regulations and Health Advisories.

U.S. Department of Agriculture, 1962, Soil Conservation Service, General Soil Map for Baldwin County, Alabama.

U.S. Geological Survey (USGS), 1980a, Topographic Map, Foley, Alabama: 7.5-minute series.

USGS, 1980b, Topographic Map, Elberta, Alabama: 7.5-minute series.

APPENDIX A

VALIDATED ANALYTICAL RESULTS

Lab Sample Number:		714894			714610			714607			714874			
Site		OLFBARIN			OLFBARIN			OLFBARIN			OLFBARIN			
Locator		WHFFB1			F22BSSRB1			F22BRB2			F22BRB3			
Collect Date:		04-MAY-95			04-MAY-95			04-MAY-95			05-MAY-95			
	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL
CLP METALS AND CYANIDE	ug/l															
Aluminum	80.4	J	ug/l	200	-		ug/l		-		ug/l		77.7	J	ug/l	200
Antimony	-	U	ug/l	60	-		ug/l		-		ug/l		2	J	ug/l	60
Barium	.62	J	ug/l	200	-		ug/l		-		ug/l		.37	J	ug/l	200
Calcium	33.5	J	ug/l	5000	-		ug/l		-		ug/l		33.6	J	ug/l	5000
Magnesium	10.3	J	ug/l	5000	-		ug/l		-		ug/l		9.7	J	ug/l	5000
Nickel	2.3	J	ug/l	40	-		ug/l		-		ug/l		-	U	ug/l	40
Potassium	55.7	J	ug/l	5000	-		ug/l		-		ug/l		50	J	ug/l	5000
Sodium	364	J	ug/l	5000	-		ug/l		-		ug/l		329	J	ug/l	5000
Zinc	3.4	J	ug/l	20	-		ug/l		-		ug/l		2.1	J	ug/l	20

Lab Sample Number:		714875			
Site		OLFBARIN			
Locator		F19BRB1			
Collect Date:		05-MAY-95			
	VALUE	QUAL	UNITS	DL	
CLP METALS AND CYANIDE	ug/l				
Aluminum		87.5	J	ug/l	200
Antimony		2.1	J	ug/l	60
Barium		.67	J	ug/l	200
Calcium		44.5	J	ug/l	5000
Magnesium		-	U	ug/l	5000
Nickel		-	U	ug/l	40
Potassium		53.5	J	ug/l	5000
Sodium		283	J	ug/l	5000
Zinc		-	U	ug/l	20

		Lab Sample Number:	714573			714577			714578			714580		
		Site	OLFBARIN			OLFBARIN			OLFBARIN			OLFBARIN		
		Locator	F22BSS37			F22BSS38			F22BSS39			F22BSS40		
		Collect Date:	04-MAY-95			04-MAY-95			04-MAY-95			04-MAY-95		
		VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL
LEAD	mg/kg																
Lead		422		mg/kg	.6	710		mg/kg	.6	555		mg/kg	.6	537		mg/kg	.6

Lab Sample Number:		714582			714585			714586			714590		
Site		OLFBARIN			OLFBARIN			OLFBARIN			OLFBARIN		
Locator		F22BSS40D			F22BSS41			F22BSS42			F22BSS43		
Collect Date:		04-MAY-95			04-MAY-95			04-MAY-95			04-MAY-95		
	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL
LEAD Lead	mg/kg	556	mg/kg	.6	385		mg/kg	.6	545		mg/kg	.6	219		mg/kg	.6

Lab Sample Number:		714591			714592			714594			714565		
Site		OLFBARIN			OLFBARIN			OLFBARIN			OLFBARIN		
Locator		F22BSS44			F22BSS45			F22BSS46			F22BSS47		
Collect Date:		04-MAY-95			04-MAY-95			04-MAY-95			04-MAY-95		
	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL
LEAD	mg/kg															
Lead		293	mg/kg	.6	224		mg/kg	.6	127		mg/kg	.6	233		mg/kg	.6

Lab Sample Number:		714563			714562			714601			714602		
Site		OLFBARIN			OLFBARIN			OLFBARIN			OLFBARIN		
Locator		F22BSS48			F22BSS49			F22BSS50			F22BSS50D		
Collect Date:		04-MAY-95			04-MAY-95			04-MAY-95			04-MAY-95		
	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL
LEAD Lead	mg/kg	165	mg/kg	.6	61.5		mg/kg	.6	30.5		mg/kg	.6	51.9		mg/kg	.6

