TCLP ANALYSIS OF SEDIMENT AND WATER SAMPLES

SOUTH SURFACE IMPOUNDMENT SYSTEM
SOUTH PLANT

CEDAR CHEMICAL CORPORATION
VICKSBURG CHEMICAL DIVISION

for:

Cedar Chemical Corporation
Memphis, Tennessee

April 1991

Woodward-Clyde Consultants

Consulting Engineers • Geologists • Environmental Scientists

460 Briarwood Drive, Suite 520, Jackson, Mississippi 39206

460 Briarwood Drive, Suite 520
Jackson, Mississippi 39206
(601) 957-7666
FAX (601) 957-7692

Woodward-Clyde Consultants

April 16, 1991

Mr. Steve Boswell
Cedar Chemical Corporation
P. O. Box 3
Riffle Range Road
Vicksburg, Mississippi 39180

RE: TCLP Analysis of Sediment and Water Samples
South Surface Impoundment System
Vicksburg Chemical Division
Vicksburg, Mississippi
WCC File No. 90B403C - Task 0001

Dear Mr. Boswell:

Attached is the above-referenced report for TCLP analysis of sediment and water samples collected during January, February, and March 1991 from the South Surface Impoundment System.

We appreciate the opportunity to be of service to Cedar Chemical. If you have any questions, please call.

Very truly yours,

Caleb H. Dana, Jr., P. E.
Senior Project Engineer

(for)
Richard D. Karkkainen
Vice President

CHD:tar

Attachment

RECEIVED
APR 17 1991
DEPT. OF

TCLP ANALYSIS OF SEDIMENT AND WATER SAMPLES

SOUTH SURFACE IMPOUNDMENT SYSTEM
SOUTH PLANT

CEDAR CHEMICAL CORPORATION
VICKSBURG CHEMICAL DIVISION

for:

Cedar Chemical Corporation
Memphis, Tennessee

April 1991

Woodward-Clyde Consultants

Consulting Engineers • Geologists • Environmental Scientists

460 Briarwood Drive, Suite 520, Jackson, Mississippi 39206

TABLE OF CONTENTS

		Page Number
1.0	Introduction	1
	1.1 Purpose	1
	1.2 Site Background	1
	1.2.1 Surface Impoundment System and SWCA Description	2
	1.2.2 Estimated Pond Sediment Quantities	3
	1.3 Previous Sampling	3
2.0	Technical Approach	4
	2.1 Pond Sediment Sample Collection	4
	2.2 SWCA Leachate Collection System Sample Collection	4
	2.3 Pond A and Inlet Wastewater Sample Collection	5
	2.4 QA/QC Sample Collection	5
	2.5 Sample Collection Methods	5
	2.6 Sample Processing	6
	2.7 Decontamination and Cross-contamination Control	6
	2.7.1 General	7
	2.7.2 Frequencies and Procedures	7
	2.8 Health and Safety Plan Addendum	7
3.0	Documentation	8
	3.1 Field Log Book	8
	3.2 Sample Labeling	8
	3.3 Sample Identification Code	9
	3.4 Chain-of-Custody	9
4.0	Analytical Methods	11
5.0	Quality Assurance/Quality Control	11
6.0	Results	11

TABLE OF CONTENTS (Continued)

		Page Number
6.1	Ponds B and C and SCWA Composite Sediment Sample Analytical Results	11
6.2	Leachate Collection System Sample Analytical Results	12
6.3	Pond A, Pond A Inlet, Pond A Blanket Drain Water Sample Analytical Results	12
6.4	QA/QC Sample Analytical Results	13

LIST OF TABLES

Table

1 Pond and SWCA Sediment Sample TCLP Analytical Results (and Regulatory Criteria)

2 SWCA Leachate Collection System Sample TCLP Analytical Results (and Regulatory Criteria)

3 Pond A Inlet Water, Pond A Water, and Pond A Blanket Drain Water Sample TCLP Analytical Results (and Regulatory Criteria)

LIST OF FIGURES

Figure

1 Site Location

2 Site Facilities Map

3 Sample Locations

APPENDIXES

Appendix

A Previous Sampling Results

B Laboratory Data Sheets

C QA/QC Review Summary

1.0 INTRODUCTION

1.1 Purpose

The purpose of this document is to present the analytical results of Toxicity Characteristic Leaching Procedure (TCLP) analysis of Ponds B & C sediment, Solid Waste Consolidation Area (SWCA) sediment, Pond A water, Pond A Inlet water, Pond A Blanket Drain, and SWCA leachate collection system samples obtained during January, February, and March 1991 from the South Impoundment System at the Cedar Chemical Corporation (Cedar Chemical) located in Vicksburg, Mississippi. The objective of this project was to determine whether the sediments from the ponds exhibited hazardous waste characteristics under the Resources Conservation and Recovery Act (RCRA) program as a result of the Toxicity Characteristic Leaching Procedure (TCLP) test. A secondary objective was to determine if wastewater streams entering Pond A exhibited hazardous waste characteristics based on the TCLP test.

1.2 Site Background

Cedar Chemical is situated less than one mile south of Interstate 20 bordering the city of Vicksburg, Mississippi (Figure 1). The site occupies roughly 640 acres. Residential properties are located to the north and west of the site, while residential and rural properties are located to the south. The Vicksburg water treatment facility and an asphalt mixing and gravel drying operation are located to the east.

There are two plants currently operating at Cedar Chemical. The south plant produces nitric acid and the north plant produces potassium nitrate. These plants utilize the chemicals anhydrous ammonia, nitric acid and potassium chloride to produce chlorine, nitrogen tetroxide, and potassium nitrate.

For a number of years, Cedar Chemical and earlier owners produced various types of pesticides and herbicides such as dinoseb, toxaphene, atrazine, methyl parathion, and monosodium methane arsonate.

1.2.1 Surface Impoundment System and SWCA Description. The South Surface Impoundment System was originally constructed in the 1950's when the facility was owned by Spencer Chemical. Spencer Chemical operated facilities producing nitric acid and urea and ammonium nitrate fertilizers. The impoundment system configuration may have changed over time, but is believed to have been a three-cell pond system since 1983. The present site facilities and impoundment system location are shown in Figure 2. Discharge from the impoundment system presently goes through a activated carbon filtration treatment system and is discharged to the Mississippi River under a NPDES permit.

The south impoundment system receives stormwater runoff from approximately 20.7 acres of the south plant. Runoff water possibly contained "de minimis" residuals from facility operations including atrazine, dinoseb, and toxaphene. Runoff wastewater presently enters Pond A through the inlet pipe. In addition, Pond A receives wastewater from the Blanket Drain collection system which collected water from beneath the Pond A liner, and from the SWCA leachate collection system. The Blanket Drain system was utilized for dewatering Pond A during its construction and is presently being pumped to the carbon treatment units.

As result of discussions with Mississippi Department of Environmental Quality and EPA Region IV, Cedar Chemical agreed to address the sediments in the impoundment system. The agreement included removal of sediments from the pond bottoms, solidification, and placement in the SWCA. The South Impoundment System was then to be reconstructed using an impervious liner system.

The SWCA was located within the boundaries of the impoundment system and has a leachate collection system and a leak detection system which discharge into Pond A. Pond A discharge goes to the activated carbon unit for treatment and then to the Mississippi River. When removal of the pond sediments is complete, the impoundment system will consist of three ponds operated in series flow. Stormwater will enter Pond C and flow to Pond B and then to Pond A. Pond A discharge will go to the activated carbon treatment units and after treatment, the water will discharge into the Mississippi River.

1.2.2 Estimated Pond Sediment Quantities. Pond B covers approximately 53,000 square feet and Pond C approximately 13,000 square feet. At the time of sampling on January 19, 1991, approximately 8,600 cubic yards of sediment had been excavated from Ponds B and C and placed in the SWCA. An approximate average depth of 3.5 feet of sediment had thus been removed from Ponds B and C at the time of sampling.

1.3 Previous Sampling

Previous construction was performed on Pond A during early 1989 to remove water and the sediments from the pond. Analytical results for TCLP sample analysis of the Pond A sediments in the SWCA collected during April 1989 did not indicate a problem (see Appendix A). Analytical results for TCLP analysis of a sample collected on September 26, 1990 from Pond C sediments showed 1,1 dichloroethylene to be 1.9 ppm which exceeded the TC standard limitation of 0.7 ppm. An expanded sampling effort was therefore performed on January 19, 1991, to characterize the Pond B and C sediments. The results of the sediment sampling are presented in the following sections. In addition to the sediment sampling, a sample from the SWCA leachate water was analyzed for TCLP parameters. Carbon Tetrachloride was detected at a concentration above the TCLP standard. Therefore, additional samples of the Pond A, Pond A Inlet, SWCA leachate, and Pond A Blanket Drain water were collected. These samples were analyzed for TCLP volatiles and the results are also presented in the following sections.

2.0 TECHNICAL APPROACH

In order to achieve the objectives stated in Section 1.1, a systematic procedure of collecting representative sediment samples from the pond bottoms and SWCA and water samples from Pond A and influent wastewater streams was developed. The methodology and samples are described in the following sections.

2.1 Pond Sediment Sample Collection

Composite sediment samples were collected from Ponds B, C, and the SWCA during this investigation on January 19, 1991. Ponds B and C and the SWCA were divided into four, two, and four zones, respectively (see Figure 3). A total of 11 composite sediment samples were collected during this sampling including one duplicate sample. One composite sample was collected from each zone. The composite sample consisted of four samples collected from each zone from generally equally-spaced areas. Sample collection methods are described in Section 2.6. All of the sediment samples were analyzed for TCLP test parameters.

2.2 SWCA Leachate Collection System Sample Collection

A water sample from the SWCA leachate collection system was collected from the discharge pipe at Pond A on January 19, 1991 (Figure 3). A second sample from the SWCA leachate collection system was obtained on February 20, 1991 in order to confirm previous analytical results. The sample collection method is described in Section 2.6. The first water sample was analyzed for all TCLP test parameters, while the second was analyzed for the TCLP volatiles only.

2.3 Pond A and Influent Wastewater Sample Collection

A water sample was collected from Pond A as well as other wastewater streams entering Pond A other than the SWCA leachate collection system water. Other wastewater streams include the Inlet to Pond A and Pond A Blanket Drain (Figure 3). Water samples from Pond A, Pond A Inlet, and the SWCA leachate collection system were collected on February 20, 1991, and from the discharge pump for the Pond A Blanket Drain system on March 5, 1991. The sample collection procedures are described in Section 2.5.

2.4 QA/QC Sample Collection

QA/QC samples were collected to meet the data quality objectives for accuracy, reproducability, and precision. These included duplicate samples for each media sampled, and equipment rinsate and trip blank samples. One duplicate sample was collected for the sediment sampling, two for the SWCA leachate collection system samples, and one for the Pond A Blanket Drain sample. A rinsate blank for each type of sample was also taken during these field activities. A rinsate blank consists of deionized water which is poured into or over decontaminated sampling equipment in such a manner as to contact the same surface as the sample would. For the sediment samples, the rinsate blank was collected from water poured onto the trowel and bowl after these were decontaminated.

2.5 Sample Collection Methods

Core sediment samples were collected in Ponds B and C and the SWCA using stainless steel hand trowels at a soil depth interval from land surface to 12 inches in depth. Samples were collected from individual sample points within each zone and placed in a stainless-steel mixing bowl. These four samples, all of approximate equal volume, were then homogenized thoroughly, taking care to ensure all samples are broken up

and combined into a uniform mixture so that a representative sample was obtained for analysis. All sampling equipment was thoroughly decontaminated before the samples were taken as described in Section 2.7.2.

SWCA leachate collection system water was collected directly from the piping system outfall into Pond A. The system was first pumped to purge the lines in order to obtain a representative sample of the leachate. Leachate water was collected in a stainless-steel bowl beneath the discharge and the pipe sample container was dipped into the water to collect a sample in a manner that would least evolve volatiles.

Personal protective equipment was worn by field personnel and the proper decontamination procedures for equipment were implemented. All information pertinent to field observations and sampling was recorded in a field log book with consecutively numbered pages including all specified entries.

2.6 Sample Processing

After collection, composited sediment samples and the water samples were placed in an appropriately labeled, certified laboratory container. Composited sediment samples for analysis were placed in wide-mouth glass jars with teflon liners. Water samples were placed in glass jars. Samples were then placed on ice and cooled to 4° C (± 2° C) prior to shipment to EMS Laboratories in Indianapolis, Indiana. All samples were sent to the laboratory via Federal Express. At least one copy of the chain-of-custody forms and the Federal Express receipts were retained by the field collection personnel.

2.7 Decontamination and Cross-contamination Control

The following procedures and methods were utilized in an effort to control potential cross-contamination of samples and decontamination of sampling equipment.

2.7.1 General.

- Sample containers were kept in limited access areas or locked storage until they were used.
- Latex or nitrile gloves were worn during all sampling activities and changed between sampling events.
- Decontaminated sampling equipment was wrapped in aluminum foil prior to use.
- Clean sheets of plastic were laid out in the sampling area and all equipment placed on these sheets. This plastic was discarded after each use.
- A designated area was set up away from all sample points for decontamination activities.

2.7.2 Frequencies and Procedures. All equipment used to collect sediment samples was decontaminated between sample collection locations. Decontamination of this equipment was accomplished by the following procedure:

1. Washing in a detergent solution (Alconox).
2. Triple rinsing with clean deionized water.
3. Rinsing with methanol.
4. Triple rinsing with clean deionized water.

2.8 Health and Safety Plan Addendum

The site field work was performed in accordance with the site Health and Safety Plan Addendum dated February 1991.

3.0 DOCUMENTATION

3.1 Field Log Book.

All information pertinent to field observations and sampling was recorded in a field log book with consecutively numbered pages. Entries in the log book included at least the following:

- Project name and project number.
- Location of sampling activity.
- Purpose of sampling.
- Type of sample.
- Number and approximate volume of samples.
- Description of sampling point.
- Date and time of sampling.
- Field observations.
- Any field measurements.
- Weather conditions.
- Sample identification number.

3.2 Sample Labeling.

All samples collected were labeled with the following information:

- Project name.
- Project number.
- Sample identification number.
- Date and time.
- Description of sample location.
- Analysis required.

- Name of sampling personnel.

Labels were adhered directly to sample containers. All sample shipments were accompanied by a chain-of-custody document as described below.

3.3 Sample Identification Code.

The identification code for the samples consists of a combination of letters and numbers consisting of 7 characters. The first four letters of each sample code is CEDR for Cedar Chemicals followed by one letter specifying the area to be sampled. This code is followed by two digits specifying the sampling zone number. For example, a composite sediment sample collected in Pond C, zone 01 during this effort would be labeled CEDR-C-01. The coding for the areas are:

B	Pond B
C	Pond C
D	SWCA
L	SWCA Leachate Collection System

Subsequent sampling conducted on February 20 and March 5, 1991 labeled samples according to the sample location.

3.4 Chain-of-Custody.

In addition to the field log book, each sample sent offsite was recorded on a chain-of-custody document with an identifying code assigned to each sample. This code was used on the chain-of-custody, in the log book, and on the sample label to ensure that the sample description is identifiable.

Chain-of-custody documentation included the following applicable data:

- Field sample number and site name and project number.
- Date and time sample was taken.
- Date sample submitted to the laboratory.
- Sample taken by (signature).
- Number and type of shipping containers.
- Signature of persons relinquishing and obtaining custody of sample.
- Amounts of sample transferred.
- Identification of analytical parameters for sample analysis.

The sample was kept in limited access or locked storage at the proper temperature until custody was relinquished from the site and formal documentation of the transfer was completed. Upon each transfer of custody, the person involved verified the sample number and condition and documented the sample acquisition and transfer.

The field personnel properly packaged the sample, indicated the shipping method, prepared the chain-of-custody documentation, and obtained documentation of the shipment, such as certified mail receipt or bill of lading number. Copies of these shipment records were maintained in the record files. Upon transfer of custody of the samples to the transport agency, the field sample custodian signed and retained a copy of the chain-of-custody, and one copy of this documentation was sent with the samples. On arrival at the laboratory, the sample custodian signed for custody and returned a copy of the completed chain-of-custody document with the analytical results. Samples were shipped as environmental samples by commercial carrier following Department of Transportation and Development regulations for environmental samples.

4.0 ANALYTICAL METHODS

The sediment samples were analyzed for the TCLP test parameters in accordance with SW846 method 7000 series for metals, method 8240 for volatiles, method 8270 for semivolatiles, method 8080 for pesticides and method 8150 for herbicides. The water sample collected from the SWCA leachate collection system was analyzed for the TCLP test parameters in accordance with the same SW846 methods as for the sediment samples. The QA/QC samples were also tested for the TCLP test parameters using the same methods.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

The level of field and laboratory quality control is particularly important to a sampling plan. The level of QA/QC sampling and documentation was developed in accordance with the data quality objectives. QA/QC sample types and collection are described in Section 2.4 and the analytical results are discussed in Section 6.4. Laboratory QA/QC information also included matrix spike/matrix spike duplicate recoveries and surrogate recoveries. A summary of the QA/QC analytical results and documentation is found in Appendix C.

6.0 RESULTS

The analytical results for samples collected during this project are shown in Tables 1, 2, and 3. Copies of the laboratory data sheets are found in Appendix B. Sample locations are shown on Figure 3.

6.1 Ponds B and C and SWCA Composite Sediment Sample Analytical Results

Table 1 displays the analytical results associated with the composite sediment samples collected from Ponds B and C and the SWCA. All TCLP test parameters were

analyzed and none were found to be above the maximum concentration of contaminants for RCRA Toxicity Characteristics.

6.2 Leachate Collection System Sample Analytical Results

Table 2 displays the analytical results associated with the SWCA leachate collection system discharge water sample collected on January 19, 1991. All TCLP test parameters were analyzed, and only Carbon Tetrachloride was found to be above the maximum concentration of contaminants for toxicity characteristics. The carbon tetrachloride concentration was 2.1 mg/l (parts per million parts (ppm)), while the TCLP standard is 0.5 mg/l. A subsequent sample was collected on February 20, 1991, and analyzed for TCLP volatiles only in an effort to confirm the previous results. Carbon Tetrachloride was again detected at a concentration of 1.2 mg/l. The analytical results for this sample are shown in Table 3. Table 3 includes results only for parameters detected in at least one sample.

6.3 Pond A, Pond A Inlet, Pond A Blanket Drain Water Sample Analytical Results

A TCLP volatile scan was performed on the Pond A, Pond A Inlet, and the Pond A Blanket Drain water samples. The analytical results for the water sample collected from Pond A detected only Carbon Tetrachloride at a concentration of 0.120 mg/l. The Pond A Inlet sample had a detection of only Carbon Tetrachloride also at a concentration of 0.075 mg/l. However, the Carbon Tetrachloride results for the Pond A Blanket Drain water sample and duplicate showed 39.0 and 44.0 mg/l concentration, respectively. In addition, the Blanket Drain sample also showed concentrations of Chloroform and Trichloroethylene above the TCLP standards. Chloroform concentrations of 10.0 and 13.0 mg/l were detected in the sample and duplicate, respectively, while the TCLP standard is 6.0 mg/l. Trichloroethylene concentrations of 0.800 and 0.770 mg/l were detected in the sample and duplicate, respectively, while the TCLP standard is 0.5 mg/l.

6.4 QA/QC Sample Analytical Results

QA/QC sample types include 1) matrix spike/matrix spike duplicate recoveries, 2) surrogate recoveries, 3) field duplicates, 4) laboratory method blanks, 5) equipment rinsate, and 6) one field blank. The analytical results indicated the data was acceptable without qualifiers. No contaminates were found in the equipment rinsate blank, laboratory method blanks, or the field blank samples.

TABLE 1

POND AND SWCA SEDIMENT SAMPLE TCLP ANALYTICAL RESULTS (AND REGULATORY CRITERIA)[1]

Samples Collected on January 19, 1991

D = SWCA samples

	CEDR-B-01	CEDR-B-02	CEDR-B-03	CEDR-B-04	CEDR-C-01	CEDR-C-02	CEDR-D-01	CEDR-D-02	CEDR-D-03	CEDR-D-04	CEDR-D-04D	STD
INORGANIC COMPOUNDS (METALS)												
Arsenic	0.036	0.034	0.038	ND	0.049	0.046	0.036	0.052	0.044	0.056	0.031	5.0
Barium	ND	4.400	ND	ND	ND	ND	ND	ND	ND	ND	ND	100.0
Cadmium	0.020	0.020	0.020	ND	0.020	ND	ND	ND	ND	ND	ND	1.0
Chromium	0.150	0.240	0.090	0.090	0.100	0.510	0.100	0.060	0.070	0.050	0.170	5.0
Lead	ND	ND	ND	ND	ND	ND	0.480	ND	ND	ND	0.810	5.0
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.2
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0
VOLATILE ORGANIC COMPOUNDS												
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100.0
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.0
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
1,1 Dichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7
Methyl ethyl ketone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200.0
Tetrachloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7
Trichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.2

Please note
Detetection Limits in
a separate column

TABLE 1 (continued)

POND AND SWCA SEDIMENT SAMPLE TCLP ANALYTICAL RESULTS (AND REGULATORY CRITERIA)[1]

Samples Collected on January 19,1991

	CEDR-B-01	CEDR-B-02	CEDR-B-03	CEDR-B-04	CEDR-C-01	CEDR-C-02	CEDR-D-01	CEDR-D-02	CEDR-D-03	CEDR-D-04	CEDR-D-04D	STD
EXTRACTABLES - BASE NEUTRALS												
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.5
2,4 Dinitrotoluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.13
Hexachlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.13
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Hexachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0
Nitrobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0
Pyridine	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0
EXTRACTABLES - ACIDS												
2-Methyl Phenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200.0
3-Methyl Phenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200.0
4-Methyl Phenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200.0
Cresylic Acid	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200.0
Pentachlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100.0
2,4,5-Trichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	400.0
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0
PESTICIDES												
Chlordane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.03
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.008
Lindane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.4
Methoxychlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
Toxaphene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5

TABLE 1 (concluded)

POND AND SWCA SEDIMENT SAMPLE TCLP ANALYTICAL RESULTS (AND REGULATORY CRITERIA)[1]

Samples Collected on January 19, 1991

	CEDR-B-01	CEDR-B-02	CEDR-B-03	CEDR-B-04	CEDR-C-01	CEDR-C-02	CEDR-D-01	CEDR-D-02	CEDR-D-03	CEDR-D-04	CEDR-D-04D	STD
HERBICIDES												
2,4-Dichlorophenoxyacetic Acid	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
Silvex	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0

[1]Concentrations listed as mg/l.

ND = Not detected at Method Detection Limit (MDL).

STD = Maximum Concentration of Contaminants for Toxicity Characteristics as Determined Using TCLP

TABLE 2

SWCA LEACHATE COLLECTION SYSTEM TCLP ANALYTICAL RESULTS (AND REGULATORY CRITERIA)[1]

Samples Collected on January 19, 1991

	CEDR-L-01	CEDR-L-01D	STD
INORGANIC COMPOUNDS (METALS)			
Arsenic	1.500	1.500	5.0
Barium	ND	ND	100.0
Cadmium	ND	ND	1.0
Chromium	0.120	0.130	5.0
Lead	ND	ND	5.0
Mercury	ND	ND	0.2
Selenium	0.019	0.021	1.0
Silver	ND	ND	5.0
VOLATILE ORGANIC COMPOUNDS			
Benzene	ND	ND	0.5
Carbon Tetrachloride	1.800	2.100	0.5
Chlorobenzene	ND	ND	100.0
Chloroform	.310	.310	6.0
1,2-Dichloroethane	ND	ND	0.5
1,1 Dichloroethylene	.097	.110	0.7
Methyl ethyl ketone	.500	.640	200.0
Tetrachloroethylene	ND	ND	0.7
Trichloroethylene	ND	.046	0.5
Vinyl chloride	ND	ND	0.2

	CEDR-L-01	CEDR-L-01D	STD
EXTRACTABLES - BASE NEUTRALS			
1,4-Dinitrobenzene	ND	ND	7.5
2,4-Dinitrotoluene	ND	ND	0.13
Hexachlorobenzene	ND	ND	0.013
Hexachlorobutadiene	ND	ND	0.5
Hexachloroethane	ND	ND	3.0
Nitrobenzene	ND	ND	2.0
Pyridine	ND	ND	5.0
EXTRACTABLES - ACIDS			
2-Methyl Phenol	ND	ND	200.0
3-Methyl Phenol	ND	ND	200.0
4-Methyl Phenol	ND	ND	200.0
Creslic Acid	ND	ND	200.0
Pentachlorophenol	ND	ND	100.0
2,4,5-Trichlorophenol	ND	ND	400.0
2,4,6-Trichlorophenol	ND	ND	2.0

	CEDR-L-01	CEDR-L-01D	STD
PESTICIDES			
Chlordane	ND	ND	0.03
Endrin	ND	ND	0.02
Heptachlor	ND	ND	0.008
Lindane	ND	ND	0.4
Methoxychlor	ND	ND	10.0
Toxaphene	ND	ND	0.5
HERBICIDES			
2,4-Dichlorophenoxyacetic Acid	ND	ND	10.0
Silvex	ND	ND	1.0

[1]Concentrations listed as mg/l.

ND = Not detected at Method Detection Limit (MDL).

STD = Maximum Concentration of Contaminants for Toxicity Characteristics as determined using TCLP test method.

TABLE 3

POND A, POND A INLET, AND POND A BLANKET DRAIN WATER SAMPLE TCLP ANALYTICAL RESULTS (AND REGULATORY CRITERIA)[1]

Volatile Organic Compounds	Inlet[2]	Pond A[2]	Leachate[2]	Leachate (Dup)[2]	Blanket Drain[3]	Blanket Drain (Dup)[3]	STD[4]
Benzene	ND[5]	ND	0.064	ND	ND	ND	0.5
Carbon Tetrachloride	0.075	0.120	1.200	1.100	39.000	44.000	0.5
Chloroform	ND	ND	0.190	0.190	10.000	13.000	6.0
1,1 Dichloroethlyene	ND	ND	0.065	0.051	ND	ND	0.7
Methyl Ethyl Ketone	ND	ND	0.830	0.830	0.830	ND	200.0
Trichloroethylene	ND	ND	ND	ND	0.800	0.770	0.5

[1]Concentration listed as mg/l.

[2]Samples collected on February 20, 1991. Collected to confirm results of Jan 19, 1991

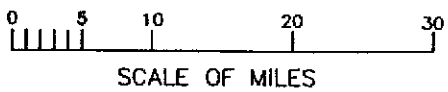
[3]Samples collected on March 5, 1991.

[4]STP = Maximum concentration of contaminants for toxicity characteristics as determined using TCLP test method.

[5]ND = Not detected at Method Detection Limit (MDL).

used to go ~~[illegible]~~ to impoundment A, but now goes directly to carbon absorbers.

