DRAFT

Field Sampling and Analysis Plan

Field Sampling Program at Area F

Redstone Arsenal, Alabama

Prepared for:

U.S. ARMY CORPS OF ENGINEERS
Savannah District

EPA ID NO. AL2 210 020 742

Contract: DACA 21-91-D-0024

March 25, 1994

EBASCO ENVIRONMENTAL
A Division of Ebasco Services Incorporated

Draft
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for
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Redstone Arsenal
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NOTICE

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SYMBOLS AND ABBREVIATIONS

LIST OF ABBREVIATIONS

ADEM	Alabama Department of Environmental Management
ARARs	Applicable or Relevant and Appropriate Requirments
BNA	Base/Neutral/Acid Extractables
CESAS	Savannah District Corps of Engineers
CDAP	Chemical Data Acquisition Plan
CDQO	Chemical Data Quality Objectives
CFR	Code of Federal Regulations
C.I.H.	Certified Industrial Hygienist
CO	Contracting Officer
DQO	Data Quality Objective
EPA	US Environmental Protection Agency
FSAP	Field Sampling and Analysis Plan
G&M	Geraghty and Miller, Inc.
HASP	Health and Safety Plan
HEA	Health and Environmental Analysis
HSM	Health and Safety Manager
ICM	Interim Corrective Measure
IQCP	Installation Quality Control Plan
IRA	Interim Remedial Action
MCL	Maximum Contaminant Level
mg/l	milligrams per liter
MICOM	U.S. Army Missile Command
MSFC	Marshall Space Flight Center
msl	mean sea level
N/A	Not Applicable
NOV	Notice of Violation
NTP	Notice to Proceed
OSWER	Office of Solid Waste and Emergency Response, EPA
PAH	Polynuclear Aromatic Hydrocarbons
P.E.	Professional Engineer
PELA	P.E. Lamoreaux and Associates, Inc.
P.G.	Professional Geologist
PM	Project Manager
ppb	parts per billion
PPE	Personal Protective Equipment
QA/QC	Quality Assurance, Quality Control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RSA	Redstone Arsenal

SS	Stainless Steel
SWMU	Solid Waste Management Unit
TCE	Trichloroethylene or Trichloroethene
TM	Task Manager
USACE	United States Army Corps of Engineers
VOC	Volatile Organic Compound
WP	Work Plan

1.0 INTRODUCTION

The Field Sampling and Analysis Plan (FSAP) combines the contents of a typical Soil Boring Plan and a typical Chemical Data Acquisition Plan (CDAP).

A Soil Boring Plan describes the boring and sampling methodologies to be implemented in the field.

The purpose of a CDAP is to ensure that chemical analytical data acquired during the investigation are of sufficient quality to meet the intended usage. Data quality depends not only on how carefully an analytical method is carried out but also on the sample point selection, sampling procedures, sample integrity and analytical method selected.

This FSAP defines the project Data Quality Objectives (DQO). It describes the project organization and functional responsibilities and details the field activities and laboratory analytical procedures established to meet the DQO.

Development of this document was guided by a number of documents including the following:

- Chemical Data Management for Hazardous Waste Remedial Activities, USACE, 1 October, 1990.
- Minimum Chemistry Data Reporting Requirements for DERP and Superfund HTW Projects, USACE memorandum, August 1989.
- Guidance for Data Usability In Risk Assessment, US EPA, October 1990.
- Installation of Groundwater Monitor Wells and Exploratory Borings at Hazardous Waste Sites, USACE, Missouri River Division, May 1990.

1.1 Background

The U.S. Army Missile Command (MICOM) Environmental Management Office of Redstone Arsenal, Alabama, has tasked the U.S. Army Corps of Engineers (USACE), Savannah District (CESAS) to conduct an interim remedial action (IRA) at Area F, former arsenic waste disposal ponds at Redstone Arsenal. The Interim Corrective Measure (ICM) for this project involves the design and construction of a protective clay cap to isolate the arsenic wastes from the environment.

The CESAS has tasked Ebasco Environmental (Ebasco) under the Indefinite Delivery Order Contract DACA 21-91-D-0024 to prepare design documents for the ICM at Area F. In order to facilitate design of the ICM, Ebasco will perform a field sampling program to obtain additional field data at the Area F site. This new task has been added to design an effective ICM system (Final Cap).

1.2 Location

Redstone Arsenal (RSA) is a U.S. Army facility located in Madison County, Alabama, as shown in Figure 1-1. It is bounded on the north and east by the City of Huntsville, on the south by Wheeler National Wildlife Refuge and the Tennessee River, and on the west by agricultural, residential and light industrial areas.

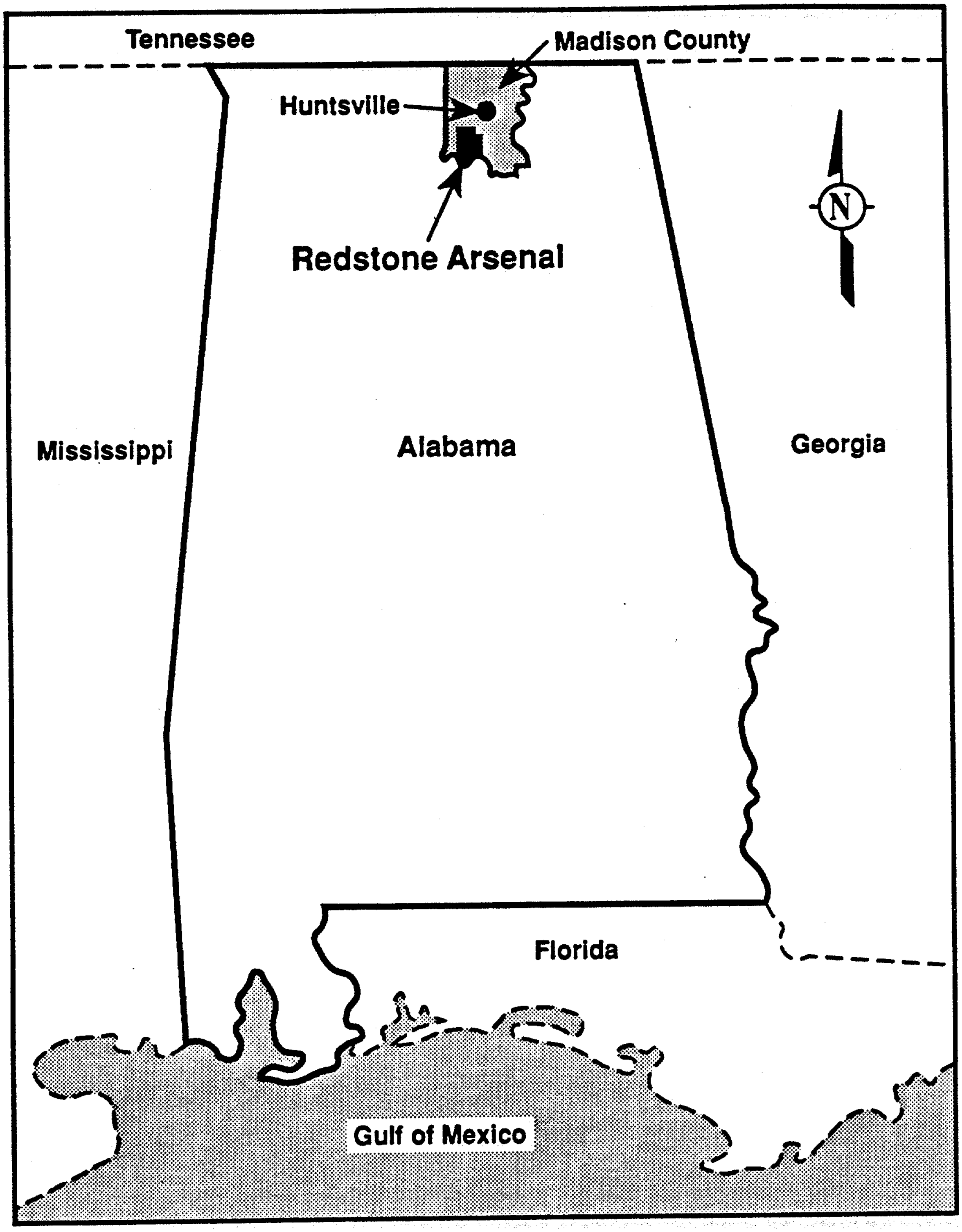
Area F is located in central RSA north of the former Lewisite Manufacturing Plant Area (Figure 1-2: Location of Area F) and north of Digney Road. As shown in Figure 1-3: Area F - Closed Arsenic Impoundments, Area F is approximately 5 acres in size and consists of 3 ponds which were used to dispose of arsenic-contaminated wastes from the Lewisite manufacturing operations. Rubble and industrial wastes were disposed in the impoundments subsequent to the disposal of arsenic wastes. Arsenic has been encountered in the groundwater at concentrations of approximately 110 parts per billion (ppb) and in the soil up to 40,000 mg/Kg.

1.3 Field Sampling Objectives

The objectives of this work are to further determine the extent of arsenic contamination, both vertically and laterally at Area F, and to sample potential borrow areas for clay cap material. This will entail the excavation of test pits to determine if on-site material may be used as a liner material for cap construction, and the collection of undisturbed samples for hydraulic conductivity testing.

The contaminant characterization activities have been designed to fully define the limits of contamination in soil. The resulting analytical data will be used to prepare an Interim Corrective Measure for Area F.

This project will require surveying services within and adjacent to the sites. The surveying services will include the surveying of horizontal locations and vertical elevations of subsurface soil sampling locations and test pits.



ICM DESIGN AT AREA F, REDSTONE ARSENAL

LOCATION OF REDSTONE ARSENAL

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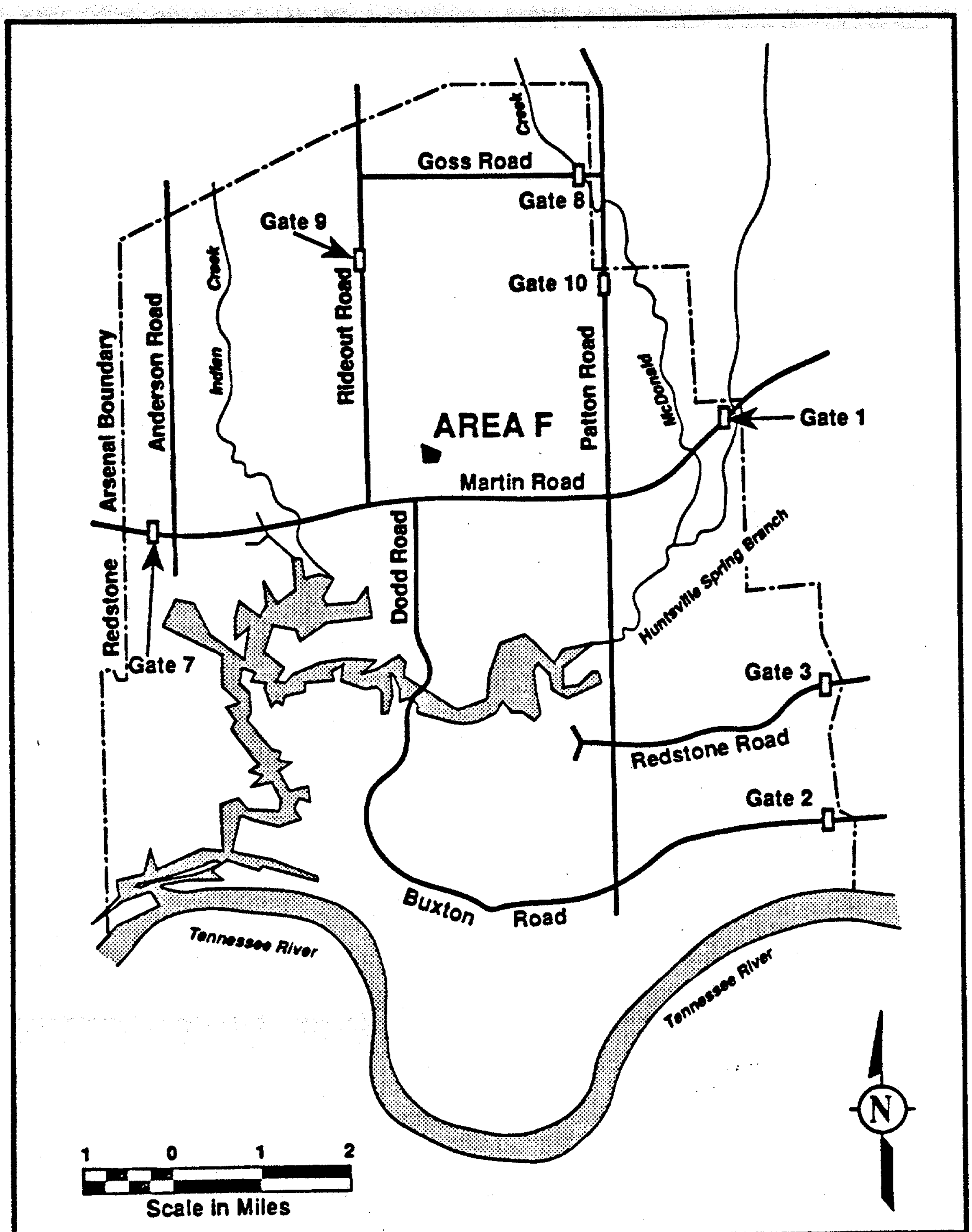
FIGURE 1-1 LOCATION OF REDSTONE ARSENAL



ICM DESIGN AT AREA F, REDSTONE ARSENAL

LOCATION OF AREA F

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FIGURE 1-2 LOCATION OF AREA F