Lab Sample Number:			714598			714595			714595		
Site			OLFBARIN			OLFBARIN			OLFBARIN		
Locator			F22BSS51			F22BSS52			F22BSS52		
Collect Date:			04-MAY-95			04-MAY-95			04-MAY-95		
		VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL
LEAD	mg/kg												
Lead		9.2		mg/kg	.6	24.8		mg/kg	.6	24.8		mg/kg	.6

Lab Sample Number:		714869			714870			714871			714872		
Site		OLFBARIN			OLFBARIN			OLFBARIN			OLFBARIN		
Locator		F25BSP01			F25BSP02			F25BSP03			F25BSP04		
Collect Date:		05-MAY-95			05-MAY-95			05-MAY-95			05-MAY-95		
	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL
LEAD Lead	mg/kg	21.7	mg/kg	.6	4.4		mg/kg	.6	3.7		mg/kg	.6	21.2		mg/kg	.6

Lab Sample Number:		714873		
Site		OLFBARIN		
Locator		F25BSP05		
Collect Date:		05-MAY-95		
	VALUE	QUAL UNITS		DL
LEAD mg/kg				
Lead	6.1	mg/kg		.6

Lab Sample Number:		714863			714864			714865			714569		
Site		OLFBARIN			OLFBARIN			OLFBARIN			OLFBARIN		
Locator		F22BSB14A			F22BSB14B			F22BSB14C			F22B34A		
Collect Date:		05-MAY-95			05-MAY-95			05-MAY-95			04-MAY-95		
	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL
LEAD mg/kg																
Lead	410		mg/kg	.6	83.7		mg/kg	.6	11.7		mg/kg	.6	690		mg/kg	.6

Lab Sample Number:		714571				714572			
Site		OLFBARIN				OLFBARIN			
Locator		F22B34B				F22B34C			
Collect Date:		04-MAY-95				04-MAY-95			
	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	
LEAD			mg/kg						
Lead	21.6		mg/kg	.6	38.9		mg/kg	.6	

Lab Sample Number:		714620			714895			714626			714896		
Site		OLFBARIN			OLFBARIN			OLFBARIN			OLFBARIN		
Locator		F26BMW1			F26BMW1			F26BMW1D			F26BMW1F		
Collect Date:		04-MAY-95			04-MAY-95			04-MAY-95			04-MAY-95		
	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL
CLP METALS AND CYANIDE	ug/l															
Aluminum		-	ug/l		147	J	ug/l	200	-		ug/l		93.7	J	ug/l	200
Barium		-	ug/l		24.2	J	ug/l	200	-		ug/l		23.4	J	ug/l	200
Calcium		-	ug/l		1550	J	ug/l	5000	-		ug/l		1600	J	ug/l	5000
Cobalt		-	ug/l		2	J	ug/l	50	-		ug/l		1.7	J	ug/l	50
Magnesium		-	ug/l		1120	J	ug/l	5000	-		ug/l		1150	J	ug/l	5000
Manganese		-	ug/l		66.9		ug/l	15	-		ug/l		65.2		ug/l	15
Potassium		-	ug/l		615	J	ug/l	5000	-		ug/l		616	J	ug/l	5000
Sodium		-	ug/l		1790	J	ug/l	5000	-		ug/l		1740	J	ug/l	5000
Zinc		-	ug/l		19	J	ug/l	20	-		ug/l		18.8	J	ug/l	20