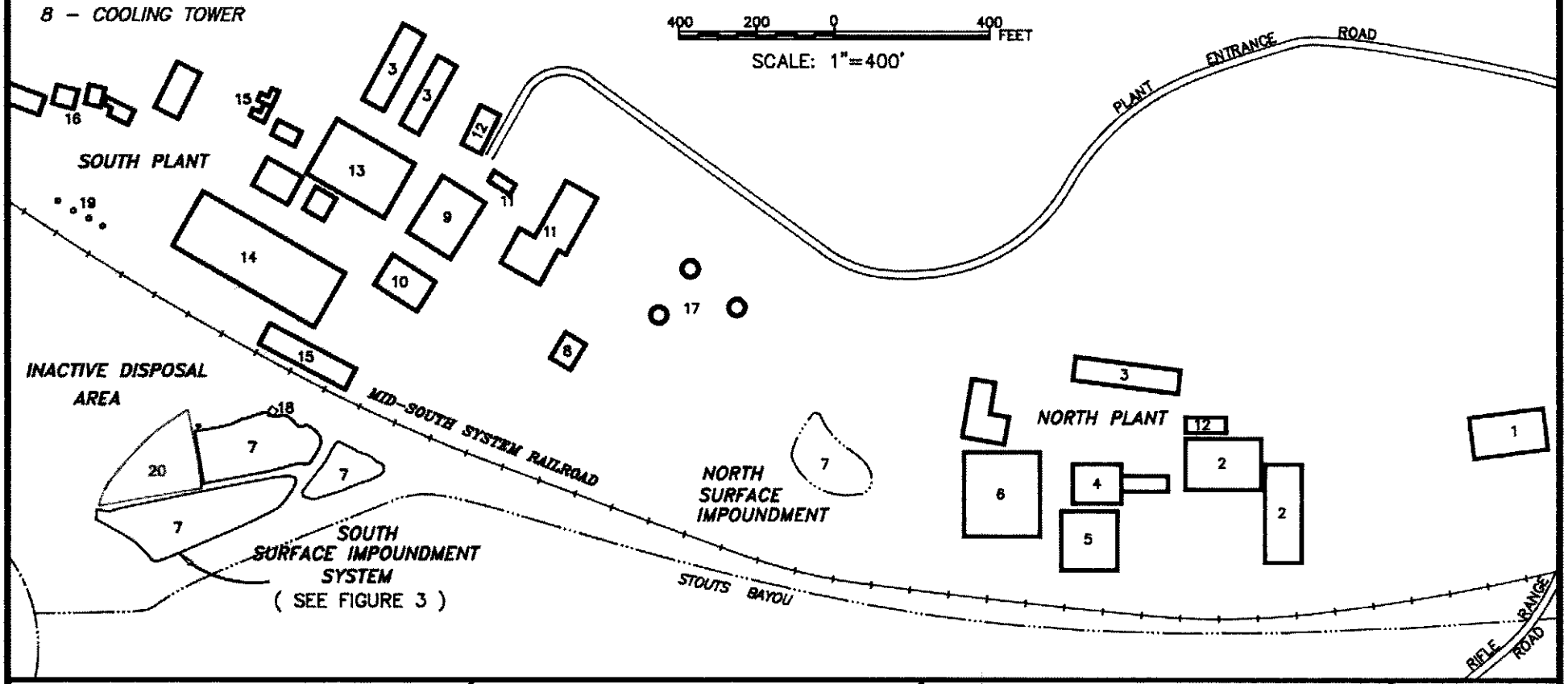
FIGURES



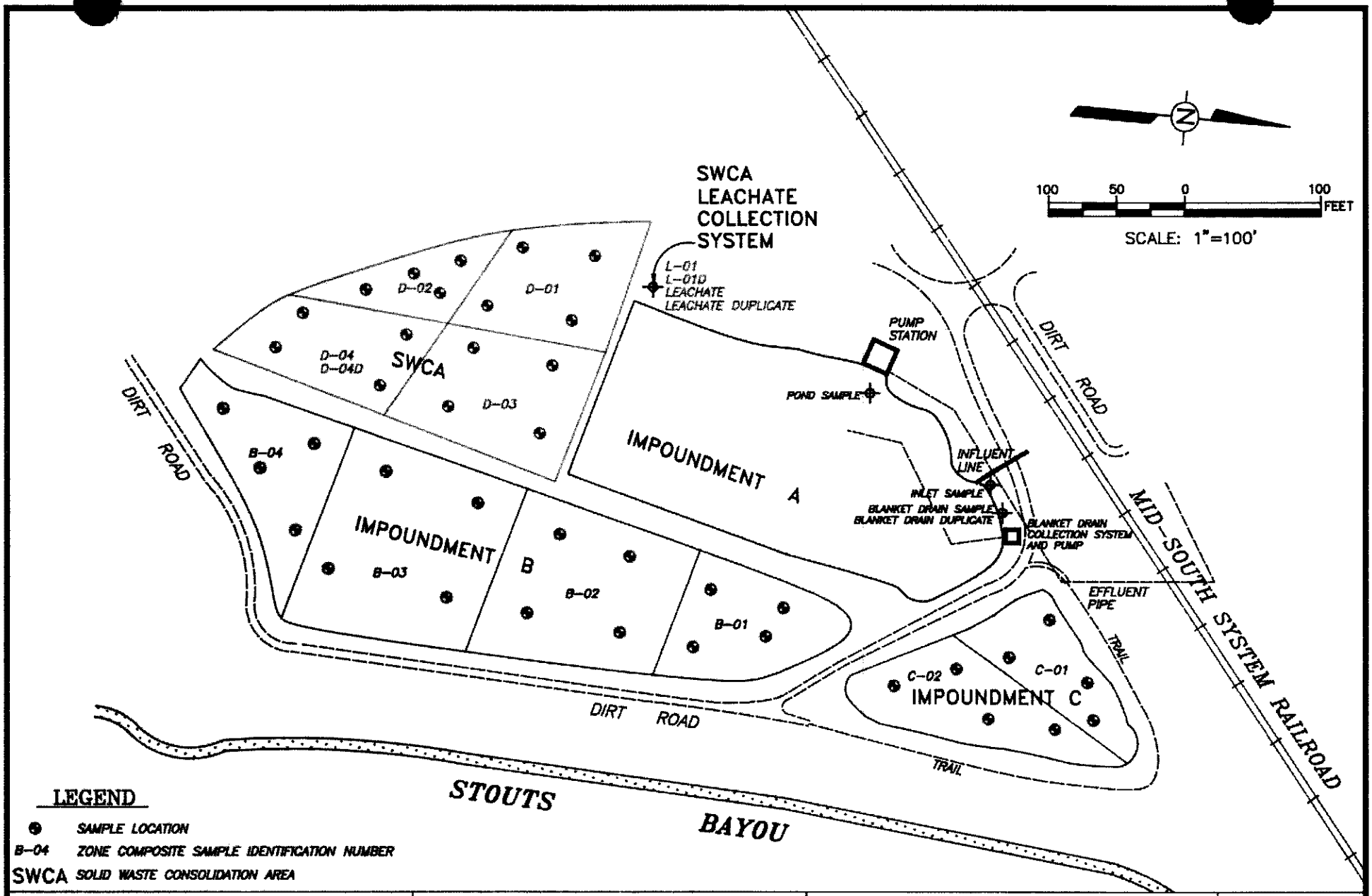
CEDAR CHEMICAL CORPORATION VICKSBURG, MISSISSIPPI	Woodward–Clyde Consultants Consulting Engineers, Geologists and Environmental Scientists Jackson, Mississippi SCALE: AS SHOWN · DRAWN BY: D.A.C. · DATE: 2/15/91 CHKD. BY: · DATE:	SITE LOCATION	PROJ. NO. 90B4030 FIG. NO. 1

FACILITY INDEX

1 – ADMINISTRATION BUILDING
2 – STORAGE
3 – MAINTENANCE AND WAREHOUSE
4 – PROCESS
5 – Rx AREA
6 – UTILITIES
7 – SURFACE IMPOUNDMENT
8 – COOLING TOWER
9 – AMMONIA STORAGE
10 – NITRIC ACID
11 – BORDEN FORMALDEHYDE PLANT
12 – OFFICE AND LAB
13 – MSMA (INACTIVE)
14 – FORMER DRUMMING AREA
15 – TOX–DINITRO AREA
16 – ATRAZINE AREA
17 – CHEMICAL STORAGE TANKS (FORMER LOCATION)
18 – PUMP STATION
19 – ACTIVATED CARBON COLUMNS
20 – SOLID WASTE CONSOLIDATION AREA



CEDAR CHEMICAL CORPORATION VICKSBURG, MISSISSIPPI	Woodward–Clyde Consultants Consulting Engineers, Geologists and Environmental Scientists Jackson, Mississippi	SITE FACILITIES MAP	PROJ. NO. 90B403C
	SCALE: 1"=400' / DRAWN BY: D.A.C. / DATE: 2/15/91 / CHKD. BY: / DATE:		FIG. NO. 2



CEDAR CHEMICAL CORPORATION VICKSBURG, MISSISSIPPI	Woodward-Clyde Consultants Consulting Engineers, Geologists and Environmental Scientists Jackson, Mississippi		SAMPLE LOCATIONS	PROJ. NO. 90B403C FIG. NO. 3
	SCALE: 1"=100'	DRAWN BY: D.A.C. / DATE: 2/15/91 CHKD. BY: / DATE:		

STATE OF MISSISSIPPI

DEPARTMENT OF ENVIRONMENTAL QUALITY

RAY MABUS
GOVERNOR

March 27, 1990

Mr. Steve Boswell
Director of Environmental Affairs
Cedar Chemical Corporation
P.O. Box 3
Vicksburg, Mississippi 39181

Dear Mr. Boswell:

Re: Cedar Chemical Corporation
South Pond Closure Project

As we discussed in our telecon of March 26, 1990, the Bureau requests that the sludge removed from your wastewater pond be sampled and tested for the toxicity characteristic constituents, using the Toxicity-Characteristic Leaching Procedure.

A copy of the toxicity characteristic constituent list is enclosed. If you have any questions, please contact me at (601) 961-5171.

Sincerely,

Toby M. Cook

Toby M. Cook, P.E.
Hazardous Waste Division

TMC-40:lr
Enclosure

EPS Analytical Services
5360 I-55 North • Jackson, MS 39211 • Telephone (601) 956-1400 • FAX (601) 956-2365

LABORATORY REPORT

CLIENT: VICKSBURG CHEMICAL DIV OF CEDAR CHEM DATE: 04/27/90 COLLECTED BY: EPS-TC REPORT NO.: 13093 PAGE NO.: 2
LOCATION: VICKSBURG, MS 39180 PROJECT LOCATION: VICKSBURG, MS. RECEIPT DATE: 04/05/90 PROJECT NO.:

ANALYTE	UNITS	LABORATORY RESULTS / REGULATORY LIMIT				ANALYSIS INFORMATION			BATCH QUALITY CONTROL		
						ANALYST	DATE	TIME	SPIKE VALUE	% RECOVERY	RELATIVE % DEVIATION
TEST RESULTS FOR SAMPLE LOG NUMBER:		16949.00									
Chromium, TCLP Leachable	mg/l	0.26				BSC	04/16/90	13:00	1.00	97	0
Hexavalent Chromium, TCLP Leachable	mg/l	0.06				BSC	04/16/90	13:00	1.00	97	0
Mercury, TCLP Leachable	mg/l	<0.01				BSC	04/11/90	08:30	0.005	104	0
Lead, TCLP Leachable	mg/l	<0.1				BSC	04/16/90	16:00	0.200	98	0
Selenium, TCLP Leachable	mg/l	<0.3				BSC	04/10/90	23:30	0.200	90	25
Silver, TCLP Leachable	mg/l	<0.1				BCP	04/25/90	11:00	NA	NA	NA
Toxic Characteristic Leaching Procedure	NA	YES				TCT	04/09/90	12:00	NA	NA	NA

SUPPLEMENTARY INFORMATION:
Analyses conducted in accordance with 40 CFR, Part 261, November 1986, "Test Methods for Evaluating Solid Waste" (SW-846).

SAMPLE DESCRIPTION:
16949.00 SPECIAL SOIL SAMPLE

COLLECTION DATE/TIME:
04/05/90 04/05/90 11:07

CERTIFICATION:

John Bouvard
Quality Assurance and Quality Control

Herbert A. Johnston
Analytical Services

This report applies only to the sample(s) analyzed. The liability of the laboratory is limited to the amount paid for the report by the client. The client assumes all liability for the further distribution of this report or its content and by making such distribution agrees to hold the laboratory harmless against

EPS Analytical Services
5360 I-55 North • Jackson, MS 39211 • Telephone (601) 956-1400 • FAX (601) 956-2365

LABORATORY REPORT

CLIENT: VICKSBURG CHEMICAL DIV OF CEDAR CHEMDATE: 04/27/90
LOCATION: VICKSBURG, MS 39180 PROJECT LOCATION: VICKSBURG, MS.
COLLECTED BY: EPS-TC
RECEIPT DATE: 04/05/90
REPORT NO.: 13093 PAGE NO.: 1
PROJECT NO.:

ANALYTE	UNITS	LABORATORY RESULTS / REGULATORY LIMIT				ANALYSIS INFORMATION			BATCH QUALITY CONTROL		
						ANALYST	DATE	TIME	SPIKE VALUE	% RECOVERY	RELATIVE % DEVIATION
TEST RESULTS FOR SAMPLE LOG NUMBER:		16949.00									
2,4-D, TCLP Leachable	mg/l	<0.1				SCP	04/25/90	11:00	NA	NA	NA
Halogenated Volatiles, TCLP Leachable	mg/l	<5				SCP	04/26/90	10:36	40	90	NA
Aromatic Volatiles, TCLP Leachable	mg/l	<5				SCP	04/26/90	10:36	40	90	NA
BOBO Pesticides, TCLP Leachable	mg/l	<0.1				SCP	04/25/90	09:30	NA	NA	NA
8270 Semi Volatiles, TCLP Leachable	mg/l	<0.01				SCP	04/25/90	10:00	0.24	116	5.1
Silver, TCLP Leachable	mg/l	0.02				BSC	04/12/90	10:50	0.40	102	0
Arsenic, TCLP Leachable	mg/l	<0.3				BSC	04/10/90	21:00	0.200	104	0
Barium, TCLP Leachable	mg/l	2.1				BSC	04/16/90	07:00	0.200	92	0
Cadmium, TCLP Leachable	mg/l	0.03				BSC	04/17/90	10:00	0.40	95	0

SUPPLEMENTARY INFORMATION:
Analyses conducted in accordance with 40 CFR, Part 261, November 1986, "Test Methods for Evaluating Solid Waste" (SW-846).

SAMPLE DESCRIPTION:
16949.00 SPECIAL SOIL SAMPLE

COLLECTION DATE/TIME:
04/05/90 04/05/90 11:07

CERTIFICATION:

John Richmond
Quality Assurance and Quality Control

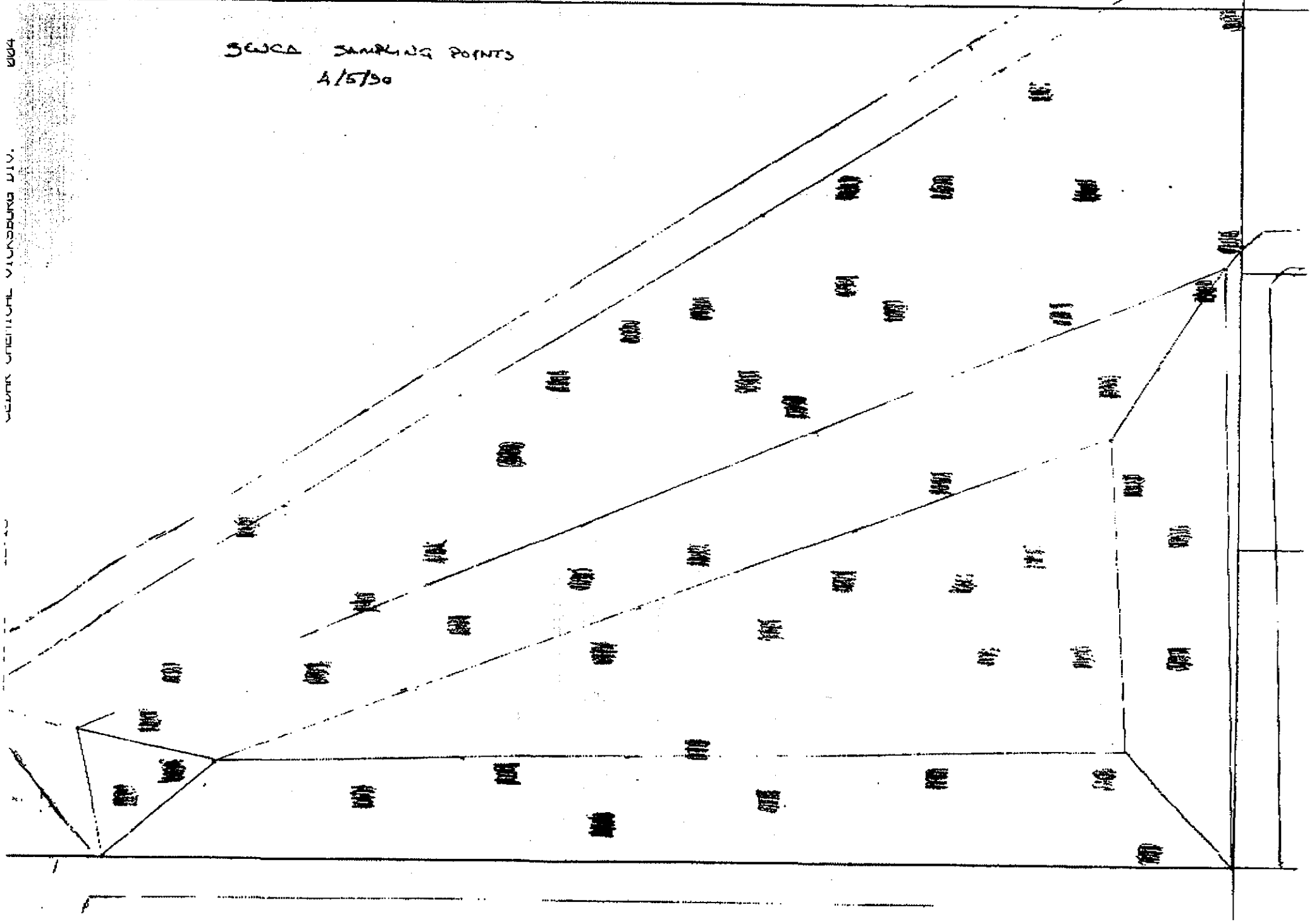
Herbert A. Johnston
Analytical Services

This report applies only to the sample(s) analyzed. The liability of the laboratory is limited to the amount paid for the report by the client. The client assumes all liability for the further distribution of this report or its content and by making such distribution agrees to hold the laboratory harmless against

Price

NATIONAL 42-182 100 SHEETS

SWCA SAMPLING POINTS
4/5/90



CEDAR CHEMICAL VICKSBURG DIV. 004

CEDAR CHEMICAL CORPORATION

24th Floor • 5100 Poplar Avenue • Memphis, TN 38137 • 901-685-5348

REPLY TO: P. O. BOX 3
VICKSBURG, MS 39180
(601) 636-1231

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
P 850 518 317

Mr. Toby Cook
Environmental Engineer
Mississippi Department of Environmental Quality
Bureau of Pollution Control
2380 Highway 80 West
Jackson, MS 39204

May 8, 1990

Re: Cedar Chemical Corporation
South Pond Closure Project

Dear Mr. Cook:

As you requested in your letter of March 27, 1990, Cedar has sampled and analyzed the sludges removed from the South Pond using the Toxicity-Characteristic Leaching Procedure. The results of the analysis are attached.

A diagram of the SWCA is attached and shows the location of the samples which were composited for analysis. Each location was sampled at a depth of six to eight inches beneath the surface.

If there are any questions concerning this matter, please contact me.

Sincerely,

Steven T. Boswell
Director of Env. Affairs

STB: pc

xc: Mr. Ahlers
Mr. Madsen

EPS Analytical Services

February 13,1991

Mr. Steve Boswell
Vicksburg Chemical
Rifle Range Road
Vicksburg, MS 39180

Dear Mr. Boswell:

On the sample we analyzed for TCLP parameters, EPS sample # 16949 and report # 13093, our data system did not break down the organic parameters by compound. The following organic compounds were analyzed and found to be less than detection limit for that sample:

Benzene
Carbon Tetrachloride
Chlordane
Chlorobenzene
Chloroform
o-Cresol
p-Cresol
m-Cresol
Cresol
2,4-D
1,4-Dichlorobenzene
1,2-Dichloroethane
1,1-Dichloroethylene
2,4-Dinitrotoluene
Endrin
Heptachlor (and its hydroxide)
Hexachlorobutadiene
Hexachloroethane
Lindane
Methoxychlor
Methyl ethyl ketone
Nitrobenzene
Pentachlorophenol
Pyridine
Tetrachloroethylene
Toxaphene
Trichloroethylene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
2,4,5-TP Silvex
Vinyl Chloride
Hexachlorobenzene

Please accept our apology for this inconvenience. If you need further information, or you have any questions, please do not hesitate to contact me.

Sincerely,

L. Raymond Hudnall
Client Services Coordinator

LRH/bde

5360 I-55 North, Jackson, Mississippi 39211 (601) 956-1400 FAX (601) 956-2365

CEDAR CHEMICAL CORPORATION

24th Floor • 5100 Poplar Avenue • Memphis, TN 38137 • 901-685-5348

REPLY TO: P.O. BOX 3
VICKSBURG, MS 39181
(601) 636-1231

Mr. Toby Cook
Environmental Engineer
Mississippi Department of Environmental Quality
Bureau of Pollution Control
2380 Highway 80 West
Jackson, MS 39204

Janaury 16, 1991

Re: TCLP Results, Impoundment "C"
Cedar Chemical Corp.

Dear Mr. Cook:

Please find attached results of TCLP analysis of the sediment in Impoundment "C" at Cedar Chemical's South Pond Closure project. Sampling was performed September 26, 1990. A diagram of sampling point is attached. A sample from Impoundment "B" is currently being analyzed.

Please contact me with any questions you may have.

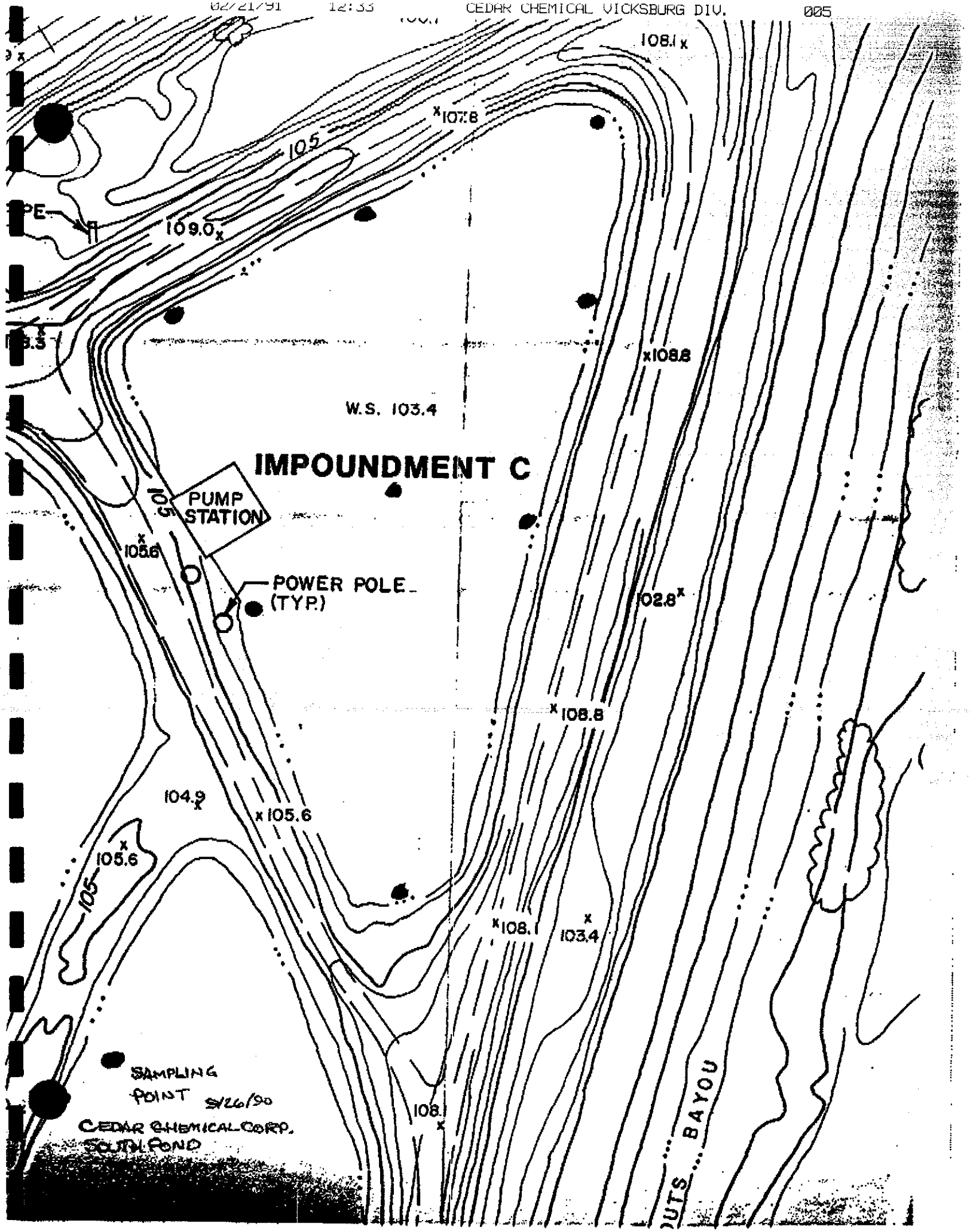
Sincerely,

Steven T. Boswell

Steven T. Boswell
Dir. of Env. Affairs

STB: pc

xc: Mr. Ahlers
Mr. Madsen


108.1
107.8
105
109.0
108.8
W.S. 103.4
IMPOUNDMENT C
PUMP STATION
105.6
POWER POLE (TYP.)
102.8
108.8
104.9
105.6
105.6
105
108.1
103.4
108.1
SAMPLING POINT 5/26/90
CEDAR CHEMICAL CORP. SOUTH POND
BAYOU

EPS Analytical Services
5360 I-55 North • Jackson, MS 39211 • Telephone (601) 956-1400 • FAX (601) 956-2365

LABORATORY REPORT

CLIENT: VICKSBURG CHEMICAL DIV OF CEDAR CHEM DATE: 10/17/90
LOCATION: VICKSBURG, MS 39180 PROJECT LOCATION: VICKSBURG, MS.
COLLECTED BY: CLIENT
RECEIPT DATE: 09/27/90
REPORT NO.: 16186
PROJECT NO.:
PAGE NO.: 1

ANALYTE	UNITS	LABORATORY RESULTS / REGULATORY LIMIT				ANALYSIS INFORMATION			BATCH QUALITY CONTROL		
						ANALYST	DATE	TIME	SPIKE VALUE	% RECOVERY	RELATIVE % DEVIATION
TEST RESULTS FOR SAMPLE LOG NUMBER:		20676.00									
2,4,5-Trichlorophenol, TCLP Leachable	mg/l	<0.01				SCP	10/07/90	13:00	1.0	111	0
2,4,6-Trichlorophenol, TCLP Leachable	mg/l	<0.01				SCP	10/07/90	13:00	1.0	111	0
2,4-D, TCLP Leachable	mg/l	<0.01				SCP	10/10/90	11:00	0.1	32	0
Silver, TCLP Leachable	mg/l	0.01				BSC	10/03/90	12:10	0.40	96	0
Arsenic, TCLP Leachable	mg/l	1.5				BSC	10/01/90	22:00	0.200	88	0
Barium, TCLP Leachable	mg/l	<0.5				BSC	10/02/90	16:00	0.200	105	0
Benzene, TCLP Leachable	mg/l	<0.001				SCP	10/11/90	08:24	0.02	113	0
Chlorobenzene, TCLP Leachable	mg/l	<0.001				SCP	10/11/90	08:24	0.02	113	0
Cadmium, TCLP Leachable	mg/l	0.01				BSC	10/02/90	10:20	0.40	95	0

SUPPLEMENTARY INFORMATION:
Analyses conducted in accordance with 40 CFR, Part 261, March 1990, "Test Methods for Evaluating Solid Waste" (SW-846).

SAMPLE DESCRIPTION:
20676.00 NORTH POND BOTTOM SAMPLE

COLLECTION DATE/TIME:
09/26/90 09/26/90 UNK

CERTIFICATION:
Ray Hudnall
Quality Assurance and Quality Control
Herbert A. Johnston
Analytical Services

This report applies only to the sample(s) analyzed. The liability of the laboratory is limited to the amount paid for the report by the client. The client assumes all liability for the further distribution of this report or its content and by making such distribution agrees to hold the laboratory harmless against

006 CEDAR CHEMICAL VICKSBURG DIV. 12:34 02/21/91

EPS Analytical Services
5360 I-55 North • Jackson, MS 39211 • Telephone (601) 956-1400 • FAX (601) 956-2365

LABORATORY REPORT

CLIENT: VICKSBURG CHEMICAL DIV OF CEDAR CHEM DATE: 10/17/90
LOCATION: VICKSBURG, MS 39180 PROJECT LOCATION: VICKSBURG, MS.
COLLECTED BY: CLIENT
RECEIPT DATE: 09/27/90
REPORT NO.: 16186 PAGE NO.: 2
PROJECT NO.:

ANALYTE	UNITS	LABORATORY RESULTS / REGULATORY LIMIT				ANALYSIS INFORMATION			BATCH QUALITY CONTROL		
						ANALYST	DATE	TIME	SPIKE VALUE	% RECOVERY	RELATIVE % DEVIATION
TEST RESULTS FOR SAMPLE LOG NUMBER:		20676.00									
Chlordane, TCLP Leachable	mg/l	<0.00002				SCP	10/08/90	13:00	2.5	40	0
Chloroform, TCLP Leachable	mg/l	0.16				SCP	10/11/90	08:24	0.02	113	0
Chromium, TCLP Leachable	mg/l	0.02				BSC	10/01/90	12:45	1.00	96	0
Hexavalent Chromium, TCLP Leachable	mg/l	<0.02				BSC	10/01/90	12:45	1.00	96	0
Carbon Tetrachloride, TCLP Leachable	mg/l	<0.001				SCP	10/11/90	08:24	0.02	113	0
1,2-Dichloroethane, TCLP Leachable	mg/l	<0.001				SCP	10/11/90	08:24	0.02	113	0
1,1-Dichloroethylene, TCLP Leachable	mg/l	1.9				SCP	10/11/90	08:24	0.02	113	0
2,4-Dinitrotoluene, TCLP Leachable	mg/l	<0.01				SCP	10/07/90	13:00	0.125	102	3.8
Endrin, TCLP Leachable	mg/l	<0.00002				SCP	10/08/90	13:00	2.5	40	0

SUPPLEMENTARY INFORMATION:
Analyses conducted in accordance with 40 CFR, Part 261, March 1990, "Test Methods for Evaluating Solid Waste" (SW-846).