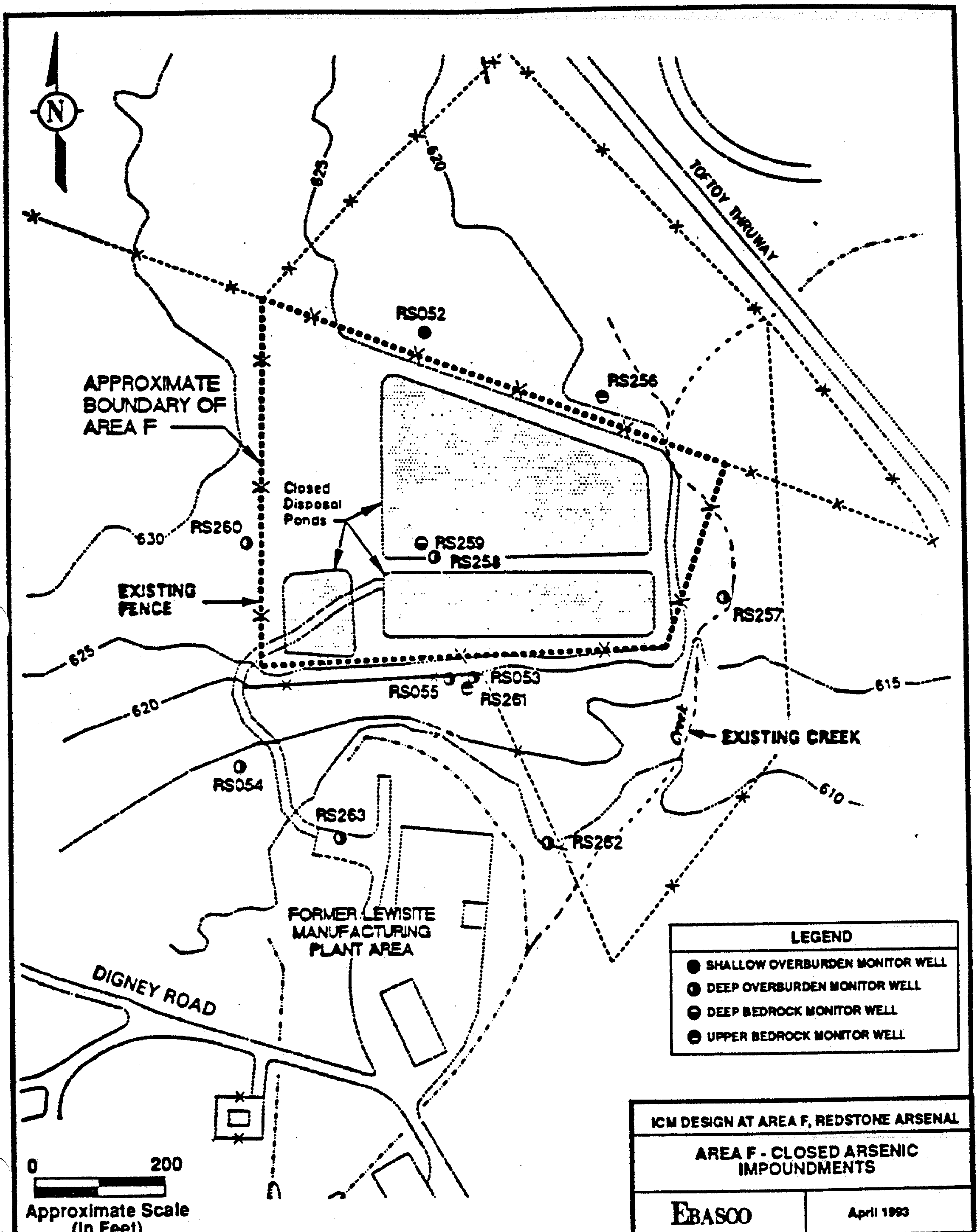


FIGURE 1-3 AREA F - ARSENIC IMPOUNDMENT AREA

Source: Geraghty & Miller Inc., 1991

2.0 FIELD ACTIVITIES

Field activities to be performed at the RSA Area F site consist of:

- Location of Underground Utilities
- Subsurface Soil Investigation at Area F
- Geophysical testing and sample collection at 12 test pits

The publications listed below form a part of this FSAP to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY for TESTING and MATERIALS (ASTM) STANDARDS:

D-1586/87 Split-spoon Sampling

C 150-85a Portland Cement

D 421/22 Grain Size Distribution

D 2216 Moisture Content

D2487 Classification of Soils for Engineering Purposes

D 2488 Description and Identification of Soils

D 4318 Atterberg Limits

2.1 General Field Operations

2.1.1 Mobilization

Upon approval of this plan by RSA and the USACE, a field sampling crew and subsurface drilling contractor will be scheduled and sampling and health/safety equipment will be mobilized to the site.

The sampling crews will be thoroughly familiar with this FSAP, and the Site Safety and Health Plan (SSHP) prior to initiating field activities.

2.1.2 Utilities Location

During field mobilization activities, Contractor personnel will accompany RSA or oth personnel qualified to locate underground utilities. Shallow boring locations will repositioned if there is a conflict with underground utilities as identified by the util locator and maps identifying underground utilities' locations. The presence/absence : location of utilities will be determined at each site prior to subsurface drilling excavating activities. Allowances shall also be made for drilling around overh utilities.

2.1.3 Sample Identification, Chain-of-Custody, and Transportation

Each sample collected will have its own number, which will apply during the duration of the project. The sample numbers will consist of a multi-faceted alpha-numeric code, that will identify: 1) the area of investigation, 2) the site designation, 3) the type of sample, and 4) the sample location.

The sample codes and types are:

RSA- Redstone Arsenal
SB - Soil Boring
QA - USACE QA Split
FB - Field Blank
TP - Test Pit

The site designation numbers are:

Area F - Area F
TP - 1 - Test Pit 1
TP - 2 - Test Pit 2
TP - 3 - Test Pit 3
....
TP - 12 - Test Pit 12

All sample locations will begin with a "RSA" designation indicating the sample is from Redstone Arsenal, and will be followed by the site designation number. For example, when soil boring SB-01 is sampled at Area F, the number shall be:

RSA-Area F-SB-01.

For soil samples from the initial borings, the two digit number designating the boring location will be followed by a sample depth range in parenthesis. A sample collected at soil boring SB-05 at Area F from a depth range of 0-2 feet would be designated:

RSA-Area F-SB-05(0-2)

Additional split samples will be denoted as "QA," for shipment to the USACE laboratory. For example, a (QA) split sample from soil boring SB-05 at Area F taken at a depth of 2-4 feet will be:

RSA-Area F-SB-05(2-4)-QA

All samples will be labeled using indelible ink.

To maintain and document sample possession, chain-of-custody (COC) procedures are required. These procedures are necessary to insure the integrity of samples from collection to data reporting. COC provides the ability to trace possession and handling of samples from the time of collection through analysis and data deposition. A sample is considered under custody if:

- It is in your possession; or
- It is in your view after being in your possession; or
- It was in your possession and you locked it up; or
- It is in a designated secure area.

Personnel collecting samples are personally responsible for the care and integrity of these samples until they are properly transferred or dispatched. Therefore, the number of people handling a sample should be kept to a minimum.

A COC Form (Figure 2-1) will be completed by the sampler. The sampler will sign the form where indicated and record site as Redstone Arsenal, sample number, time, sample location, and analysis for each sample collected. The Field Operations Leader (FOL) will check off each sample analysis required on the COC Form and check the sample label and COC record for accuracy and completeness.

When transferring custody of samples, the individuals relinquishing custody and receiving custody will sign, date, and record the time on the COC Form. The COC Form documents the transfer of samples from the sampler to the analytical laboratory. Upon receipt of shipment at the laboratory, a designated sample custodian will accept custody of the samples and verify that information on the sample labels matches the COC Form. Pertinent information on shipment, air bill number, pickup, courier, date, and time will be recorded on the record. It is then the laboratory's responsibility to maintain internal logbooks and custody records throughout sample preparation and analysis.

Based on existing information, it is not anticipated that any environmental samples will be hazardous enough to warrant special considerations for packaging and shipping. Samples will be shipped for overnight delivery by the way of Federal Express in waterproof coolers using the following procedures:

- Place about 3 inches of inert cushioning material such as vermiculite in the bottom of the plastic garbage bag.

FI[illegible] 2-1

EBASCO SERVICES INCORPORATED
CHAIN OF CUSTODY RECORD

PROJECT	
SAMPLERS: (Signature)	

SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	NO. CONTAINERS	P P METALS	P P MERCURY	BASE/NEUTRAL EXT.	ACID EXT.	VOLATILE ORG.						REMARKS OR SAMPLE LOCATION	PRESERVATION: ICED	PRESERVATION: SPECIFY CHEMICALS ADDED AND FINAL pH IF KNOWN

Relinquished by: (Signature) ①	Date / Time	Received by: (Signature)	Relinquished by: (Signature) ④	Date / Time	Shipped via:
Relinquished by: (Signature) ②	Date / Time	Received by: (Signature)	Received for Laboratory by: (Signature)	Date / Time	Shipping Ticket No.
Relinquished by: (Signature) ③	Date / Time	Received by: (Signature)	Remarks		

- Enclose the bottles in clear plastic bags through which sample labels are visible, and seal the bag. Place bottles upright in the cooler in such a way that they do not touch and will not touch during shipment.

- Put in additional inert packing material to partially cover sample bottles (more than halfway). Place bags of ice around, among, and on top of the sample bottles. If chemical ice is used, it should be placed in a plastic bag.

- Fill cooler with cushioning material.

- Put paperwork (chain-of-custody record and cooler receipt form) in a waterproof plastic bag and tape it with duct tape to the inside lid of the cooler.

- Tape the drain shut.

- Secure lid by taping. Wrap the cooler completely with strapping tape at a minimum of two locations. Do not cover any labels.

- Attach completed shipping label to top of the cooler.

- Put "This Side Up" label on all four sides and "Fragile" labels on at least two sides.

- Affix numbered and signed custody seals on front right and back left of cooler. Cover seals with wide, clear tape.

Samples will be shipped for overnight delivery twice per week.

2.1.4 Sample Analytical Parameters, Containers, Preservation and Holding Times

Table 2-1 lists the expected totals of each type of sample to be collected, as well as the analytical methods and associated container, preservation, and holding time requirements. All sample containers will be obtained from the laboratory certified clean. Containers used for sending samples to the USACE QA laboratory will be obtained from the same source as the other sample containers. The analytical methods are discussed in more detail in Section 5.1 of this document. Approximately 10 percent of all samples will be sent as QA splits to the USACE QA laboratory. An additional 10 percent, consisting of splits/duplicates and 5 percent for matrix spike/matrix spike duplicate will be sent to the contracted laboratory for Quality Control (QC) purposes. Field and laboratory QA/QC samples are discussed in greater detail in Section 5.2.

TABLE 2-1
SUMMARY OF SAMPLING TASKS, QC REQUIREMENTS, ANALYTICAL PARAMETERS WITH SAMPLE CONTAINERS, PRESERVATION PROCEDURES AND HOLDING TIMES

Sampling	Field Samples	Field Duplicates	MS/MSD	Trip Blanks	Total Samples	QA Dup/Splits	Trip Blanks	Total QA	Method No.	Reference	Holding Time	Preservation Requirements	Bottle Requirements Number per sample
Subsurface Soil													
Arsenic	102	10	3	0	115	10	0	10	7060	SW-846	6 months	ice to 4°C	1-4oz. poly or glass
Decon Water													
Arsenic	8	1	1	0	10	1	0	1	7060	SW-846	6 months	ice to 4°C	1-4oz. poly or glass

2.1.5 Field Instrumentation

Numerous monitoring instruments will be used during field activities. These include but are not limited to the following:

- Flame Ionization Detector (Foxboro OVA 128 or 108, calibrated with methane)
- Photoionization meter (Photovac micro-tip with 10.6 ev lamp calibrated with isobutylene)

Each device will be calibrated according to the manufacturer's operating manual before each day's use. These calibration procedures are described in Appendix C. Calibration will be documented in the appropriate field logbook. During calibration, an appropriate maintenance check will be performed on each piece of equipment. If damaged or failed parts are identified during the daily maintenance check, and it is determined that the damage could have an impact on the instrument's performance, the instrument will be removed from service until the identified parts are repaired or replaced.

A detailed list of all equipment and supplies necessary for the field investigation is provided in Appendix D.

2.1.6 Decontamination Procedures and Supplies

Drilling equipment will be decontaminated prior to sampling using the following procedures:

- Steam clean equipment;
- Rinse with potable water;
- Air dry all equipment;
- Wrap in aluminum foil or plastic (if equipment is not to be used immediately).

  All sampling equipment that comes in direct contact with an analytical sample and is not disposable will be constructed of either teflon or stainless steel and be decontaminated prior to each sampling episode using the following procedure.

- Scrub equipment with a low-sudsing, non-phosphate detergent in potable water;
- Rinse with potable water; and
- Rinse with 0.1N nitric acid solution (4.2 ml of conc. reagent grade nitric acid added to 1000 ml deionized water)

The decontamination of all drilling and sampling equipment, including appropriate portions of the drill rig, augers, drill casing, rods, tools, etc., will be performed before arrival at the site. At the site, equipment will again be steam cleaned prior to commencing drilling. In addition, the rear of the drill rig and all downhole equipment will be steam-cleaned between site locations or as directed by the Ebasco FOL.

2.1.7 Field Documentation

Bound, weather-proof field notebooks will be maintained by the field team. Team members shall record all information related to sampling time, weather, unusual or significant events (such as visitors or well tampering), field measurements, and all other site activities.

In addition to the field notebook, a site logbook shall be maintained by the FOL. Essentially, this book will contain a summary of the day's activities and will reference the field notebooks when applicable. Various field reports will also be maintained as directed by field activities.

As field activities progress it may become necessary to alter the procedures outlined in this FSAP to respond to field conditions. Any changes or deviations from this FSAP will be documented by the FOL in the site logbook and a Field Change Request (FCR) Form initiated (see Figure 2-2). The FCR will be signed by the Project Manager, distributed to the Program Manager, the USACE Project Manager and the project file. A copy will also be kept in the on-site office trailer with the FSAP. Major changes will be discussed with the USACE Technical Manager (TM) before implementation.