Lab Sample Number:		714912				714910				714911			
Site		OLFBARIN				OLFBARIN				OLFBARIN			
Locator		F26BSS01				F26BSB01				F26BSB01D			
Collect Date:		06-MAY-95				06-MAY-95				06-MAY-95			
		VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL
CLP METALS AND CYANIDE	mg/kg												
Aluminum		1150	J	mg/kg	40	2450	J	mg/kg	40	2080	J	mg/kg	40
Antimony		.56	J	mg/kg	12	-	UJ	mg/kg	12	-	UJ	mg/kg	12
Arsenic		-	U	mg/kg	20	.73	J	mg/kg	20	.73	J	mg/kg	20
Barium		32.2	J	mg/kg	40	8	J	mg/kg	40	5.7	J	mg/kg	40
Beryllium		.16	J	mg/kg	1	.08	J	mg/kg	1	.05	J	mg/kg	1
Cadmium		2.1		mg/kg	1	.15	J	mg/kg	1	.12	J	mg/kg	1
Calcium		1080		mg/kg	1000	166	J	mg/kg	1000	116	J	mg/kg	1000
Chromium		8.9		mg/kg	2	4.7		mg/kg	2	4		mg/kg	2
Copper		50.1		mg/kg	5	13.8		mg/kg	5	10.4		mg/kg	5
Iron		2030		mg/kg	20	2360		mg/kg	20	1890		mg/kg	20
Lead		84.6		mg/kg	.6	8.5		mg/kg	.6	7.2		mg/kg	.6
Magnesium		123	J	mg/kg	1000	49.5	J	mg/kg	1000	47	J	mg/kg	1000
Manganese		43		mg/kg	3	8		mg/kg	3	7.1		mg/kg	3
Mercury		2.4		mg/kg	.1	.24		mg/kg	.1	.25		mg/kg	.1
Silver		20.8		mg/kg	2	2.2		mg/kg	2	1.8	J	mg/kg	2
Sodium		198	J	mg/kg	1000	191	J	mg/kg	1000	180	J	mg/kg	1000
Vanadium		2.3	J	mg/kg	10	6	J	mg/kg	10	4.7	J	mg/kg	10
Zinc		84.1		mg/kg	4	12		mg/kg	4	9.4		mg/kg	4

Lab Sample Number:		714889			714876			714890			714905		
Site		OLFBARIN			OLFBARIN			OLFBARIN			OLFBARIN		
Locator		F19BMW12			F19BMW12			F19BMW12F			F19BMW13		
Collect Date:		05-MAY-95			05-MAY-95			05-MAY-95			06-MAY-95		
	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL
CLP METALS AND CYANIDE	ug/l															
Aluminum		-	ug/l		15000		ug/l	200	1040		ug/l	200	-		ug/l	
Antimony		-	ug/l		-	U	ug/l	60	-	U	ug/l	60	-		ug/l	
Arsenic		-	ug/l		5.9	J	ug/l	10	-	U	ug/l	10	-		ug/l	
Barium		-	ug/l		24	J	ug/l	200	11.1	J	ug/l	200	-		ug/l	
Beryllium		-	ug/l		-	U	ug/l	5	-	U	ug/l	5	-		ug/l	
Cadmium		-	ug/l		.42	J	ug/l	5	-	U	ug/l	5	-		ug/l	
Calcium		-	ug/l		982	J	ug/l	5000	638	J	ug/l	5000	-		ug/l	
Chromium		-	ug/l		24.3		ug/l	10	1.2	J	ug/l	10	-		ug/l	
Cobalt		-	ug/l		4.4	J	ug/l	50	2.7	J	ug/l	50	-		ug/l	
Copper		-	ug/l		8.7	J	ug/l	25	1.3	J	ug/l	25	-		ug/l	
Iron		-	ug/l		16100		ug/l	100	668		ug/l	100	-		ug/l	
Lead		-	ug/l		6.6		ug/l	5	-	U	ug/l	5	-		ug/l	
Magnesium		-	ug/l		594	J	ug/l	5000	494	J	ug/l	5000	-		ug/l	
Manganese		-	ug/l		31.2		ug/l	15	15	J	ug/l	15	-		ug/l	
Mercury		-	ug/l		-	U	ug/l	.2	-	U	ug/l	.2	-		ug/l	
Nickel		-	ug/l		-	U	ug/l	40	1.6	J	ug/l	40	-		ug/l	
Potassium		-	ug/l		699	J	ug/l	5000	403	J	ug/l	5000	-		ug/l	
Sodium		-	ug/l		2720	J	ug/l	5000	2700	J	ug/l	5000	-		ug/l	
Vanadium		-	ug/l		31.9	J	ug/l	50	2	J	ug/l	50	-		ug/l	
Zinc		-	ug/l		26		ug/l	20	10.5	J	ug/l	20	-		ug/l	