SAMPLE DESCRIPTION:
20676.00 NORTH POND BOTTOM SAMPLE

COLLECTION DATE/TIME:
09/26/90 09/26/90 UNK

CERTIFICATION:
Ray Hudnall
Quality Assurance and Quality Control
Herbert A. Johnston
Analytical Services

This report applies only to the sample(s) analyzed. The liability of the laboratory is limited to the amount paid for the report by the client. The client assumes all liability for the further distribution of this report or its content and by making such distribution agrees to hold the laboratory harmless against

02/21/91 12:35 CEDAR CHEMICAL VICKSBURG DIV. 007

LABORATORY REPORT

CLIENT: [redacted]BURG CHEMICAL DIV OF CEDAR CHEMDATE: 10/17/90
LOCATION: VICKSBURG, MS 39180 PROJECT LOCATION: VICKSBURG, MS.

COLLECTED BY: CLIENT
RECEIPT DATE: 09/27/90

REPORT NO.: 16186 [redacted]GE NO.: 3
PROJECT NO.:

ANALYTE	UNITS	LABORATORY RESULTS / REGULATORY LIMIT				ANALYSIS INFORMATION			BATCH QUALITY CONTROL		
						ANALYST	DATE	TIME	SPIKE VALUE	% RECOVERY	RELATIVE % DEVIATION
TEST RESULTS FOR SAMPLE LOG NUMBER:		20676.00									
Hexachlor-1,3-Butadiene, TCLP Leachable	mg/l	<0.01				SCP	10/07/90	13:00	0.125	102	3.9
Hexachlorobenzene, TCLP Leachable	mg/l	<0.00002				SCP	10/08/90	13:00	2.5	40	0
Hexachloroethane, TCLP Leachable	mg/l	<0.01				SCP	10/07/90	13:00	0.125	102	3.9
Heptachlor Epoxide, TCLP Leachable	mg/l	<0.00002				SCP	10/08/90	13:00	2.5	40	0
Mercury, TCLP Leachable	mg/l	<0.01				BSC	10/02/90	13:00	0.005	102	0
Heptachlor, TCLP Leachable	mg/l	<0.00002				SCP	10/08/90	13:00	2.5	40	0
Lindane, TCLP Leachable	mg/l	<0.00002				SCP	10/08/90	13:00	2.5	40	0
m-Cresol, TCLP Leachable	mg/l	<0.01				SCP	10/07/90	13:00	0.125	102	3.9
Methyl Ethyl Ketone, TCLP Leachable	mg/l	<0.01				SCP	10/11/90	08:44	1000	107	6.7

SUPPLEMENTARY INFORMATION:
Analyses conducted in accordance with 40 CFR, Part 261, March 1990, "Test Methods for Evaluating Solid WAste" (SW-846).

SAMPLE DESCRIPTION:
20676.00 NORTH POND BOTTOM SAMPLE

COLLECTION DATE/TIME:
09/26/90 09/26/90 UNK

CERTIFICATION:
Ray Hudnall
Quality Assurance and Quality Control
Herbert A. Johnston
Analytical Services

This report applies only to the sample(s) analyzed. The liability of the laboratory is limited to the amount paid for the report by the client. The client assumes all liability for the further distribution of this report or its content and by making such distribution agrees to hold the laboratory harmless against all claims of persons so informed of the contents hereof.

CEDAR CHEMICAL VICKSBURG DIV. 12:30 10/17/90 008

EPS Analytical Services
5360 I-55 North • Jackson, MS 39211 • Telephone (601) 956-1400 • FAX (601) 956-2365

LABORATORY REPORT

CLIENT: VICKSBURG CHEMICAL DIV OF CEDAR CHE DATE: 10/17/90
LOCATION: VICKSBURG, MS 39180 PROJECT LOCATION: VICKSBURG, MS.
COLLECTED BY: CLIENT
RECEIPT DATE: 09/27/90
REPORT NO.: 16186 PAGE NO.: 4
PROJECT NO.:

ANALYTE	UNITS	LABORATORY RESULTS / REGULATORY LIMIT				ANALYSIS INFORMATION			BATCH QUALITY CONTROL		
						ANALYST	DATE	TIME	SPIKE VALUE	% RECOVERY	RELATIVE % DEVIATION
TEST RESULTS FOR SAMPLE LOG NUMBER:		20676.00									
Methoxychlor, TCLP Leachable	mg/l	<0.00002				SCP	10/08/90	13:30	2.5	40	0
Nitrobenzene, TCLP Leachable	mg/l	<0.01				SCP	10/07/90	13:00	0.125	102	3.9
o-Cresol, TCLP Leachable	mg/l	<0.01				SCP	10/07/90	13:00	0.125	102	3.9
Lead, TCLP Leachable	mg/l	<0.1				BSC	10/01/90	13:30	0.200	100	0
Tetrachloroethylene, TCLP Leachable	mg/l	<0.001				SCP	10/11/90	08:24	0.02	113	0
p-Cresol, TCLP Leachable	mg/l	<0.01				SCP	10/07/90	13:00	0.125	102	3.9
1,4-Dichlorobenzene, TCLP Leachable	mg/l	<0.001				SCP	10/11/90	08:24	0.02	113	0
Pentachlorophenol, TCLP Leachable	mg/l	<0.01				SCP	10/07/90	13:00	1.0	111	0
Pyridine, TCLP Leachable	mg/l	<0.01				SCP	10/07/90	13:00	0.125	102	3.9

SUPPLEMENTARY INFORMATION:
Analyses conducted in accordance with 40 CFR, Part 261, March 1990, "Test Methods for Evaluating Solid Waste" (SW-846).

SAMPLE DESCRIPTION:
20676.00 NORTH POND BOTTOM SAMPLE

COLLECTION DATE/TIME:
09/26/90 09/26/90 UNK

CERTIFICATION:

Ray Hudnall
Quality Assurance and Quality Control

Herbert A. Johnston
Analytical Services

This report applies only to the sample(s) analyzed. The liability of the laboratory is limited to the amount paid for the report by the client. The client

[redacted] 5360 [redacted] North [redacted] Jackson, [redacted] 39211 [redacted] Telephone ([redacted]) 956-[redacted] • [redacted] (601) [redacted]-23[redacted]

LABORATORY REPORT

CLIENT: VICKSBURG CHEMICAL DIV OF CEDAR CHEMDATE: 10/17/90
LOCATION: VICKSBURG, MS 39180
PROJECT LOCATION: VICKSBURG, MS.
COLLECTED BY: CLIENT
RECEIPT DATE: 09/27/90
REPORT NO.: 16186
PROJECT NO.:
PAGE NO.: 5

ANALYTE	UNITS	LABORATORY RESULTS / REGULATORY LIMIT				ANALYSIS INFORMATION			BATCH QUALITY CONTROL		
						ANALYST	DATE	TIME	SPIKE VALUE	% RECOVERY	RELATIVE % DEVIATION
TEST RESULTS FOR SAMPLE LOG NUMBER:		20676.00									
Selenium, TCLP Leachable	mg/l	<0.3				BSC	10/01/90	23:30	0.200	92	0
Silver, TCLP Leachable	mg/l	<0.01				SCP	10/10/90	11:00	0.1	54	0
Trichloroethylene, TCLP Leachable	mg/l	<0.001				SCP	10/11/90	08:24	0.02	113	0
Toxic Characteristic Leaching Procedure	NA	YES				BSC	09/30/90	14:00	NA	NA	NA
Toxaphene, TCLP Leachable	mg/l	<0.00002				SCP	10/08/90	13:00	2.5	40	0
Vinyl Chloride, TCLP Leachable	mg/l	<0.001				SCP	10/11/90	08:24	0.02	113	0

SUPPLEMENTARY INFORMATION:
Analyses conducted in accordance with 40 CFR, Part 261, March 1990, "Test Methods for Evaluating Solid WAste" (SW-846).

SAMPLE DESCRIPTION:
20676.00 NORTH POND BOTTOM SAMPLE

COLLECTION DATE/TIME:
09/26/90 09/26/90 UNK

CERTIFICATION:
Ray Hedrall
Quality Assurance and Quality Control
Herbert R. Johnston
Analytical Services

This report applies only to the sample(s) analyzed. The liability of the laboratory is limited to the amount paid for the report by the client. The client assumes all liability for the further distribution of this report or its content and by making such distribution agrees to hold the laboratory harmless against all claims of persons so informed of the contents hereof.

CEDAR CHEMICAL VICKSBURG DIV. 10/17/90 010

APPENDIX B

LABORATORY DATA SHEETS

Woodward-Clyde Consultants

CHAIN - OF - CUSTODY RECORD

Full TCLP

SAMPLE NO.	MATRIX	YR: 91 DATE MM/DD	TIME	SAMPLE DEPTH FROM	SAMPLE DEPTH TO	STATION LOCATION	TOTAL NO. CONTAINERS	VOA	SVOA/ Pest, Herb	Metals		
CEDR-C-01	SO	01/19	1200	0	12"	C	4	2	1	1		
CEDR-C-02	SO	01/19	1225	0	12"	C	4	2	1	1		
CEDR-B-01	SO	01/19	1337	0	12"	B	4	2	1	1		
CEDR-B-02	SO	01/19	1405	0	12"	B	4	2	1	1		
CEDR-B-03	SO	01/19	1426	0	12"	B	4	2	1	1		
CEDR-B-04	SO	01/19	1452	0	12"	B	4	2	1	1		
CEDR-D-01	SO	01/19	1522	0	12"	D	4	2	1	1		
CEDR-D-02	SO	01/19	1539	0	12"	D	4	2	1	1		
CEDR-D-03	SO	01/19	1559	0	12"	D	6	2	2	2		
CEDR-D-04	SO	01/19	1623	0	12"	D	6	2	2	2		
CEDR-D-04D	SO	01/19	1623	0	12"	D	6	2	2	2		
CEDR-L-01	LI	01/19	1700	-	-	L	3	1	2	1		
CEDR-L-01D	LI	01/19	1715	-	-	L	3	1	2	1		
CEDR-R-01	LI	01/19	1717	-	-	R	6	2	2	2		
CEDR-TB-01	LI	01/19	1721	-	-	TB	2					

SAMPLE COLLECTION:

PROJECT NO. AND NAME 90B403C-1 CEDAR CHEMICAL, Vicksburg, MS
LOCATION OF SAMPLE: Pond B, Pond C, Disposal Pit and Leak Detection/Leachate Coll.
TEAM LEADER: BRAD MARLER TELEPHONE: (601) 957-7666
COMPANY NAME: Woodward-Clyde Consultants
ADDRESS: 460 BRIARWOOD DR., Suite 520 Jackson MS 39206
WITNESS: [signature] COMPANY NAME: WCC

FIELD INFORMATION:

TYPES OF SAMPLES: (MATRIX) LIQUID (LI) FISH (FI) SLUDGE (SL) SOIL (SO) WIPE (WI) SEDIMENT (SE) OTHER (SPECIFY) _____
FIELD NOTES: _____
TRANSPORTER: Fed. ex. AIRBILL/INVOICE: 9828130864 DESTINATION: Indianapolis

SAMPLE TRANSFER (Original must be retained with sample at all times)

		RELINQUISHED BY	DATE/TIME	RECEIVED BY	DATE/TIME
1	NAME:	Brad Marler	1-21-91/1725		
	COMPANY:		1725		
2	NAME:				
	COMPANY:				
3	NAME:				
	COMPANY:				

TERMINATION OF CHAIN-OF-CUSTODY:

AUTHORIZED BY: _____ DATE: _____ TIME: _____
COMPANY NAME: _____
SAMPLE DISPOSTION: STORAGE _____ DISPOSAL _____ OTHER _____

From 01-JAN-91 to 10-FEB-91
For
WOODWARD CLYDE CONSULTANTS
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Project: 617 : WOODWARD CLYDE MISS - TCLPS & TOTALS (BLKS)

Sample	St	Date Sampled	Date Received	Date Complete	Description
A222255	1	19-JAN-91	22-JAN-91	N/A	SOIL CEDR-C-01 (0-12") "C"
A222256	1	19-JAN-91	22-JAN-91	N/A	SOIL CEDR-C-02 (0-12") "C"
A222257	1	19-JAN-91	22-JAN-91	N/A	SOIL CEDR-B-01 (0-12") "B"
A222258	1	19-JAN-91	22-JAN-91	N/A	SOIL "B" CEDR-B-02 (0-12")
A222259	1	19-JAN-91	22-JAN-91	N/A	SOIL "B" CEDR-B-03 (0-12")
A222260	1	19-JAN-91	22-JAN-91	N/A	SOIL CEDR-B-04 (0-12") "B"
A222261	1	19-JAN-91	22-JAN-91	N/A	SOIL CEDR-D-01 (0-12") "D"
A222262	1	19-JAN-91	22-JAN-91	N/A	SOIL "D" CEDR-D-02 (0-12")
A222263	1	19-JAN-91	22-JAN-91	N/A	SOIL "D" CEDR-D-03 (0-12")
A222264	1	19-JAN-91	22-JAN-91	N/A	SOIL CEDR-D-04 (0-12") "D"
A222265	1	19-JAN-91	22-JAN-91	N/A	SOIL CEDR-D-04D (0-12") "D"
A222266	1	19-JAN-91	22-JAN-91	N/A	LIQUID "L" CEDR-L-01
A222267	1	19-JAN-91	22-JAN-91	N/A	LIQUID CEDR-L-01D "L"
A222268	1	19-JAN-91	22-JAN-91	N/A	LIQUID "R" CEDR-R-01
A222269	1	19-JAN-91	22-JAN-91	N/A	LIQUID

* N/A = Information Not Available

From 01-JAN-91 to 10-FEB-91
For
WOODWARD CLYDE CONSULTANTS
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Project: 617 : WOODWARD CLYDE MISS - TCLPS & TOTALS (BLKS)

Sample	St	Date Sampled	Date Received	Date Complete	Description
A222269	1	19-JAN-91	22-JAN-91	N/A	"TB" CEDR-TB-01
Z102396	1	N/A	17-JAN-91	N/A	MATRIX SPIKE SAMPLES - SOIL & H20
Z102398	1	N/A	17-JAN-91	N/A	FOR UNSPIKED SOIL & H20 SAMPLES
Z102399	1	N/A	17-JAN-91	N/A	TOTALS FOR TRIP AND RINSATE BLANKS!!!

* N/A = Information Not Available

(sampproj.sql)

48 rows selected.

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 01 W. MORRIS ST. NDIANAPOLIS, IN 46231 (317)243-8305	22-JAN-91	A222255
	Complete 14-FEB-91	PO Number 90B403C-1
	Printed 15-FEB-91	Sampled 19-JAN-91 12:00

Report To

WOODWARD CLYDE CONSULTANTS
DEJONNETT KING
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Bill To

WOODWARD CLYDE CONSULTANTS
ACCOUNTS PAYABLE
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Sample Description

SAMPLE NO.: CEDR-C-01 (0-12")
DESCRIPTION: SOIL
LOCATION:: "C"

TOTAL SOLIDS EPA 160.3

Analyst: K. SCOTT — Analysis Date: 23-JAN-91 — Test: G401.7. 0

Parameter	Result	Det. Limit	Units
SOLIDS	62	1	Percent

TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Analyst: R. EATON — Analysis Date: 23-JAN-91 — Test: P107.2. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	100		Grams
LIQUID FRACTION (GRAMS)			Grams
EXTRACTED SAMPLE	100		Grams
SOLIDS	100		Percent
9.5 MM SIEVE TEST			Passed
INITIAL PH	11.3		Std. Units
ADJUSTED PH	2.0		Std. Units
BUFFER SOLUTION PH	4.95		Std. Units
FINAL PH	6.1		Std. Units
VOLUME BUFFERED SOLUTION	2000		mL
VOLUME EXTRACT FILTERED	2000		mL
LIQUID FRACTION			mL
TOTAL VOLUME FILTRATE	2000		mL
INITIAL TIME	9398.5		HRS
FINAL TIME	9416.6		HRS

AMBIENT TEMP: 23 DEGREES

FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Analyst: M. SCROGHAN — Analysis Date: 25-JAN-91 — Test: P130.8. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	100		mL
FINAL WEIGHT OR VOLUME	100		mL

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222255

TCLP BARIUM FAA (1 POINT MSA) SW846-7080

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M704.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BARIUM	BDL	2.0	mg/L	BDL	1.00		
ADDITION 1			mg/L	2.50			
SAMPLE			Conc	0.01			
SAMPLE + ADD 1			Conc	2.92			
DILUTION				10			

spike diluted out

TCLP CADMIUM FAA (1 POINT MSA) SW846-7130

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M708.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CADMIUM	BDL	0.02	mg/L	BDL	0.20	0.21	95
ADDITION 1			mg/L	0.50			
SAMPLE			Conc	0.02			
SAMPLE + ADD 1			Conc	0.49			
DILUTION				1			

TCLP CHROMIUM FAA (1 POINT MSA) SW846-7190

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M710.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CHROMIUM	0.10	0.05	mg/L	0.10	0.40	0.52	105
ADDITION 1			mg/L	1.00			
SAMPLE			Conc	0.10			
SAMPLE + ADD 1			Conc	1.24			
DILUTION				1			

TCLP LEAD FAA (1 POINT MSA) SW846-7420

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M716.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
LEAD	BDL	0.2	mg/L	BDL	2.00	1.85	93
ADDITION 1			mg/L	5.00			
SAMPLE			Conc	0.03			
SAMPLE + ADD 1			Conc	4.71			
DILUTION				1			

TCLP SILVER FAA (1 POINT MSA) SW846-7760

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M730.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SILVER	BDL	0.04	mg/L	BDL	0.20	0.16	80
ADDITION 1			mg/L	0.50			

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222255

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
[illegible]PLE			Conc	0.00			
[illegible]LE + ADD 1			Conc	0.47			
DILUTION				1			

GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Analyst: M. SCROGHAM Analysis Date: 25-JAN-91 Test: P130.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

TCLP ARSENIC GFAA (1 POINT MSA) SW846-7060

Analyst: P. SIMS Analysis Date: 25-JAN-91 Instrument: GFAA Test: M703.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
ARSENIC	0.049	0.005	mg/L	0.03	0.0250	0.0457	61
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.030			
SAMPLE + ADD 1			Conc	0.039			
DILUTION				1			

TCLP SELENIUM GFAA (1 POINT MSA) SW846-7740

Analyst: S. GRAY Analysis Date: 26-JAN-91 Instrument: GFAA Test: M728.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SELENIUM	BDL	0.005	mg/L	BDL	0.0250	0.0171	68
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.0022			
SAMPLE + ADD 1			Conc	0.0092			
DILUTION				2			

SPIKE DILUTION 1:3

MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Analyst: S. O'NEAL Analysis Date: 29-JAN-91 Test: P131.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10		mL
FINAL VOLUME	100		mL

TCLP MERCURY CVAA (1 POINT MSA) SW846-7470

Analyst: J. WARE Analysis Date: 30-JAN-91 Instrument: CVAA Test: M720.6. 0

Prep: MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
MERCURY	BDL	0.005	mg/L	BDL	0.0200	0.0215	108
[illegible]ION 1			mg/L	0.0010			
[illegible]E			Conc	0.000			
SAMPLE + ADD 1			Conc	0.0010			
DILUTION				1			

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222255

TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: R. BRANCH Analysis Date: 24-JAN-91 Test: P733.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	1		mL

TCLP SEMIVOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8270

Analyst: J. ELLIS Analysis Date: 25-JAN-91 Instrument: GC/MS SVOA Test: O514.7. 0

Prep: TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
1,4-DICHLOROBENZENE	BDL	50	ug/L	BDL	500	455	91
2,4-DINITROTOLUENE	BDL	50	ug/L	BDL	500	505	101
HEXACHLOROBENZENE	BDL	50	ug/L	BDL	500	670	134
HEXACHLOROBUTADIENE	BDL	50	ug/L	BDL	500	555	111
HEXACHLOROETHANE	BDL	50	ug/L	BDL	500	400	80
NITROBENZENE	BDL	50	ug/L	BDL	500	525	105
PYRIDINE		250	ug/L	BDL			
CRESYLIC ACID		120	ug/L	BDL			
2-METHYL PHENOL	BDL	50	ug/L	BDL	500	175	35
3-METHYL PHENOL		50	ug/L	BDL			
4-METHYLPHENOL	BDL	50	ug/L	BDL	500	155	31
PENTACHLOROPHENOL	BDL	250	ug/L	BDL	500	395	79
2,4,5-TRICHLOROPHENOL	BDL	1600	ug/L	BDL	500	320	64
2,4,6-TRICHLOROPHENOL	BDL	50	ug/L	BDL	500	470	95
.							
SURROGATE RECOVERY							

2-FLUOROPHENOL			% Rec	35			
PHENOL-D5			% Rec	27			
NITROBENZENE-D5			% Rec	82			
2-FLUOROBIPHENYL			% Rec	62			
2,4,6-TRIBROMOPHENOL			% Rec	94			
TERPHENYL-D14			% Rec	91			

TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: M. KEEZER Analysis Date: 29-JAN-91 Test: P733.1. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP ORGANOCHLORINE PESTICIDES BY GC:ECD SW846-8080

Analyst: A. GOZDECKI Analysis Date: 10-FEB-91 Instrument: GC/ECD Test: D164.7. 0

Prep: TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
GAMMA-BHC (LINDANE)	*	.125	mg/L	*	0.04	0	0
HEPTACHLOR	BDL	.0012	mg/L	BDL	0.16	0.165	103
[illegible]CHLOR EPOXIDE	BDL	.0012	mg/L	BDL	0.16	0.200	125
[illegible]	BDL	.0025	mg/L	BDL	0.10	0.194	195
METHOXYCHLOR	BDL	.012	mg/L	BDL	0.10	0.138	138
CHLORDANE		.012	mg/L	BDL			
TOXAPHENE	BDL	.025	mg/L	BDL	1.00	0.939	94

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222255

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
DILUTION FACTOR 1:5							

*NOTE: * GAMMA-BHC NOT REPORTABLE DUE TO MATRIX INTERFERENCE. RUN AT 1:500*
*NOTE: ** HIGH SPIKE RECOVERIES DUE TO MATRIX INTERFERENCE*
ATRAZINE WAS DETECTED IN THE SAMPLE AT HIGH LEVEL

TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Analyst: A. GOZDECKI Analysis Date: 28-JAN-91 Test: P701.4. 0
Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP CHLORINATED HERBICIDES SW846-8150

Analyst: B. WOOD Analysis Date: 01-FEB-91 Instrument: GC/ECD Test: 0253.7. 0
Prep: TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150
Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
2,4-DICHLOROPHENOXYACETIC ACID	BDL	.05	mg/L	BDL	0.0625	0.0568	91
SILVEX	BDL	.005	mg/L	BDL	0.0125	0.0193	154
DILUTION FACTOR 1:5							

*NOTE: * SILVEX SPIKE RECOVERY HIGH DUE TO COELUTION WITH MATRIX INTERFERENCES*

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: T. BILLE Analysis Date: 23-JAN-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	25.0		Grams
LIQUID PORTION	473.4		mL
LIQUID FRACTION (GRAMS)	0.00		Grams
EXTRACTED SAMPLE	25.0		Grams
PHASE ONE VOLUME (REP 0)	473.4		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: H. WILLIAMS Analysis Date: 25-JAN-91 Instrument: GC/MS VOA Test: 0513.7. 0
Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500	470	94
CARBON TETRACHLORIDE	BDL	50	ug/L	BDL	500	460	92
CHLOROBENZENE	BDL	50	ug/L	BDL	500	470	94
CHLOROFORM	BDL	50	ug/L	BDL	500	480	96
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500	520	104
1,1-DICHLOROETHYLENE	BDL	50	ug/L	BDL	500	470	94
METHYL ETHYL KETONE	BDL	100	ug/L	BDL	500	530	106
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL	500	480	96
TRICHLOROETHYLENE	BDL	50	ug/L	BDL	500	640	128
VINYL CHLORIDE	BDL	100	ug/L	BDL	500	490	98
SURROGATE RECOVERY							
DICHLOROETHANE-D4			% Rec	94			
TOLUENE-D8			% Rec	99			
BROMOFLUOROBENZENE			% Rec	102			

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222255

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
DILUTION FACTOR 1:10							

Sample Comments

THIS SAMPLE WAS SPIKED AND THE SPIKE RECOVERY INFORMATION WAS USED FOR MATRIX BIAS CORRECTIONS ON OTHER SOIL SAMPLES IN THIS BATCH.