During the field investigation activities, a Daily Quality Control Report (DQCR) (Figure 2-3) will be prepared which summarizes all work performed and documents any changes or deviations from this CDAP. These reports will be compiled and sent to the USACE TM and the Base Environmental Coordinator weekly. At the conclusion of the field activities, a QC Report will be prepared by consolidating all DQCRs, Field Change Requests and Driller's Daily Report and Drilling Logs into a summary report, and will be submitted with the Draft and Final Project Report.

2.1.8 Field Audits and Corrective Action

Quality Assurance performance audits may be performed by a designated QA Specialist during the field activities. The audits include checks on adherence to all sampling protocols. Any audit findings will be documented and distributed to appropriate project team members. Any necessary corrective action will be implemented immediately by the FOL.

FIGURE 2-2
FIELD CHANGE REQUEST
-TYPICAL-

Site Name　　Ebasco Charge Number　　Field Change Number

____

To______________ Location______________ Date__________

Description:

____
____
____

Reason For Change:

____
____
____

Recommended Disposition:

____
____
____

____
Field Operations Leader (Signature)　　Date

Disposition:

____
____
____

____
Project Manager (Signature)　　Date

Distribution: Program Manager

Others as required: ____________
USACE Project Manager ____________
Quality Assurance Manager ____________
Project File

Figure 2-3

DAILY QUALITY CONTROL REPORT

Project: **Redstone Arsenal**	Date:
Location:	Weather: Temp: Wind: Humidity:

Personnel:

Name	Position	Company	Hours Worked

Field Installations:

ID No(s). Drilled: From: To: Footage:	

Equipment:

Description	Purpose/Use	Time Used

Hours Drilling: Hours Installing: Hours Decon: Hours Development: Hours Sampling: Hours Shut Down:	
No. of Samples:	
Type:	

Description of Work Performed:

Health and Safety Levels:

Problems Encountered:

Any Changes From Work Plan:

Remarks:

Signature:

2.2 Field Investigation Procedures

2.2.1 Certificates, Laws and Ordinances

All drilling and well construction will meet all requirements of the Alabama Department of Environmental Management (ADEM) and regulations promulgated thereunder. All work will be performed by a drilling Contractor holding a current registration certificate in the State of Alabama, and all Federal, State and local permits required for drilling will be obtained.

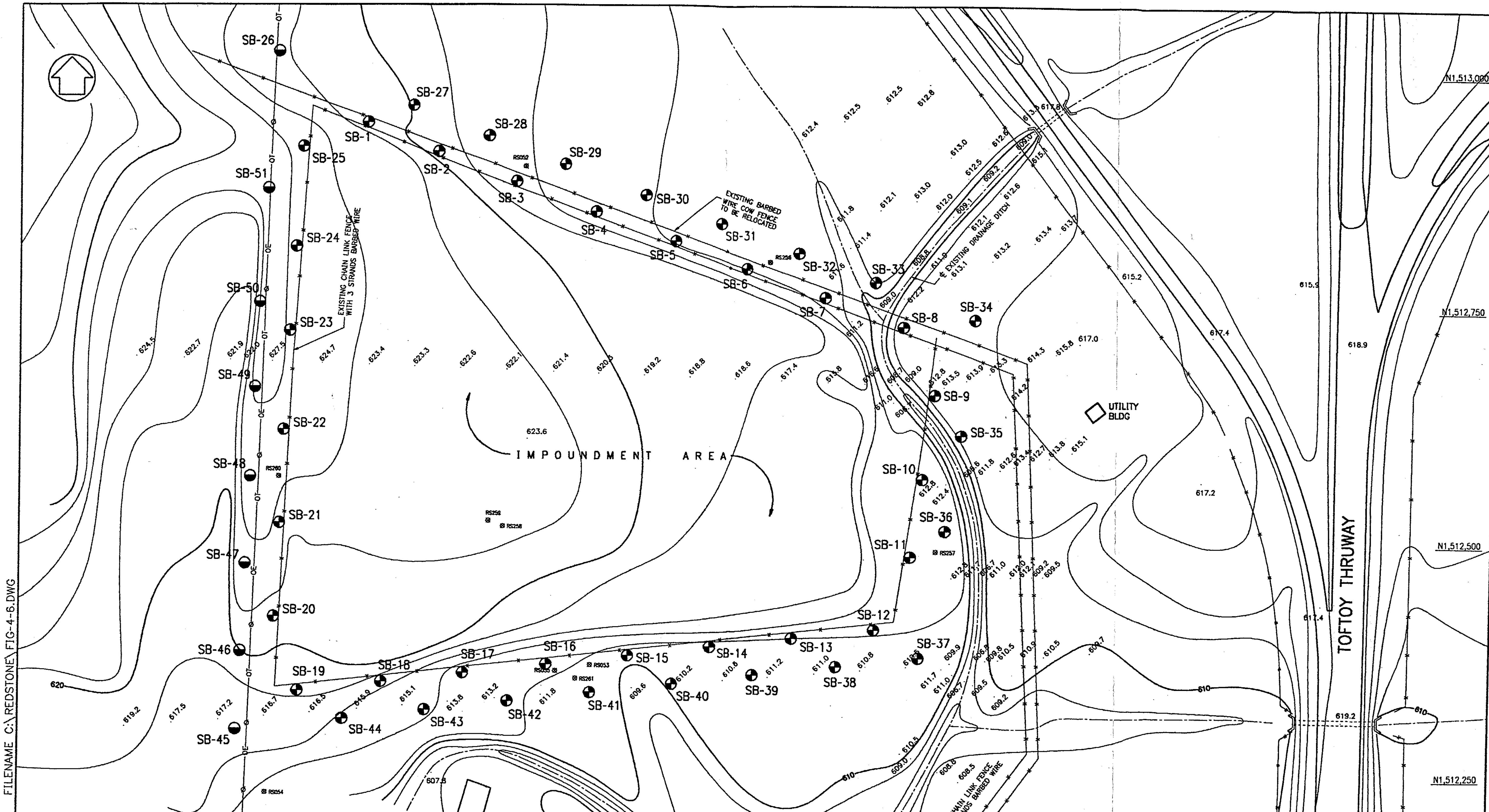
2.2.2 Subsurface Soil Investigation

A total of fifty-one (51) shallow soil borings are proposed for Area F. A ring of twenty five (25) borings at 100 foot spacing, will be drilled around the perimeter of Area F. A second perimeter of twenty-six (26) borings will be offset by 35 feet and staggered from the first perimeter. Placement of the shallow soil borings will be as shown on Figure 2-4. The shallow soil borings will be completed to a depth of four feet. The exact placement of borings in the field may vary by a few feet from those discussed with and approved by the USACE TM due to the findings of the underground utilities investigation or other unexpected obstructions. The borings will be advanced using hollow-stem augers with split-spoon samples (ASTM D 1586/87) collected at depths of two (2) feet, and four (4) feet for shallow borings. A boring log will be maintained detailing soil boring activities (Figure 2-5).

Eight (8) of the shallow soil borings in the second perimeter will have to be hand augered due to a conflict with overhead utilities. These eight borings are located on the east side of Area F as shown on Figure 2-4. Split-spoon samples will be collected at two (2) feet and four (4) feet.

When each split-spoon sampler is retrieved from the hole, it will be opened and a Photovac MicroTip photoionization meter will be used to screen each sample interval for volatile contamination. These readings will be recorded.

The sample for laboratory analysis will be placed in a clean stainless steel bowl, mixed thoroughly with a stainless steel spoon and placed into the sampling containers. QA/QC samples will be collected using the same procedure. If the sample volume of the first sample is not adequate, another split-spoon sample will be collected immediately below the original sample. Samples will be immediately labelled and placed on ice after collection, then packaged and shipped to the contractor laboratory to be analyzed for the parameters specified in Table 4-1. In addition, a government on-site field lab will screen duplicates of each sample taken for arsenic content.



FILENAME C:\REDSTONE\FIG-4-6.DWG

PLOT DATE MARCH 22, 1994

WELL DATA

WELL	NORTHING	EASTING	ELEV
RS052	1,512,901.21	252,474.74	616.02
RS053	1,512,372.49	252,547.54	611.15
RS054	1,512,232.46	252,196.99	613.90
RS055	1,512,368.63	252,508.72	612.13
RS256	1,512,800.25	252,742.50	612.09
RS257	1,512,491.06	252,923.50	613.04
RS258	1,512,516.87	252,451.64	623.68
RS259	1,512,522.76	252,435.25	623.50
RS260	1,512,569.85	252,209.39	624.50
RS261	1,512,354.50	252,531.69	611.70
RS262	1,512,117.95	252,656.77	608.71
RS263	1,512,124.49	252,347.76	608.34

NOTES

EXISTING TOPOGRAPHIC DATA BASED ON MAPS FURNISHED BY THE SAVANNAH DISTRICT CORPS OF ENGINEERS.

ALL SOIL SAMPLES SHOWN ALONG THE EXISTING FENCE LINE WILL BE DRILLED AT A DISTANCE OF 5' FROM THE FENCE OR AS CLOSE TO THE FENCE AS POSSIBLE.

ALL SOIL SAMPLES TAKEN WITHIN 25' OF OVERHEAD POWER LINES SHALL BE HAND AUGERED.

LEGEND

- DRILLED SHALLOW SOIL BORING
- HAND-AUGERED SHALLOW SOIL BORING

ENSERCH ENVIRONMENTAL *CORPORATION*

SHALLOW SOIL BORING LOCATIONS
REDSTONE ARSENAL, ALABAMA

Figure 2-4

FIGURE 2-5

ENSERCH ENVIRONMENTAL CORPORATION

SOIL BORING LOG

SITE NAME: ____________________
ADDRESS: ____________________
CLIENT: ____________________
DRILLING SUBCONTRACTOR: ____________________
DRILLER: ____________________
DRILLING EQUIPMENT: ____________________
BORING LOCATION: ____________________
GEOTECHNICAL SAMPLES: ____________________
CHEMICAL ANALYSIS SAMPLES: ____________________

BORING NUMBER: ____________________
HYDROPUNCH NUMBER: ____________________
MONITOR WELL NUMBER: ____________________
DATE STARTED: ____________________
DATE COMPLETED: ____________________
BORING DIAMETER: ____________________
TOTAL BORING DEPTH: ____________________
GROUND ELEVATION: ____________________
DEPTH TO WATER: _______ AFTER _______ HRS.

SAMPLE DEPTH (FT)	MICRO-TIP READING (ppm)	CGI READING (% LEL)	BLOW COUNT	WATER PRESENCE	USCS SYMBOL	DESCRIPTION / REMARKS

COMMENTS:

LOGGED BY: ____________________

SW-0031

All borings shall be backfilled with grout immediately after sampling is completed.

Drill cuttings from soil borings will be containerized in 55 gallon drums as described in Section 2.3.

A mobile laboratory will be set up onsite by USACE to provide rapid turnaround of arsenic analysis using x-ray fluorescence. This data may provide additional sample boring locations. If the field laboratory screening results in a contaminated four foot sample, then augering will continue to a depth of six (6) feet. At the six foot depth a split-spoon sample will be taken and analyzed for arsenic content.

Additional Sampling

If field screening of the two foot soil sample, or deeper, indicates arsenic contamination an additional soil boring will be performed 50 feet from the first boring in a perpendicular direction away from the closed arsenic ponds. Soil boring and sampling will continue in this manner until field screening indicates no contamination at any depth. It should be noted that field laboratory screening procedures limit of detection for arsenic is 10 mg/kg. The existing site soil background levels for arsenic are 8.8 mg/kg.

Driller's Daily Report and Drilling Log

During drilling of each boring, a daily detailed driller's report will be maintained and be available upon request at the well site. The report shall give a complete description of all number of feet drilled, number of hours on the job and dates, shutdown due to breakdown, and water level encountered.

During drilling of each boring a drill log will be kept by a qualified geologist setting forth the following parameters:

- The reference point for all depth measurements (formations, samples, total depth, etc.);
- Depth of each change of stratum and stratum thickness;
- Identification of material from each stratum (according to USCS);
- Hole instability, special drilling problems, odors, and evidence of contamination; and
- The depth at which the first water was encountered.

A copy of the field logs shall be submitted to the USACE TM not later than ten (10) days following completion of the soil borings.

2.2.3 Borrow Area Sampling

A backhoe will be used to excavate twelve (12) test pits to a depth of 15 feet at the proposed borrow site area. Field logs of the test pits will contain soil classifications based on the Unified Soil Classification System and ASTM D 2488. Changes in material type shall be measured to the nearest 0.1 foot. Past the five foot depth, marked changes in soil conditions will be visually identified from the top of the excavation, as the sides of the test pit will not be shored and OSHA regulations will not allow personnel to enter the excavation. In-situ strength tests shall be performed on identified cohesive materials up to an excavation depth of five feet using pocket penetrometers and hand shear vanes.

The test pits will be excavated on one of the four possible borrow areas located immediately west and northwest of Area F (see Figure 2-6). The layout of the test pits shall be so as to: maximize the areal coverage of the borrow area, take advantage of existing subsurface information on vertical location of low permeability layers, and provide information on potential for horizontal expansion of the borrow area limits. Upon completion, each test pit will be backfilled and marked with a wooden stake indicating the test pit number.

Disturbed soil samples from the test pit shall be obtained on three foot centers beginning at the surface and at each change in soil classification. Soil samples shall be obtained with the backhoe bucket and stored in sealed, one pint plastic jars in order to preserve in-situ moisture contents and provide material from soil identification tests. Three identification tests shall be performed for every test pit for a total of thirty-six (36) tests. Fine grained and clayey soils anticipated to have low permeabilities shall be tested.