Lab Sample Number:		714897			714621			714623			714909		
Site		OLFBARIN			OLFBARIN			OLFBARIN			OLFBARIN		
Locator		F19BMW13			F19BMW13D			F19BMW13D			F19BMW13D		
Collect Date:		06-MAY-95			06-MAY-95			06-MAY-95			06-MAY-95		
	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL
CLP METALS AND CYANIDE	ug/l															
Aluminum		395		ug/l	200	-	ug/l		-		ug/l		332		ug/l	200
Antimony		-	U	ug/l	60	-	ug/l		-		ug/l		-	U	ug/l	60
Arsenic		-	U	ug/l	10	-	ug/l		-		ug/l		-	U	ug/l	10
Barium		12.7	J	ug/l	200	-	ug/l		-		ug/l		12.4	J	ug/l	200
Beryllium		-	U	ug/l	5	-	ug/l		-		ug/l		-	U	ug/l	5
Cadmium		-	U	ug/l	5	-	ug/l		-		ug/l		-	U	ug/l	5
Calcium		967	J	ug/l	5000	-	ug/l		-		ug/l		971	J	ug/l	5000
Chromium		-	U	ug/l	10	-	ug/l		-		ug/l		-	U	ug/l	10
Cobalt		1.5	J	ug/l	50	-	ug/l		-		ug/l		1.6	J	ug/l	50
Copper		-	U	ug/l	25	-	ug/l		-		ug/l		-	U	ug/l	25
Iron		314		ug/l	100	-	ug/l		-		ug/l		256		ug/l	100
Lead		-	U	ug/l	5	-	ug/l		-		ug/l		-	U	ug/l	5
Magnesium		569	J	ug/l	5000	-	ug/l		-		ug/l		561	J	ug/l	5000
Manganese		17.4		ug/l	15	-	ug/l		-		ug/l		17.5		ug/l	15
Mercury		-	U	ug/l	.2	-	ug/l		-		ug/l		-	U	ug/l	.2
Nickel		-	U	ug/l	40	-	ug/l		-		ug/l		-	U	ug/l	40
Potassium		535	J	ug/l	5000	-	ug/l		-		ug/l		547	J	ug/l	5000
Sodium		3130	J	ug/l	5000	-	ug/l		-		ug/l		3200	J	ug/l	5000
Vanadium		1.3	J	ug/l	50	-	ug/l		-		ug/l		1.1	J	ug/l	50
Zinc		10.1	J	ug/l	20	-	ug/l		-		ug/l		11.2	J	ug/l	20

Lab Sample Number:		714901				714907			714906			714908		
Site		OLFBARIN				OLFBARIN			OLFBARIN			OLFBARIN		
Locator		F19BMW13F				F19BMW14			F19BMW14			F19BMW14F		
Collect Date:		06-MAY-95				06-MAY-95			06-MAY-95			06-MAY-95		
	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL	VALUE	QUAL	UNITS	DL
CLP METALS AND CYANIDE	ug/l															
Aluminum		-	U	ug/l	200	-		ug/l	102000		ug/l	200	100	J	ug/l	200
Antimony		-	U	ug/l	60	-		ug/l	4	J	ug/l	60	-	U	ug/l	60
Arsenic		-	U	ug/l	10	-		ug/l	18.2		ug/l	10	-	U	ug/l	10
Barium		13.9	J	ug/l	200	-		ug/l	92.4	J	ug/l	200	6	J	ug/l	200
Beryllium		-	U	ug/l	5	-		ug/l	.54	J	ug/l	5	.25	J	ug/l	5
Cadmium		-	U	ug/l	5	-		ug/l	1.4	J	ug/l	5	.48	J	ug/l	5
Calcium		1020	J	ug/l	5000	-		ug/l	1400	J	ug/l	5000	1180	J	ug/l	5000
Chromium		-	U	ug/l	10	-		ug/l	90.9		ug/l	10	-	U	ug/l	10
Cobalt		1.6	J	ug/l	50	-		ug/l	10	J	ug/l	50	3.5	J	ug/l	50
Copper		-	U	ug/l	25	-		ug/l	48.2		ug/l	25	2.3	J	ug/l	25
Iron		-	U	ug/l	100	-		ug/l	52100		ug/l	100	33.2	J	ug/l	100
Lead		-	U	ug/l	5	-		ug/l	55.5		ug/l	5	-	U	ug/l	5
Magnesium		604	J	ug/l	5000	-		ug/l	1400	J	ug/l	5000	577	J	ug/l	5000
Manganese		16.7		ug/l	15	-		ug/l	156		ug/l	15	43.1		ug/l	15
Mercury		-	U	ug/l	.2	-		ug/l	.26		ug/l	.2	-	U	ug/l	.2
Nickel		-	U	ug/l	40	-		ug/l	22.7	J	ug/l	40	13.3	J	ug/l	40
Potassium		531	J	ug/l	5000	-		ug/l	1950	J	ug/l	5000	588	J	ug/l	5000
Sodium		3370	J	ug/l	5000	-		ug/l	2650	J	ug/l	5000	2720	J	ug/l	5000
Vanadium		.44	J	ug/l	50	-		ug/l	145		ug/l	50	-	U	ug/l	50
Zinc		8.5	J	ug/l	20	-		ug/l	59.8		ug/l	20	17	J	ug/l	20