* *See Note for Parameter*
** *See Note for Parameter*
BDL Below Detection Limit

Quality Assurance Officer: GaBusch

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 401 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-JAN-91	A222256
	Complete 14-FEB-91	PO Number 90B403C-1
	Printed 15-FEB-91	Sampled 19-JAN-91 12:25

Report To

WOODWARD CLYDE CONSULTANTS
DEJONNETT KING
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Bill To

WOODWARD CLYDE CONSULTANTS
ACCOUNTS PAYABLE
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Sample Description

SAMPLE NO.: CEDR-C-02 (0-12")
DESCRIPTION: SOIL
LOCATION:: "C"

TOTAL SOLIDS EPA 160.3

Analyst: K. SCOTT Analysis Date: 23-JAN-91 Test: G401.7. 0

Parameter	Result	Det. Limit	Units
SOLIDS	69	1	Percent

TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Analyst: R. EATON Analysis Date: 23-JAN-91 Test: P107.2. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	100		Grams
LIQUID FRACTION (GRAMS)			Grams
EXTRACTED SAMPLE	100		Grams
SOLIDS	100		Percent
9.5 MM SIEVE TEST			Passed
INITIAL PH	10.9		Std. Units
ADJUSTED PH	2.0		Std. Units
BUFFER SOLUTION PH	4.95		Std. Units
FINAL PH	5.1		Std. Units
VOLUME BUFFERED SOLUTION	2000		mL
VOLUME EXTRACT FILTERED	2000		mL
LIQUID FRACTION			mL
TOTAL VOLUME FILTRATE	2000		mL
INITIAL TIME	4751.5		HRS
FINAL TIME	4769.4		HRS

AMBIENT TEMP: 23 DEGREES

FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Analyst: M. SCROGHAM Analysis Date: 25-JAN-91 Test: P130.8. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	100		mL
FINAL WEIGHT OR VOLUME	100		mL

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222256

TCLP BARIUM FAA (1 POINT MSA) SW846-7080

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M704.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BARIUM	BDL	2.0	mg/L	BDL			
ADDITION 1			mg/L	2.50			
SAMPLE			Conc	0.17			
SAMPLE + ADD 1			Conc	2.73			
DILUTION				10			

spike diluted out

TCLP CADMIUM FAA (1 POINT MSA) SW846-7130

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M708.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CADMIUM	BDL	0.02	mg/L	BDL			95
ADDITION 1			mg/L	0.50			
SAMPLE			Conc	0.01			
SAMPLE + ADD 1			Conc	0.49			
DILUTION				1			

TCLP CHROMIUM FAA (1 POINT MSA) SW846-7190

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M710.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CHROMIUM	0.51	0.05	mg/L	0.54	4		105
ADDITION 1			mg/L	1.00			
SAMPLE			Conc	0.54			
SAMPLE + ADD 1			Conc	1.68			
DILUTION				1			

TCLP LEAD FAA (1 POINT MSA) SW846-7420

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M716.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
LEAD	BDL	0.2	mg/L	BDL			93
ADDITION 1			mg/L	5.00			
SAMPLE			Conc	0.04			
SAMPLE + ADD 1			Conc	4.74			
DILUTION				1			

TCLP SILVER FAA (1 POINT MSA) SW846-7760

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M730.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SILVER	BDL	0.04	mg/L	BDL			80
ADDITION 1			mg/L	0.50			

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222256

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
[illegible]LE			Conc	0.00			
[illegible]LE + ADD 1			Conc	0.46			
DILUTION				1			

GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Analyst: M. SCROGHAM Analysis Date: 25-JAN-91 Test: P130.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

TCLP ARSENIC GFAA (1 POINT MSA) SW846-7060

Analyst: P. SIMS Analysis Date: 25-JAN-91 Instrument: GFAA Test: M703.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
ARSENIC	0.046	0.005	mg/L	0.028	0.0250		61
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.028			
SAMPLE + ADD 1			Conc	0.038			
DILUTION				1			

TCLP SELENIUM GFAA (1 POINT MSA) SW846-7740

Analyst: S. GRAY Analysis Date: 26-JAN-91 Instrument: GFAA Test: M728.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SELENIUM	BDL	0.005	mg/L	BDL	0.0250		65
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.000			
SAMPLE + ADD 1			Conc	0.0047			
DILUTION				2			

MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Analyst: S. O'NEAL Analysis Date: 29-JAN-91 Test: P131.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10		mL
FINAL VOLUME	100		mL

TCLP MERCURY CVAA (1 POINT MSA) SW846-7470

Analyst: J. WARE Analysis Date: 30-JAN-91 Instrument: CVAA Test: M720.6. 0

Prep: MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
MERCURY	BDL	0.005	mg/L	BDL	0.0200	0.0215	108
ADDITION 1			mg/L	0.0010			
SAMPLE			Conc	0.000			
[illegible] + ADD 1			Conc	0.0010			
[illegible]ION				1			

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222256

TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: M. FRANK Analysis Date: 24-JAN-91 Test: P733.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	1		mL

TCLP SEMIVOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8270

Analyst: J. ELLIS Analysis Date: 25-JAN-91 Instrument: GC/MS SVOA Test: 0514.7. 0

Prep: TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
1,4-DICHLOROBENZENE	BDL	50	ug/L	BDL	500	455	91
2,4-DINITROTOLUENE	BDL	50	ug/L	BDL	500	505	101
HEXACHLOROBENZENE	BDL	50	ug/L	BDL	500	670	134
HEXACHLOROBUTADIENE	BDL	50	ug/L	BDL	500	555	111
HEXACHLOROETHANE	BDL	50	ug/L	BDL	500	400	80
NITROBENZENE	BDL	50	ug/L	BDL	500	525	105
PYRIDINE		250	ug/L	BDL			
CRESYLIC ACID		120	ug/L	BDL			
2-METHYL PHENOL	BDL	50	ug/L	BDL	500	175	35
3-METHYL PHENOL		50	ug/L	BDL			
4-METHYLPHENOL	BDL	50	ug/L	BDL	500	155	31
PENTACHLOROPHENOL	BDL	250	ug/L	BDL	500	395	79
2,4,5-TRICHLOROPHENOL	BDL	1600	ug/L	BDL	500	320	64
2,4,6-TRICHLOROPHENOL	BDL	50	ug/L	BDL	500	475	95
SURROGATE RECOVERY							

2-FLUOROPHENOL			% Rec	* 0			
PHENOL-D5			% Rec	* 0			
NITROBENZENE-D5			% Rec	97			
2-FLUOROBIPHENYL			% Rec	94			
2,4,6-TRIBROMOPHENOL			% Rec	10			
TERPHENYL-D14			% Rec	96			

*NOTE: * SAMPLE WAS RE-EXTRACTED WITH NO IMPROVEMENT IN SURROGATE RECOVERY*

TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: L. DOBBINS Analysis Date: 29-JAN-91 Test: P733.1. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP ORGANOCHLORINE PESTICIDES BY GC:ECD SW846-8080

Analyst: A. GOZDECKI Analysis Date: 10-FEB-91 Instrument: GC/ECD Test: 0164.7. 0

Prep: TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
GAMMA-BHC (LINDANE)	*	.125	mg/L	*	0.04	0	0
[illegible]CHLOR	BDL	.0025	mg/L	BDL	0.16	0.165	103
[illegible]CHLOR EPOXIDE	BDL	.0025	mg/L	BDL	0.16	0.200	125
ENDRIN	BDL	.005	mg/L	BDL	0.10	0.194	195
METHOXYCHLOR	BDL	.025	mg/L	BDL	0.10	0.138	138
CHLORDANE		.025	mg/L	BDL			

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222256

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
PHENE	BDL	.05	mg/L	BDL	1.00	0.939	94
ION FACTOR 1:10							

*NOTE: * GAMMA-BHC NOT REPORTABLE DUE TO MATRIX INTERFERENCE. RUN AT 1:500*
*NOTE: ** HIGH SPIKE RECOVERIES DUE TO MATRIX INTERFERENCE.*
ATRAZINE WAS DETECTED IN THE SAMPLE AT HIGH LEVEL

TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Analyst: J. MOWAT Analysis Date: 28-JAN-91 Test: P701.4. 0
Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP CHLORINATED HERBICIDES SW846-8150

Analyst: B. WOOD Analysis Date: 01-FEB-91 Instrument: GC/ECD Test: 0253.7. 0
Prep: TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150
Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
2,4-DICHLOROPHENOXYACETIC ACID	BDL	.2	mg/L	BDL	0.0625	0.0568	91
SILVEX	BDL	.02	mg/L	BDL	0.0125	0.0193	154
DILUTION FACTOR 1:20							

*NOTE: * SILVEX SPIKE RECOVERY HIGH DUE TO COELUTION WITH MATRIX INTERFERENCES*

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: T. BILLE Analysis Date: 23-JAN-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	25.0		Grams
LIQUID PORTION	478.3		mL
LIQUID FRACTION (GRAMS)	0.00		Grams
EXTRACTED SAMPLE	25.0		Grams
PHASE ONE VOLUME (REP 0)	478.3		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: H. WILLIAMS Analysis Date: 25-JAN-91 Instrument: GC/MS VOA Test: 0513.7. 0
Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500	470	94
CARBON TETRACHLORIDE	BDL	50	ug/L	BDL	500	460	92
CHLOROBENZENE	BDL	50	ug/L	BDL	500	470	94
CHLOROFORM	BDL	50	ug/L	BDL	500	480	96
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500	520	104
1,1-DICHLOROETHYLENE	BDL	50	ug/L	BDL	500	470	94
METHYL ETHYL KETONE	BDL	100	ug/L	BDL	500	530	106
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL	500	480	96
TRICHLOROETHYLENE	BDL	50	ug/L	BDL	500	640	128
VINYL CHLORIDE	BDL	100	ug/L	BDL	500	490	98
ATE RECOVERY							

DICHLOROETHANE-D4			% Rec	95			
TOLUENE-D8			% Rec	96			

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222256

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
[redacted]FLUOROBENZENE			% Rec	104			
[redacted]ION FACTOR 1:10							

Sample Comments

MATRIX BIAS CORRECTIONS WERE CALCULATED USING SPIKE RECOVERIES FROM SAMPLE A222255.

* *See Note for Parameter*
** *See Note for Parameter*
BDL Below Detection Limit

Quality Assurance Officer: GaBusch

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 501 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-JAN-91	A222257
	Complete 14-FEB-91	PO Number 90B403C-1
	Printed 15-FEB-91	Sampled 19-JAN-91 13:37

Report To

WOODWARD CLYDE CONSULTANTS
DEJONNETT KING
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Bill To

WOODWARD CLYDE CONSULTANTS
ACCOUNTS PAYABLE
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Sample Description

SAMPLE NO.: CEDR-B-01 (0-12")
DESCRIPTION: SOIL
LOCATION:: "B"

TOTAL SOLIDS EPA 160.3

Analyst: K. SCOTT Analysis Date: 23-JAN-91 Test: G401.7. 0

Parameter	Result	Det. Limit	Units
SOLIDS	69	1	Percent

TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Analyst: R. EATON Analysis Date: 23-JAN-91 Test: P107.2. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	100		Grams
LIQUID FRACTION (GRAMS)			Grams
EXTRACTED SAMPLE	100		Grams
SOLIDS	100		Percent
9.5 MM SIEVE TEST			Passed
INITIAL PH	11.6		Std. Units
ADJUSTED PH	2.7		Std. Units
BUFFER SOLUTION PH	4.95		Std. Units
FINAL PH	6.1		Std. Units
VOLUME BUFFERED SOLUTION	2000		mL
VOLUME EXTRACT FILTERED	2000		mL
LIQUID FRACTION			mL
TOTAL VOLUME FILTRATE	2000		mL
INITIAL TIME	4751.5		HRS
FINAL TIME	4769.4		HRS

AMBIENT TEMP: 23 DEGREES

FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Analyst: M. SCROGHAM Analysis Date: 25-JAN-91 Test: P130.8. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	100		mL
FINAL WEIGHT OR VOLUME	100		mL

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222257

TCLP BARIUM FAA (1 POINT MSA) SW846-7080

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M704.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BARIUM	BDL	2.0	mg/L	BDL			
ADDITION 1			mg/L	2.50			
SAMPLE			Conc	-0.03			
SAMPLE + ADD 1			Conc	2.76			
DILUTION				10			

spike diluted out

TCLP CADMIUM FAA (1 POINT MSA) SW846-7130

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M708.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CADMIUM	BDL	0.02	mg/L	BDL			95
ADDITION 1			mg/L	0.50			
SAMPLE			Conc	0.02			
SAMPLE + ADD 1			Conc	0.49			
DILUTION				1			

TCLP CHROMIUM FAA (1 POINT MSA) SW846-7190

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M710.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CHROMIUM	0.15	0.05	mg/L	0.16			105
ADDITION 1			mg/L	1.00			
SAMPLE			Conc	0.16			
SAMPLE + ADD 1			Conc	1.30			
DILUTION				1			

TCLP LEAD FAA (1 POINT MSA) SW846-7420

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M716.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
LEAD	BDL	0.2	mg/L	BDL			93
ADDITION 1			mg/L	5.00			
SAMPLE			Conc	0.05			
SAMPLE + ADD 1			Conc	4.81			
DILUTION				1			

TCLP SILVER FAA (1 POINT MSA) SW846-7760

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M730.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SILVER	BDL	0.04	mg/L	BDL			80
ADDITION 1			mg/L	0.50			

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222257

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
[illegible]LE			Conc	0.00			
[illegible]E + ADD 1			Conc	0.47			
DILUTION				1			

GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Analyst: M. SCROGHAM Analysis Date: 25-JAN-91 Test: P130.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

TCLP ARSENIC GFAA (1 POINT MSA) SW846-7060

Analyst: P. SIMS Analysis Date: 25-JAN-91 Instrument: GFAA Test: M703.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
ARSENIC	0.036	0.005	mg/L	0.022	0.0250		61
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.022			
SAMPLE + ADD 1			Conc	0.031			
DILUTION				1			

TCLP SELENIUM GFAA (1 POINT MSA) SW846-7740

Analyst: S. GRAY Analysis Date: 26-JAN-91 Instrument: GFAA Test: M728.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SELENIUM	BDL	0.005	mg/L	BDL	0.0250		68
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.0015			
SAMPLE + ADD 1			Conc	0.0093			
DILUTION				2			

MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Analyst: S. O'NEAL Analysis Date: 29-JAN-91 Test: P131.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10		mL
FINAL VOLUME	100		mL

TCLP MERCURY CVAA (1 POINT MSA) SW846-7470

Analyst: J. WARE Analysis Date: 30-JAN-91 Instrument: CVAA Test: M720.6. 0

Prep: MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
MERCURY	BDL	0.005	mg/L	BDL	0.0200	0.000	108
ADDITION 1			mg/L	0.0010			
SAMPLE			Conc	0.000			
[illegible]E + ADD 1			Conc	0.0010			
[illegible]ION				1			

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222257

TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: M. FRANK Analysis Date: 24-JAN-91 Test: P733.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	1		mL

TCLP SEMIVOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8270

Analyst: J. ELLIS Analysis Date: 28-JAN-91 Instrument: GC/MS SVOA Test: 0514.7. 0

Prep: TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
1,4-DICHLOROBENZENE	BDL	50	ug/L	BDL	500	455	91
2,4-DINITROTOLUENE	BDL	50	ug/L	BDL	500	505	101
HEXACHLOROBENZENE	BDL	50	ug/L	BDL	500	670	134
HEXACHLOROBUTADIENE	BDL	50	ug/L	BDL	500	555	111
HEXACHLOROETHANE	BDL	50	ug/L	BDL	500	400	80
NITROBENZENE	BDL	50	ug/L	BDL	500	425	105
PYRIDINE		250	ug/L	BDL			
CRESYLIC ACID		120	ug/L	BDL			
2-METHYL PHENOL	BDL	50	ug/L	BDL	500	175	35
3-METHYL PHENOL		50	ug/L	BDL			
4-METHYLPHENOL	BDL	50	ug/L	BDL	500	155	31
PENTACHLOROPHENOL	BDL	250	ug/L	BDL	500	395	79
2,4,5-TRICHLOROPHENOL	BDL	1600	ug/L	BDL	500	320	64
2,4,6-TRICHLOROPHENOL	BDL	50	ug/L	BDL	500	475	95
.							
SURROGATE RECOVERY							

2-FLUOROPHENOL			% Rec	33			
PHENOL-D5			% Rec	28			
NITROBENZENE-D5			% Rec	113			
2-FLUOROBIPHENYL			% Rec	119			
2,4,6-TRIBROMOPHENOL			% Rec	50			
TERPHENYL-D14			% Rec	109			

TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: L. DOBBINS Analysis Date: 29-JAN-91 Test: P733.1. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP ORGANOCHLORINE PESTICIDES BY GC:ECD SW846-8080

Analyst: A. GOZDECKI Analysis Date: 10-FEB-91 Instrument: GC/ECD Test: 0164.7. 0

Prep: TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
GAMMA-BHC (LINDANE)	*	0.025	mg/L	*	0.04	0	0
HEPTACHLOR	BDL	0.00025	mg/L	BDL	0.16	0.165	103
HEPTACHLOR EPOXIDE	BDL	0.00025	mg/L	BDL	0.16	0.200	125
[illegible]	BDL	0.00050	mg/L	BDL	0.10	0.194	195
[illegible]YCHLOR	BDL	0.0025	mg/L	BDL	0.10	0.138	138
CHLORDANE		0.0025	mg/L	BDL			
TOXAPHENE	BDL	0.0050	mg/L	BDL	1.00	0.939	94

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222257

*NOTE: * GAMMA-BHC NOT REPORTABLE DUE TO MATRIX INTERFERENCE. RUN AT 1:100*
*NOTE: ** HIGH SPIKE RECOVERIES DUE TO MATRIX INTERFERENCE.*
ATRAZINE WAS DETECTED IN THE SAMPLE AT A HIGH LEVEL.

TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Analyst: J. MOWAT Analysis Date: 28-JAN-91 Test: P701.4. 0
Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP CHLORINATED HERBICIDES SW846-8150

Analyst: B. WOOD Analysis Date: 01-FEB-91 Instrument: GC/ECD Test: 0253.7. 0
Prep: TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150
Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
2,4-DICHLOROPHENOXYACETIC ACID	BDL	0.01	mg/L	BDL	0.0625	0.0568	91
SILVEX	BDL	0.001	mg/L	BDL	0.0125	0.0193	154

NOTE: SILVEX SPIKE RECOVERY HIGH DUE TO COELUTION WITH MATRIX INTERFERENCES

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: T. BILLE Analysis Date: 23-JAN-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	25.0		Grams
LIQUID PORTION	496.6		mL
LIQUID FRACTION (GRAMS)	0.00		Grams
EXTRACTED SAMPLE	25.0		Grams
PHASE ONE VOLUME (REP 0)	496.6		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: H. WILLIAMS Analysis Date: 25-JAN-91 Instrument: GC/MS VOA Test: 0513.7. 0
Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500	470	94
CARBON TETRACHLORIDE	BDL	50	ug/L	BDL	500	460	92
CHLOROBENZENE	BDL	50	ug/L	BDL	500	470	94
CHLOROFORM	BDL	50	ug/L	BDL	500	480	96
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500	520	104
1,1-DICHLOROETHYLENE	BDL	50	ug/L	BDL	500	470	94
METHYL ETHYL KETONE	BDL	100	ug/L	BDL	500	530	106
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL	500	480	96
TRICHLOROETHYLENE	BDL	50	ug/L	BDL	500	640	128
VINYL CHLORIDE	BDL	100	ug/L	BDL	500	490	98
SURROGATE RECOVERY							
DICHLOROETHANE-D4			% Rec	100			
TOLUENE-D8			% Rec	98			
BROMOFLUOROBENZENE			% Rec	102			
DILUTION FACTOR 1:10							

Sample Comments
MATRIX BIAS CORRECTIONS WERE CALCULATED USING SPIKE RECOVERIES FROM

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222257

Sample Comments

SAMPLE A222255.

See Note for Parameter
** *See Note for Parameter*
BDL Below Detection Limit

Quality Assurance Officer: GaBusch

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 001 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-JAN-91	A222258
	Complete 14-FEB-91	PO Number 90B403C-1
	Printed 15-FEB-91	Sampled 19-JAN-91 14:05

Report To

WOODWARD CLYDE CONSULTANTS
DEJONNETT KING
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Bill To

WOODWARD CLYDE CONSULTANTS
ACCOUNTS PAYABLE
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Sample Description

SAMPLE NO.: CEDR-B-02 (0-12")
DESCRIPTION: SOIL
LOCATION:: "B"

TOTAL SOLIDS EPA 160.3

Analyst: K. SCOTT — Analysis Date: 23-JAN-91 — Test: G401.7, 0

Parameter	Result	Det. Limit	Units
SOLIDS	71	1	Percent

TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Analyst: R. EATON — Analysis Date: 23-JAN-91 — Test: P107.2, 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	100		Grams
LIQUID FRACTION (GRAMS)			Grams
EXTRACTED SAMPLE	100		Grams
SOLIDS	100		Percent
9.5 MM SIEVE TEST			Passed
INITIAL PH	11.3		Std. Units
ADJUSTED PH	2.0		Std. Units
BUFFER SOLUTION PH	4.95		Std. Units
FINAL PH	5.8		Std. Units
VOLUME BUFFERED SOLUTION	2000		mL
VOLUME EXTRACT FILTERED	2000		mL
LIQUID FRACTION			mL
TOTAL VOLUME FILTRATE	2000		mL
INITIAL TIME	4751.5		HRS
FINAL TIME	4769.4		HRS

AMBIENT TEMP: 23 DEGREES

FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Analyst: M. SCROGHAM — Analysis Date: 25-JAN-91 — Test: P130.8, 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	100		mL
FINAL WEIGHT OR VOLUME	100		mL

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222258

TCLP BARIUM FAA (1 POINT MSA) SW846-7080

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M704.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BARIUM	4.4	2.0	mg/L	4.4			
ADDITION 1			mg/L	2.50			
SAMPLE			Conc	0.44			
SAMPLE + ADD 1			Conc	2.80			
DILUTION				10			

spike diluted out

TCLP CADMIUM FAA (1 POINT MSA) SW846-7130

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M708.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CADMIUM	BDL	0.02	mg/L	BDL			95
ADDITION 1			mg/L	0.50			
SAMPLE			Conc	0.02			
SAMPLE + ADD 1			Conc	0.49			
DILUTION				1			

TCLP CHROMIUM FAA (1 POINT MSA) SW846-7190

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M710.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CHROMIUM	0.24	0.05	mg/L	0.24			105
ADDITION 1			mg/L	1.00			
SAMPLE			Conc	0.24			
SAMPLE + ADD 1			Conc	1.39			
DILUTION				1			

TCLP LEAD FAA (1 POINT MSA) SW846-7420

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M716.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
LEAD	BDL	0.2	mg/L	BDL			93
ADDITION 1			mg/L	5.00			
SAMPLE			Conc	0.02			
SAMPLE + ADD 1			Conc	4.76			
DILUTION				1			

TCLP SILVER FAA (1 POINT MSA) SW846-7760

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M730.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SILVER	BDL	0.04	mg/L	BDL			80
ADDITION 1			mg/L	0.50			

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222258

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
[illegible]LE			Conc	0.00			
[illegible]E + ADD 1			Conc	0.47			
DILUTION				1			

GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Analyst: M. SCROGHAM Analysis Date: 25-JAN-91 Test: P130.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

TCLP ARSENIC GFAA (1 POINT MSA) SW846-7060

Analyst: P. SIMS Analysis Date: 25-JAN-91 Instrument: GFAA Test: M703.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
ARSENIC	0.034	0.005	mg/L	0.021	0.0250		61
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.021			
SAMPLE + ADD 1			Conc	0.031			
DILUTION				1			

TCLP SELENIUM GFAA (1 POINT MSA) SW846-7740

Analyst: S. GRAY Analysis Date: 26-JAN-91 Instrument: GFAA Test: M728.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SELENIUM	BDL	0.005	mg/L	BDL	0.0250		68
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.0001			
SAMPLE + ADD 1			Conc	0.0053			
DILUTION				2			

MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Analyst: S. O'NEAL Analysis Date: 29-JAN-91 Test: P131.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10		mL
FINAL VOLUME	100		mL

TCLP MERCURY CVAA (1 POINT MSA) SW846-7470

Analyst: J. WARE Analysis Date: 30-JAN-91 Instrument: CVAA Test: M720.6. 0

Prep: MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
MERCURY	BDL	0.005	mg/L	BDL	0.0200		108
ADDITION 1			mg/L	0.0010			
SAMPLE			Conc	0.000			
[illegible] + ADD 1			Conc	0.00215			
[illegible]ON				1			

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222258

TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: R. BRANCH Analysis Date: 24-JAN-91 Test: P733.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	1		mL

TCLP SEMIVOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8270

Analyst: M. DONOFRIO Analysis Date: 25-JAN-91 Instrument: GC/MS SVOA Test: 0514.7. 0

Prep: TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
1,4-DICHLOROBENZENE	BDL	50	ug/L	BDL	500	455	91
2,4-DINITROTOLUENE	BDL	50	ug/L	BDL	500	505	101
HEXACHLOROBENZENE	BDL	50	ug/L	BDL	500	670	134
HEXACHLOROBUTADIENE	BDL	50	ug/L	BDL	500	555	111
HEXACHLOROETHANE	BDL	50	ug/L	BDL	500	400	80
NITROBENZENE	BDL	50	ug/L	BDL	500	525	105
PYRIDINE		250	ug/L	BDL			
CRESYLIC ACID		120	ug/L	BDL			
2-METHYL PHENOL	BDL	50	ug/L	BDL	500	175	35
3-METHYL PHENOL		50	ug/L	BDL			
4-METHYLPHENOL	BDL	50	ug/L	BDL	500	155	31
PENTACHLOROPHENOL	BDL	250	ug/L	BDL	500	395	79
2,4,5-TRICHLOROPHENOL	BDL	1600	ug/L	BDL	500	320	64
2,4,6-TRICHLOROPHENOL	BDL	50	ug/L	BDL	500	470	95
SURROGATE RECOVERY							
2-FLUOROPHENOL			% Rec	21			
PHENOL-D5			% Rec	15			
NITROBENZENE-D5			% Rec	95			
2-FLUOROBIPHENYL			% Rec	88			
2,4,6-TRIBROMOPHENOL			% Rec	59			
TERPHENYL-D14			% Rec	83			

TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: M. KEEZER Analysis Date: 29-JAN-91 Test: P733.1. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP ORGANOCHLORINE PESTICIDES BY GC:ECD SW846-8080

Analyst: A. GOZDECKI Analysis Date: 10-FEB-91 Instrument: GC/ECD Test: 0164.7. 0

Prep: TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
GAMMA-BHC (LINDANE)	*	0.025	mg/L	*	0.04	0	0
HEPTACHLOR	BDL	0.00025	mg/L	BDL	0.16	0.165	103
HEPTACHLOR EPOXIDE	BDL	0.00025	mg/L	BDL	0.16	0.200	125
E[illegible]	BDL	0.00050	mg/L	BDL	0.10	0.194	195
M[illegible]YCHLOR	BDL	0.0025	mg/L	BDL	0.10	0.138	138
CHLORDANE		0.0025	mg/L	BDL			
TOXAPHENE	BDL	0.0050	mg/L	BDL	1.00	0.939	94

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222258

*NOTE: * GAMMA-BHC NOT REPORTABLE DUE TO MATRIX INTERFERENCE. RUN AT 1:100*
*NOTE: ** HIGH SPIKE RECOVERIES DUE TO MATRIX INTERFERENCE.*
ATRAZINE WAS DETECTED IN THE SAMPLE AT A HIGH LEVEL.

TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Analyst: A. GOZDECKI Analysis Date: 28-JAN-91 Test: P701.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP CHLORINATED HERBICIDES SW846-8150

Analyst: B. WOOD Analysis Date: 01-FEB-91 Instrument: GC/ECD Test: 0253.7. 0

Prep: TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
2,4-DICHLOROPHENOXYACETIC ACID	BDL	0.01	mg/L	BDL	0.0625	0.0568	91
SILVEX	BDL	0.001	mg/L	BDL	0.0125	0.0193	154

*NOTE: * SILVEX SPIKE RECOVERY HIGH DUE TO COELUTION WITH INTERFERENCES*

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: T. BILLE Analysis Date: 23-JAN-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	25.0		Grams
LIQUID PORTION	477.9		mL
LIQUID FRACTION (GRAMS)	0.00		Grams
EXTRACTED SAMPLE	25.0		Grams
PHASE ONE VOLUME (REP 0)	477.9		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: H. WILLIAMS Analysis Date: 25-JAN-91 Instrument: GC/MS VOA Test: 0513.7. 0

Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500	470	94
CARBON TETRACHLORIDE	BDL	50	ug/L	BDL	500	460	92
CHLOROBENZENE	BDL	50	ug/L	BDL	500	470	94
CHLOROFORM	BDL	50	ug/L	BDL	500	480	96
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500	520	104
1,1-DICHLOROETHYLENE	BDL	50	ug/L	BDL	500	470	94
METHYL ETHYL KETONE	BDL	100	ug/L	BDL	500	530	106
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL	500	480	96
TRICHLOROETHYLENE	BDL	50	ug/L	BDL	500	640	128
VINYL CHLORIDE	BDL	100	ug/L	BDL	500	490	98
.							
SURROGATE RECOVERY							

DICHLOROETHANE-D4			% Rec	99			
TOLUENE-D8			% Rec	100			
[illegible]OFLUOROBENZENE			% Rec	102			
[illegible]ION FACTOR 1:10							

Sample Comments

MATRIX BIAS CORRECTIONS WERE CALCULATED USING SPIKE RECOVERIES FROM

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222258

Sample Comments

SAMPLE A222255.