Each identification test shall consist of the following laboratory tests:

- Atterberg Limit Test (ASTM D4318)
- Laboratory Soil Classification (ASTM D2487)
- Sieve Analysis Test (ASTM D422)
- Moisture Content (ASTM D2216)

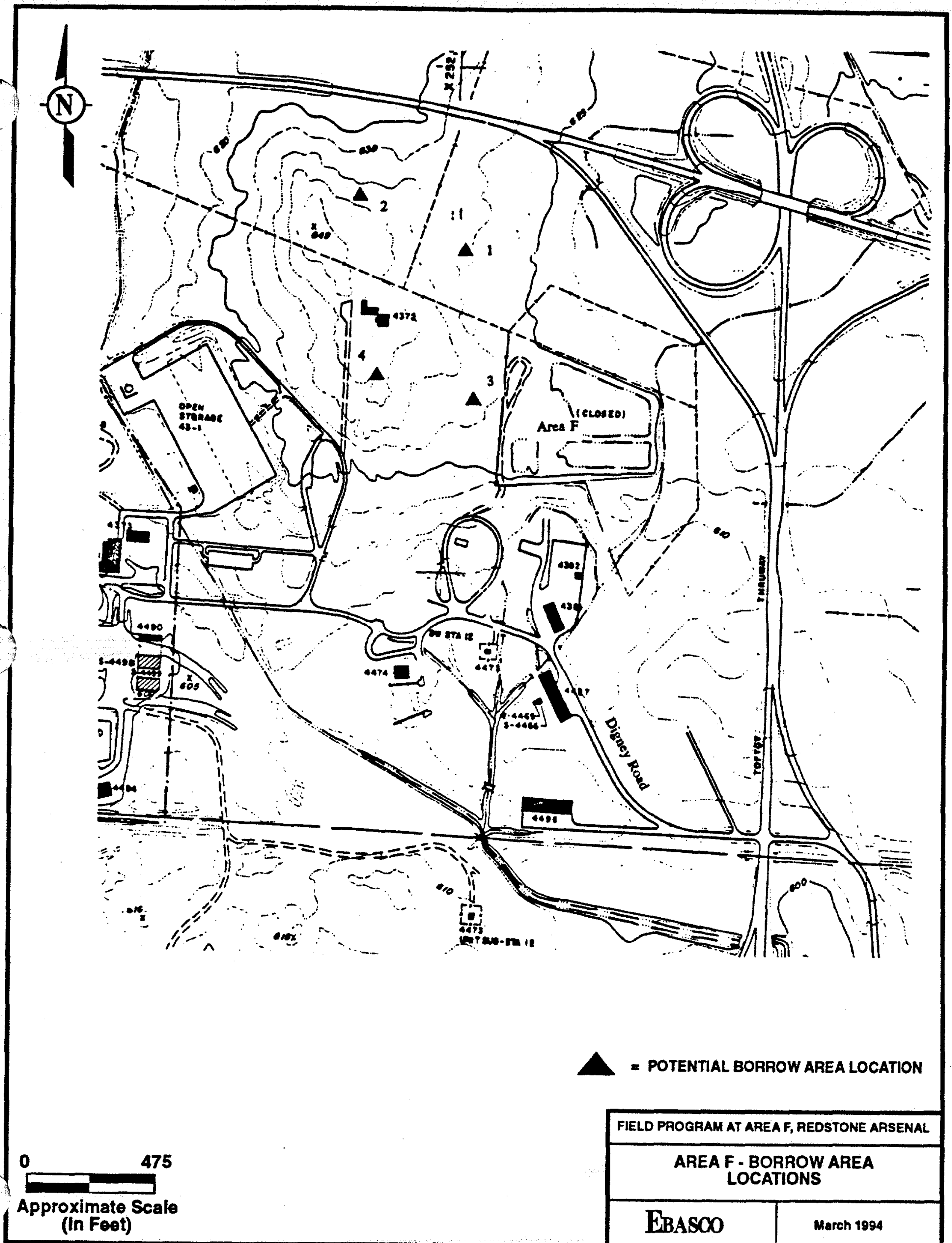


FIGURE 2-6 AREA F - POTENTIAL BORROW AREA LOCATIONS

Source: U.S. Army, 1987

Five (5) bag samples of clayey material most likely to meet the requirements for a low permeability soil shall be obtained from the test pits. Each bag sample shall weigh a minimum of 250 pounds and shall be contained in a plastic-lined canvas bag capable of preserving the in-situ moisture content. A sealed jar sample shall be included in each bag sample, and all samples will be properly labeled. Various compaction tests shall be run on each of the five bag samples at differing water contents. Four (4) inch molds shall be used for all compaction tests. Laboratory hydraulic conductivity tests shall be performed on two (2) of the five bag samples. Fifteen (15) remolded soil specimens from each bag shall be tested at various moisture contents and densities to determine the range of hydraulic conductivities for various compactive efforts. The laboratory hydraulic conductivity tests (ASTM D50840 shall be performed under the following conditions:

- using a flexible wall permeameter (triaxial device);
- back pressure saturated to 100 percent saturation;
- average effective confining pressure of 5 psi;
- hydraulic gradient of 10;
- permeant shall be tap water, and
- the test will be terminated when three consecutive reading intervals indicate the same hydraulic conductivity.

2.2.4 Surveying

This project will require surveying services within and adjacent to the site. The surveying services will include the surveying of horizontal locations and vertical elevations of subsurface soil sampling locations, test pits and undisturbed samples and all aboveground and, where possible, underground physical features at each site.

Four primary horizontal and vertical control benchmarks will be established to accurately establish control at the sites. Reference data for surveying will be:

- Horizontal Control - Alabama State Plane Coordinate System or appropriate survey control system. Coordinates will be established to the nearest one foot.
- Vertical Control - Referenced to Mean Sea Level (MSL), specifically to the National Geodetic Vertical Datum (NGVD) of 1983. If the 1983 Datum is not available, the NGVD 1929 Datum shall be used. Ground elevations and top of casing elevations will be to the nearest 0.01 foot.

The location, identification, coordinates and elevations of the wells and monuments will be tabulated and plotted on drawings to be included in the ICM.

2.3 Investigative Derived Waste Handling

All discarded materials, waste materials, or other objects will be handled in such a way as to control the potential for spreading contamination, creating a sanitary hazard or causing litter to be left on site. All personnel protection equipment materials, (e.g., Tyvek suits, gloves, etc.), will be collected and drummed for appropriate disposal.

All cuttings generated from boring activities will be containerized in DOT 17-C-55 gallon drums and placed in an area approved by USACE personnel. Cuttings will be segregated based on field screening either possibly contaminated or non contaminated. The drums will be appropriately labeled, sealed, and recorded drums. Drummed cuttings will remain onsite until analytical results indicate the presence or absence of contamination. Non-contaminated material will be appropriately labeled and remain onsite for subsequent disposal as directed by USACE according to applicable guidelines. If analytical results indicate that the soil concentrations of arsenic are above the TCLP maximum criteria, as presented in 40 CFR 261.24, the drummed soil will be classified as hazardous and will be disposed of or treated at an approved hazardous waste facility.

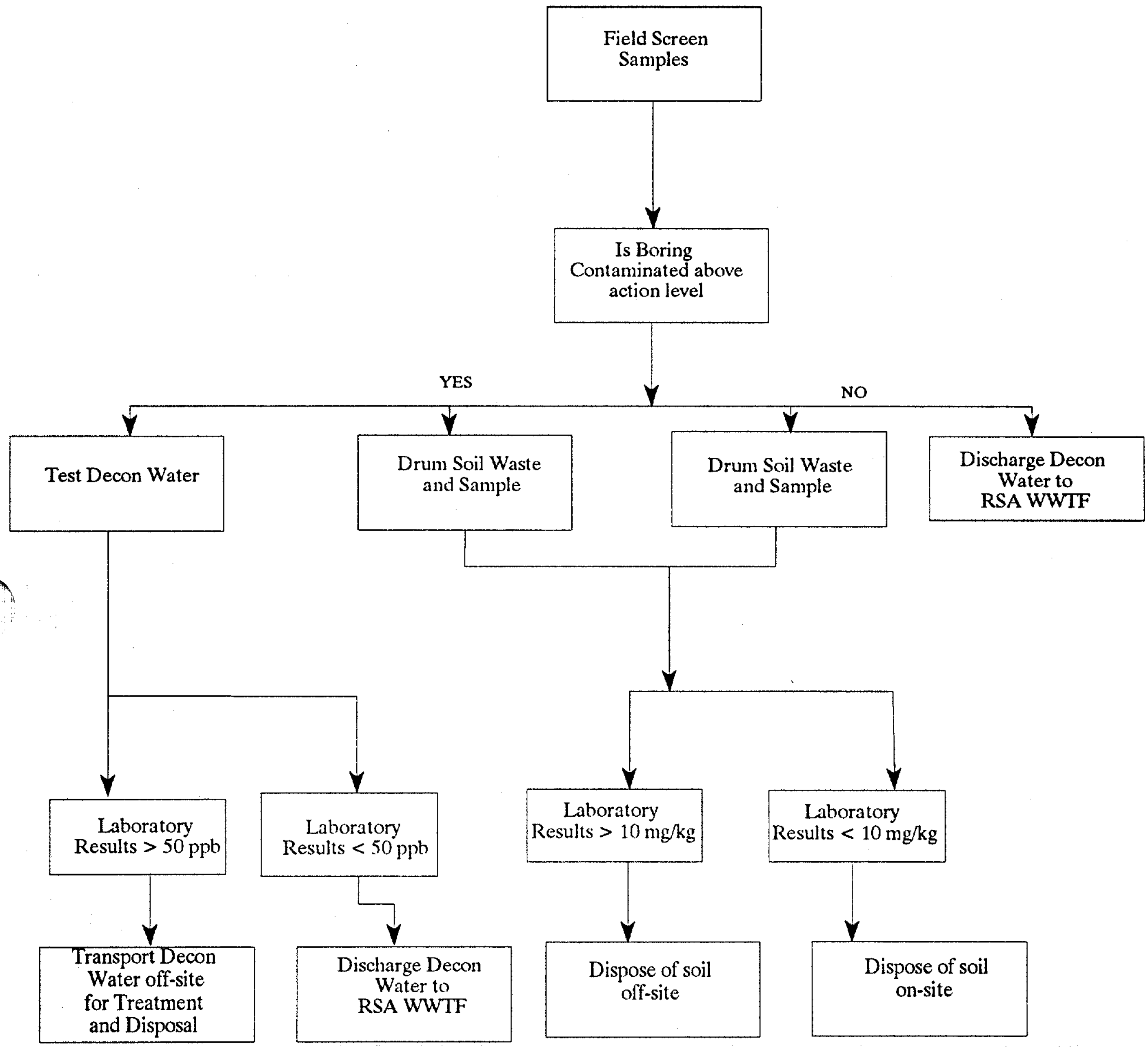
The decontamination water will be drummed in DOT approved containers and labeled with a unique drum ID number, contents description, and source(s) (soil boring number). For the borings whose soil results were greater than site action levels for arsenic, the water will be tested for arsenic. If the result is less than 50 parts per billion (ppb) the water will be discharged to the Redstone Arsenal Wastewater Treatment Facility. If the results are greater than 50 ppb off-site treatment will be arranged. Figure 2-7 shows the decision tree to follow.

A record of the number of drums and their contents will be completed for the entire site and included in the field logbook.

Wastes which are determined to be nonhazardous will be handled in the following manner. Nonhazardous wastes will be disposed of only after proper authorization from ADEM. The proposed approach is that nonhazardous soil cuttings will be spread on the ground at the Area F site. Decontamination water will be transported to a wastewater treatment facility within RSA for treatment. Nonhazardous waste PPE and other trash will be emptied ito dumpsters or other appropriate containers (roll-offs for example) for disposal at a municipal landfill.

All waste management activities will be performed in accordance with ADEM Hazardous Waste Regulations Division 14 Parts 335-14-2-01(2) and 335-14-3-03.

The determination of the hazardous/nonhazardous status of PPE and other waste trash generated during and drilling and sampling will be made by evaluating analytical results of the soil sampled at the site where the PPE was generated. If the soil from that site is hazardous, then the PPE or waste trash will be considered to be hazardous.



EBASCO	IDW DECISION TREE FOR DECON WATER AND SOIL, AREA F REDSTONE ARSENAL, ALABAMA	FIGURE 2-7

3.0 EBASCO PROJECT ORGANIZATION AND FUNCTIONAL AREA RESPONSIBILITIES

3.1 Project Organization

The Program Manager, David Schaer is responsible for the quality of all work performed under USACE Contract DACA 21-91-D-0024. Kirk Mays will serve as Project Manager (PM). The PM has primary responsibility for implementing the investigation. The PM are supported by Joel Davis: Project Geologist and Field Operations Leader (FOL), and Weldon Evans: Field Health and Safety officer (HSO). The FOL is responsible for on-site management of activities during the field investigation.

Additional project personnel are listed on Table 3-1. This table also denotes quality control officers. Resumes of all Ebasco personnel are provided in Appendix A. All Ebasco field personnel are hazardous waste health and safety trained and medically monitored. Health and safety monitoring equipment will be used in the field, as outlined in the Site Safety and Health Plan.

3.2 Quality Assurance/Quality Control

Project quality assurance and quality control will be performed under the direction of Ashion Pearson from Ebasco's corporate QA/QC group. The project QA officer will be Sue Jones who is responsible for laboratory activities.

All project personnel are responsible for ensuring the quality of work on the project. Project quality control officers are identified in Table 3-1. Each officer is responsible for the quality of work performed under their direction. Mr. David Schaer is responsible for quality control at the program level, Mr. Mays is responsible for the quality of work at the project level. Mr. Davis is responsible for quality control in the field.

3.3 Analytical Laboratories

(TBD) will be utilized during this project to provide for all analyses identified in the scope of work. Their current Missouri River Division Corps of Engineers validation is included in Appendix B.