APPENDIX B

CASE NARRATIVE OF QUALIFICATIONS USED IN DATA VALIDATION PROCESS

DATA ASSESSMENT NARRATIVE
Lead

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, calibration standards, blank analysis results and MS/MSD results. A minimum of ten percent of all laboratory calculations are recalculated by the reviewer. All comments made within this report should be considered when examining the analytical results (Form Is).

This data package consisted of results from **OLF Barin, SDG# 306601,** the analysis of sixteen (16) field soil samples and one Matrix Spike and Duplicate pair for Lead. Overall, the inorganic data quality was fair. All protocol requirements were followed with the exception of the following problems.

Specific QA/QC deficiency Findings are listed numerically in the following categories:

Holding Times

The holding times were met as specified in Section 3 of the NEESA (20.2-047B) QA protocol.

Calibration

No deficiencies in this section.

Preparation and Field Blank

No deficiencies in this section.

Interferences

No significant interferences were observed.

Spike Recovery

No deficiencies in this section.

Duplicate

No deficiencies in this section.

LCS

No deficiencies in this section.

Serial Dilution

No deficiencies in this section.

SUMMARY OF DATA QUALIFICATIONS

SAMPLE ID	ANALYTE	DL	QL	SPECIFIC FINDING

Data stands as reported without qualification.

DL - denotes laboratory qualifier/reported value
+ denotes positive values
U denotes non-detect values

QL - denotes data validation qualifier

DATA ASSESSMENT NARRATIVE
Lead

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, calibration standards, blank analysis results and MS/MSD results. A minimum of ten percent of all laboratory calculations are recalculated by the reviewer. All comments made within this report should be considered when examining the analytical results (Form Is).

This data package consisted of results from **OLF Barin, SDG# 06601I**, the analysis of one (1) field water QC sample and no Matrix Spike and Duplicate pair for Lead. Overall, the inorganic data quality was fair. All protocol requirements were followed with the exception of the following problems.

Specific QA/QC deficiency Findings are listed numerically in the following categories:

Holding Times

The holding times were met as specified in Section 3 of the NEESA (20.2-047B) QA protocol.

Calibration

No deficiencies in this section.

Preparation and Field Blank

No deficiencies in this section.

Interferences

No significant interferences were observed.

Spike Recovery

No deficiencies in this section.

Duplicate

No deficiencies in this section.

LCS

No deficiencies in this section.

Serial Dilution

No deficiencies in this section.

SUMMARY OF DATA QUALIFICATIONS

SAMPLE ID	ANALYTE	DL	QL	SPECIFIC FINDING

Data stands as reported without qualification.

DL - denotes laboratory qualifier/reported value
+ denotes positive values
U denotes non-detect values

QL - denotes data validation qualifier

DATA ASSESSMENT NARRATIVE
Lead

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, calibration standards, blank analysis results and MS/MSD results. A minimum of ten percent of all laboratory calculations are recalculated by the reviewer. All comments made within this report should be considered when examining the analytical results (Form Is).

This data package consisted of results from OLF Barin, SDG# 306602, the analysis of six (6) field soil samples and one Matrix Spike and Duplicate pair for Lead. Overall, the inorganic data quality was fair. All protocol requirements were followed with the exception of the following problems.