● *See Note for Parameter*
** *See Note for Parameter*
BDL Below Detection Limit

Quality Assurance Officer: GaBusch

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-JAN-91	A222259
	Complete 14-FEB-91	PO Number 90B403C-1
	Printed 15-FEB-91	Sampled 19-JAN-91 14:26

Report To	Bill To
WOODWARD CLYDE CONSULTANTS DEJONNETT KING SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206	WOODWARD CLYDE CONSULTANTS ACCOUNTS PAYABLE SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206

Sample Description

SAMPLE NO.: CEDR-B-03 (0-12")
DESCRIPTION: SOIL
LOCATION:: "B"

TOTAL SOLIDS EPA 160.3

Analyst: K. SCOTT — Analysis Date: 23-JAN-91 — Test: G401.7. 0

Parameter	Result	Det. Limit	Units
SOLIDS	72	1	Percent

TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Analyst: R. EATON — Analysis Date: 23-JAN-91 — Test: P107.2. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	100		Grams
LIQUID FRACTION (GRAMS)			Grams
EXTRACTED SAMPLE	100		Grams
SOLIDS	100		Percent
9.5 MM SIEVE TEST			Passed
INITIAL PH	11.3		Std. Units
ADJUSTED PH	2.0		Std. Units
BUFFER SOLUTION PH	4.96		Std. Units
FINAL PH	6.4		Std. Units
VOLUME BUFFERED SOLUTION	2000		mL
VOLUME EXTRACT FILTERED	2000		mL
LIQUID FRACTION			mL
TOTAL VOLUME FILTRATE	2000		mL
INITIAL TIME	8999.5		HRS
FINAL TIME	9017.1		HRS

AMBIENT TEMP: 23 DEGREES

FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Analyst: M. SCROGHAM — Analysis Date: 25-JAN-91 — Test: P130.8. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	100		mL
FINAL WEIGHT OR VOLUME	100		mL

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222259

TCLP BARIUM FAA (1 POINT MSA) SW846-7080

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M704.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BARIUM	BDL	2.0	mg/L	BDL			
ADDITION 1			mg/L	2.50			
SAMPLE			Conc	0.03			
SAMPLE + ADD 1			Conc	2.69			
DILUTION				10			

spike diluted out

TCLP CADMIUM FAA (1 POINT MSA) SW846-7130

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M708.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CADMIUM	BDL	0.02	mg/L	BDL			95
ADDITION 1			mg/L	0.50			
SAMPLE			Conc	0.02			
SAMPLE + ADD 1			Conc	0.49			
DILUTION				1			

TCLP CHROMIUM FAA (1 POINT MSA) SW846-7190

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M710.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CHROMIUM	0.09	0.05	mg/L	0.09			105
ADDITION 1			mg/L	1.00			
SAMPLE			Conc	0.09			
SAMPLE + ADD 1			Conc	1.20			
DILUTION				1			

TCLP LEAD FAA (1 POINT MSA) SW846-7420

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M716.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
LEAD	BDL	0.2	mg/L	BDL			93
ADDITION 1			mg/L	5.00			
SAMPLE			Conc	0.16			
SAMPLE + ADD 1			Conc	4.85			
DILUTION				1			

TCLP SILVER FAA (1 POINT MSA) SW846-7760

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M730.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SILVER	BDL	0.04	mg/L	BDL			80
ADDITION 1			mg/L	0.50			

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222259

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
[illegible]LE			Conc	0.00			
[illegible]E + ADD 1			Conc	0.48			
DILUTION				1			

GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Analyst: M. SCROGHAM Analysis Date: 25-JAN-91 Test: P130.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

TCLP ARSENIC GFAA (1 POINT MSA) SW846-7060

Analyst: P. SIMS Analysis Date: 25-JAN-91 Instrument: GFAA Test: M703.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
ARSENIC	0.0380	0.005	mg/L	0.023	0.0250		61
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.023			
SAMPLE + ADD 1			Conc	0.032			
DILUTION				1			

TCLP SELENIUM GFAA (1 POINT MSA) SW846-7740

Analyst: S. GRAY Analysis Date: 26-JAN-91 Instrument: GFAA Test: M728.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SELENIUM	BDL	0.005	mg/L	BDL	0.0250		68
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.0005			
SAMPLE + ADD 1			Conc	0.0077			
DILUTION				2			

MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Analyst: S. O'NEAL Analysis Date: 29-JAN-91 Test: P131.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10		mL
FINAL VOLUME	100		mL

TCLP MERCURY CVAA (1 POINT MSA) SW846-7470

Analyst: J. WARE Analysis Date: 30-JAN-91 Instrument: CVAA Test: M720.6. 0

Prep: MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
MERCURY	BDL	0.005	mg/L	BDL	0.0200		108
ADDITION 1			mg/L	0.0010			
SAMPLE			Conc	0.000			
[illegible] + ADD 1			Conc	0.00215			
[illegible]ON				1			

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222259

TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: M. FRANK Analysis Date: 25-JAN-91 Test: P733.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	1		mL

TCLP SEMIVOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8270

Analyst: M. DONOFRIO Analysis Date: 26-JAN-91 Instrument: GC/MS SVOA Test: 0514.7. 0

Prep: TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
1,4-DICHLOROBENZENE	BDL	50	ug/L	BDL	500	455	91
2,4-DINITROTOLUENE	BDL	50	ug/L	BDL	500	505	101
HEXACHLOROBENZENE	BDL	50	ug/L	BDL	500	670	134
HEXACHLOROBUTADIENE	BDL	50	ug/L	BDL	500	555	111
HEXACHLOROETHANE	BDL	50	ug/L	BDL	500	400	80
NITROBENZENE	BDL	50	ug/L	BDL	500	525	105
PYRIDINE		250	ug/L	BDL			
CRESYLIC ACID		120	ug/L	BDL			
2-METHYL PHENOL	BDL	50	ug/L	BDL	500	175	35
3-METHYL PHENOL		50	ug/L	BDL			
4-METHYLPHENOL	BDL	50	ug/L	BDL	500	155	31
PENTACHLOROPHENOL	BDL	250	ug/L	BDL	500	395	79
2,4,5-TRICHLOROPHENOL	BDL	1600	ug/L	BDL	500	320	64
2,4,6-TRICHLOROPHENOL	BDL	50	ug/L	BDL	500	470	95
.							
SURROGATE RECOVERY							

2-FLUOROPHENOL			% Rec	53			
PHENOL-D5			% Rec	38			
NITROBENZENE-D5			% Rec	97			
2-FLUOROBIPHENYL			% Rec	79			
2,4,6-TRIBROMOPHENOL			% Rec	62			
TERPHENYL-D14			% Rec	96			

TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: M. KEEZER Analysis Date: 29-JAN-91 Test: P733.1. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP ORGANOCHLORINE PESTICIDES BY GC:ECD SW846-8080

Analyst: A. GOZDECKI Analysis Date: 10-FEB-91 Instrument: GC/ECD Test: 0164.7. 0

Prep: TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
GAMMA-BHC (LINDANE)	*	.025	mg/L	*	0.04	0	0
HEPTACHLOR	BDL	.0012	mg/L	BDL	0.16	0.165	103
HEPTACHLOR EPOXIDE	BDL	.0012	mg/L	BDL	0.16	0.200	125
[illegible]	BDL	.0025	mg/L	BDL	0.10	0.194	195
[illegible]YCHLOR	BDL	.012	mg/L	BDL	0.10	0.138	138
CHLORDANE		.012	mg/L	BDL			
TOXAPHENE	BDL	.025	mg/L	BDL	1.00	0.939	94
DILUTION FACTOR 1:5							

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222259

*NOTE: * GAMMA-BHC NOT REPORTABLE DUE TO MATRIX INTERFERENCE. RUN AT 1:100*
*NOTE: ** HIGH SPIKE RECOVERIES DUE TO MATRIX INTERFERENCE.*
ATRAZINE WAS DETECTED IN THE SAMPLE AT A HIGH LEVEL.

TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Analyst: A. GOZDECKI Analysis Date: 28-JAN-91 Test: P701.4. 0
Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP CHLORINATED HERBICIDES SW846-8150

Analyst: B. WOOD Analysis Date: 01-FEB-91 Instrument: GC/ECD Test: 0253.7. 0
Prep: TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150
Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
2,4-DICHLOROPHENOXYACETIC ACID	BDL	0.01	mg/L	BDL	0.0625	0.0568	91
SILVEX	BDL	0.001	mg/L	BDL	0.0125	0.0193	154

*NOTE: * SILVEX SPIKE RECOVERY HIGH DUE TO COELUTION WITH MATRIX INTERFERENCES*

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: T. BILLE Analysis Date: 23-JAN-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	25.0		Grams
LIQUID PORTION	477.5		mL
LIQUID FRACTION (GRAMS)	0.00		Grams
EXTRACTED SAMPLE	25.0		Grams
PHASE ONE VOLUME (REP 0)	477.5		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: H. WILLIAMS Analysis Date: 25-JAN-91 Instrument: GC/MS VOA Test: 0513.7. 0
Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500	470	94
CARBON TETRACHLORIDE	BDL	50	ug/L	BDL	500	460	92
CHLOROBENZENE	BDL	50	ug/L	BDL	500	470	94
CHLOROFORM	BDL	50	ug/L	BDL	500	480	96
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500	520	104
1,1-DICHLOROETHYLENE	BDL	50	ug/L	BDL	500	470	94
METHYL ETHYL KETONE	BDL	100	ug/L	BDL	500	530	106
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL	500	480	96
TRICHLOROETHYLENE	BDL	50	ug/L	BDL	500	640	128
VINYL CHLORIDE	BDL	100	ug/L	BDL	500	490	98
SURROGATE RECOVERY							
DICHLOROETHANE-D4			ug/L	BDL			
DICHLOROETHANE-D4			% Rec	94			
TOLUENE-D8			% Rec	98			
[illegible]LUOROBENZENE			% Rec	101			
DILUTION FACTOR 1:10							

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222260

TCLP BARIUM FAA (1 POINT MSA) SW846-7080

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M704.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BARIUM	BDL	2.0	mg/L	BDL			
ADDITION 1			mg/L	2.50			
SAMPLE			Conc	0.07			
SAMPLE + ADD 1			Conc	2.66			
DILUTION				10			

spike diluted out

TCLP CADMIUM FAA (1 POINT MSA) SW846-7130

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M708.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CADMIUM	BDL	0.02	mg/L	BDL			95
ADDITION 1			mg/L	0.50			
SAMPLE			Conc	0.01			
SAMPLE + ADD 1			Conc	0.49			
DILUTION				1			

TCLP CHROMIUM FAA (1 POINT MSA) SW846-7190

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M710.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CHROMIUM	0.09	0.05	mg/L	0.09			105
ADDITION 1			mg/L	1.00			
SAMPLE			Conc	0.09			
SAMPLE + ADD 1			Conc	1.21			
DILUTION				1			

TCLP LEAD FAA (1 POINT MSA) SW846-7420

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M716.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
LEAD	BDL	0.2	mg/L	BDL			93
ADDITION 1			mg/L	5.00			
SAMPLE			Conc	0.02			
SAMPLE + ADD 1			Conc	4.80			
DILUTION				1			

TCLP SILVER FAA (1 POINT MSA) SW846-7760

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M730.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SILVER	BDL	0.04	mg/L	BDL			80
ADDITION 1			mg/L	0.50			

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 01 W. MORRIS ST. NDIANAPOLIS, IN 46231 (317)243-8305	22-JAN-91	A222260
	Complete 14-FEB-91	PO Number 90B403C-1
	Printed 15-FEB-91	Sampled 19-JAN-91 14:52

Report To

WOODWARD CLYDE CONSULTANTS
DEJONNETT KING
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Bill To

WOODWARD CLYDE CONSULTANTS
ACCOUNTS PAYABLE
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Sample Description

SAMPLE NO.: CEDR-B-04 (0-12")
DESCRIPTION: SOIL
LOCATION:: "B"

TOTAL SOLIDS EPA 160.3

Analyst: K. SCOTT — Analysis Date: 23-JAN-91 — Test: G401.7. 0

Parameter	Result	Det. Limit	Units
SOLIDS	71	1	Percent

TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Analyst: R. EATON — Analysis Date: 23-JAN-91 — Test: P107.2. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	100		Grams
LIQUID FRACTION (GRAMS)			Grams
EXTRACTED SAMPLE	100		Grams
SOLIDS	100		Percent
9.5 MM SIEVE TEST			Passed
INITIAL PH	10.9		Std. Units
ADJUSTED PH	2.0		Std. Units
BUFFER SOLUTION PH	4.96		Std. Units
FINAL PH	5.3		Std. Units
VOLUME BUFFERED SOLUTION	2000		mL
VOLUME EXTRACT FILTERED	2000		mL
LIQUID FRACTION			mL
TOTAL VOLUME FILTRATE	2000		mL
INITIAL TIME	8999.5		HRS
FINAL TIME	9017.1		HRS

AMBIENT TEMP: 23 DEGREES

FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Analyst: M. SCROGHAM — Analysis Date: 25-JAN-91 — Test: P130.8. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	100		mL
FINAL WEIGHT OR VOLUME	100		mL

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222259

Sample Comments

MATRIX BIAS CORRECTIONS WERE CALCULATED USING SPIKE RECOVERIES FROM SAMPLE A222255.

*	*See Note for Parameter*
**	*See Note for Parameter*
BDL	*Below Detection Limit*

Quality Assurance Officer: GaBusch

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222260

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SAMPLE			Conc	0.00			
SAMPLE + ADD 1			Conc	0.47			
DILUTION				1			

GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Analyst: M. SCROGHAM Analysis Date: 25-JAN-91 Test: P130.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

TCLP ARSENIC GFAA (1 POINT MSA) SW846-7060

Analyst: P. SIMS Analysis Date: 25-JAN-91 Instrument: GFAA Test: M703.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
ARSENIC	BDL	0.005	mg/L	BDL	0.0250		61
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.0038			
SAMPLE + ADD 1			Conc	0.013			
DILUTION				1			

TCLP SELENIUM GFAA (1 POINT MSA) SW846-7740

Analyst: S. GRAY Analysis Date: 26-JAN-91 Instrument: GFAA Test: M728.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SELENIUM	BDL	0.005	mg/L	BDL	0.0250		68
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.0005			
SAMPLE + ADD 1			Conc	0.0080			
DILUTION				2			

MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Analyst: S. O'NEAL Analysis Date: 29-JAN-91 Test: P131.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10		mL
FINAL VOLUME	100		mL

TCLP MERCURY CVAA (1 POINT MSA) SW846-7470

Analyst: J. WARE Analysis Date: 30-JAN-91 Instrument: CVAA Test: M720.6. 0

Prep: MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
MERCURY	BDL	0.005	mg/L	BDL	0.0200		108
ADDITION 1			mg/L	0.0010			
SAMPLE			Conc	0.000			
SAMPLE + ADD 1			Conc	0.00215			
DILUTION				1			

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222260

TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: M. FRANK Analysis Date: 25-JAN-91 Test: P733.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	1		mL

TCLP SEMIVOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8270

Analyst: M. DONOFRIO Analysis Date: 31-JAN-91 Instrument: GC/MS SVOA Test: O514.7. 0

Prep: TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
1,4-DICHLOROBENZENE	BDL	50	ug/L	BDL	500	455	91
2,4-DINITROTOLUENE	BDL	50	ug/L	BDL	500	505	101
HEXACHLOROBENZENE	BDL	50	ug/L	BDL	500	670	134
HEXACHLOROBUTADIENE	BDL	50	ug/L	BDL	500	555	111
HEXACHLOROETHANE	BDL	50	ug/L	BDL	500	400	80
NITROBENZENE	BDL	50	ug/L	BDL	500	525	105
2-METHYL PHENOL	BDL	50	ug/L	BDL	500	175	35
4-METHYLPHENOL	BDL	50	ug/L	BDL	500	155	31
PENTACHLOROPHENOL	BDL	250	ug/L	BDL	500	395	79
2,4,5-TRICHLOROPHENOL	BDL	1600	ug/L	BDL	500	320	64
2,4,6-TRICHLOROPHENOL	BDL	50	ug/L	BDL	500	470	95
SURROGATE RECOVERY							
2-FLUOROPHENOL			% Rec	2			
PHENOL-D5			% Rec	0			
NITROBENZENE-D5			% Rec	94			
2-FLUOROBIPHENYL			% Rec	99			
2,4,6-TRIBROMOPHENOL			% Rec	87			
TERPHENYL-D14			% Rec	90			

NOTE: SAMPLE EXTRACTED TWICE WITH NO IMPROVEMENT IN SURROGATE RECOVERY.

TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: L. DOBBINS Analysis Date: 29-JAN-91 Test: P733.1. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP ORGANOCHLORINE PESTICIDES BY GC:ECD SW846-8080

Analyst: A. GOZDECKI Analysis Date: 10-FEB-91 Instrument: GC/ECD Test: O164.7. 0

Prep: TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
GAMMA-BHC (LINDANE)	*	0.025	mg/L	*	0.04	0.00	0.00
HEPTACHLOR	BDL	.00025	mg/L	BDL	0.16	0.165	103
HEPTACHLOR EPOXIDE	BDL	.00025	mg/L	BDL	0.16	0.200	125
ENDRIN	BDL	.0005	mg/L	BDL	0.10	0.194	195
METHOXYCHLOR	BDL	.0025	mg/L	BDL	1.00	0.138	138
[illegible]ANE		.0025	mg/L	BDL			
TOXAPHENE	BDL	.005	mg/L	BDL	1.00	0.939	94

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222260

*NOTE: * GAMMA-BHC NOT REPORTABLE DUE TO MATRIX INTERFERENCE*
*NOTE: ** HIGH SPIKE RECOVERIES DUE TO MATRIX INTERFERENCE*
NOTE: ATRAZINE WAS DETECTED IN THE SAMPLE AT A HIGH LEVEL
*NOTE: * FROM 1:100 DILUTION*

TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Analyst: J. MOWAT Analysis Date: 28-JAN-91 Test: P701.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP CHLORINATED HERBICIDES SW846-8150

Analyst: B. WOOD Analysis Date: 01-FEB-91 Instrument: GC/ECD Test: 0253.7. 0

Prep: TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
2,4-DICHLOROPHENOXYACETIC ACID	BDL	0.01	mg/L	BDL	0.0625	0.0568	91
SILVEX	BDL	0.001	mg/L	BDL	0.0125	0.0193	154

*NOTE: * SILVEX SPIKE RECOVERY HIGH DUE TO COELUTION WITH MATRIX INTERFERENCES*

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: J. MINNIEAR, II Analysis Date: 24-JAN-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	25.0		Grams
LIQUID PORTION	481.41		mL
LIQUID FRACTION (GRAMS)	0.00		Grams
EXTRACTED SAMPLE	25.0		Grams
PHASE ONE VOLUME (REP 0)	481.41		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: H. WILLIAMS Analysis Date: 25-JAN-91 Instrument: GC/MS VOA Test: 0513.7. 0

Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500	470	94
CARBON TETRACHLORIDE	BDL	50	ug/L	BDL	500	460	92
CHLOROBENZENE	BDL	50	ug/L	BDL	500	470	94
CHLOROFORM	BDL	50	ug/L	BDL	500	480	96
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500	520	104
1,1-DICHLOROETHYLENE	BDL	50	ug/L	BDL	500	470	94
METHYL ETHYL KETONE	BDL	100	ug/L	BDL	500	530	106
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL	500	480	96
TRICHLOROETHYLENE	BDL	50	ug/L	BDL	500	640	128
VINYL CHLORIDE	BDL	100	ug/L	BDL	500	490	98
.							
SURROGATE RECOVERY							

DICHLOROETHANE-D4			% Rec	103			
TOLUENE-D8			% Rec	98			
[illegible]FLUOROBENZENE			% Rec	102			
DILUTION FACTOR 1:10							

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222260

Sample Comments

MATRIX BIAS CORRECTIONS WERE CALCULATED USING SPIKE RECOVERIES FROM SAMPLE A222255.

*	*See Note for Parameter*
**	*See Note for Parameter*
BDL	*Below Detection Limit*

Quality Assurance Officer: GaBusch

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222261

TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: J. MINNIEAR, II Analysis Date: 25-JAN-91 Test: P733.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	1		mL

TCLP SEMIVOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8270

Analyst: M. DONOFRIO Analysis Date: 26-JAN-91 Instrument: GC/MS SVOA Test: 0514.7. 0

Prep: TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
1,4-DICHLOROBENZENE	BDL	50	ug/L	BDL	500	455	91
2,4-DINITROTOLUENE	BDL	50	ug/L	BDL	500	505	101
HEXACHLOROBENZENE	BDL	50	ug/L	BDL	500	670	134
HEXACHLOROBUTADIENE	BDL	50	ug/L	BDL	500	555	111
HEXACHLOROETHANE	BDL	50	ug/L	BDL	500	400	80
NITROBENZENE	BDL	50	ug/L	BDL	500	525	105
PYRIDINE		250	ug/L	BDL			
CRESYLIC ACID		120	ug/L	BDL			
2-METHYL PHENOL	BDL	50	ug/L	BDL	500	175	35
3-METHYL PHENOL		50	ug/L	BDL			
4-METHYLPHENOL	BDL	50	ug/L	BDL	500	155	31
PENTACHLOROPHENOL	BDL	250	ug/L	BDL	500	395	79
2,4,5-TRICHLOROPHENOL	BDL	1600	ug/L	BDL	500	320	64
2,4,6-TRICHLOROPHENOL	BDL	50	ug/L	BDL	500	470	95
SURROGATE RECOVERY							
2-FLUOROPHENOL			% Rec	40			
PHENOL-D5			% Rec	27			
NITROBENZENE-D5			% Rec	47			
2-FLUOROBIPHENYL			% Rec	73			
2,4,6-TRIBROMOPHENOL			% Rec	63			
TERPHENYL-D14			% Rec	93			

TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: M. KEEZER Analysis Date: 29-JAN-91 Test: P733.1. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP ORGANOCHLORINE PESTICIDES BY GC:ECD SW846-8080

Analyst: A. GOZDECKI Analysis Date: 10-FEB-91 Instrument: GC/ECD Test: 0164.7. 0

Prep: TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
GAMMA-BHC (LINDANE)	*	0.025	mg/L	*	0.04	0.00	0.00
HEPTACHLOR	BDL	.0012	mg/L	BDL	0.16	0.165	103
HEPTACHLOR EPOXIDE	BDL	.0012	mg/L	BDL	0.16	0.200	125
ENDRIN	BDL	.0025	mg/L	BDL	0.10	0.194	195
METHOXYCHLOR	BDL	.012	mg/L	BDL	0.10	0.138	138
CHLORDANE		.012	mg/L	BDL			
TOXAPHENE	BDL	.025	mg/L	BDL	1.00	0.939	94
DILUTION FACTOR 1:5							

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222261

*NOTE: * GAMMA-BHC NOT REPORTABLE DUE TO MATRIX INTERFERENCE. FROM 1:100 DILUTION*
*NOTE: ** HIGH SPIKE RECOVERIES DUE TO MATRIX INTERFERENCE*
NOTE: ATRAZINE WAS DETECTED IN THE SAMPLE AT A HIGH LEVEL

TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Analyst: J. MOWAT Analysis Date: 28-JAN-91 Test: P701.4. 0
Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP CHLORINATED HERBICIDES SW846-8150

Analyst: B. WOOD Analysis Date: 01-FEB-91 Instrument: GC/ECD Test: 0253.7. 0
Prep: TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150
Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
2,4-DICHLOROPHENOXYACETIC ACID	BDL	0.01	mg/L	BDL	0.0625	0.0568	91
SILVEX	BDL	0.001	mg/L	BDL	0.0125	0.0193	154

*NOTE: * SILVEX SPIKE RECOVERY HIGH DUE TO COELUTION WITH MATRIX INTERFERENCES*

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: J. MINNIEAR, II Analysis Date: 24-JAN-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	25.0		Grams
LIQUID PORTION	505.78		mL
LIQUID FRACTION (GRAMS)	0.00		Grams
EXTRACTED SAMPLE	25.0		Grams
PHASE ONE VOLUME (REP 0)	505.78		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: H. WILLIAMS Analysis Date: 25-JAN-91 Instrument: GC/MS VOA Test: 0513.7. 0
Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500	470	94
CARBON TETRACHLORIDE	BDL	50	ug/L	BDL	500	460	92
CHLOROBENZENE	BDL	50	ug/L	BDL	500	470	94
CHLOROFORM	BDL	50	ug/L	BDL	500	480	96
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500	520	104
1,1-DICHLOROETHYLENE	BDL	50	ug/L	BDL	500	470	94
METHYL ETHYL KETONE	BDL	100	ug/L	BDL	500	530	106
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL	500	480	96
TRICHLOROETHYLENE	BDL	50	ug/L	BDL	500	640	128
VINYL CHLORIDE	BDL	100	ug/L	BDL	500	490	98
.							
SURROGATE RECOVERY							

DICHLOROETHANE-D4			% Rec	100			
TOLUENE-D8			% Rec	98			
[illegible]FLUOROBENZENE			% Rec	105			
[illegible]ION FACTOR 1:10							

Sample Comments
MATRIX BIAS CORRECTIONS WERE CALCULATED USING SPIKE RECOVERIES FROM

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222261

Sample Comments

SAMPLE A222255.

● *See Note for Parameter*
** *See Note for Parameter*
BDL Below Detection Limit

Quality Assurance Officer: GABusch

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 2001 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-JAN-91	A222262
	Complete 14-FEB-91	PO Number 90B403C-1
	Printed 15-FEB-91	Sampled 19-JAN-91 15:39

Report To	Bill To
WOODWARD CLYDE CONSULTANTS DEJONNETT KING SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206	WOODWARD CLYDE CONSULTANTS ACCOUNTS PAYABLE SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206

Sample Description

SAMPLE NO.: CEDR-D-02 (0-12")
DESCRIPTION: SOIL
LOCATION:: "D"

TOTAL SOLIDS EPA 160.3

Analyst: K. SCOTT Analysis Date: 23-JAN-91 Test: G401.7. 0

Parameter	Result	Det. Limit	Units
SOLIDS	67	1	Percent

TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Analyst: R. EATON Analysis Date: 23-JAN-91 Test: P107.2. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	100		Grams
LIQUID FRACTION (GRAMS)			Grams
EXTRACTED SAMPLE	100		Grams
SOLIDS	100		Percent
9.5 MM SIEVE TEST			Passed
INITIAL PH	11.0		Std. Units
ADJUSTED PH	1.9		Std. Units
BUFFER SOLUTION PH	4.96		Std. Units
FINAL PH	6.7		Std. Units
VOLUME BUFFERED SOLUTION	2000		mL
VOLUME EXTRACT FILTERED	2000		mL
LIQUID FRACTION			mL
TOTAL VOLUME FILTRATE	2000		mL
INITIAL TIME	1052.5		HRS
FINAL TIME	1070.3		HRS

AMBIENT TEMP: 23 DEGREES

FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Analyst: M. SCROGHAM Analysis Date: 25-JAN-91 Test: P130.8. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	100		mL
FINAL WEIGHT OR VOLUME	100		mL

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222262

TCLP BARIUM FAA (1 POINT MSA) SW846-7080

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M704.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BARIUM	BDL	2.0	mg/L	BDL			
ADDITION 1			mg/L	2.50			
SAMPLE			Conc	-0.03			
SAMPLE + ADD 1			Conc	2.69			
DILUTION				10			

spike diluted out

TCLP CADMIUM FAA (1 POINT MSA) SW846-7130

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M708.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CADMIUM	BDL	0.02	mg/L	BDL			95
ADDITION 1			mg/L	0.50			
SAMPLE			Conc	0.01			
SAMPLE + ADD 1			Conc	0.49			
DILUTION				1			

TCLP CHROMIUM FAA (1 POINT MSA) SW846-7190

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M710.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CHROMIUM	0.06	0.05	mg/L	0.06			105
ADDITION 1			mg/L	1.00			
SAMPLE			Conc	0.06			
SAMPLE + ADD 1			Conc	1.20			
DILUTION				1			

TCLP LEAD FAA (1 POINT MSA) SW846-7420

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M716.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
LEAD	BDL	0.2	mg/L	BDL			93
ADDITION 1			mg/L	5.00			
SAMPLE			Conc	0.00			
SAMPLE + ADD 1			Conc	4.74			
DILUTION				1			

TCLP SILVER FAA (1 POINT MSA) SW846-7760

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M730.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SILVER	BDL	0.04	mg/L	BDL			80
ADDITION 1			mg/L	0.50			

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222262

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SAMPLE			Conc	0.00			
SAMPLE + ADD 1			Conc	0.47			
DILUTION				1			

GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Analyst: M. SCROGHAM Analysis Date: 25-JAN-91 Test: P130.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

TCLP ARSENIC GFAA (1 POINT MSA) SW846-7060

Analyst: P. SIMS Analysis Date: 25-JAN-91 Instrument: GFAA Test: M703.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
ARSENIC	0.052	0.005	mg/L	0.032	0.032		61
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.032			
SAMPLE + ADD 1			Conc	0.042			
DILUTION				1			

TCLP SELENIUM GFAA (1 POINT MSA) SW846-7740

Analyst: S. GRAY Analysis Date: 26-JAN-91 Instrument: GFAA Test: M728.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SELENIUM	BDL	0.005	mg/L	BDL	0.0250		68
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.0025			
SAMPLE + ADD 1			Conc	0.0091			
DILUTION				1			

CORRECTED VALUE FROM A222256

MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Analyst: S. O'NEAL Analysis Date: 29-JAN-91 Test: P131.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10		mL
FINAL VOLUME	100		mL

TCLP MERCURY CVAA (1 POINT MSA) SW846-7470

Analyst: J. WARE Analysis Date: 30-JAN-91 Instrument: CVAA Test: M720.6. 0

Prep: MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
MERCURY	BDL	0.005	mg/L	BDL	0.0200		108
ADDITION 1			mg/L	0.0010			
SAMPLE			Conc	0.000			
SAMPLE + ADD 1			Conc	0.00215			
DILUTION				1			

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222262

TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: J. MINNIEAR, II Analysis Date: 25-JAN-91 Test: P733.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	1		mL

TCLP SEMIVOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8270

Analyst: M. DONOFRIO Analysis Date: 26-JAN-91 Instrument: GC/MS SVOA Test: 0514.7. 0

Prep: TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
1,4-DICHLOROBENZENE	BDL	50	ug/L	BDL	500	455	91
2,4-DINITROTOLUENE	BDL	50	ug/L	BDL	500	505	101
HEXACHLOROBENZENE	BDL	50	ug/L	BDL	500	670	134
HEXACHLOROBUTADIENE	BDL	50	ug/L	BDL	500	555	111
HEXACHLOROETHANE	BDL	50	ug/L	BDL	500	400	80
NITROBENZENE	BDL	50	ug/L	BDL	500	525	105
PYRIDINE		250	ug/L	BDL			
CRESYLIC ACID		120	ug/L	BDL			
2-METHYL PHENOL	BDL	50	ug/L	BDL	500	175	35
3-METHYL PHENOL		50	ug/L	BDL			
4-METHYLPHENOL	BDL	50	ug/L	BDL	500	155	31
PENTACHLOROPHENOL	BDL	250	ug/L	BDL	500	395	79
2,4,5-TRICHLOROPHENOL	BDL	1600	ug/L	BDL	500	320	64
2,4,6-TRICHLOROPHENOL	BDL	50	ug/L	BDL	500	470	95
.							
SURROGATE RECOVERY							

2-FLUOROPHENOL			% Rec	50			
PHENOL-D5			% Rec	33			
NITROBENZENE-D5			% Rec	94			
2-FLUOROBIPHENYL			% Rec	68			
2,4,6-TRIBROMOPHENOL			% Rec	75			
TERPHENYL-D14			% Rec	99			

TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: L. DOBBINS Analysis Date: 29-JAN-91 Test: P733.1. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP ORGANOCHLORINE PESTICIDES BY GC:ECD SW846-8080

Analyst: A. GOZDECKI Analysis Date: 10-FEB-91 Instrument: GC/ECD Test: 0164.7. 0

Prep: TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
GAMMA-BHC (LINDANE)	*	0.025	mg/L	*	0.04	0.00	0.00
HEPTACHLOR	BDL	.0025	mg/L	BDL	0.16	0.165	103
[illegible]ACHLOR EPOXIDE	BDL	.0025	mg/L	BDL	0.16	0.200	125
[illegible]N	BDL	.005	mg/L	BDL	0.10	0.194	195
METHOXYCHLOR	BDL	.025	mg/L	BDL	0.10	0.138	138
CHLORDANE		.025	mg/L	BDL			
TOXAPHENE	BDL	.05	mg/L	BDL	1.00	0.939	94

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222262

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
DILUTION FACTOR 1:10							

*NOTE: * GAMMA-BHC NOT REPORTABLE DUE TO MATRIX INTERFERENCE. FROM 1:100 DILUTION*
*NOTE: ** HIGH SPIKE RECOVERIES DUE TO MATRIX INTERFERENCE*
NOTE: ATRAZINE WAS DETECTED IN THE SAMPLE AT A HIGH LEVEL

TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Analyst: A. GOZDECKI Analysis Date: 28-JAN-91 Test: P701.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP CHLORINATED HERBICIDES SW846-8150

Analyst: B. WOOD Analysis Date: 01-FEB-91 Instrument: GC/ECD Test: O253.7. 0

Prep: TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
2,4-DICHLOROPHENOXYACETIC ACID	BDL	0.01	mg/L	BDL	0.0625	0.0568	91
SILVEX	BDL	0.001	mg/L	BDL	0.0125	0.0193	154

*NOTE: * SILVEX SPIKE RECOVERY HIGH DUE TO COELUTION WITH MATRIX INTERFERENCES*

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: J. MINNIEAR, II Analysis Date: 24-JAN-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	25.0		Grams
LIQUID PORTION	469.27		mL
LIQUID FRACTION (GRAMS)	0.00		Grams
EXTRACTED SAMPLE	25.0		Grams
PHASE ONE VOLUME (REP 0)	469.27		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: H. WILLIAMS Analysis Date: 25-JAN-91 Instrument: GC/MS VOA Test: O513.7. 0

Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500	470	94
CARBON TETRACHLORIDE	BDL	50	ug/L	BDL	500	460	92
CHLOROBENZENE	BDL	50	ug/L	BDL	500	470	94
CHLOROFORM	BDL	50	ug/L	BDL	500	480	96
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500	520	104
1,1-DICHLOROETHYLENE	BDL	50	ug/L	BDL	500	470	94
METHYL ETHYL KETONE	BDL	100	ug/L	BDL	500	530	106
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL	500	480	96
TRICHLOROETHYLENE	BDL	50	ug/L	BDL	500	640	128
VINYL CHLORIDE	BDL	100	ug/L	BDL	500	490	98
.							
SURROGATE RECOVERY							

OROETHANE-D4			% Rec	98			
TOLUENE-D8			% Rec	99			
BROMOFLUOROBENZENE			% Rec	102			
DILUTION FACTOR 1:10							

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222262

Sample Comments

MATRIX BIAS CORRECTIONS WERE CALCULATED USING SPIKE RECOVERIES FROM SAMPLE A222255.