TABLE 3-1

EBASCO PROJECT PERSONNEL

Program Manager

David Schaer*

Project Managers

Kirk Mays*

Site Manager

Joel Davis*

Health and Safety Officer

Weldon Evans

Corporate Health and Safety

Gerry Delaney

Corporate QA/QC

Ashion Pearson

QA Officer

Sue Jones

* Quality Control Officers

4.0 CHEMICAL DATA QUALITY OBJECTIVES (CDQO)

The primary objective of this investigation is to collect and analyze subsurface soil at Area F to determine the extent of contamination. The results of the sample analyses will be used to design an Interim Corrective Measure (clay cap). To achieve the project objective, a multi-step process is used to develop site-specific Chemical Data Quality Objectives (CDQO) needed for this task. CDQO are developed to ensure that:

- Data needs for the engineering requirements are met.
- Alabama Corrective Action Levels and Federal Applicable or Relevant and Appropriate Requirements (ARARs), risk-based criteria, and data needs for the engineering requirements are met to determine the need for remediation.
- Samples are analyzed using well defined methods that will provide confident detection limits sufficiently below Alabama Corrective Action Levels and Federal ARARs. The methods will be accurate enough for detecting the presence or absence of contaminations directly related to releases from the various sites.
- The precision and accuracy of data are well defined and adequate to provide defensible data.
- Samples are collected using approved techniques and are representative of existing environmental conditions.
- Quality Assurance/Quality Control (QA/QC) procedures for both field and laboratory activities meet the USACE guidance document requirements.

A modified Data Quality Level III was selected for this project as a result of consultation with the United States Army Corps of Engineers (USACE). This level of quality represents data generated under laboratory conditions using USEPA approved procedures. This type of data is used for determination of source, extent, or characterization of contaminants and to support evaluation of treatment technologies and treatability studies, if applicable. These data are both qualitative and quantitative. The specifics of the chemical data quality objective as it applies to field and laboratory procedures are discussed in the QA/QC section of this FSAP.

In addition to the general level of effort required for DQO III, there are additional factors that will aid in judging the quality of the data. The first of these is the use of split samples. To judge reproducibility and the quality of data from the contractor laboratory, samples will be split in the field and also sent to the South Atlantic Division (SAD) laboratory in Marietta, Georgia. Upon evaluation of these samples and receipt of contract lab data, the SAD lab will generate a QA report of its findings. The contractor laboratory will be required to have a current Missouri River Division validation that involves on-site inspections and successful evaluation of performance samples. If the anticipated contractor laboratory ______(TBD)______ cannot fulfill this requirement, another laboratory will be substituted.

5.0 LABORATORY ANALYTICAL PROGRAM

5.1 Laboratory Analytical Procedures

The samples collected will be analyzed using the methods specified in USEPA's SW-846, "Test Methods for Evaluating Solid Waste" and "Methods for Chemical Analysis of Water and Wastes". This section is designed to provide information on analysis type, sample preparation, analytical methods, and QA/QC information necessary to achieve the project goals.

5.1.1 Method Specific Data Quality Objectives

This section is intended to discuss data quality objectives as applied to the various methods of sample analysis. Analytical methods were selected based on the precision, accuracy, reproducibility, completeness, and comparability (PARCC parameters) necessary to satisfy the intended end use and the requirements of various regulatory agencies that will be involved in the review cycle. The criteria used for evaluation of data quality is dependent on the specific analytical method which will contain method-specific quality control requirements.

The description and procedures to assess the PARCC parameters of the measurement data are discussed in the following section. The objectives for the PARCC parameters are shown in Table 5-1.

TABLE 5-1
ANALYTICAL METHODS AND DQ OBJECTIVES

Matrix	Parameter	Preparation Method	Analytical Method[2]	Precision (RPD)	Accuracy (%R)
Soil	Arsenic	3005	7060	50	60-140

<u>Precision</u>

The measurement of precision will be performed for both sample collection and laboratory analysis procedures. The goal of this evaluation is to determine how much the quality of data is affected due to variation associated with field and/or laboratory techniques. For the purpose of evaluation, precision data will be obtained by calculating Relative Percent Difference (RPD) for field and laboratory duplicate sample results. The formula to be used is as follows:

$$RPD = \frac{|R_1 - R_2| \times 100}{(R_1 + R_2) / 2}$$

Where R_1 and R_2 are initial and duplicate results, respectively.

Accuracy

Accuracy measures the bias in a measurement system. The measurement of accuracy will be performed in accordance with specifics provided in the analytical methods. For all analyses, one field sample in an analytical batch (20 samples) will be spiked with a known amount of arsenic and percent recoveries will be calculated. The general formula for calculation of accuracy is as follows:

$$\%R = \frac{\text{Concentration of spike found X 100}}{\text{Concentration of spike added}}$$

Additionally, laboratory control samples will be run at least once during every batch analysis.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent an environmental condition. The placement of sample locations will be a multi-discipline effort involving the project geologist, hydrogeologist, biologist, engineers and risk assessment personnel.

Comparability

Comparability is a qualitative parameter expressing the confidence with which one set of data can be compared with another. For this project, comparability will be measured by ten percent of actual field samples being split between the USACE and contractor laboratories. In accordance with the Scope of Services, samples will be shipped to the USACE laboratory for monitoring of the contract laboratory. The results of these samples will be reviewed by USACE and final recommendations provided to Ebasco for action, if necessary.

Additionally, the following measures will be taken to further ensure the comparability of the data:

- Appropriate selection of sampling and analysis procedures
- Standardized written sampling and analysis procedures
- Standardized handling and shipping procedures for all collected samples

Completeness

Analytical completeness is the percentage of reported analytical data that is usable. This evaluation should be determined during data validation (see Section 5.6). Ebasco will achieve a high level of analytical completeness by ensuring that work is performed by well-trained personnel who know the project-specific objectives in both the field and laboratory. Furthermore, the guidance document requirements for QA/QC will be employed to help define and maintain the data quality level for the project. Ebasco expects to obtain a completion percentage of at least 90. The remaining data may be rejected by validation processes.

5.1.2 Laboratory Analytical Methods and Reporting

Samples will be prepared and analyzed using the methods specified in Table 5-1. The details of the sample preparation and analysis techniques are contained in the respective method documentations as referenced above and it is not anticipated that any deviations from the referenced methods will be needed.

The laboratory will submit to Ebasco a data package that will include but not be limited to summaries of sample and quality control results, a narrative section addressing unusual events, and chain-of-custody information. The Ebasco Laboratory Coordinator will then perform an evaluation of the data consistent with a Level III package. Spikes, duplicates, and blanks will be evaluated along with holding times. The results of this evaluation will be submitted by Ebasco to the USACE TM at the completion of the project.

5.2 Chemical Data Quality Assurance/Quality Control

The collection of samples and the analyses of the samples for this project will include quality control samples designed to monitor general techniques and practices. Evaluation of these results and the impact on actual field samples will be the responsibility of Ebasco. The QC samples will be applied as discussed in the proceeding section of this text. In addition, the MRD QA Program will verify that quality control procedures have been carried out effectively.

5.2.1 Field Quality Control Samples

Field QC samples will be used to monitor the techniques used during sample collection, shipment, and equipment/container cleaning. Certified clean sample containers will be used for all samples. The following QC samples will apply for the field activities:

Split/Duplicate Samples: Split samples are samples that are collected as a single sample then homogenized, divided, and placed in two separate sets of containers. Duplicates are multiple grab samples, collected separately, that equally represent a medium at a given time and location. Splits and duplicates will be selected from areas having the highest potential for contamination. Approximately 10 percent of all samples will be sent as QA splits to the USACE QA laboratory. An additional 10 percent duplicates will be sent to the contracted laboratory for QC purposes.

5.2.2 Laboratory Quality Control Samples

Method blank: Each analytical batch (20 samples) will contain at a minimum one method blank. Generally, the blank will consist of laboratory grade water carried through the analytical process as if it were an actual environmental sample. This analysis will measure any laboratory generated contamination.

Matrix-Spiked/Duplicate Samples (MS/MSD): Matrix-spiked samples will be used to evaluate precision and accuracy. Spiked samples will be applied one in ten per matrix (soil or water). Triple volume of sample will be collected at this frequency and spiked at the laboratory. For inorganic analyses the duplicates will be analytical duplicates of the field samples without spiking. MS/MSD results will be reported with all analytical results whether or not the MS/MSD is performed on a site specific sample.

Calibration Procedures and Frequency

Initial Calibration: On the first day of analysis for a given analytical method, the instrument will be calibrated as specified in the method. A minimum coefficient of correlation of 0.995 will be used unless specified by the method or alternative evaluation technique provided.

Daily Calibration: On subsequent days daily calibration will be performed if no other analytical activities were conducted on the instrument in the interim period. Daily calibration will consist of the analysis of one of the standards. This determination must agree within two standard deviations or 25 percent of the mean of previous calibration standards at chosen concentrations. If the calibration standard is not within these two determinations, the standard will be reanalyzed. If the results of the second determination still do not fall within the guidelines, the analyses will be considered invalid, and the samples will be reanalyzed after initial calibration is reported.

Preventive Maintenance: All standards are purchased from commercial suppliers and are traceable to the National Institute of Standards and Technology. Preparations and dilutions made in the laboratory are documented for this use. Dates are placed on all standards when they arrive, and records showing when the standards are opened and used are also documented.

The laboratory will periodically maintain and calibrate its major equipment including gas chromatograph/mass spectrophotometer, gas chromatograph, atomic absorption spectrophotometer, inductively coupled plasma spectrophotometer, etc. This maintenance requirement will apply to all test and measurement equipment used in the laboratory. A spare parts inventory is maintained for all major equipment.

All equipment maintained and calibrated will have an assigned record number permanently affixed to the instrument. A label will be affixed to each instrument showing: description, manufacturer, model number, serial number, date of test calibration or maintenance, by whom it was calibrated/maintained, and due date of next service. Calibration reports and compensation or correction figures will be maintained with the instrument.

5.3 Corrective Actions

Corrective action will be taken when practices, procedures, or documentation are not in conformance with project direction, goals, or USACE QA requirements. Such actions are most effective if discrepancies are recognized and resolved at the lowest level since, at these levels, the actions tend to be most immediate.

In accordance with this philosophy, when a discrepancy in the analytical system is observed, actions will be designed to correct the problem immediately and to bring the system into conformance with project QA/QC requirements demonstrating reestablishment of control. The corrective action will be implemented at the lowest level to ensure rapid response. Problems that cannot be resolved at one level will be brought to the attention of the next successive level for action.

Data resulting from a nonconforming action will be reviewed by Ebasco Program QA Coordinator for validity. If data are deemed questionable, action will be taken either to verify the results or to repeat the procedure after the problem is corrected. In no case will invalid data be used or reported.

5.4 Laboratory Turn-around Time

Ebasco plans to receive chemical data not more than 28 calendar days after receipt of samples by the laboratory. In case of unanticipated delays, USACE will be informed and the submission date will be adjusted accordingly.

5.5 Documentation

Ebasco will propose that all activities associated with sample analyses be documented on hard copy and computer tapes/diskettes as appropriate, including bound notebooks, standard laboratory QA forms, and binders. These forms of documentation will be available for review during laboratory audits. Copies of logs, records of safety meetings, equipment calibration and repair records, FCRs, and visitor logs will be forwarded to the COE project manager at the end of each week of field work. A telefax with a follow-up hard copy is acceptable.

5.6 Data Reduction, Validation, and Reporting

The equations used in calculating actual sample results are identified in the Laboratory's Quality Assurance Manual previously submitted to the USACE Missouri River Division for laboratory certification.

Data evaluation will be performed by the Ebasco Laboratory Coordinator using EPA functional guidelines, when able. The anticipated laboratory data package will not include calibrations and some of the other data that would be necessary to perform a complete validation according to EPA Region IV Functional Guidelines. The evaluation of chemical data will include evaluation of blanks and quality control results. Upon completion of data evaluation, the data will be incorporated into the project report. This section of the report will consist of a factual summary of the results of all quality control measures as well as an interpretation of the effect on data usability. The intent and rationale of the Functional Guidelines will be used. It will also include the methods and results of the QA report done by USACE SAD.

A Daily Quality Control Report will be submitted by the FOL to the USACE Project Manager during field activities which will include a description of all activities, as well as any unusual occurrences or problems.

All of the laboratory data will be included in the project report. This will include sample results, QC results, a Quality Control Summary Report, QA results, and a narrative describing any problems encountered. The contractor laboratory data will be sent to the USACE within 10 days of receipt by Ebasco.

6.0 LIST OF REFERENCES

Ebasco Environmental. Ebasco Field Technical Guidelines.

Kirk-Othmer. Encyclopedia of Chemical Technology, Third Edition, Volume 9:. New York: John Wiley & Sons, Inc. 1978.

U.S. Army Corps of Engineers, Washington, D.C. Chemical Data Quality Management for Hazardous Waste Remedial Activities. ER 1110-1-263. October 1, 1990.

U.S. Army Corps of Engineers, Missouri River Division. Minimum Chemistry Data Reporting Requirements for DERP and Superfund HTW Projects Memorandum. August 16, 1989.

U.S. Army Corps of Engineers, Missouri River Division. Installation of Ground-Water Monitoring Wells and Exploratory Borings at Hazardous Waste Sites. May 1990.

Environmental Compliance Branch, Standard Operating Procedures and Quality Assurance
Manual, February 1, 1991.

APPENDIX A

RESUMES

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J. A. DAVIS
Geologist

SUMMARY OF EXPERIENCE (Since 1982)

Total Experience - Four years of experience as a petroleum geologist. Four years experience in underground leak detection and investigation. Three years experience as an environmental geologist on hazardous waste projects.

Education - B.S., Geology, 1983, University of Southern Mississippi, Hattiesburg, Mississippi

Courses - Certified Petro-Tite Tank Tester through completion of Heath Consultants Inc., Petro-Tite Tank Testing Systems Training Course, May 19-23, 1987. Expiration date: May, 1989

Completed 40 hours of Health and Safety Training for Hazardous Waste Operations. Refresher Training Annually.

Attended USEPA, Region IV, Environmental Services Division, Regional Sample Control Center (RSCC) Workshop for regional users of RSCC

Attended EPA Leak Detection Methods for UST Seminar, 1988

Completed USEPA, Region IV, Environmental Services Division, Hazardous Waste Section, ARCS short course

Attended USEPA Revised Hazardous Ranking System (HRS) Orientation course

Member - National Water Well Association/Association of Groundwater Scientists and Engineers

REPRESENTATIVE EBASCO EXPERIENCE (Since 1987)

Geologist

Responsible for planning and conducting surface and subsurface investigations to determine geological and hydrological conditions such as aquifer properties, site stratigraphy, structure and potential for contaminant migrations for hazardous waste projects and other industrial and commercial projects.