Specific QA/QC deficiency Findings are listed numerically in the following categories:

Holding Times

The holding times were met as specified in Section 3 of the NEESA (20.2-047B) QA protocol.

Calibration

No deficiencies in this section.

Preparation and Field Blank

No deficiencies in this section.

Interferences

No significant interferences were observed.

Spike Recovery

No deficiencies in this section.

Duplicate

No deficiencies in this section.

LCS

No deficiencies in this section.

Serial Dilution

No deficiencies in this section.

SUMMARY OF DATA QUALIFICATIONS

SAMPLE ID	ANALYTE	DL	QL	SPECIFIC FINDING

Data stands as reported without qualification.

DL - denotes laboratory qualifier/reported value
+ denotes positive values
U denotes non-detect values

QL - denotes data validation qualifier

DATA ASSESSMENT NARRATIVE
Lead

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, calibration standards, blank analysis results and MS/MSD results. A minimum of ten percent of all laboratory calculations are recalculated by the reviewer. All comments made within this report should be considered when examining the analytical results (Form Is).

This data package consisted of results from **OLF Barin, SDG# 306603,** the analysis of eight (8) field soil samples and one Matrix Spike and Duplicate pair for Lead. Overall, the inorganic data quality was fair. All protocol requirements were followed with the exception of the following problems.

Specific QA/QC deficiency Findings are listed numerically in the following categories:

Holding Times

The holding times were met as specified in Section 3 of the NEESA (20.2-047B) QA protocol.

Calibration

No deficiencies in this section.

Preparation and Field Blank

No deficiencies in this section.

Interferences

No significant interferences were observed.

Spike Recovery

No deficiencies in this section.

Duplicate

No deficiencies in this section.

LCS

No deficiencies in this section.

Serial Dilution

No deficiencies in this section.

SUMMARY OF DATA QUALIFICATIONS

SAMPLE ID	ANALYTE	DL	QL	SPECIFIC FINDING

Data stands as reported without qualification.

DL - denotes laboratory qualifier/reported value
+ denotes positive values
U denotes non-detect values

QL - denotes data validation qualifier

DATA ASSESSMENT NARRATIVE
Metals

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, calibration standards, blank analysis results and MS/MSD results. A minimum of ten percent of all laboratory calculations are recalculated by the reviewer. All comments made within this report should be considered when examining the analytical results (Form Is).

This data package consisted of results from **OLF Barin, SDG# 06601T,** the analysis of one (1) field water QC sample and no Matrix Spike and Duplicate pair for TAL Metals. Overall, the inorganic data quality was fair. All protocol requirements were followed with the exception of the following problems.

Specific QA/QC deficiency Findings are listed numerically in the following categories:

Holding Times

The holding times were met as specified in Section 3 of the NEESA (20.2-047B) QA protocol.

Calibration

No deficiencies in this section.

Preparation and Field Blank

No deficiencies in this section.

Interferences

No significant interferences were observed.

Spike Recovery

No deficiencies in this section.

Duplicate

No deficiencies in this section.

LCS

No deficiencies in this section.

Serial Dilution

No deficiencies in this section.

SUMMARY OF DATA QUALIFICATIONS

SAMPLE ID	ANALYTE	DL	QL	SPECIFIC FINDING

Data stands as reported without qualification.

DL - denotes laboratory qualifier/reported value
+ denotes positive values
U denotes non-detect values

QL - denotes data validation qualifier

DATA ASSESSMENT NARRATIVE
Metals

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, calibration standards, blank analysis results and MS/MSD results. A minimum of ten percent of all laboratory calculations are recalculated by the reviewer. All comments made within this report should be considered when examining the analytical results (Form Is).

This data package consisted of results from **OLF Barin, SDG# 06602D,** the analysis of four (4) field water samples and one Matrix Spike and Duplicate pair for TAL Metals. Overall, the inorganic data quality was fair. All protocol requirements were followed with the exception of the following problems.

Specific QA/QC deficiency Findings are listed numerically in the following categories:

Holding Times

The holding times were met as specified in Section 3 of the NEESA (20.2-047B) QA protocol.