*	*See Note for Parameter*
**	*See Note for Parameter*
BDL	*Below Detection Limit*

Quality Assurance Officer: GABusch

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 01 W. MORRIS ST. NDIANAPOLIS, IN 46231 (317)243-8305	22-JAN-91	A222263
	Complete 14-FEB-91	PO Number 90B403C-1
	Printed 15-FEB-91	Sampled 19-JAN-91 15:59

Report To

WOODWARD CLYDE CONSULTANTS
DEJONNETT KING
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Bill To

WOODWARD CLYDE CONSULTANTS
ACCOUNTS PAYABLE
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Sample Description

SAMPLE NO.: CEDR-D-03 (0-12")
DESCRIPTION: SOIL
LOCATION:: "D"

TOTAL SOLIDS EPA 160.3

Analyst: K. SCOTT — Analysis Date: 23-JAN-91 — Test: G401.7. 0

Parameter	Result	Det. Limit	Units
SOLIDS	71	1	Percent

TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Analyst: R. EATON — Analysis Date: 23-JAN-91 — Test: P107.2. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	100		Grams
LIQUID FRACTION (GRAMS)			Grams
EXTRACTED SAMPLE	100		Grams
SOLIDS	100		Percent
9.5 MM SIEVE TEST			Passed
INITIAL PH	11.1		Std. Units
ADJUSTED PH	2.1		Std. Units
BUFFER SOLUTION PH	4.96		Std. Units
FINAL PH	6.6		Std. Units
VOLUME BUFFERED SOLUTION	2000		mL
VOLUME EXTRACT FILTERED	2000		mL
LIQUID FRACTION			mL
TOTAL VOLUME FILTRATE	2000		mL
INITIAL TIME	1052.5		HRS
FINAL TIME	1070.3		HRS

AMBIENT TEMP: 23 DEGREES

FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Analyst: M. SCROGHAM — Analysis Date: 25-JAN-91 — Test: P130.8. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	100		mL
FINAL WEIGHT OR VOLUME	100		mL

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222263

TCLP BARIUM FAA (1 POINT MSA) SW846-7080

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M704.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BARIUM	BDL	2.0	mg/L	BDL			
ADDITION 1			mg/L	2.50			
SAMPLE			Conc	0.13			
SAMPLE + ADD 1			Conc	2.64			
DILUTION				10			

spike diluted out

TCLP CADMIUM FAA (1 POINT MSA) SW846-7130

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M708.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CADMIUM	BDL	0.02	mg/L	BDL			95
ADDITION 1			mg/L	0.50			
SAMPLE			Conc	0.01			
SAMPLE + ADD 1			Conc	0.49			
DILUTION				1			

TCLP CHROMIUM FAA (1 POINT MSA) SW846-7190

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M710.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CHROMIUM	0.07	0.05	mg/L	0.07			105
ADDITION 1			mg/L	1.00			
SAMPLE			Conc	0.07			
SAMPLE + ADD 1			Conc	1.21			
DILUTION				1			

TCLP LEAD FAA (1 POINT MSA) SW846-7420

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M716.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
LEAD	BDL	0.2	mg/L	BDL			93
ADDITION 1			mg/L	5.00			
SAMPLE			Conc	0.10			
SAMPLE + ADD 1			Conc	4.80			
DILUTION				1			

TCLP SILVER FAA (1 POINT MSA) SW846-7760

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M730.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SILVER	BDL	0.04	mg/L	BDL			80
ADDITION 1			mg/L	0.50			

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222263

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SAMPLE			Conc	-0.01			
SAMPLE + ADD 1			Conc	0.48			
DILUTION				1			

GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Analyst: M. SCROGHAM Analysis Date: 25-JAN-91 Test: P130.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

TCLP ARSENIC GFAA (1 POINT MSA) SW846-7060

Analyst: P. SIMS Analysis Date: 25-JAN-91 Instrument: GFAA Test: M703.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
ARSENIC	0.044	0.005	mg/L	0.027	0.0250		61
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.027			
SAMPLE + ADD 1			Conc	0.036			
DILUTION				1			

TCLP SELENIUM GFAA (1 POINT MSA) SW846-7740

Analyst: S. GRAY Analysis Date: 26-JAN-91 Instrument: GFAA Test: M728.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SELENIUM	BDL	0.005	mg/L	BDL	0.0250		68
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.0001			
SAMPLE + ADD 1			Conc	0.0093			
DILUTION				2			

CORRECTED VALUE FROM A222256

MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Analyst: S. O'NEAL Analysis Date: 29-JAN-91 Test: P131.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10		mL
FINAL VOLUME	100		mL

TCLP MERCURY CVAA (1 POINT MSA) SW846-7470

Analyst: J. WARE Analysis Date: 30-JAN-91 Instrument: CVAA Test: M720.6. 0

Prep: MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
MERCURY	BDL	0.005	mg/L	BDL	0.0200		108
ADDITION 1			mg/L	0.0010			
SAMPLE			Conc	0.000			
SAMPLE + ADD 1			Conc	0.00215			
DILUTION				1			

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222263

TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: M. FRANK Analysis Date: 25-JAN-91 Test: P733.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	1		mL

TCLP SEMIVOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8270

Analyst: M. DONOFRIO Analysis Date: 26-JAN-91 Instrument: GC/MS SVOA Test: 0514.7. 0

Prep: TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
1,4-DICHLOROBENZENE	BDL	50	ug/L	BDL	500	455	91
2,4-DINITROTOLUENE	BDL	50	ug/L	BDL	500	505	101
HEXACHLOROBENZENE	BDL	50	ug/L	BDL	500	670	134
HEXACHLOROBUTADIENE	BDL	50	ug/L	BDL	500	555	111
HEXACHLOROETHANE	BDL	50	ug/L	BDL	500	400	80
NITROBENZENE	BDL	50	ug/L	BDL	500	525	105
PYRIDINE		250	ug/L	BDL			
CRESYLIC ACID		120	ug/L	BDL			
2-METHYL PHENOL	BDL	50	ug/L	BDL	500	175	35
3-METHYL PHENOL		50	ug/L	BDL			
4-METHYLPHENOL	BDL	50	ug/L	BDL	500	155	31
PENTACHLOROPHENOL	BDL	250	ug/L	BDL	500	395	79
2,4,5-TRICHLOROPHENOL	BDL	1600	ug/L	BDL	500	320	64
2,4,6-TRICHLOROPHENOL	BDL	50	ug/L	BDL	500	470	95
.							
SURROGATE RECOVERY							

2-FLUOROPHENOL			% Rec	56			
PHENOL-D5			% Rec	40			
NITROBENZENE-D5			% Rec	97			
2-FLUOROBIPHENYL			% Rec	69			
2,4,6-TRIBROMOPHENOL			% Rec	70			
TERPHENYL-D14			% Rec	95			

TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: L. DOBBINS Analysis Date: 29-JAN-91 Test: P733.1. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP ORGANOCHLORINE PESTICIDES BY GC:ECD SW846-8080

Analyst: A. GOZDECKI Analysis Date: 10-FEB-91 Instrument: GC/ECD Test: 0164.7. 0

Prep: TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
GAMMA-BHC (LINDANE)	*	0.025	mg/L	*	0.04	0.00	0.00
HEPTACHLOR	BDL	.005	mg/L	BDL	0.16	0.165	103
HEPTACHLOR EPOXIDE	BDL	.005	mg/L	BDL	0.16	0.200	125
ENDRIN	BDL	.01	mg/L	BDL	0.10	0.194	195
METHOXYCHLOR	BDL	.05	mg/L	BDL	0.10	0.138	138
CHLORDANE		.05	mg/L	BDL			
TOXAPHENE	BDL	.1	mg/L	BDL	1.00	0.939	94

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222263

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
DILUTION FACTOR 1:20							

*NOTE: * GAMMA-BHC NOT REPORTABLE DUE TO MATRIX INTERFERENCE. FROM 1:100 DILUTION*
*NOTE: ** HIGH SPIKE RECOVERIES DUE TO MATRIX INTERFERENCE*
NOTE: ATRAZINE WAS DETECTED IN THE SAMPLE AT A HIGH LEVEL

TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Analyst: A. GOZDECKI Analysis Date: 28-JAN-91 Test: P701.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP CHLORINATED HERBICIDES SW846-8150

Analyst: B. WOOD Analysis Date: 01-FEB-91 Instrument: GC/ECD Test: 0253.7. 0

Prep: TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
2,4-DICHLOROPHENOXYACETIC ACID	BDL	0.01	mg/L	BDL	0.0625	0.0568	91
SILVEX	BDL	0.001	mg/L	BDL	0.0125	0.0193	154

*NOTE: * SILVEX SPIKE RECOVERY HIGH DUE TO COELUTION WITH MATRIX INTERFERENCES*

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: J. MINNIEAR, II Analysis Date: 24-JAN-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	25.0		Grams
LIQUID PORTION	489.95		mL
LIQUID FRACTION (GRAMS)	0.00		Grams
EXTRACTED SAMPLE	25.0		Grams
PHASE ONE VOLUME (REP 0)	489.95		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: H. WILLIAMS Analysis Date: 25-JAN-91 Instrument: GC/MS VOA Test: 0513.7. 0

Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500	470	94
CARBON TETRACHLORIDE	BDL	50	ug/L	BDL	500	460	92
CHLOROBENZENE	BDL	50	ug/L	BDL	500	470	94
CHLOROFORM	BDL	50	ug/L	BDL	500	480	96
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500	520	104
1,1-DICHLOROETHYLENE	BDL	50	ug/L	BDL	500	470	94
METHYL ETHYL KETONE	BDL	100	ug/L	BDL	500	530	106
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL	500	480	96
TRICHLOROETHYLENE	BDL	50	ug/L	BDL	500	640	128
VINYL CHLORIDE	BDL	100	ug/L	BDL	500	490	98
SURROGATE RECOVERY							

[illegible]OROETHANE-D4			% Rec	100			
TOLUENE-D8			% Rec	97			
BROMOFLUOROBENZENE			% Rec	102			
DILUTION FACTOR 1:10							

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222263

Sample Comments

MATRIX BIAS CORRECTIONS WERE CALCULATED USING SPIKE RECOVERIES FROM SAMPLE A222255

** See Note for Parameter*
*** See Note for Parameter*
BDL Below Detection Limit

Quality Assurance Officer: GaBusch

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-JAN-91	A222264
	Complete 14-FEB-91	PO Number 90B403C-1
	Printed 15-FEB-91	Sampled 19-JAN-91 16:23

Report To	Bill To
WOODWARD CLYDE CONSULTANTS DEJONNETT KING SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206	WOODWARD CLYDE CONSULTANTS ACCOUNTS PAYABLE SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206

Sample Description

SAMPLE NO.: CEDR-D-04 (0-12")
DESCRIPTION: SOIL
LOCATION:: "D"

TOTAL SOLIDS EPA 160.3

Analyst: K. SCOTT — Analysis Date: 23-JAN-91 — Test: G401.7. 0

Parameter	Result	Det. Limit	Units
SOLIDS	72	1	Percent

TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Analyst: R. EATON — Analysis Date: 23-JAN-91 — Test: P107.2. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	100		Grams
LIQUID FRACTION (GRAMS)			Grams
EXTRACTED SAMPLE	100		Grams
SOLIDS	100		Percent
9.5 MM SIEVE TEST			Passed
INITIAL PH	11.3		Std. Units
ADJUSTED PH	2.5		Std. Units
BUFFER SOLUTION PH	4.96		Std. Units
FINAL PH	6.2		Std. Units
VOLUME BUFFERED SOLUTION	2000		mL
VOLUME EXTRACT FILTERED	2000		mL
LIQUID FRACTION			mL
TOTAL VOLUME FILTRATE	2000		mL
INITIAL TIME	1052.5		HRS
FINAL TIME	1070.3		HRS

AMBIENT TEMP: 23 DEGREES

FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Analyst: M. SCROGHAM — Analysis Date: 25-JAN-91 — Test: P130.8. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	100		mL
FINAL WEIGHT OR VOLUME	100		mL

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222264

TCLP BARIUM FAA (1 POINT MSA) SW846-7080

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M704.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BARIUM	BDL	2.0	mg/L	BDL			
ADDITION 1			mg/L	2.50			
SAMPLE			Conc	-0.02			
SAMPLE + ADD 1			Conc	2.77			
DILUTION				10			

TCLP CADMIUM FAA (1 POINT MSA) SW846-7130

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M708.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CADMIUM	BDL	0.02	mg/L	BDL			95
ADDITION 1			mg/L	0.50			
SAMPLE			Conc	0.01			
SAMPLE + ADD 1			Conc	0.49			
DILUTION				1			

TCLP CHROMIUM FAA (1 POINT MSA) SW846-7190

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M710.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CHROMIUM	0.05	0.05	mg/L	0.05			105
ADDITION 1			mg/L	1.00			
SAMPLE			Conc	0.05			
SAMPLE + ADD 1			Conc	1.18			
DILUTION				1			

TCLP LEAD FAA (1 POINT MSA) SW846-7420

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M716.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
LEAD	BDL	0.2	mg/L	BDL			93
ADDITION 1			mg/L	5.00			
SAMPLE			Conc	0.02			
SAMPLE + ADD 1			Conc	4.80			
DILUTION				1			

TCLP SILVER FAA (1 POINT MSA) SW846-7760

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M730.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
	BDL	0.04	mg/L	BDL			80
ADDITION 1			mg/L	0.50			
SAMPLE			Conc	-0.01			
SAMPLE + ADD 1			Conc	0.48			

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222264

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
DILUTION				1			

GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Analyst: M. SCROGHAM Analysis Date: 28-JAN-91 Test: P130.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

TCLP ARSENIC GFAA (1 POINT MSA) SW846-7060

Analyst: P. SIMS Analysis Date: 28-JAN-91 Instrument: GFAA Test: M703.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
ARSENIC	0.056	0.005	mg/L	0.034	0.0250		61
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.034			
SAMPLE + ADD 1			Conc	0.045			
DILUTION				1			

TCLP SELENIUM GFAA (1 POINT MSA) SW846-7740

Analyst: K. KEHOE Analysis Date: 29-JAN-91 Instrument: GFAA Test: M728.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SELENIUM		0.005	mg/L	BDL			68
ADDITION 1			mg/L	0.0100			
SAMPLE			Conc	0.0014			
SAMPLE + ADD 1			Conc	0.0071			
DILUTION				1			

MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Analyst: S. O'NEAL Analysis Date: 29-JAN-91 Test: P131.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10		mL
FINAL VOLUME	100		mL

TCLP MERCURY CVAA (1 POINT MSA) SW846-7470

Analyst: J. WARE Analysis Date: 30-JAN-91 Instrument: CVAA Test: M720.6. 0

Prep: MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
MERCURY	BDL	0.005	mg/L	BDL	0.0200		108
ADDITION 1			mg/L	0.0010			
SAMPLE			Conc	0.000			
SAMPLE + ADD 1			Conc	0.00215			
DILUTION				1			

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222264

TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: M. FRANK Analysis Date: 25-JAN-91 Test: P733.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	1		mL

TCLP SEMIVOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8270

Analyst: R. ADAMS Analysis Date: 29-JAN-91 Instrument: GC/MS SVOA Test: 0514.7. 0

Prep: TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
1,4-DICHLOROBENZENE	BDL	50	ug/L	BDL	500	455	91
2,4-DINITROTOLUENE	BDL	50	ug/L	BDL	500	505	101
HEXACHLOROBENZENE	BDL	50	ug/L	BDL	500	670	134
HEXACHLOROBUTADIENE	BDL	50	ug/L	BDL	500	555	111
HEXACHLOROETHANE	BDL	50	ug/L	BDL	500	400	80
NITROBENZENE	BDL	50	ug/L	BDL	500	525	105
2-METHYL PHENOL	BDL	50	ug/L	BDL	500	170	35
4-METHYLPHENOL	BDL	50	ug/L	BDL	500	155	31
PENTACHLOROPHENOL	BDL	250	ug/L	BDL	500	395	79
2,4,5-TRICHLOROPHENOL	BDL	1600	ug/L	BDL	500	320	64
2,4,6-TRICHLOROPHENOL	BDL	50	ug/L	BDL	500	470	95
SURROGATE RECOVERY							
2-FLUOROPHENOL			% Rec	59			
PHENOL-D5			% Rec	42			
NITROBENZENE-D5			% Rec	106			
2-FLUOROBIPHENYL			% Rec	90			
2,4,6-TRIBROMOPHENOL			% Rec	98			
TERPHENYL-D14			% Rec	104			

TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: M. KEEZER Analysis Date: 29-JAN-91 Test: P733.1. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP ORGANOCHLORINE PESTICIDES BY GC:ECD SW846-8080

Analyst: A. GOZDECKI Analysis Date: 10-FEB-91 Instrument: GC/ECD Test: 0164.7. 0

Prep: TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
GAMMA-BHC (LINDANE)	*	0.025	mg/L	*	0.04	0.00	0.00
HEPTACHLOR	BDL	.005	mg/L	BDL	0.16	0.165	103
HEPTACHLOR EPOXIDE	BDL	.005	mg/L	BDL	0.16	0.200	125
ENDRIN	BDL	.01	mg/L	BDL	0.10	0.194	195
METHOXYCHLOR	BDL	.05	mg/L	BDL	0.10	0.138	138
CHLORDANE		.05	mg/L	BDL			
TOXAPHENE	BDL	.1	mg/L	BDL	1.00	0.939	94
DILUTION FACTOR 1:20							

*NOTE: * GAMMA-BHC NOT REPORTABLE DUE TO MATRIX INTERFERENCE. FROM 1:100 DILUTION*

*NOTE: ** HIGH SPIKE RECOVERIES DUE TO MATRIX INTERFERENCE*

NOTE: ATRAZINE WAS DETECTED IN THE SAMPLE AT A HIGH LEVEL

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222264

TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Analyst: J. MOWAT Analysis Date: 28-JAN-91 Test: P701.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP CHLORINATED HERBICIDES SW846-8150

Analyst: B. WOOD Analysis Date: 01-FEB-91 Instrument: GC/ECD Test: 0253.7. 0

Prep: TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
2,4-DICHLOROPHENOXYACETIC ACID	BDL	0.01	mg/L	BDL	0.0625	0.0568	91
SILVEX	BDL	0.001	mg/L	BDL	0.0125	0.0193	154

*NOTE: * SILVEX SPIKE RECOVERY HIGH DUE TO COELUTION WITH MATRIX INTERFERENCES*

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: J. MINNIEAR, II Analysis Date: 24-JAN-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	25.0		Grams
LIQUID PORTION	478.51		mL
LIQUID FRACTION (GRAMS)	0.00		Grams
EXTRACTED SAMPLE	25.0		Grams
PHASE ONE VOLUME (REP 0)	478.51		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: H. WILLIAMS Analysis Date: 25-JAN-91 Instrument: GC/MS VOA Test: 0513.7. 0

Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500	470	94
CARBON TETRACHLORIDE	BDL	50	ug/L	BDL	500	460	92
CHLOROBENZENE	BDL	50	ug/L	BDL	500	470	94
CHLOROFORM	BDL	50	ug/L	BDL	500	480	96
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500	520	104
1,1-DICHLOROETHYLENE	BDL	50	ug/L	BDL	500	470	94
METHYL ETHYL KETONE	BDL	100	ug/L	BDL	500	530	106
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL	500	480	96
TRICHLOROETHYLENE	BDL	50	ug/L	BDL	500	640	128
VINYL CHLORIDE	BDL	100	ug/L	BDL	500	490	98
.							
SURROGATE RECOVERY							

DICHLOROETHANE-D4			% Rec	100			
TOLUENE-D8			% Rec	99			
BROMOFLUOROBENZENE			% Rec	103			
DILUTION FACTOR 1:10							

Sample Comments

MATRIX BIAS CORRECTIONS WERE CALCULATED USING SPIKE RECOVERIES FROM SAMPLE A222255.

See Note for Parameter

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222264

Sample Comments

** *See Note for Parameter*
BDL *Below Detection Limit*

Quality Assurance Officer: GaBusch

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-JAN-91	A222265
	Complete 14-FEB-91	PO Number 90B403C-1
	Printed 15-FEB-91	Sampled 19-JAN-91 16:23

Report To

WOODWARD CLYDE CONSULTANTS
DEJONNETT KING
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Bill To

WOODWARD CLYDE CONSULTANTS
ACCOUNTS PAYABLE
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Sample Description

SAMPLE NO.: CEDR-D-04D (0-12")
DESCRIPTION: SOIL
LOCATION:: "D"

TOTAL SOLIDS EPA 160.3

Analyst: K. SCOTT — Analysis Date: 23-JAN-91 — Test: G401.7. 0

Parameter	Result	Det. Limit	Units
SOLIDS	72	1	Percent

TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Analyst: R. EATON — Analysis Date: 23-JAN-91 — Test: P107.2. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	100		Grams
LIQUID FRACTION (GRAMS)			Grams
EXTRACTED SAMPLE	100		Grams
SOLIDS	100		Percent
9.5 MM SIEVE TEST			Passed
INITIAL PH	11.3		Std. Units
ADJUSTED PH	2.1		Std. Units
BUFFER SOLUTION PH	4.91		Std. Units
FINAL PH	5.8		Std. Units
VOLUME BUFFERED SOLUTION	2000		mL
VOLUME EXTRACT FILTERED	2000		mL
LIQUID FRACTION			mL
TOTAL VOLUME FILTRATE	2000		mL
INITIAL TIME	1052.5		HRS
FINAL TIME	1070.3		HRS

AMBIENT TEMP: 23 DEGREES

FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Analyst: M. SCROGHAM — Analysis Date: 25-JAN-91 — Test: P130.8. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	100		mL
FINAL WEIGHT OR VOLUME	100		mL

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222265

TCLP BARIUM FAA (1 POINT MSA) SW846-7080

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M704.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BARIUM	BDL	2.0	mg/L	BDL			
ADDITION 1			mg/L	2.50			
SAMPLE			Conc	0.16			
SAMPLE + ADD 1			Conc	2.69			
DILUTION				10			

TCLP CADMIUM FAA (1 POINT MSA) SW846-7130

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M708.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CADMIUM	BDL	0.02	mg/L	BDL			95
ADDITION 1			mg/L	0.50			
SAMPLE			Conc	0.02			
SAMPLE + ADD 1			Conc	0.49			
DILUTION				1			

TCLP CHROMIUM FAA (1 POINT MSA) SW846-7190

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M710.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CHROMIUM	0.17	0.05	mg/L	0.18			105
ADDITION 1			mg/L	1.00			
SAMPLE			Conc	0.18			
SAMPLE + ADD 1			Conc	1.31			
DILUTION				1			

TCLP LEAD FAA (1 POINT MSA) SW846-7420

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M716.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
LEAD	0.81	0.2	mg/L	0.75			93
ADDITION 1			mg/L	5.00			
SAMPLE			Conc	0.75			
SAMPLE + ADD 1			Conc	5.39			
DILUTION				1			

TCLP SILVER FAA (1 POINT MSA) SW846-7760

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M730.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
R	BDL	0.04	mg/L	BDL			80
ADDITION 1			mg/L	0.50			
SAMPLE			Conc	-0.01			
SAMPLE + ADD 1			Conc	0.47			

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222265

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
DILUTION				1			

GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Analyst: M. SCROGHAM Analysis Date: 28-JAN-91 Test: P130.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

TCLP ARSENIC GFAA (1 POINT MSA) SW846-7060

Analyst: P. SIMS Analysis Date: 28-JAN-91 Instrument: GFAA Test: M703.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
ARSENIC	0.031	0.005	mg/L	0.019	0.0250		61
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.019			
SAMPLE + ADD 1			Conc	0.028			
DILUTION				1			

TCLP SELENIUM GFAA (1 POINT MSA) SW846-7740

Analyst: K. KEHOE Analysis Date: 29-JAN-91 Instrument: GFAA Test: M728.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SELENIUM		0.010	mg/L	BDL			68
ADDITION 1			mg/L	0.0100			
SAMPLE			Conc	0.000			
SAMPLE + ADD 1			Conc	0.0062			
DILUTION				2			

MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Analyst: S. O'NEAL Analysis Date: 29-JAN-91 Test: P131.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10		mL
FINAL VOLUME	100		mL

TCLP MERCURY CVAA (1 POINT MSA) SW846-7470

Analyst: J. WARE Analysis Date: 30-JAN-91 Instrument: CVAA Test: M720.6. 0

Prep: MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
MERCURY	BDL	0.005	mg/L	BDL	0.0200		108
ADDITION 1			mg/L	0.0010			
SAMPLE			Conc	0.000			
SAMPLE + ADD 1			Conc	0.00215			
DILUTION				1			

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222265

TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: T. BILLE Analysis Date: 25-JAN-91 Test: P733.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	1		mL