Projects include:

Fort Jackson, South Carolina. Served as Site Manager for preliminary investigations at three UST sites at the Fort Jackson military reservation for the Army Corps of Engineers (ACOE).

J. A. DAVIS (Continued)

Duties involved preparation of planning documents, coordination and oversight of field activities, and preparation of final engineering report.

Fort Gordon, Georgia. Served as Site Manager for preliminary investigations at 15 UST sites at the Fort Gordon military reservation for the ACOE. Duties involved preparation of planning documents, coordination and oversight of field activities, and preparation of final engineering report.

New Hanover International Airport, Wilmington, NC. Served as Site Manager for preliminary investigations at two landfills at the airport for the ACOE. Duties involved preparation of planning documents and coordination and oversight of field activities.

Geiger (C&M Oil) Site, South Carolina. Participated in post Record of Decision (ROD) field investigation. Duties involved site gridding, surface and subsurface soil sampling for full scan target compound list analysis. Additional duties included packing and shipping of samples in accordance with ESD SOP's and state and federal regulations.

Kimberly Clark Corporation, Beech Island, South Carolina. Supervised the installation of groundwater monitoring wells and the collection of surface soil samples in accordance with Kimberly Clark Corporation's sludge management plan and SCDHEC regulations.

Sangamo Weston Sites, South Carolina. Participated in Sampling Investigation to determine the presence, types and concentration levels of hazardous and toxic chemicals at the sites. Duties involved the collection of samples from surface waters, sediments, surface soils, subsurface soils and private wells. Additional duties included packing and shipping of samples in accordance with ESD SOP's and state and federal regulations.

SCRDI Dixania, South Carolina. Served as Field Operations Leader during groundwater sampling required for treatment system design modifications as part of the groundwater remediation program. Responsible for the supervision of technical staff during sampling operations.

Wrigley Charcoal Plant RI/FS. Served as Field Operations Leader (FOL) for the RI drilling, well installation, sampling and geophysical operations necessary to characterize site conditions, and contaminants. Responsible for the supervision of technical staff and subcontractors during site operations.

Lee's Lane Land Fill. Participated in Operation and Maintenance (O&M) field investigation. Conducted monitor well groundwater sampling and air quality monitoring at both ambient and gas well stations. Additional duties included set up, operation and maintenance of meteorlogical station in support of ambient air monitoring operations.

Gwinnett County Georgia. Field manager responsible for the oversight and coordination of a county-wide Underground Storage Tank (UST) Precision Testing Program utilizing the Petro-Tite Superior Tank and Line Testing system.

J. A. DAVIS (Continued)

A. L. Taylor Site. Participated in Operation and Maintenance (O&M) field investigation. Conducted monitor well groundwater and surface water sampling. Additional duties included packing and shipping of samples in accordance with ESD SOP's and state and federal regulations.

Distler Brickyard Site. Participated in Operation and Maintenance (O&M) field investigation. Conducted the sampling of public and private drinking water wells. Additional duties included packing and shipping of samples in accordance with ESD SOP's and state and federal regulations.

Newport Dump Site. Site manager responsible for coordinating and scheduling the Operation and Maintenance (O&M) field investigation. Performed groundwater monitoring and collected grab samples from gas wells utilizing evacuated stainless steel canisters.

U.S. EPA, Region I. Prepared comprehensive monitoring evaluations (CMEs) at RCRA hazardous waste facilities. Evaluated the adequacy of groundwater monitoring and assessment programs and their compliance with federal regulations.

Georgia Pacific Corporation. Project manager responsible for the monitoring of a product recovery and pump and treat system at an underground storage tank leak. Also responsible for the semi-monthly collection of groundwater samples, evaluation of hydrogeological data and monthly activity reports submitted to client and state regulatory agency.

Dow Corning Corporation. Participated in preparation of RCRA Facility Assessment (RFA). Duties involved preparation of section of report dealing with regional and local environmental setting and target populations in the vicinity of the facility.

Teledyne Brown Engineering/U.S. Army MICOM - Participated in the noise and air quality assessment portions of the Environmental Assessment of the Intermediate Range Nuclear Forces (INF) Treaty. Duties involved measuring noise levels 1.3 miles from the horizontal static firing of a Pershing II rocket motor at Redstone Arsenal in Alabama. Additional duties included photodocumentation of the horizontal plume for purposes of air quality assessment.

Black & Veatch, Engineers-Architects. Participated in an aquatic study designed for the purpose of establishing baseline water quality and biological conditions at two proposed combustion turbine facility sites. Duties involved water quality, periphyton, plankton, benthic macroinvertebrate, ichthyoplankton, juvenile fish and adult fish sample collection.

J. A. DAVIS (Continued)

Hughes Inc.
Geologist and Certified Petro-Tite Tank Tester.

Selected projects included:

Chevron USA, Exxon, and Gulf. Conducted volumetric tank tests utilizing Petro-Tite Superior Tank and Line Testing systems to determine underground storage tank leakage throughout the southeastern United States.

Gulf Petroleum, Forest, Mississippi. Supervised drilling operation for installation of soil boring and installed product recovery trench and recovery system.

Exxon. Supervised drilling operations for installations of monitoring wells and soil borings to determine extent of hydrologic and soil contamination at an underground storage tank leak.

Independent Consultant Research Geologist

Contracted work with oil and gas exploration companies to research and compile reports involving production, production trends, and surface and subsurface mapping. Worked on location as well-site geologist during drilling and completion operations.

Southstar Petroleum Corporation
Staff Geologist

Researched and compiled reports on production, production trends, and surface and subsurface mapping. Worked on location during drilling and completion operations.

Wyatt Interest Inc.
Geological Technician

Major responsibility was mapping potential oil and gas prospects. Worked as well-site geologist during drilling, completion, and connection of oil and gas wells into production lines.

GERALD L. DELANEY
CIH Supervising Engineer

SUMMARY OF EXPERIENCE

Mr. Delaney has over 25 years of progressively responsible experience in safety, industrial hygiene, environmental engineering and project management for hazardous and toxic waste and environmental programs. He provided program oversight for the Department of the Army in both the occupational health and environmental health arenas.

Education:	*MS/1966/Environmental Engineering*
	BCE/1964/Civil Engineering
Registrations:	*1980/Certified Industrial Hygienist*

REPRESENTATIVE EBASCO EXPERIENCE

As Industrial Hygiene Consultant to the Army Surgeon General, LTC Delaney provided oversight of the Army's industrial hygiene program worldwide. As Director for Industrial Hygiene at the U.S. Army Environmental Hygiene Agency (USAEHA) Col Delaney managed a worldwide industrial hygiene support program which supported DERP, IRP, and the Kuwait Oil Fire Health Risk assessment.

As Director for Environmental Quality/Environmental Health Engineering at the U.S. Army Environmental Hygiene Agency, Col Delaney managed oversight of USAEHA support of the Army's DERP, IRP and all hazardous waste projects worldwide. He oversaw the USAEHA and the Agency for Toxic Substances and Disease Registry (ATSDR) interface on all hazardous waste projects/sites which the ATSDR evaluated. He developed and presented the 8-Hour annual OSHA update to employees requiring annual recertification within the Hazardous Waste Division at the USAEHA.

As Commander, U.S. Army Pacific Environmental Health Engineering Agency, Sagami, Japan, he directed studies and laboratory services in environmental health, environmental pollution, environmental sanitation, industrial hygiene, medical entomology, radiological health, and toxic and hazardous waste disposal, for all U.S. Army and selected DoD installations in the western pacific area of operations.

As Project Officer at U.S. Army Medical Laboratory, Ft. Baker, CA, he conducted radiation protection surveys and industrial hygiene surveys at U.S. Army facilities throughout the western United States and Alaska.

As Industrial Hygienist at USAEHA, he conducted comprehensive industrial hygiene studies at U.S. Army facilities worldwide.

J. W. EVANS
Senior Technician

SUMMARY OF EXPERIENCE (Since 1979)

Total Experience - Thirteen years of experience in boundary survey, construction layout, topographic mapping, and wetland studies.

Education - Kennasaw College, Continuing Education Courses

Certification - 40-Hour Refresher Health & Safety Training for Hazardous Waste Sites - 1992

8-Hour Annual Refresher/Supervisory Health and Safety Training for Hazardous Waste Operations

REPRESENTATIVE EBASCO EXPERIENCE (Since 1992)

Projects Include:

New Hanover International Airport - Wilmington, NC. Participated in a comprehensive field sampling investigation to presence, types and concentrations of hazardous and toxic chemicals at the site. Duties involved the collection of samples from surface waters, sediments, surface soils, subsurface soils, and groundwater monitoring wells. Additional duties included packing and shipping of samples in accordance with Army Corps of Engineers planning documents, and state and federal regulations.

Environmental Protection Agency - SCRDI/Dixiana, South Carolina Superfund Site (ARCS IV Program). Participated in a comprehensive field sampling program which included sampling contaminated groundwater from monitoring well, influent and effluent associated with a 20-well groundwater extraction and treatment system. Additional responsibilities included general inspection of treatment plant to ensure proper functioning.

PRIOR EXPERIENCE SINCE (Since 1984)

Projects Include:

- Southlake Festival - Morrow, GA
- Gwinnett County Courthouse - Lawrenceville, GA
- Ronald Reagan Parkway - Gwinnett County, Lawrenceville, GA
- South Mock Road - Albany, GA
- Liveoak Landfill - Ellenwood, GA

J. W. Evans (Continued)

- Rolling Hills Landfill - Riverdale, GA
- B. J. Landfill - Norcross, GA
- Bumpass Cove landfill - Bumpass Cove, TN
- Homestead Air Force Base - Homestead FL
- Navel Surface Warfare Base - Dalgren VA

Responsibilities included the managing of field survey crews; managed boundary survey for control; staking and grading of building sites, parking lots, storm drain pipes, curb and gutters, leachate collection systems, detention ponds, and sanitary sewers lines and locating wetlands.

M. KIRK MAYS, P.E.
Manager of Engineering Group

SUMMARY OF EXPERIENCE (Since 1979)

Total Experience - Mr. Mays has over 16 years experience in wastewater treatment design and hazardous waste remediation. Industrial waste experience included projects for the petroleum, chemical, textile, leather tanning, metal finishing, electroplating, pharmaceutical, poultry, and beverage industries.

Education - BS/1972/Biology
BS/1976/Civil and Environmental Engineer

Member - 1989/PE - Georgia
Health and Safety Trained

REPRESENTATIVE EBASCO EXPERIENCE

Hollingsworth Solderless Terminal Company Site, Fort Lauderdale, Florida - Project manager for groundwater treatment and remedial action. The groundwater treatment system included groundwater extraction, air stripping and reinjection of treated wastewater. Developed specifications for remedial action, soil sampling, pump tests, well development, and well installation. Managed and performed oversight activities for remediation subcontractors.

Times Beach Site, Times Beach Missouri - Designed a water and wastewater treatment system for a dioxin contaminated site. The wastewater treatment system required a high level of treatment prior to being land applied.

North Cavalcade Site, Houston, Texas - Project engineer for a groundwater extraction and treatment system for a CERCLA site. Site contaminants include benzene and polynuclear aromatic hydrocarbons. Developed site remediation specifications, site layout and source quantity estimates.

DOE Site, Piketon, Ohio - Project Engineer for wastewater treatment plant compliance. Developed a preliminary design to address high pH suspended solids in the effluent.

Whitehouse Oil Pits, Whitehouse, Florida - US EPA ARCS IV Program. Project engineer for a treatability study for remediation of waste oil sludge and acid from an oil reclamation process.

Times Beach Site, Times Beach Missouri - Evaluated options for site design, developed hazardous waste incineration bid packages , specifications and evaluated vendor proposals.

M. KIRK MAYS, P.E. (Continued)

Wastes from the Times Beach site and 26 other eastern Missouri sites will be thermally treated in a hazardous waste incinerator.

Geiger (C&M Oil) Site, Charleston County, South Carolina - Project engineer for the development of design specifications, source quantity estimates, and cost estimates for a hazardous waste site. The project involved the excavation and solidification of wastes.

Tower Chemical, Lake County, Florida - Project engineer for the development of design specifications, sample analysis evaluation, cost estimates and bid evaluations. The project involved groundwater extraction followed by chemical precipitation, air stripping and sludge dewatering.

City of Atlanta, Atlanta, Georgia - Metro fuel facility underground storage tank closure and soil remediation based on an approved Corrective Action Plan.

Gwinnett County Fire Station, Buford Georgia - Developed a corrective action plan for leaking underground storage tanks.

OTHER EXPERIENCE

Shell Chemical, Deer Park, Texas - Evaluated wastewater treatment options and sludge dewatering equipment and operation for a chemical and refinery plant. The evaluation included pilot testing of different types of dewatering equipment.

Shell Chemical, Taft, Louisiana - Project engineer for the design of a "grass roots" wastewater treatment plant for a chemical manufacturer. Performed a characterization of the waste stream, bioassay testing, bench-scale treatability testing and design of new treatment facilities.

Fina Oil and Chemical Company, Beaumont, Texas - Conducted a sludge dewatering and disposal project for a major refinery. The project included an evaluation on the existing wastewater treatment system, development and evaluation of hazardous waste treatment alternatives and design of new hazardous waste treatment and disposal facilities.

Sterling Chemical, Bay City, Texas - Conducted wastewater characterization, preliminary design and engineering report for a chemical manufacturer.

Lyondell Petroleum Company, Pasadena, Texas - Evaluated the impact on effluent quality of new wastewater sources generated at the refinery. Because of the new wastewater sources and the need to stay in regulatory compliance, the project included an evaluation and design of wastewater treatment system modifications. The project also included wastewater characterization, treatability studies, and evaluation report.