Calibration

No deficiencies in this section.

Preparation and Field Blank

No deficiencies in this section.

Interferences

No significant interferences were observed.

Spike Recovery

1. The Matrix Spike recovery for Thallium was below the lower control limits. All positive and non-detect results are qualified as estimated, "J" or "UJ".

Duplicate

No deficiencies in this section.

LCS

No deficiencies in this section.

Serial Dilution

2. The Serial Dilution for Magnesium was outside the control limits. All positive results are qualified as estimated, "J".

MSA

3. The following analytes exhibited low recovery during the GFAA spiking procedure. All positive and non-detect results are qualified as estimated, "J" or "UJ".

Analytes	Samples
Thallium	F19BMW12F, F19BMW14F and F26BMW1F.

Rinsate Blank

4. The Rinsate Blank exhibited contamination for the following elements.

Aluminum	87.5	ug/l
Antimony	2.1	ug/l
Barium	0.67	ug/l
Calcium	44.5	ug/l
Potassium	53.5	ug/l
Sodium	283.0	ug/l

ABB requires that all positive results equal to or less than the rinsate blank contamination be qualified as "U".

SUMMARY OF DATA QUALIFICATIONS

SAMPLE ID	ANALYTE	DL	QL	SPECIFIC FINDING
All water samples	Tl.	+/U	J/UJ	1
All water samples	Mg.	+	J	2
F19BMW12F, F19BMW14F and F26BMW1F.	Tl.	+/U	J/UJ	3
All water samples	Al, Sb, Ba, Ca, K and Na.	+	U	4

DL - denotes laboratory qualifier/reported value
+ denotes positive values
U denotes non-detect values

QL - denotes data validation qualifier

DATA ASSESSMENT NARRATIVE
Metals

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, calibration standards, blank analysis results and MS/MSD results. A minimum of ten percent of all laboratory calculations are recalculated by the reviewer. All comments made within this report should be considered when examining the analytical results (Form Is).

This data package consisted of results from **OLF Barin, SDG# 06602T**, the analysis of six (6) field water samples and one Matrix Spike and Duplicate pair for TAL Metals. Overall, the inorganic data quality was fair. All protocol requirements were followed with the exception of the following problems.

Specific QA/QC deficiency Findings are listed numerically in the following categories:

Holding Times

The holding times were met as specified in Section 3 of the NEESA (20.2-047B) QA protocol.

Calibration

No deficiencies in this section.

Preparation and Field Blank

1. The preparation blank exhibited contamination for the following elements.

Chromium	0.91	ug/l
Copper	0.97	ug/l
Nickel	1.74	ug/l
Zinc	1.56	ug/l

The USEPA requires that all sample values below five times the preparation or calibration blank contamination be qualified as estimated, "U".

Interferences

No significant interferences were observed.

Spike Recovery

2. The Matrix Spike recovery for Thaliium was below the lower control limits. All positive and non-detect results are qualified as estimated, "J" or "UJ".

Duplicate

No deficiencies in this section.

LCS

No deficiencies in this section.

Serial Dilution

3. The Serial dilution for Barium was outside the control limits. All positive results are qualified as estimated, "J".

MSA

4. The following analytes exhibited low recovery during the GFAA spiking procedure. All positive and non-detect results are ualified as estimated, "J" or "UJ".

Analytes	Samples
Thallium	F19BMW12, F19BMW13, F19BMW13D, F26BMW1 and F19BMW14.

Rinsate Blank

The Rinsate Blank exhibited contamination for the following elements.

Aluminum	87.5	ug/l	no impact
Antimony	2.1	ug/l	no impact
Barium	0.67	ug/l	no impact
Calcium	44.5	ug/l	no impact
Potassium	53.5	ug/l	no impact
Sodium	283.0	ug/l	no impact

ABB requires that all positive results equal to or less than the rinsate blank contamination be qualified as "U".