TCLP SEMIVOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8270

Analyst: J. ELLIS Analysis Date: 29-JAN-91 Instrument: GC/MS SVOA Test: 0514.7. 0

Prep: TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
1,4-DICHLOROBENZENE	BDL	50	ug/L	BDL	500	455	91
2,4-DINITROTOLUENE	BDL	50	ug/L	BDL	500	505	101
HEXACHLOROBENZENE	BDL	50	ug/L	BDL	500	670	134
HEXACHLOROBUTADIENE	BDL	50	ug/L	BDL	500	555	111
HEXACHLOROETHANE	BDL	50	ug/L	BDL	500	400	80
NITROBENZENE	BDL	50	ug/L	BDL	500	525	105
2-METHYL PHENOL	BDL	50	ug/L	BDL	500	170	35
4-METHYLPHENOL	BDL	50	ug/L	BDL	500	155	31
PENTACHLOROPHENOL	BDL	250	ug/L	BDL	500	395	79
2,4,5-TRICHLOROPHENOL	BDL	1600	ug/L	BDL	500	320	64
2,4,6-TRICHLOROPHENOL	BDL	50	ug/L	BDL	500	470	95
SURROGATE RECOVERY							
2-FLUOROPHENOL			% Rec	39			
PHENOL-D5			% Rec	28			
NITROBENZENE-D5			% Rec	105			
2-FLUOROBIPHENYL			% Rec	71			
2,4,6-TRIBROMOPHENOL			% Rec	67			
TERPHENYL-D14			% Rec	106			

TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: M. KEEZER Analysis Date: 29-JAN-91 Test: P733.1. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP ORGANOCHLORINE PESTICIDES BY GC:ECD SW846-8080

Analyst: A. GOZDECKI Analysis Date: 10-FEB-91 Instrument: GC/ECD Test: 0164.7. 0

Prep: TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
GAMMA-BHC (LINDANE)	*	0.025	mg/L	*	0.04	0.00	0.00
HEPTACHLOR	BDL	.005	mg/L	BDL	0.16	0.165	103
HEPTACHLOR EPOXIDE	BDL	.005	mg/L	BDL	0.16	0.200	125
ENDRIN	BDL	.01	mg/L	BDL	0.10	0.194	195
METHOXYCHLOR	BDL	.05	mg/L	BDL	0.10	0.138	138
CHLORDANE		.05	mg/L	BDL			
[illegible]PHENE	BDL	.1	mg/L	BDL	1.00	0.939	94
[illegible]ION FACTOR 1:20							

*NOTE: * GAMMA-BHC NOT REPORTABLE DUE TO MATRIX INTERFERENCE. FROM 1:100 DILUTION*

*NOTE: ** HIGH SPIKE RECOVERIES DUE TO MATRIX INTERFERENCE*

NOTE: ATRAZINE WAS DETECTED IN THE SAMPLE AT A HIGH LEVEL

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222265

TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Analyst: J. MOWAT Analysis Date: 28-JAN-91 Test: P701.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

TCLP CHLORINATED HERBICIDES SW846-8150

Analyst: B. WOOD Analysis Date: 01-FEB-91 Instrument: GC/ECD Test: 0253.7. 0

Prep: TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
2,4-DICHLOROPHENOXYACETIC ACID	BDL	0.01	mg/L	BDL	0.0625	0.0568	91
SILVEX	BDL	0.001	mg/L	BDL	0.0125	0.0193	154

*NOTE: * SILVEX SPIKE RECOVERY HIGH DUE TO COELUTION WITH MATRIX INTERFERENCES*

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: J. MINNIEAR, II Analysis Date: 24-JAN-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	25.0		Grams
LIQUID PORTION	502.33		mL
LIQUID FRACTION (GRAMS)	0.00		Grams
EXTRACTED SAMPLE	25.0		Grams
PHASE ONE VOLUME (REP 0)	502.33		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: H. WILLIAMS Analysis Date: 25-JAN-91 Instrument: GC/MS VOA Test: 0513.7. 0

Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500	470	94
CARBON TETRACHLORIDE	BDL	50	ug/L	BDL	500	460	92
CHLOROBENZENE	BDL	50	ug/L	BDL	500	470	94
CHLOROFORM	BDL	50	ug/L	BDL	500	480	96
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500	520	104
1,1-DICHLOROETHYLENE	BDL	50	ug/L	BDL	500	470	94
METHYL ETHYL KETONE	BDL	100	ug/L	BDL	500	530	106
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL	500	480	96
TRICHLOROETHYLENE	BDL	50	ug/L	BDL	500	640	128
VINYL CHLORIDE	BDL	100	ug/L	BDL	500	490	98
SURROGATE RECOVERY							
DICHLOROETHANE-D4			% Rec	101			
TOLUENE-D8			% Rec	97			
BROMOFLUOROBENZENE			% Rec	106			
DILUTION FACTOR 1:10							

Sample Comments

MATRIX BIAS CORRECTIONS WERE CALCULATED USING SPIKE RECOVERIES FROM SAMPLE A222255.

See Note for Parameter

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222265

Sample Comments

** *See Note for Parameter*
BDL *Below Detection Limit*

Quality Assurance Officer: G A Busch

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 401 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-JAN-91	A222261
	Complete 14-FEB-91	PO Number 90B403C-1
	Printed 15-FEB-91	Sampled 19-JAN-91 15:22

Report To	Bill To
WOODWARD CLYDE CONSULTANTS DEJONNETT KING SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206	WOODWARD CLYDE CONSULTANTS ACCOUNTS PAYABLE SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206

Sample Description

SAMPLE NO.: CEDR-D-01 (0-12")
DESCRIPTION: SOIL
LOCATION:: "D"

TOTAL SOLIDS EPA 160.3

Analyst: K. SCOTT — Analysis Date: 23-JAN-91 — Test: G401.7. 0

Parameter	Result	Det. Limit	Units
SOLIDS	69	1	Percent

TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Analyst: R. EATON — Analysis Date: 23-JAN-91 — Test: P107.2. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	100		Grams
LIQUID FRACTION (GRAMS)			Grams
EXTRACTED SAMPLE	100		Grams
SOLIDS	100		Percent
9.5 MM SIEVE TEST			Passed
INITIAL PH	11.1		Std. Units
ADJUSTED PH	2.3		Std. Units
BUFFER SOLUTION PH	4.96		Std. Units
FINAL PH	6.3		Std. Units
VOLUME BUFFERED SOLUTION	2000		mL
VOLUME EXTRACT FILTERED	2000		mL
LIQUID FRACTION			mL
TOTAL VOLUME FILTRATE	2000		mL
INITIAL TIME	8999.5		HRS
FINAL TIME	9017.1		HRS

AMBIENT TEMP: 23 DEGREES

FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Analyst: M. SCROGHAM — Analysis Date: 25-JAN-91 — Test: P130.8. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	100		mL
FINAL WEIGHT OR VOLUME	100		mL

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222261

TCLP BARIUM FAA (1 POINT MSA) SW846-7080

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M704.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BARIUM	BDL	2.0	mg/L	BDL			
ADDITION 1			mg/L	2.50			
SAMPLE			Conc	0.17			
SAMPLE + ADD 1			Conc	2.57			
DILUTION				10			

spike diluted out

TCLP CADMIUM FAA (1 POINT MSA) SW846-7130

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M708.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CADMIUM	BDL	0.02	mg/L	BDL			95
ADDITION 1			mg/L	0.50			
SAMPLE			Conc	0.01			
SAMPLE + ADD 1			Conc	0.49			
DILUTION				1			

TCLP CHROMIUM FAA (1 POINT MSA) SW846-7190

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M710.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CHROMIUM	0.10	0.05	mg/L	0.10			105
ADDITION 1			mg/L	1.0			
SAMPLE			Conc	0.10			
SAMPLE + ADD 1			Conc	1.23			
DILUTION				1			

TCLP LEAD FAA (1 POINT MSA) SW846-7420

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M716.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
LEAD	0.48	0.2	mg/L	0.45			93
ADDITION 1			mg/L	5.00			
SAMPLE			Conc	0.45			
SAMPLE + ADD 1			Conc	5.15			
DILUTION				1			

TCLP SILVER FAA (1 POINT MSA) SW846-7760

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M730.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SILVER	BDL	0.04	mg/L	BDL			80
ADDITION 1			mg/L	0.50			

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222261

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SAMPLE			Conc	0.00			
SAMPLE + ADD 1			Conc	0.47			
DILUTION				1			

GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Analyst: M. SCROGHAM Analysis Date: 25-JAN-91 Test: P130.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

TCLP ARSENIC GFAA (1 POINT MSA) SW846-7060

Analyst: P. SIMS Analysis Date: 25-JAN-91 Instrument: GFAA Test: M703.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
ARSENIC	0.036	0.020	mg/L	0.022	0.0250		61
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.0056			
SAMPLE + ADD 1			Conc	0.015			
DILUTION				4			

TCLP SELENIUM GFAA (1 POINT MSA) SW846-7740

Analyst: S. GRAY Analysis Date: 26-JAN-91 Instrument: GFAA Test: M728.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SELENIUM	BDL	0.005	mg/L	BDL	0.0250		68
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.0019			
SAMPLE + ADD 1			Conc	0.011			
DILUTION				2			

MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Analyst: S. O'NEAL Analysis Date: 29-JAN-91 Test: P131.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10		mL
FINAL VOLUME	100		mL

TCLP MERCURY CVAA (1 POINT MSA) SW846-7470

Analyst: J. WARE Analysis Date: 30-JAN-91 Instrument: CVAA Test: M720.6. 0

Prep: MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
MERCURY	BDL	0.005	mg/L	BDL	0.0200		108
ADDITION 1			mg/L	0.0010			
SAMPLE			Conc	0.000			
SAMPLE + ADD 1			Conc	0.00215			
DILUTION				1			

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-JAN-91	A222266
	Complete 14-FEB-91	PO Number 90B403C-1
	Printed 15-FEB-91	Sampled 19-JAN-91 17:00

Report To	Bill To
WOODWARD CLYDE CONSULTANTS DEJONNETT KING SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206	WOODWARD CLYDE CONSULTANTS ACCOUNTS PAYABLE SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206

Sample Description

SAMPLE NO.: CEDR-L-01
DESCRIPTION: LIQUID
LOCATION:: "L"

TOTAL SOLIDS EPA 160.3

Analyst: K. SCOTT — Analysis Date: 23-JAN-91 — Test: G401.7. 0

Parameter	Result	Det. Limit	Units
SOLIDS	6900	10	mg/L

TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Analyst: R. EATON — Analysis Date: 23-JAN-91 — Test: P107.2. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	2377		Grams
LIQUID FRACTION (GRAMS)	2377		Grams
EXTRACTED SAMPLE			Grams
SOLIDS	0		Percent
9.5 MM SIEVE TEST			Passed
INITIAL PH	11.4		Std. Units
ADJUSTED PH			Std. Units
BUFFER SOLUTION PH			Std. Units
FINAL PH	11.4		Std. Units
VOLUME BUFFERED SOLUTION			mL
VOLUME EXTRACT FILTERED	2377		mL
LIQUID FRACTION	2377		mL
TOTAL VOLUME FILTRATE	2377		mL
INITIAL TIME			HRS
FINAL TIME			HRS

AMBIENT TEMP: 23 DEGREES

FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Analyst: M. SCROGHAM — Analysis Date: 24-JAN-91 — Test: P130.8. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	100		mL
FINAL WEIGHT OR VOLUME	100		mL

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222266

TCLP BARIUM FAA (1 POINT MSA) SW846-7080

Analyst: A. STOCKBURGER Analysis Date: 24-JAN-91 Instrument: FAA Test: M704.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BARIUM	BDL	2.0	mg/L	BDL	1.00		
ADDITION 1			mg/L	2.50			
SAMPLE			Conc	0.08			
SAMPLE + ADD 1			Conc	2.51			
DILUTION				10			

NO TCLP SPIKE RECOVERY TO DILUTION.

TCLP CADMIUM FAA (1 POINT MSA) SW846-7130

Analyst: A. STOCKBURGER Analysis Date: 24-JAN-91 Instrument: FAA Test: M708.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CADMIUM	BDL	0.02	mg/L	BDL	0.20	0.17	85
ADDITION 1			mg/L	0.50			
SAMPLE			Conc	0.01			
SAMPLE + ADD 1			Conc	0.45			
DILUTION				1			

TCLP CHROMIUM FAA (1 POINT MSA) SW846-7190

Analyst: A. STOCKBURGER Analysis Date: 24-JAN-91 Instrument: FAA Test: M710.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CHROMIUM	0.12	0.05	mg/L	0.13	0.40	0.55	105
ADDITION 1			mg/L	1.00			
SAMPLE			Conc	0.13			
SAMPLE + ADD 1			Conc	1.25			
DILUTION				1			

TCLP LEAD FAA (1 POINT MSA) SW846-7420

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M716.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
LEAD	BDL	0.2	mg/L	BDL	2.00	1.79	90
ADDITION 1			mg/L	5.00			
SAMPLE			Conc	-0.02			
SAMPLE + ADD 1			Conc	4.66			
DILUTION				1			

TCLP SILVER FAA (1 POINT MSA) SW846-7760

Analyst: A. STOCKBURGER Analysis Date: 24-JAN-91 Instrument: FAA Test: M730.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SILVER	BDL	0.04	mg/L	BDL	0.20	0.13	65
ADDITION 1			mg/L	0.50			

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222266

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SAMPLE			Conc	-0.01			
SAMPLE + ADD 1			Conc	0.46			
DILUTION				1			

GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Analyst: M. SCROGHAM Analysis Date: 24-JAN-91 Test: P130.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

TCLP ARSENIC GFAA (1 POINT MSA) SW846-7060

Analyst: M. BAUER Analysis Date: 24-JAN-91 Instrument: GFAA Test: M703.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
ARSENIC	1.5	0.005	mg/L	1.5	0.0250	1.4	
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.015			
SAMPLE + ADD 1			Conc	0.023			
DILUTION				100			

SPIKE DILUTED OUT % RECOVERY.

TCLP SELENIUM GFAA (3 POINT MSA) SW846-7740

Analyst: S. GRAY Analysis Date: 26-JAN-91 Instrument: GFAA Test: M728.2. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SELENIUM	0.019	0.005	mg/L	0.0191	0.0250	0.0438	99
ADDITION 1			mg/L	0.010			
ADDITION 2			mg/L	0.011			
ADDITION 3			Conc	0.018			
SAMPLE			Conc	0.024			
SAMPLE + ADD 1				1			
SAMPLE + ADD 2			mg/L				
SAMPLE + ADD 3			mg/L				
DILUTION				1			

SELENIUM ANALYZED BY 3 POINT MSA DUE TO POOR RECOVERY OF 1 POINT MSA.
NOTE: 3 POINT STANDARD ADDITIONS REQUIRED DUE TO POOR SPIKE RECOVERY. THIS NECESSITATED AN ADDITIONAL CHARGE IN ORDER TO COVER COSTS ASSOCIATED WITH QA/QC REQUIREMENTS OF SW846 WHENEVER MATRIX INTERFERENCE CAUSES POOR SPIKE RECOVERY.

MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Analyst: S. O'NEAL Analysis Date: 29-JAN-91 Test: P131.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10		mL
FINAL VOLUME	100		mL

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222266

TCLP MERCURY CVAA (1 POINT MSA) SW846-7470

Analyst: J. WARE Analysis Date: 30-JAN-91 Instrument: CVAA Test: M720.6. 0

Prep: MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
MERCURY	BDL	0.005	mg/L	BDL	0.0200	0.023	115
ADDITION 1			mg/L	0.0010			
SAMPLE			Conc	0.000			
SAMPLE + ADD 1			Conc	0.00107			
DILUTION				1			

TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: R. BRANCH Analysis Date: 24-JAN-91 Test: P733.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	1		mL

TCLP SEMIVOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8270

Analyst: M. DONOFRIO Analysis Date: 25-JAN-91 Instrument: GC/MS SVOA Test: O514.7. 0

Prep: TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
1,4-DICHLOROBENZENE	BDL	50	ug/L	BDL	500	160	33
2,4-DINITROTOLUENE	BDL	50	ug/L	BDL	500	170	34
HEXACHLOROBENZENE	BDL	50	ug/L	BDL	500	1400	280
HEXACHLOROBUTADIENE	BDL	50	ug/L	BDL	500	110	23
HEXACHLOROETHANE	BDL	50	ug/L	BDL	500	110	22
NITROBENZENE	BDL	50	ug/L	BDL	500	500	100
PYRIDINE		250	ug/L	BDL			
CRESYLIC ACID		120	ug/L	BDL			
2-METHYL PHENOL	BDL	50	ug/L	BDL	500	100	20
3-METHYL PHENOL		50	ug/L	BDL			
4-METHYLPHENOL	BDL	50	ug/L	BDL	500	20	4
PENTACHLOROPHENOL	BDL	250	ug/L	BDL	500	110	22
2,4,5-TRICHLOROPHENOL	BDL	1600	ug/L	BDL	500	240	49
2,4,6-TRICHLOROPHENOL	BDL	50	ug/L	BDL	500	330	67
.							
SURROGATE RECOVERY							

2-FLUOROPHENOL			% Rec	23			
PHENOL-D5			% Rec	17			
NITROBENZENE-D5			% Rec	83			
2-FLUOROBIPHENYL			% Rec	79			
2,4,6-TRIBROMOPHENOL			% Rec	20			
TERPHENYL-D14			% Rec	58			

TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: A. HOAGLAND Analysis Date: 25-JAN-91 Test: P733.1. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222266

TCLP ORGANOCHLORINE PESTICIDES BY GC:ECD SW846-8080

Analyst: A. HOAGLAND Analysis Date: 28-JAN-91 Instrument: GC/ECD Test: 0164.7. 0

Prep: TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
GAMMA-BHC (LINDANE)	BDL	.025	mg/L	BDL	0.0005	0.00	
HEPTACHLOR	BDL	.00025	mg/L	BDL	0.002	0.0019	95
HEPTACHLOR EPOXIDE	BDL	.00025	mg/L	BDL	0.002	0.0015	75
ENDRIN	BDL	.0005	mg/L	BDL	0.00125	0.0012	96
METHOXYCHLOR	BDL	.0025	mg/L	BDL	0.0125	0.012	96
CHLORDANE		.0025	mg/L	BDL			
TOXAPHENE	BDL	.005	mg/L	BDL	0.0125	0.0058	46

NOTE: SPIKE RECOVERY WAS LOST IN MATRIX INTERFERENCE
NOTE: GAMMA-BHC FROM 1:100 DILUTION

TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Analyst: L. DOBBINS Analysis Date: 24-JAN-91 Test: P701.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	250		mL
FINAL VOLUME	10		mL

TCLP CHLORINATED HERBICIDES SW846-8150

Analyst: E. WERNZ Analysis Date: 31-JAN-91 Instrument: GC/ECD Test: 0253.7. 0

Prep: TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
2,4-DICHLOROPHENOXYACETIC ACID	BDL	10	mg/L	BDL		0.0080	
SILVEX	BDL	1	mg/L	BDL		0.0040	

NOTE: DILUTED 1:1000
SPIKE AND DUP-SPIKE RECOVERY WERE NOT POSSIBLE TO REPORT DUE TO EXTREMELY HIGH INTERFERENCE LEVELS. DETECTION LIMITS WERE RAISED DUE TO DILUTIONS.

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: J. MINNIEAR, II Analysis Date: 24-JAN-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	500		Grams
LIQUID PORTION	496.07		mL
LIQUID FRACTION (GRAMS)	0.00		Grams
EXTRACTED SAMPLE	0.00		Grams
PHASE ONE VOLUME (REP 0)	0.00		mL
PHASE TWO VOLUME (REP 1)	496.07		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: A. WIDZISZ Analysis Date: 30-JAN-91 Instrument: GC/MS VOA Test: 0513.7. 0

Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500	380	76
CARBON TETRACHLORIDE	1800	50	ug/L	1490	500	1900	82
CHLOROBENZENE	BDL	50	ug/L	BDL	500	440	88
CHLOROFORM	310	50	ug/L	240	500	630	78
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500	510	102
1,1-DICHLOROETHYLENE	97	50	ug/L	60	500	370	62

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222266

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
ETHYL ETHYL KETONE	500	100	ug/L	540	500	1080	108
TRACHLOROETHYLENE	BDL	50	ug/L	BDL	500	360	72
TRICHLOROETHYLENE	BDL	50	ug/L	BDL	500	540	108
VINYL CHLORIDE	BDL	100	ug/L	BDL	500	300	60
.							
SURROGATE RECOVERY							

DICHLOROETHANE-D4			% Rec	102			
TOLUENE-D8			% Rec	99			
BROMOFLUOROBENZENE			% Rec	103			
DILUTION FACTOR 1:10							

Sample Comments

THIS SAMPLE WAS SPIKED AND THE SPIKE RECOVERY INFORMATION WAS USED FOR MATRIX BIAS CORRECTIONS ON OTHER SAMPLES IN THIS BATCH.

* *See Note for Parameter*
BDL Below Detection Limit

Quality Assurance Officer: GABusch

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-JAN-91	A222267
	Complete 14-FEB-91	PO Number 90B403C-1
	Printed 15-FEB-91	Sampled 19-JAN-91 17:15

Report To

WOODWARD CLYDE CONSULTANTS
DEJONNETT KING
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Bill To

WOODWARD CLYDE CONSULTANTS
ACCOUNTS PAYABLE
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Sample Description

SAMPLE NO.: CEDR-L-01D
DESCRIPTION: LIQUID
LOCATION:: "L"

TOTAL SOLIDS EPA 160.3

Analyst: K. SCOTT — Analysis Date: 23-JAN-91 — Test: G401.7. 0

Parameter	Result	Det. Limit	Units
SOLIDS	6900	10	mg/L

TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Analyst: R. EATON — Analysis Date: 23-JAN-91 — Test: P107.2. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	2377		Grams
LIQUID FRACTION (GRAMS)	2377		Grams
EXTRACTED SAMPLE			Grams
SOLIDS	0		Percent
9.5 MM SIEVE TEST			Passed
INITIAL PH	11.4		Std. Units
ADJUSTED PH			Std. Units
BUFFER SOLUTION PH			Std. Units
FINAL PH	11.4		Std. Units
VOLUME BUFFERED SOLUTION			mL
VOLUME EXTRACT FILTERED	2377		mL
LIQUID FRACTION	2377		mL
TOTAL VOLUME FILTRATE	2377		mL
INITIAL TIME			HRS
FINAL TIME			HRS

AMBIENT TEMP: 23 DEGREES

FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Analyst: M. SCROGHAM — Analysis Date: 24-JAN-91 — Test: P130.8. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	100		mL
FINAL WEIGHT OR VOLUME	100		mL

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222267

TCLP BARIUM FAA (1 POINT MSA) SW846-7080

Analyst: A. STOCKBURGER Analysis Date: 24-JAN-91 Instrument: FAA Test: M704.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BARIUM	BDL	2.0	mg/L	BDL	1.00		
ADDITION 1			mg/L	2.50			
SAMPLE			Conc	0.09			
SAMPLE + ADD 1			Conc	2.54			
DILUTION				10			

SPIKE DILUTED OUT

TCLP CADMIUM FAA (1 POINT MSA) SW846-7130

Analyst: A. STOCKBURGER Analysis Date: 24-JAN-91 Instrument: FAA Test: M708.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CADMIUM	BDL	0.02	mg/L	BDL			85
ADDITION 1			mg/L	0.50			
SAMPLE			Conc	0.00			
SAMPLE + ADD 1			Conc	0.46			
DILUTION				1			

TCLP CHROMIUM FAA (1 POINT MSA) SW846-7190

Analyst: A. STOCKBURGER Analysis Date: 24-JAN-91 Instrument: FAA Test: M710.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CHROMIUM	0.13	0.05	mg/L	0.14			105
ADDITION 1			mg/L	1.00			
SAMPLE			Conc	0.14			
SAMPLE + ADD 1			Conc	1.26			
DILUTION				1			

TCLP LEAD FAA (1 POINT MSA) SW846-7420

Analyst: A. STOCKBURGER Analysis Date: 25-JAN-91 Instrument: FAA Test: M716.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
LEAD	BDL	0.2	mg/L	BDL			90
ADDITION 1			mg/L	5.00			
SAMPLE			Conc	-0.02			
SAMPLE + ADD 1			Conc	4.66			
DILUTION				1			

TCLP SILVER FAA (1 POINT MSA) SW846-7760

Analyst: A. STOCKBURGER Analysis Date: 24-JAN-91 Instrument: FAA Test: M730.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SILVER	BDL	0.04	mg/L	BDL			65
ADDITION 1			mg/L	0.50			

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222267

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SAMPLE			Conc	-0.01			
SAMPLE + ADD 1			Conc	0.46			
DILUTION				1			

GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Analyst: M. SCROGHAM Analysis Date: 24-JAN-91 Test: P130.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

TCLP ARSENIC GFAA (1 POINT MSA) SW846-7060

Analyst: W. WATNESS Analysis Date: 25-JAN-91 Instrument: GFAA Test: M703.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
ARSENIC	1.5	0.25	mg/L	1.5	0.0250		
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.029			
SAMPLE + ADD 1			Conc	0.039			
DILUTION				50			

SPIKE DILUTED OUT

TCLP SELENIUM GFAA (3 POINT MSA) SW846-7740

Analyst: S. GRAY Analysis Date: 26-JAN-91 Instrument: GFAA Test: M728.2. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SELENIUM	0.021	0.005	mg/L	0.021	0.0250		99
ADDITION 1			mg/L	0.010			
ADDITION 2			mg/L	0.020			
ADDITION 3			mg/L	0.040			
SAMPLE			mg/L	0.0090			
SAMPLE + ADD 1			Conc	0.014			
SAMPLE + ADD 2			Conc	0.020			
SAMPLE + ADD 3			Conc	0.028			
DILUTION				1			

SELENIUM WAS ANALYZED BY 3 POINT MSA DUE TO PORR RECOVERY OF 1 POINT MSA.
CORRECTED VALUE A222266
NOTE: 3 POINT STANDARD ADDITIONS REQUIRED DUE TO POOR SPIKE RECOVERY. THIS NECESSITATED AN ADDITIONAL CHARGE IN ORDER TO COVER COSTS ASSOCIATED WITH QA/QC REQUIREMENTS OF SW846 WHENEVER MATRIX INTERFERENCE CAUSES POOR SPIKE RECOVERY.

MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Analyst: S. O'NEAL Analysis Date: 29-JAN-91 Test: P131.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10		mL
FINAL VOLUME	100		mL

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222267

TCLP MERCURY CVAA (1 POINT MSA) SW846-7470

Analyst: J. WARE Analysis Date: 30-JAN-91 Instrument: CVAA Test: M720.6. 0

Prep: MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
MERCURY	BDL	0.005	mg/L	BDL	0.0200	0.0231	115
ADDITION 1			mg/L	0.0010			
SAMPLE			Conc	0.000			
SAMPLE + ADD 1			Conc	0.0011			
DILUTION				1			

TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: R. BRANCH Analysis Date: 24-JAN-91 Test: P733.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	1		mL

TCLP SEMIVOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8270

Analyst: M. DONOFRIO Analysis Date: 25-JAN-91 Instrument: GC/MS SVOA Test: O514.7. 0

Prep: TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
1,4-DICHLOROBENZENE	BDL	50	ug/L	BDL	500	160	33
2,4-DINITROTOLUENE	BDL	50	ug/L	BDL	500	170	34
HEXACHLOROBENZENE	BDL	50	ug/L	BDL	500	1400	280
HEXACHLOROBUTADIENE	BDL	50	ug/L	BDL	500	110	23
HEXACHLOROETHANE	BDL	50	ug/L	BDL	500	110	22
NITROBENZENE	BDL	50	ug/L	BDL	500	500	100
PYRIDINE		250	ug/L	BDL			
CRESYLIC ACID		120	ug/L	BDL			
2-METHYL PHENOL	BDL	50	ug/L	BDL	500	100	20
3-METHYL PHENOL		50	ug/L	BDL			
4-METHYLPHENOL	BDL	50	ug/L	BDL	500	20	4
PENTACHLOROPHENOL	BDL	250	ug/L	BDL	500	110	22
2,4,5-TRICHLOROPHENOL	BDL	1600	ug/L	BDL	500	240	49
2,4,6-TRICHLOROPHENOL	BDL	50	ug/L	BDL	500	330	67
.							
SURROGATE RECOVERY							

2-FLUOROPHENOL			% Rec	25			
PHENOL-D5			% Rec	21			
NITROBENZENE-D5			% Rec	100			
2-FLUOROBIPHENYL			% Rec	88			
2,4,6-TRIBROMOPHENOL			% Rec	23			
TERPHENYL-D14			% Rec	72			

TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: A. HOAGLAND Analysis Date: 25-JAN-91 Test: P733.1. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222267

TCLP ORGANOCHLORINE PESTICIDES BY GC:ECD SW846-8080

Analyst: A. HOAGLAND Analysis Date: 28-JAN-91 Instrument: GC/ECD Test: 0164.7, 0

Prep: TCLP GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
GAMMA-BHC (LINDANE)	BDL	.025	mg/L	BDL	0.0005	0.00	
HEPTACHLOR	BDL	.00025	mg/L	BDL	0.002	0.0019	95
HEPTACHLOR EPOXIDE	BDL	.00025	mg/L	BDL	0.002	0.0015	75
ENDRIN	BDL	.0005	mg/L	BDL	0.00125	0.0012	96
METHOXYCHLOR	BDL	.0025	mg/L	BDL	0.0125	0.012	96
CHLORDANE		.0025	mg/L	BDL			
TOXAPHENE	BDL	.005	mg/L	BDL	0.0125	0.0058	46

*NOTE: * SPIKE RECOVERY WAS LOST IN MATRIX INTERFERENCE*

NOTE: GAMMA-BHC FROM 1:100 DILUTION

TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Analyst: L. DOBBINS Analysis Date: 24-JAN-91 Test: P701.4, 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	250		mL
FINAL VOLUME	10		mL

TCLP CHLORINATED HERBICIDES SW846-8150

Analyst: E. WERNZ Analysis Date: 31-JAN-91 Instrument: GC/ECD Test: 0253.7, 0

Prep: TCLP DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ORG+PEST+HERBS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
2,4-DICHLOROPHENOXYACETIC ACID	BDL	10	mg/L	BDL		0.0080	
SILVEX	BDL	1	mg/L	BDL		0.0040	

NOTE: DILUTED 1:1000

SPIKE AND DUP-SPIKE RECOVERY NOT REPORTED DUE TO HIGH INTERFERENCE LEVELS.