M. KIRK MAYS, P.E. (Continued)

Arco Chemical, Bayport, Texas - Developed conceptual cost estimates, design drawings and equipment specifications for stormwater management.

Chemical Specialists Inc., Valdosta, Georgia - Managed a RI/FS of contaminated soils containing arsenic and chromium.

Great Lakes Chemical, Kingsport, Tennessee - Performed wastewater permitting assistance and developed a preliminary wastewater treatment plant design. The design addressed the high dissolved solids in the wastewater from the artificial sweetener production.

Anheuser Busch, Jacksonville, Florida - Due to the introduction of new product line (dry beer) the existing wastewater treatment system required modifications prior to discharge. Developed equipment specifications and was a project engineer on an anaerobic wastewater treatment plant design.

Tennessee Investment Castings, Bristol, Tennessee - Performed wastewater and hazardous waste permitting assistance, closure and post closure plans for an electroplating site in eastern Tennessee. Identified wastewater treatment and remediation options to bring the site into regulatory compliance. The project included a preliminary design of a wastewater metal removal system, pH adjustment and sludge dewatering.

Keller Industries, Woodville, Texas - Designed a metal finishing wastewater treatment plant and sludge handling facilities.

Gebhardt-Vogel, Milwaukee, Wisconsin - Developed a preliminary design, basis of design and engineering report for a wastewater pretreatment system for a leather tanning facility. The project included heavy metal removals and organic pretreatment prior to discharge into the city wastewater system.

Hoechst Celanese, Shelby, North Carolina - Designed a groundwater extraction and treatment system and conceptual design of a hazardous waste incineration system. Provided assistance to client during startup and operation.

Hoechst Celanese, Cumberland, Maryland - Performed a preliminary design of a groundwater extraction and treatment system. Provided permitting assistance for the site.

Hoechst Celanese, Clear Lake, Texas - Prepared tank and surface impoundment closure plans.

Hoechst Celanese, Salisbury, North Carolina - Project engineer for a remedial facility investigation.

Hoechst Celanese, Cumberland, Maryland - Performed a preliminary design of a groundwater extraction and treatment system. Provided permitting assistance for the site.

M. KIRK MAYS, P.E. (Continued)

Amoco Textile and Fibers, Nashville, Georgia - To investigate the unusually high levels of mercury in the wastewater, conducted an investigation of the wastewater sources, performed wastewater sampling, assisted in wastewater permitting and provide regulatory liaison.

Amoco Textile and Fibers, Nashville, Georgia - The Amoco plant was required to land apply their wastewater site to comply with State of Georgia requirements and the project included the evaluation of the existing land application system, the development of a land application permit and assistance in regulatory liaison.

Crown Central Petroleum, Houston, Texas - Characterized refinery wastewater, evaluated the existing wastewater system and designed a pretreatment system to allow the plant to discharge into the city wastewater system.

Champlin Refining Company, Corpus Christi, Texas - Evaluated the existing stormwater and wastewater treatment system at the Corpus Christi plant and recommended system upgrades. The project included designing a new pretreatment system to bring the system into compliance with regulatory requirements.

Koch Refinery, Beaumont, Texas - Developed equipment specifications, design drawings and equipment costs for wastewater treatment plant expansion.

Mobil Oil Company, Deer Park, Texas - Prepared an processed air emissions and air quality permits. Work included modeling using Texas Episodic Model (TEM8). ISCST, and other air quality models. Provided regulatory assistance for "Community Right to Know".

Fieldale Farms, Murrayville and Toccoa, Georgia - Managed wastewater land application designs and treatment plant upgrades for different sites. Produced Design Development Reports for the sites. Provided regulatory and permitting assistance for the land application systems.

Aramco Oil Company, Dhahran, Saudi Arabia - Designed a treatment facility for oil/water separation from oil production, industrial wastewater and refinery wastes. Project engineer on the design of onshore and offshore wastewater treatment facilities. Project manager/engineer on wastewater reuse and disposal engineering studies.

Hoechst Celanese, Shelby, North Carolina - Lead engineer and principal author on a CERCLA feasibility study, treatability study and remedial design for a textile manufacturer facility. Developed plans for hazardous waste remediation including Quality Assurance Project Plan, Contingency Plan, Health and Safety Plan and Sampling and Analysis Plan. Designed a groundwater extraction and treatment system and conceptual design of a hazardous waste incineration system.

M. KIRK MAYS, P.E. (Continued)

State of Tennessee - Managed a contract for the State of Tennessee Superfund activities. The contract was for $1.5 million over a two year period and included remedial investigations, feasibility studies, remedial designs and remedial actions.

Communicorp, Columbus, Georgia - Managed a site investigation, sampling, and remediation of soils contaminated with toluene, ethyl benzene and xylene.

American Creosote Works, Pensacola, Florida - Project engineer for remedial design of a superfund site in Florida. Evaluated soil and water sampling results and provided recommendations. Developed cost estimates for a remedial design.

American Creosote Works, Jackson, Tennessee - Project manager for a CERCLA feasibility study of a superfund site in Tennessee contaminated both pentachlorophenol and creosote. Developed cost estimates for a remedial design and remedial action.

D. W. SCHAER
Principal Geologist

SUMMARY OF EXPERIENCE (Since 1977)

Total Experience - Fourteen years experience in performing and managing remedial investigations, feasibility studies, site inspections and economic minerals exploration.

Education - B.S., Geology, MESA State College, 1977
AAS, Civil Engineering Technology, MESA State College, 1975

Courses - Volcanic Rocks and Their Vent Areas - Mackey School of Mines
Tailings Ponds and Their Impoundments, Colorado State University
40 Hour Health and Safety Training for Hazardous Waste Site, 1985
Principals of Groundwater Hydrology, NWWA, 1992

Registrations - North Carolina No. 236
South Carolina No. 446
Florida No. 495
Tennessee No. 544
Wyoming (in progress)

REPRESENTATIVE EBASCO EXPERIENCE (Since 1987)

Principal Geologist/Hydrogeology Supervisor

Supervises a group of professional geologists/hydrogeologists and chemists. Responsible for job cost control and overhead accounts, in addition to making intragroup decisions.

Technically responsible for design, implementation and managing of remedial investigations for government agencies and industrial facilities. Tasks typically include preparing and implementing work plans for remedial investigations, site inspections and baseline environmental surveys for determining the presence or absence of contaminated soils and water.

Projects Include:

U.S. EPA Region IV - Sangamo Weston Site, Pickens County, South Carolina. Site Manager for an EPA Superfund Project that was designed to assess the effects of PCB contamination at several county landfills. Responsible for planning and managing the overall project and coordinating project activities with the EPA and state officials. This project was completed on schedule with a cost savings of $40K from the budget of $160K.

D. W. SCHAER (Continued)

Georgia Pacific Corporation, Spartanburg, South Carolina. Project Manager responsible for providing client with integrity/inspection of five solid waste management units at GP's container plant to determine the environmental impact caused by each individual SMU. Tasks included providing the client with a report suitable for submission to the EPA documenting the investigations findings. Additional tasks include the removal and thermal treatment of contaminated soils.

U.S. EPA - Tri-City Industrial Disposal Site, Bullitt County, Kentucky. Site Manager for an EPA Superfund RI/FS Project. Responsible for planning and managing both the remedial investigation and the feasibility study for the entire project and coordinating project activities with the EPA and state officials. These responsibilities included assisting the EPA at public meetings with technical responses to concerns voiced by the community.

U.S. EPA - Whitehouse Waste Oil Pits Site, Duval County, Florida. Responsible as Site Manager for planning and investigating bioremediation and solidification/stabilization technologies that could be used in support of a remedial action. A portion of this project included obtaining data sufficient to prepare a risk assessment and providing the EPA with a final risk assessment.

U.S. EPA - Zellwood Groundwater Contamination Site, Orange County, Florida. Responsible as Site Manager for assisting the EPA with a soil solidification/stabilization project. Additional responsibilities included planning, managing and implementing a groundwater monitoring system for monitoring the solidified product and investigating the extent of existing groundwater contamination to support a remedial design for groundwater remediation.

U.S. EPA - Picillo Farm Site, Coventry, Rhode Island. Remedial Investigation Task Leader on a RI/FS project which focused on assessing the areal extent of contamination attributable to six years of illegal bulk dumping of toxic and hazardous wastes. Tasks included developing and coordinating the plans for a field investigation for soils, surface waters, and the groundwater system.

U.S. EPA - Bluff Road Site, Columbia, South Carolina. Project Task Leader on a remedial investigation/feasibility study to assess the environmental impact caused by unregulated disposal of hazardous materials.

Teledyne-Brown Engineering/U.S. Army Missile Command - Redstone Arsenal, Huntsville, Alabama. Technical Lead responsible for the design of a monitoring plan for soils and groundwater to determine any environmental impacts associated with the destruction of Pershing missile motors at two sites in the western United States. Tasks included preparing detailed field plans for State and Federal agencies review.

Georgia Pacific Corporation, Atlanta, Georgia. Project Leader on a baseline environment survey of an existing plant which was being considered for purchase by the client. Tasks included supervision of field sampling, well installation, and preparation of final reports.

D. W. SCHAER (Continued)

PRIOR EXPERIENCE

Versar Inc., Manager of Technical Services. Responsible as technical manager for all remedial investigations and feasibility tasks associated with an EPA technical support contract (TES 7). Duties included providing EPA with independent cost analysis for remedial alternatives identified in feasibility studies generated by primary responsible parties. Additional duties included presenting feasibility studies alternatives, and EPA preferred methods at public meetings.

Project Geologist, Camp Dresser and McKee

Responsible for all aspects of groundwater monitor systems and supervision of field crews conducting remedial investigations. Other responsibilities included project planning and report preparation.

Superfund Projects Include:

Munisport Landfill, North Miami, Florida. Hollingsworth Solderless Terminal, Fort Lauderdale, Florida; Mowbray Engineering Company, Greenville, Alabama (Celanese-Shelby Fiber Operations), Shelby, North Carolina; Coleman-Evans Wood Preserving Company, Whitehouse, Florida; Newsom Brothers/Old Reichold, Columbia, Mississippi; Bypass 601 Groundwater Contamination, Concord, North Carolina; Hipps Road Landfill, Duval County, Florida; Maxey Flats Nuclear Disposal, Hillsboro, Kentucky and Perdido Groundwater Contamination, Perdido, Alabama.

Oak Ridge National Laboratory, Geologist. Team leader responsible for planning and conducting filed radiological surveys to investigate potential hazardous radioactive contamination. Prepared final reports from field-generated data for the Department of Energy's uranium mill tailings removal act.

Bendix Field Engineering Corporation, Staff Geologist. Project Geologist for remedial action programs dealing with the study of radioactive tailing piles. Duties included interpretation, sampling of tailings and installation of monitor wells. Also, as part the Bendix Exploration staff, conducted exploration drilling programs in the western United States. Planned and supervised the completion of, and lithologically logged, 54,000 feet of rotary and core test holes. Conducted comprehensive geochemical, geophysical, and reconnaissance mapping surveys as part of grass roots exploration programs in the Basin and Range Province of Nevada, California, and southeastern Utah.

Idaho Mining Company, Exploration Geologist. Conducted drilling programs in Colorado and Utah for mining exploration and development. Planned, supervised, and provided lithological and geophysical logging of more than 300 rotary test holes.

D. W. SCHAER (Continued)

SELECTED PUBLICATIONS

Publications

Schaer, D. W., 1981. A Geological Summary of the Owens Valley Drilling Project, U. S. Department of Energy, Open File Report GJBX-128(81).

Schaer, D. W., 1984. Monticello Remedial Action Project Site Analysis Report, Geological Investigation Section, U. S. Department of Energy, Open File Report GJ10.

Morrison, Schaer, Daniels, 1984. Minerals Evaluation of a Denied Area, Classified Document.

KIMBERLY SOOVAJIAN VEAL
Environmental Engineer

SUMMARY OF EXPERIENCE

Ms. Veal has over four years of engineering and management experience in applications related to environmental compliance of solid and hazardous waste projects, including regulatory and licensing activities for the government and private sector. Her responsibilities include Preliminary Assessments under CERCLA, Remedial Investigations under DERP, Contamination Assessments, preparing Environmental Impact Statements, Environmental Resource Documents, RCRA Part A and Part B Permit Applications, Work Plans and Engineering Reports.

Education: B.S., Civil Engineering, 1988

Registrations: E.I.T./1988/New York
Medically monitored and 40-Hr. Health and Safety Trained

REPRESENTATIVE EBASCO EXPERIENCE

U.S. Army Corps of Engineers, Savannah District - Task Manager of four projects which involve the design of interim corrective measures to remove, treat, and dispose of groundwater contaminated with volatiles, semi-volatiles, BNAs, pesticides, and metals. The projects involve the preparation of work plans, design drawings and specifications plans, various installation and operation plans, construction and operation scheduling and cost estimating, and community relations.

City of Atlanta - Site Manager of the Hemphill Project Site. Developed a scope of work for the City to assess the level of soil and groundwater contamination near a water supply reservoir, including TCE, PCE, TCA, and aromatic hydrocarbons. She is providing overall project management of the effort which includes field sampling and preparation of engineering reports.

U.S. Army Corps of Engineers, Mobile District - Prepared environmental assessment for the Base Realignment and Closure (BRAC) action at Anniston Army Depot.

U.S. Army Corps of Engineers, Huntsville Division - Site Manager and Site Health and Safety Officer for DERP FUDS project area suspected of chemical ordnance contamination. She conducted an archives search to determine the potential for UXO/EOD contamination and prepared the work plans for remediation of the contaminated areas. She prepared a detailed report of findings and recommendations, including a risk assessment for each site.

U.S. Army Corps of Engineers, Mobile District - Prepared a classified (DOD-secret) environmental assessment for the storage and demilitarization of nuclear weapons.

KIMBERLY SOOVAJIAN VEAL (Continued)

U.S. Army Corps of Engineers, Huntsville Division: Preparation of environmental assessment pertaining to interim remedial treatment of fuel contaminated soil and ground water at Defense Fuel Supply Point, Ozol, CA.