SUMMARY OF DATA QUALIFICATIONS

SAMPLE ID	ANALYTE	DL	QL	SPECIFIC FINDING
All water samples	Cr, Cu, Ni and Zn.	+	U	1
All water samples	Tl.	+/U	J/UJ	2
All water samples	Ba.	+	J	3
F19BMW12, F19BMW13, F19BMW13D, F19BMW14 and F26BMW1.	Tl.	+/U	J/UJ	4

DL - denotes laboratory qualifier/reported value
+ denotes positive values
U denotes non-detect values

QL - denotes data validation qualifier

DATA ASSESSMENT NARRATIVE
Metals

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, calibration standards, blank analysis results and MS/MSD results. A minimum of ten percent of all laboratory calculations are recalculated by the reviewer. All comments made within this report should be considered when examining the analytical results (Form Is).

This data package consisted of results from **OLF Barin, SDG# 06603T**, the analysis of one (1) field water QC sample and no Matrix Spike and Duplicate pair for TAL Metals. Overall, the inorganic data quality was fair. All protocol requirements were followed with the exception of the following problems.

Specific QA/QC deficiency Findings are listed numerically in the following categories:

Holding Times

The holding times were met as specified in Section 3 of the NEESA (20.2-047B) QA protocol.

Calibration

No deficiencies in this section.

Preparation and Field Blank

No deficiencies in this section.

Interferences

No significant interferences were observed.

Spike Recovery

No deficiencies in this section.

Duplicate

No deficiencies in this section.

LCS

No deficiencies in this section.

Serial Dilution

No deficiencies in this section.

SUMMARY OF DATA QUALIFICATIONS

SAMPLE ID	ANALYTE	DL	QL	SPECIFIC FINDING

Data stands as reported without qualification.

DL - denotes laboratory qualifier/reported value
+ denotes positive values
U denotes non-detect values

QL - denotes data validation qualifier

DATA ASSESSMENT NARRATIVE
Metals

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, calibration standards, blank analysis results and MS/MSD results. A minimum of ten percent of all laboratory calculations are recalculated by the reviewer. All comments made within this report should be considered when examining the analytical results (Form Is).

This data package consisted of results from **OLF Barin, SDG# 6603TS,** the analysis of three (3) field soil samples and one Matrix Spike and Duplicate pair for TAL Metals. The chain of custody did not indicate a rinsate or flied blank for this group of samples. Overall, the inorganic data quality was fair. All protocol requirements were followed with the exception of the following problems.

Specific QA/QC deficiency Findings are listed numerically in the following categories:

Holding Times

The holding times were met as specified in Section 3 of the NEESA (20.2-047B) QA protocol.

Calibration

No deficiencies in this section.

Preparation and Field Blank

1. The preparation blanks exhibited contamination for the following elements.

Calcium	6.77	mg/kg
Cobalt	0.12	mg/kg
Copper	0.25	mg/kg
Magnesium	3.13	mg/kg
Nickel	0.84	mg/kg
Potassium	11.7	mg/kg

The USEPA requires that all sample values below five times the preparation blank contamination be qualified as non-detect, "U".

2. The preparation blank exhibited negative bias for the following elements.

   Zinc -0.84 mg/kg

   It is the USEPA's policy to review the impact and requires the reviewer to make judgement on the impact negative bias will have on the data. It is the reviewer's position that all data points below ten times the absolute value of the negative prep results be qualified as estimated, "J" or "UJ".

Interferences

No significant interferences were observed.

Spike Recovery

3. The Matrix Spike recovery for Antimony was below the lower control limits. All positive and non-detect results are qualified as estimated, "J" or "UJ".

Duplicate

No deficiencies in this section.

LCS

No deficiencies in this section.

Serial Dilution

4. The Serial Dilutions for Aluminum and Magnesium were outside the control limits. All positive results are qualified as estimated, "J".

MSA

5. The following analytes exhibited low recovery during the GFAA spiking procedures. All positive and non-detect data are qualified as estimated, "J" or "UJ".

Analyte	Samples
Thallium	

SUMMARY OF DATA QUALIFICATIONS

SAMPLE ID	ANALYTE	DL	QL	SPECIFIC FINDING
All soil samples	Ca, Co, Cu, Mg, Ni and K.	+	U	1
All soil samples	Zn.	+/U	J/UJ	2
All soil samples	Sb.	+/U	J/UJ	3
All soil samples	Al and Mg.	+	J	4
F26BSS01.	Tl.	+/U	J/UJ	5

DL - denotes laboratory qualifier/reported value
+ denotes positive values
U denotes non-detect values

QL - denotes data validation qualifier