U.S. Army Corps of Engineers, Huntsville Division: Preparation of RCRA Part A and Part B permit applications for munitions deactivation furnaces at seven Army installations.

NASA, Marshall Space Flight Center: Determination of environmental baseline conditions at the entire facility and subsequent preparation of an environmental resource document.

The University of Alabama in Huntsville and U.S. Army MICOM: Preparation of supplemental environmental assessment for the addition of an Aero-Optics laboratory and photographic laboratory to the Aerophysics Test Facility on Redstone Arsenal, AL.

As an Environmental Engineer with Stone & Webster Engineering, Boston, MA, Ms. Veal managed preparation of environmental reports for the Federal Energy Commission and NY Public Service Commission and was responsible for permitting on federal, state and local levels of over 200 miles of pipeline in northeast U.S. She has been primarily responsible for the environmental impact assessments of large scale engineering and utility projects on water quality, ecological resources, topography, and other environmental resources.

Ms. Veal was assigned as an Environmental Inspector of construction and has participated in and testified at numerous public hearings.

Experience in Waste Management includes: Assisting in the development of Environmental Impact Statement for the ongoing New York City Sludge Management Project; siting studies for long-term sludge disposal; site assessments to identify potential hazardous waste sources at candidate construction site, and review of state-of-the-art and proven sludge processing and disposal technologies applying various site/technology constraints.

As an Engineering Aide for New York State Electric and Gas, Binghampton, NY, Ms. Veal designed weir to mitigate thermal plume effects of power plant cooling water discharge to meet NPDES permit requirements; coordinated contractors and vendors, prepared bid package and conducted prebid meeting site visits; and prepared numerous cost estimates and wrote technical specifications.

While employed with Broome County DPW Engineering Division; Binghampton, NY, she developed division's first computer-based engineering support system; produced computer-aided drawings of preliminary engineering projects; developed macros to complement existing software; and maintained traffic accident location maps.

APPENDIX B

LIST OF EQUIPMENT SUPPLIES

LIST OF EQUIPMENT AND SUPPLIES

Sampling

4 oz. glass or poly bottles
stainless steel bowls
stainless steel spoons & knives
stainless steel shovels
coolers
ice
polyethylene sheeting
wooden stakes
flagging
vermiculite
poly bags, assorted sizes
electrical tape
magnetic locator
hand augers

Drilling (to be provided by drill crew)

drill rig
water truck
portable steam cleaner
3-inch O.D. hollow stem augers (50' string)
5-foot long split barrels, 3-inch I.D. (4)
stainless steel or teflon core catchers
Shelby tubes
bentonite pellets
grout
drill with 1/4-inch bit
55-gallon drums
assorted tools (hacksaw, wrenches, shovels, hand trowel, etc.)

Equipment Decontamination

galvanized steel tubs
assorted brushes
Alconox
HPLC water
nitric acid, reagent grade
Teflon squirt bottles
aluminum foil
plastic wrap
saw horses
garden sprayers

Health and Safety

Photoionization Meter (Photovac Micro-tip with 10.6 ev lamp)
OVA Model 128 and calibration kit
HNU Model HW-101, 10.2 eV probe and calibration kit
APRs, MSA Ultra-twin with organic vapor/dust/mist cartridges
safety glasses
splash goggles
hard hats
ear plugs
polycoated Tyvek
non-coated Tyvek or Kleenguard
surgical gloves
nitrile gloves
first aid kit
portable eyewash
air horn
fire extinguisher
dust masks
duct tape
Gatorade

General

trash bags
paper towels
drinking cups (disposable) and drinking water cooler
camera and film
black pens
indelible markers
tape measure
calculator
clipboard
assorted tools (hammer, nails, etc.)
strapping tape
portable file boxes and file folders

Documents and Forms

log books (e.g., Lietz level books)
copy of FSAP, and Site Safety and Health Plan
chain of custody forms
Federal Express forms (both addresses pre-typed)
boring logs
field change request forms
grain size distribution chart
Unified Soil Classification chart

Health and Safety Incident Report and Follow-Up forms
copy of 29 CFR 1910.120 (final rule)
copy of Ebasco Safety and Health Manual
copy of ACOE Safety and Health Requirement Manual
ACGIH TLV book
Health and Safety documents for all on-site personnel:
- -training certificates (40 hour and refresher)
- -3-day on-site training documentation
- -fit test
- -physician's statement
- -medical data sheet

APPENDIX C

ADEM HAZARDOUS WASTE REGULATIONS DIVISION 14

handle the waste described on the manifest.

(c) A generator may also designate on the manifest one alternate facility which is permitted to handle his waste in the event an emergency prevents delivery of the waste to the primary designated facility.

(d) If the transporter is unable to deliver the hazardous waste to the designated facility or the alternate facility, the generator must either designate another facility or instruct the transporter to return the waste to the generator's facility.

(e) The requirements of this Rule do not apply to hazardous waste produced by generators of greater than 100 kg but less than 1000 kg in a calendar month where:

1. The waste is reclaimed under a contractual agreement pursuant to which:

(i) The type of waste and frequency of shipments are specified in the agreement;

(ii) The vehicle used to transport the waste to the recycling facility and to deliver regenerated material back to the generator is owned and operated by the reclaimer of the waste; and

2. The generator maintains a copy of the reclamation agreement in his files for a period of at least three years after termination or expiration of the agreement.

(2) Acquisition of manifests.

(a) If the generator intends to designate a treatment, storage, or disposal facility within the State of Alabama, he shall obtain the blank manifest forms from that facility.

(b) If the generator intends to designate a treatment, storage, or disposal facility outside the State of Alabama, he shall obtain the blank manifest forms:

1. From the facility to be designated if treatment, storage, or disposal facilities in the consignment state supply the manifest forms;

2. From the consignment state if the consignment state supplies the manifest forms; or

3. From any source if neither the facility to be designated nor the consignment state supply the manifest forms.

(3) Number of copies. The manifest shall consist of at least the number of copies which will provide the Department, the generator, each transporter, and the owner or operator of the designated facility with one copy each for their records and another copy to be returned to the generator.

(4) Use of the manifest.

(a) The generator must:

1. Sign the manifest certification by hand; and

2. Obtain the handwritten signature of the initial transporter and date of acceptance on the manifest; and

3. Retain one copy of the manifest, in accordance with 335-14-3-.04(1)(a).

(b) The generator must give the transporter the remaining copies of the manifest.

(c) For shipments of hazardous waste within the United States solely by water (bulk shipments only), the generator must send three copies of the manifest dated and signed in accordance with this paragraph to the owner or operator of the designated facility or the last water (bulk shipment) transporter to handle the waste in the United States if exported by water. Copies of the manifest are not required for each transporter.

(d) For rail shipments of hazardous waste within the United States which originate at the site of generation, the generator must send at least three copies of the manifest dated and signed in accordance with this paragraph to:

1. The next non-rail transporter, if any; or

2. The designated facility if transported solely by rail; or

3. The last rail transporter to handle the waste in the United States if exported by rail.

(e) For shipments of hazardous waste to a designated facility in an authorized State which has not yet obtained authorization to regulate that particular waste as hazardous, the generator must assure that the designated facility agrees to sign and return the manifest to the generator, and that any out-of-state transporter signs and forwards the manifest to the designated facility.

335-14-3-.03 Pre-Transport Requirements

(1) Packaging. Before transporting hazardous waste or offering hazardous waste for transportation off-site, a generator must package the waste in accordance with the applicable United States Department of Transportation regulations on packaging under 49 C.F.R. Parts 173, 178, and 179. Failure to properly package the waste in accordance with the applicable United States Department of Transportation regulations is a violation of this paragraph.

(2) Labeling. Before transporting hazardous waste or offering hazardous waste for transportation off-site, a generator must label each package in accordance with the applicable United States Department of Transportation regulations on hazardous materials under 49 C.F.R. Part 172. Failure to properly label the waste in accordance with the applicable United States Department of Transportation regulations is a violation of this paragraph.

(3) Marking.

(a) Before transporting hazardous waste or offering hazardous waste for transportation off-site, a generator must mark each package of hazardous waste in accordance with the applicable United States Department of Transportation regulations on hazardous materials under 49 C.F.R. Part 172;

(b) Before transporting hazardous waste or offering hazardous waste for transportation off-site, a generator must mark each container of 110 gallons or less used in such transportation with the following words and information displayed in accordance with the requirements of 49 C.F.R. §172.304:

HAZARDOUS WASTE — Federal Law Prohibits Improper Disposal. If found, contact the nearest police or public safety authority or the U.S. Environmental Protection Agency.

Generator's Name and Address _____.

Manifest Document Number _____.

(c) Failure to properly mark the waste packages or containers in accordance with the applicable United States Department of Transportation regulations and the requirements of this paragraph is a violation of this paragraph.

(4) Placarding. Before transporting hazardous waste or offering hazardous waste for transportation off-site, a generator must placard or offer the initial transporter the appropriate placards according to United States Department of Transportation regulations under 49 C.F.R. Part 172, Subpart F. Failure to properly placard or offer to the initial transporter the appropriate placards in accordance with the applicable United

(a) This Chapter identifies those solid wastes which are subject to regulation as hazardous wastes under Chapters 335-14-3 through 335-14-6, 335-14-8, and 335-14-9 and which are subject to the notification requirements of section 3010 of RCRA. In this Chapter:

1. Rule 335-14-2-.01 defines the terms "solid waste" and "hazardous waste," identifies those wastes which are excluded from regulation under Chapters 335-14-3 through 335-14-9, and establishes special management requirements for hazardous waste produced by conditionally exempt small quantity generators and hazardous waste which is recycled.

2. Rule 335-14-2-.02 sets forth the criteria used by the Department to identify characteristics of hazardous waste and to list particular hazardous wastes.

3. Rule 335-14-2-.03 identifies characteristics of hazardous waste.

4. Rule 335-14-2-.04 lists particular hazardous wastes.

(b)1. The definition of solid waste contained in this Chapter applies only to wastes that also are hazardous for purposes of the AHWMMA. For example, it does not apply to materials such as non-hazardous scrap, paper, textiles, or rubber) that are not otherwise hazardous wastes and that are recycled.

2. This Chapter identifies only some of the materials which are solid wastes and hazardous wastes under AHWMMA. A material which is not defined as a solid waste in this Chapter, or is not a hazardous waste identified or listed in this Chapter, is still a solid waste and a hazardous waste for purposes of the applicable sections of the AHWMMA if the material may be a solid waste within the meaning of Code of Alabama 1975, §22-30-3(11), and a hazardous waste within the meaning of Code of Alabama 1975, §22-30-3(5).

(c) For the purposes of paragraphs (2) and (6) of this Rule:

1. A "spent material" is any material that has been used and as a result of contamination can no longer serve the purpose for which it was produced without processing;

2. "Sludge" has the same meaning used in 335-14-1-.02(1);

3. A "by product" is a material that is not one of the primary products of a production process and is not solely or separately produced by the production process. Examples are process residues such as slags or distillation column bottoms. The term does not include a co-product that is produced for the general public's use and is ordinarily used in the form it is produced by the process;

4. A material is "reclaimed" if it is processed to recover a usable product, or if it is regenerated. Examples are recovery of lead values from spent batteries and regeneration of spent solvents;

5. A material is "used or reused" if it is either:

(i) Employed as an ingredient (including use as an intermediate) in an industrial process to make a product (for example, distillation bottoms from one process used as feedstock in another process). However, a material will not satisfy this condition if distinct components of the material are recovered as separate end products (as when metals are recovered from metal containing secondary materials); or

(ii) Employed in a particular function or application as an effective substitute for a commercial product (for example, spent pickle liquor used as phosphorous precipitant and sludge conditioner in wastewater treatment);

6. "Scrap metal" is bits and pieces of metal parts (e.g., bars, turnings, rods, sheets, wire) or metal pieces that may be combined together with bolts or soldering (e.g., radiators, scrap automobiles, railroad box cars) which when worn or superfluous can be recycled;

7. A material is "recycled" if it is used, reused, or reclaimed;

8. A material is "accumulated speculatively" if it is accumulated before being recycled. A material is not accumulated speculatively, however, if the person accumulating it can show that the material is potentially recyclable and has a feasible means of being recycled; and that, during the calendar year (commencing on January 1), the amount of material that is recycled, or transferred to a different site for recycling, equals at least 75 percent by weight or volume of the amount of that material accumulated at the beginning of the period. In calculating the percentage of turnover, the 75 percent requirement is to be applied to each material of the same type (e.g., slags from a single smelting process) that is recycled in the same way (i.e., from which the same material is recovered or that is used in the same way). Materials accumulating in units that would be exempt from regulation under subparagraph (4)(c) of this Rule are not included in making the calculation. (Materials that are already defined as solid wastes also are not to be included in making the calculation.) Materials are no longer in this category once they are removed from accumulation for recycling, however.

(2) Definition of solid waste.

(a)1. A solid waste is any discarded material that is not excluded by 335-14-2-.01(4)(a) or that is not excluded by variance granted under 335-14-1-.03(10) or (11).

2. A "discarded material" is any material which is:

(i) "Abandoned," as explained in subparagraph (b) of this paragraph; or

(ii) "Recycled," as explained in subparagraph (c) of this paragraph; or

(iii) Considered "inherently waste-like," as explained in subparagraph (d) of this paragraph.

(b) Materials are solid wastes if they are "abandoned" by being:

1. Disposed of; or

2. Burned or incinerated; or

3. Accumulated, stored, or treated (but not recycled) before or in lieu of being abandoned by being disposed of, burned, or incinerated.

(c) Materials are solid wastes if they are "recycled," or accumulated, stored, or treated before recycling, as specified in subparagraphs 1. through 4. below:

1. "Used in a manner constituting disposal."

(i) Materials noted with a "*" in column 1 of Table 1 are solid wastes when they are:

(I) Applied to or placed on the land in a manner that constitutes disposal; or

(II) Used to produce products that are applied to or placed on the land or are otherwise contained in products that are applied to or placed on the land (in which cases the product itself remains a solid waste).