DETECTION LIMITS WERE RAISED DUE TO DILUTIONS.

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: J. MINNIEAR, II Analysis Date: 24-JAN-91 Test: P108.1, 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	498.34		Grams
LIQUID PORTION	489.76		mL
LIQUID FRACTION (GRAMS)	0.00		Grams
EXTRACTED SAMPLE	0.00		Grams
PHASE ONE VOLUME (REP 0)	0.00		mL
PHASE TWO VOLUME (REP 1)	489.76		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: A. WIDZISZ Analysis Date: 30-JAN-91 Instrument: GC/MS VOA Test: 0513.7, 0

Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500	380	76
CARBON TETRACHLORIDE	2100	50	ug/L	1700	500	1900	82
CHLOROBENZENE	BDL	50	ug/L	BDL	500	440	88
CHLOROFORM	310	50	ug/L	240	500	630	78
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500	510	102
1,1-DICHLOROETHYLENE	110	50	ug/L	70	500	370	62

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222267

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
ETHYL ETHYL KETONE	640	100	ug/L	690	500	1080	108
TRACHLOROETHYLENE	BDL	50	ug/L	BDL	500	360	72
TRICHLOROETHYLENE	EST 46	50	ug/L	EST 50	500	540	108
VINYL CHLORIDE	BDL	100	ug/L	BDL	500	300	60
.							
SURROGATE RECOVERY							

DICHLOROETHANE-D4			% Rec	108			
TOLUENE-D8			% Rec	100			
BROMOFLUOROBENZENE			% Rec	112			
DILUTION FACTOR 1:10							

Sample Comments

MATRIX BIAS CORRECTIONS WERE CALCULATED USING SPIKE RECOVERIES FROM SAMPLE A222266.

* *See Note for Parameter*
BDL Below Detection Limit
EST Estimated Value

Quality Assurance Officer: G.A. Rusch

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-JAN-91	A222268
	Complete 14-FEB-91	PO Number 90B403C-1
	Printed 14-FEB-91	Sampled 19-JAN-91 17:17

Report To	Bill To
WOODWARD CLYDE CONSULTANTS DEJONNETT KING SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206	WOODWARD CLYDE CONSULTANTS ACCOUNTS PAYABLE SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206

Sample Description

SAMPLE NO.: CEDR-R-01
DESCRIPTION: LIQUID
LOCATION:: "R"

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: J. CARSON Analysis Date: 23-JAN-91 Test: P130.4. 0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

BARIUM ICP SW846-6010

Analyst: M. JAO Analysis Date: 24-JAN-91 Instrument: ICP Test: M104.3. 0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Parameter	Result	Det. Limit	Units
BARIUM	BDL	0.010	mg/L

CADMIUM ICP SW846-6010

Analyst: M. JAO Analysis Date: 24-JAN-91 Instrument: ICP Test: M108.3. 0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Parameter	Result	Det. Limit	Units
CADMIUM	BDL	0.0050	mg/L

CHROMIUM ICP SW846-6010

Analyst: M. JAO Analysis Date: 24-JAN-91 Instrument: ICP Test: M110.3. 0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

LEAD ICP SW846-6010

Analyst: M. JAO Analysis Date: 24-JAN-91 Instrument: ICP Test: M116.3. 0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.050	mg/L

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A222268

SILVER ICP SW846-6010

Analyst: M. JAO Analysis Date: 24-JAN-91 Instrument: ICP Test: M130.3. 0

Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Parameter	Result	Det. Limit	Units
SILVER	BDL	0.010	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: B. HAHN Analysis Date: 23-JAN-91 Test: P130.6. 0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: P. SIMS Analysis Date: 23-JAN-91 Instrument: GFAA Test: M103.2. 0

Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.0050	mg/L

SELENIUM GFAA SW846-7740

Analyst: K. KEHOE Analysis Date: 24-JAN-91 Instrument: GFAA Test: M128.2. 0

Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Parameter	Result	Det. Limit	Units
SELENIUM	BDL	0.0050	mg/L

MERCURY CVAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-7470

Analyst: P. SIMS Analysis Date: 28-JAN-91 Test: P131.6. 0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	100		mL
FINAL VOLUME	100		mL

MERCURY CVAA SW846-7470

Analyst: S. O'NEAL Analysis Date: 28-JAN-91 Instrument: CVAA Test: M120.1. 0

Prep: MERCURY CVAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-7470

Parameter	Result	Det. Limit	Units
MERCURY	BDL	0.0005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: J. MINNIEAR, II Analysis Date: 23-JAN-91 Test: P233.4. 0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	1		mL

TCLP SEMIVOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8270

Analyst: J. ELLIS Analysis Date: 25-JAN-91 Instrument: GC/MS SVOA Test: O514.3. 0

Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
1,4-DICHLOROBENZENE		50	ug/L	BDL			
2,4-DINITROTOLUENE		50	ug/L	BDL			
HEXACHLOROBENZENE		50	ug/L	BDL			
HEXACHLOROBUTADIENE		50	ug/L	BDL			
HEXACHLOROETHANE		50	ug/L	BDL			
NITROBENZENE		50	ug/L	BDL			
[illegible]INE		250	ug/L	BDL			
[illegible]IC ACID		120	ug/L	BDL			
2-METHYL PHENOL		50	ug/L	BDL			
3-METHYL PHENOL		50	ug/L	BDL			
4-METHYLPHENOL		50	ug/L	BDL			

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222268

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
[illegible]TACHLOROPHENOL		250	ug/L	BDL			
[illegible],5-TRICHLOROPHENOL		50	ug/L	BDL			
2,4,6-TRICHLOROPHENOL		50	ug/L	BDL			
SURROGATE RECOVERY							
2-FLUOROPHENOL			% Rec	44			
PHENOL-D5			% Rec	38			
NITROBENZENE-D5			% Rec	100			
2-FLUOROBIPHENYL			% Rec	80			
2,4,6-TRIBROMOPHENOL			% Rec	98			
TERPHENYL-D14			% Rec	98			

GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: L. DOBBINS Analysis Date: 23-JAN-91 Test: P233.1. 0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

ORGANOCHLORINE PESTICIDES BY GC:ECD (7 PESTICIDES) SW846-8080

Analyst: A. HOAGLAND Analysis Date: 28-JAN-91 Instrument: GC/ECD Test: O164.3. 0

Prep: GC SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Parameter	Result	Det. Limit	Units
GAMMA-BHC (LINDANE)	BDL	.00025	mg/L
HEPTACHLOR	BDL	.00025	mg/L
HEPTACHLOR EPOXIDE	BDL	.00025	mg/L
ENDRIN	BDL	.0005	mg/L
METHOXYCHLOR	BDL	.0025	mg/L
CHLORDANE	BDL	.0025	mg/L
TOXAPHENE	BDL	.005	mg/L

DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Analyst: A. GOZDECKI Analysis Date: 28-JAN-91 Test: P201.4. 0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	10		mL

CHLORINATED HERBICIDES (2,4 D AND SILVEX) SW846-8150

Analyst: B. WOOD Analysis Date: 01-FEB-91 Instrument: GC/ECD Test: O253.2. 0

Prep: DIAZOMETHANE HERBICIDE DERIVATIZATION SW846-8150

Parameter	Result	Det. Limit	Units
2,4-DICHLOROPHENOXYACETIC ACID	BDL	0.01	mg/L
SILVEX	BDL	0.001	mg/L

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: A. WIDZISZ Analysis Date: 30-JAN-91 Instrument: GC/MS VOA Test: O513.3. 0

Parameter	Result	Det. Limit	Units
BENZENE	BDL	5	ug/L
CARBON TETRACHLORIDE	BDL	5	ug/L
CHLOROBENZENE	BDL	5	ug/L
CHLOROFORM	BDL	5	ug/L
[illegible]-DICHLOROETHANE	BDL	5	ug/L
[illegible]-DICHLOROETHYLENE	BDL	5	ug/L
METHYL ETHYL KETONE	BDL	10	ug/L
TETRACHLOROETHYLENE	BDL	5	ug/L
TRICHLOROETHYLENE	BDL	5	ug/L

EMS HERITAGE LABORATORIES, INC.

Lab Sample ID: A222268

Parameter	Result	Det. Limit	Units
VINYL CHLORIDE	BDL	10	ug/L
RROGATE RECOVERY			
DICHLOROETHANE-D4	112		% Rec
TOLUENE-D8	100		% Rec
BROMOFLUOROBENZENE	106		% Rec

Sample Comments

BDL Below Detection Limit

Quality Assurance Officer: GaBurch

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-JAN-91	A222269
	Complete 14-FEB-91	PO Number 90B403C-1
	Printed 14-FEB-91	Sampled 19-JAN-91 17:21

Report To

WOODWARD CLYDE CONSULTANTS
DEJONNETT KING
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Bill To

WOODWARD CLYDE CONSULTANTS
ACCOUNTS PAYABLE
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Sample Description

SAMPLE NO.: CEDR-TB-01
DESCRIPTION: LIQUID
LOCATION:: "TB"

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: A. WIDZISZ Analysis Date: 30-JAN-91 Instrument: GC/MS VOA Test: 0513.3. 0

Parameter	Result	Det. Limit	Units
BENZENE	BDL	5	ug/L
CARBON TETRACHLORIDE	BDL	5	ug/L
CHLOROBENZENE	BDL	5	ug/L
CHLOROFORM	BDL	5	ug/L
1,2-DICHLOROETHANE	BDL	5	ug/L
1,1-DICHLOROETHYLENE	BDL	5	ug/L
METHYL ETHYL KETONE	BDL	10	ug/L
TETRACHLOROETHYLENE	BDL	5	ug/L
TRICHLOROETHYLENE	BDL	5	ug/L
VINYL CHLORIDE	BDL	10	ug/L
.			
SURROGATE RECOVERY			

DICHLOROETHANE-D4	111		% Rec
TOLUENE-D8	100		% Rec
BROMOFLUOROBENZENE	106		% Rec

Sample Comments

BDL Below Detection Limit

Quality Assurance Officer: GaBusch

CHAIN - OF - CUSTODY RECORD

SAMPLE NO.	DATE MM/DD/YR	TIME	SAMPLE TYPE COMP.	SAMPLE TYPE GRAB	STATION LOCATION	TOTAL NO. CONTAINERS
	2-20-91	1420		✓	Pond "A"	2
	"	1610		✓	Inlet	2
	2-20-91	1420		✓	Leachate	2
					Leachate	
	2-20-91	1420		✓	Duplicate	2
					Leachate	
	2-20-91	1630		✓	Spike	4

AMPLE COLLECTION:

PROJECT NO. AND NAME: Cedar Chemical [redacted]
LOCATION OF SAMPLE: Surface Impoundment A
COLLECTOR'S NAME: Killebrew-Bassell TELEPHONE: (601) 957-7666
COMPANY NAME: Woodward Clyde Consultants
ADDRESS: 460 Briarwood Drive Suite 520 Jackson, MS 39206
WITNESS: [illegible] COMPANY NAME: CEDAR CHEMICAL CORP.

ELD INFORMATION:

TYPES OF SAMPLES: (LIQUID) GAS SLUDGE SOIL OTHER(SPECIFY) _____
FIELD NOTES: _____
TRANSPORTER: UPS AIRBILL/INVOICE: _____ DESTINATION: EMS Heritage Lab

MPLE TRANSFER (Original must be retained with sample at all times)

		RELINQUISHED BY	DATE/TIME	RECEIVED BY	DATE/TIME
1	NAME:	SR Killebrew	1700		
	COMPANY:	WCC			
2	NAME:				
	COMPANY:				
3	NAME:				
	COMPANY:				

MINATION OF CHAIN-OF-CUSTODY:

UTHORIZED BY: _____ DATE: _____ TIME: _____
MPANY NAME: _____
AMPLE DISPOSTION: STORAGE _____ DISPOSAL _____ OTHER _____

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-FEB-91	A224349
	Complete 11-MAR-91	PO Number 90B403C-1
	Printed 12-MAR-91	Sampled

Report To	Bill To
WOODWARD CLYDE CONSULTANTS DEJONNETT KING SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206	WOODWARD CLYDE CONSULTANTS ACCOUNTS PAYABLE SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206

Sample Description

DESCRIPTION: TRIP BLANK

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: T. WIEGAND Analysis Date: 07-MAR-91 Instrument: GC/MS VOA Test: 0513.3. 0

Parameter	Result	Det. Limit	Units
BENZENE	BDL	5	ug/L
CARBON TETRACHLORIDE	BDL	5	ug/L
CHLOROBENZENE	BDL	5	ug/L
CHLOROFORM	BDL	5	ug/L
1,2-DICHLOROETHANE	BDL	5	ug/L
1,1-DICHLOROETHYLENE	BDL	5	ug/L
METHYL ETHYL KETONE	BDL	10	ug/L
TETRACHLOROETHYLENE	BDL	5	ug/L
TRICHLOROETHYLENE	BDL	5	ug/L
VINYL CHLORIDE	BDL	10	ug/L
SURROGATE RECOVERY			
DICHLOROETHANE-D4	101		% Rec
TOLUENE-D8	102		% Rec
BROMOFLUOROBENZENE	104		% Rec

Sample Comments

BDL Below Detection Limit

Quality Assurance Officer: D Peterson

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-FEB-91	A224345
	Complete 12-MAR-91	PO Number 90B403C-1
	Printed 13-MAR-91	Sampled 20-FEB-91 16:00

Report To	Bill To
WOODWARD CLYDE CONSULTANTS DEJONNETT KING SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206	WOODWARD CLYDE CONSULTANTS ACCOUNTS PAYABLE SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206

Sample Description

DESCRIPTION: POND "A"

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: T. BILLE Analysis Date: 28-FEB-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	470.5		Grams
LIQUID PORTION	459.3		mL
LIQUID FRACTION (GRAMS)	459.3		Grams
EXTRACTED SAMPLE	0.00		Grams
PHASE ONE VOLUME (REP 0)	459.3		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: T. WIEGAND Analysis Date: 07-MAR-91 Instrument: GC/MS VOA Test: 0513.7. 0

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500		104
CARBON TETRACHLORIDE	120	50	ug/L	140	500		120
CHLOROBENZENE	BDL	50	ug/L	BDL	500		104
CHLOROFORM	BDL	50	ug/L	BDL	500		108
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500		108
1,1-DICHLOROETHYLENE	BDL	50	ug/L	BDL	500		106
METHYL ETHYL KETONE	BDL	100	ug/L	BDL	500		132
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL	500		100
TRICHLOROETHYLENE	BDL	50	ug/L	BDL	500		176
VINYL CHLORIDE	BDL	100	ug/L	BDL	500		98
.							
SURROGATE RECOVERY							

DICHLOROETHANE-D4			% Rec	100			
TOLUENE-D8			% Rec	100			
BROMOFLUOROBENZENE			% Rec	100			
DILUTION FACTOR 1:10							

Sample Comments

Below Detection Limit

Quality Assurance Officer: _____

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-FEB-91	A224347
	Complete 12-MAR-91	PO Number 90B403C-1
	Printed 13-MAR-91	Sampled 20-FEB-91 16:20

Report To	Bill To
WOODWARD CLYDE CONSULTANTS DEJONNETT KING SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206	WOODWARD CLYDE CONSULTANTS ACCOUNTS PAYABLE SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206

Sample Description

DESCRIPTION: LEACHATE

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: T. BILLE Analysis Date: 28-FEB-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	465		Grams
LIQUID PORTION	457.9		mL
LIQUID FRACTION (GRAMS)	457.9		Grams
EXTRACTED SAMPLE	0.00		Grams
PHASE ONE VOLUME (REP 0)	457.9		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: T. WIEGAND Analysis Date: 07-MAR-91 Instrument: GC/MS VOA Test: O513.7. 0

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	64	50	ug/L	67			104
CARBON TETRACHLORIDE	1200	50	ug/L	1400			120
CHLOROBENZENE	BDL	50	ug/L	BDL			104
CHLOROFORM	190	50	ug/L	210			108
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL			108
1,1-DICHLOROETHYLENE	65	50	ug/L	69			106
METHYL ETHYL KETONE	830	100	ug/L	1100			132
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL			100
TRICHLOROETHYLENE	BDL	50	ug/L	BDL			176
VINYL CHLORIDE	BDL	100	ug/L	BDL			98
SURROGATE RECOVERY							
DICHLOROETHANE-D4			% Rec	102			
TOLUENE-D8			% Rec	102			
BROMOFLUOROBENZENE			% Rec	103			
DILUTION FACTOR 1:10							

Sample Comments

Below Detection Limit

Quality Assurance Officer: D L Peterson

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-FEB-91	A224346
	Complete 12-MAR-91	PO Number 90B403C-1
	Printed 13-MAR-91	Sampled 20-FEB-91 16:10

Report To	Bill To
WOODWARD CLYDE CONSULTANTS DEJONNETT KING SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206	WOODWARD CLYDE CONSULTANTS ACCOUNTS PAYABLE SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206

Sample Description

DESCRIPTION: INLET

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: T. BILLE Analysis Date: 28-FEB-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	470		Grams
LIQUID PORTION	460.2		mL
LIQUID FRACTION (GRAMS)	460.2		Grams
EXTRACTED SAMPLE	0.00		Grams
PHASE ONE VOLUME (REP 0)	460.2		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: T. WIEGAND Analysis Date: 07-MAR-91 Instrument: GC/MS VOA Test: 0513.7. 0

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500		104
CARBON TETRACHLORIDE	75	50	ug/L	90	500		120
CHLOROBENZENE	BDL	50	ug/L	BDL	500		104
CHLOROFORM	BDL	50	ug/L	BDL	500		108
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500		108
1,1-DICHLOROETHYLENE	BDL	50	ug/L	BDL	500		106
METHYL ETHYL KETONE	BDL	100	ug/L	BDL	500		132
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL	500		100
TRICHLOROETHYLENE	BDL	50	ug/L	BDL	500		176
VINYL CHLORIDE	BDL	100	ug/L	BDL	500		98
.							
SURROGATE RECOVERY							

DICHLOROETHANE-D4			% Rec	99			
TOLUENE-D8			% Rec	99			
BROMOFLUOROBENZENE			% Rec	101			
DILUTION FACTOR 1:10							

Sample Comments

Below Detection Limit

Quality Assurance Officer: _____

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-FEB-91	A224344
	Complete 11-MAR-91	PO Number 90B403C-1
	Printed 12-MAR-91	Sampled 20-FEB-91 16:20

Report To

WOODWARD CLYDE CONSULTANTS
DEJONNETT KING
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Bill To

WOODWARD CLYDE CONSULTANTS
ACCOUNTS PAYABLE
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Sample Description

DESCRIPTION: LEACHATE (SPIKE)

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: T. BILLE Analysis Date: 28-FEB-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	460		Grams
LIQUID PORTION	441.1		mL
LIQUID FRACTION (GRAMS)	441.1		Grams
EXTRACTED SAMPLE	0.00		Grams
PHASE ONE VOLUME (REP 0)	441.1		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: T. WIEGAND Analysis Date: 07-MAR-91 Instrument: GC/MS VOA Test: 0513.7. 0

Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500	520	104
CARBON TETRACHLORIDE	1200	50	ug/L	1400	500	2000	120
CHLOROBENZENE	BDL	50	ug/L	BDL	500	520	104
CHLOROFORM	200	50	ug/L	220	500	760	108
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500	540	108
1,1-DICHLOROETHYLENE	62	50	ug/L	66	500	600	106
METHYL ETHYL KETONE	710	100	ug/L	940	500	1600	132
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL	500	500	100
TRICHLOROETHYLENE	BDL	50	ug/L	BDL	500	880	176
VINYL CHLORIDE	BDL	100	ug/L	BDL	500	490	98
SURROGATE RECOVERY							
DICHLOROETHANE-D4			% Rec	97			
TOLUENE-D8			% Rec	99			
BROMOFLUOROBENZENE			% Rec	101			
DILUTION FACTOR 1:10							

Sample Comments

BDL Below Detection Limit

Quality Assurance Officer: D. Peterson

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 501 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	22-FEB-91	A224348
	Complete 12-MAR-91	PO Number 90B403C-1
	Printed 13-MAR-91	Sampled 20-FEB-91 16:20

Report To

WOODWARD CLYDE CONSULTANTS
DEJONNETT KING
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Bill To

WOODWARD CLYDE CONSULTANTS
ACCOUNTS PAYABLE
SUITE 520
460 BRIARWOOD DRIVE
JACKSON, MS 39206

Sample Description

DESCRIPTION: LEACHATE (DUP)

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: T. BILLE Analysis Date: 28-FEB-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	470.8		Grams
LIQUID PORTION	454.6		mL
LIQUID FRACTION (GRAMS)	454.6		Grams
EXTRACTED SAMPLE	0.00		Grams
PHASE ONE VOLUME (REP 0)	454.6		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: T. WIEGAND Analysis Date: 07-MAR-91 Instrument: GC/MS VOA Test: 0513.7. 0

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL			104
CARBON TETRACHLORIDE	1100	50	ug/L	1300			120
CHLOROBENZENE	BDL	50	ug/L	BDL			104
CHLOROFORM	190	50	ug/L	210			108
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL			108
1,1-DICHLOROETHYLENE	51	50	ug/L	67			106
METHYL ETHYL KETONE	830	100	ug/L	1100			132
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL			100
TRICHLOROETHYLENE	BDL	50	ug/L	BDL			176
VINYL CHLORIDE	BDL	100	ug/L	BDL			98
SURROGATE RECOVERY							
DICHLOROETHANE-D4			% Rec	99			
TOLUENE-D8			% Rec	105			
BROMOFLUOROBENZENE			% Rec	108			
DILUTION FACTOR 1:10							

Sample Comments

Below Detection Limit

Quality Assurance Officer: N. Peterson

TO ENSURE PROPER HANDLING OF SAMPLES PLEASE COMPLETE THIS ENTIRE FORM

EMS HERITAGE LABORATORIES, INC.

7901 West Morris Street
Indianapolis, Indiana 46231 (317) 243-0811 Fax (317) 243-0360

Co. Name: CEDAR CHEMICAL CORP.
Project Name: BLANKET DRAIN
Quote No.: PO No.:

ENVIRONMENTAL PROGRAM:
CWA NPDES_____ IWP_____ SLUDGE_____
RCRA MW_____ SW_____ DISPOSAL X
SDWA_____ CERCLA/SUPERFUND_____ OTHER_____

Sampled by:

Analyses Requested (Note special detection limits or methods): TCLP VOA

Report To:
Co: WOODWARD CLYDE CONSULTANTS
Add: 460 BRIARWOOD DR, SUITE 520
JACKSON, MS 39206
Attn: CALEB DANA
Phone: 601-957-7666

Accelerated Turnaround Requested _____ (Subject to Additional Charge)

Result Request by: ___/___/___ Mo Day Yr (Date must be Accepted and Approved by Lab.)

Sample ID:	Date:	Time:	Comp	Grab	Sample Description:	No. of Containers	TCLP VOA	Remarks:	EMS Sample No.
2 101966	5/14/91	1510		X	BLANKET DRAIN EFFLUENT	1	X		
2 102965	5/14/91	1510		X	BLANKET DRAIN EFFLUENT SPIKE	1	X		
91-1	5/14/91	1510		X	TRIP BLANK	2	X		

Relinquished by: (Signature)	Date /Time	Received by: (Signature)	Relinquished by: (Signature)	Date /Time	Received by: (Signature)
[illegible]	5/14/91 / 1530			/	
Relinquished by: (Signature)	Date /Time	Received by: (Signature)	Relinquished by: (Signature)	Date /Time	Received by: (Signature)
	/			/	
Relinquished by: (Signature)	Date /Time	Received for Lab by: (Signature)	Remarks:		
	/				

Distribution: Original and yellow copies accompany sample shipment to laboratory; Yellow copy returned to client.

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	07-MAR-91	A225138
	Complete 18-MAR-91	PO Number PROJ # 90B403C-1
	Printed 19-MAR-91	Sampled

Report To	Bill To
WOODWARD CLYDE CONSULTANTS DEJONNETT KING SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206	WOODWARD CLYDE CONSULTANTS ACCOUNTS PAYABLE SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206

Sample Description

DESCRIPTION: TRIP BLANK

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: T. WIEGAND Analysis Date: 15-MAR-91 Instrument: GC/MS VOA Test: 0513.3. 0

Parameter	Result	Det. Limit	Units
BENZENE	BDL	5	ug/L
CARBON TETRACHLORIDE	BDL	5	ug/L
CHLOROBENZENE	BDL	5	ug/L
CHLOROFORM	BDL	5	ug/L
1,2-DICHLOROETHANE	BDL	5	ug/L
1,1-DICHLOROETHYLENE	BDL	5	ug/L
METHYL ETHYL KETONE	BDL	10	ug/L
TETRACHLOROETHYLENE	BDL	5	ug/L
TRICHLOROETHYLENE	BDL	5	ug/L
VINYL CHLORIDE	BDL	10	ug/L
SURROGATE RECOVERY			
DICHLOROETHANE-D4	97		% Rec
TOLUENE-D8	100		% Rec
BROMOFLUOROBENZENE	96		% Rec

Sample Comments

BDL Below Detection Limit

Quality Assurance Officer: N L Peterson

Last Page 1

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
MS HERITAGE LABORATORIES, INC. 901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	07-MAR-91	A225135
	Complete 19-MAR-91	PO Number PROJ # 90B403C-1
	Printed 20-MAR-91	Sampled 05-MAR-91 15:10

Report To	Bill To
WOODWARD CLYDE CONSULTANTS DEJONNETT KING SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206	WOODWARD CLYDE CONSULTANTS ACCOUNTS PAYABLE SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206

Sample Description

DESCRIPTION: BLANKET DRAIN EFFLUENT (SPIKED)

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: T. BILLE Analysis Date: 12-MAR-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	500		Grams
LIQUID PORTION	495.7		mL
LIQUID FRACTION (GRAMS)	495.7		Grams
EXTRACTED SAMPLE	0.00		Grams
PHASE ONE VOLUME (REP 0)	495.7		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: T. WIEGAND Analysis Date: 15-MAR-91 Instrument: GC/MS VOA Test: 0513.7. 0

Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500	530	106
CARBON TETRACHLORIDE	37000	2500	ug/L	* 40000	25000	67000	108
CHLOROBENZENE	BDL	50	ug/L	BDL	500	530	106
CHLOROFORM	11000	2500	ug/L	* 10000	25000	33000	92
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500	600	120
1,1-DICHLOROETHYLENE	BDL	50	ug/L	BDL	500	530	106
METHYL ETHYL KETONE	BDL	100	ug/L	BDL	500	710	142
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL	500	570	114
TRICHLOROETHYLENE	820	50	ug/L	820	500	1320	100
VINYL CHLORIDE	BDL	100	ug/L	BDL	500	490	98
SURROGATE RECOVERY							
DICHLOROETHANE-D4			% Rec	101			
TOLUENE-D8			% Rec	98			
BROMOFLUOROBENZENE			% Rec	95			
DILUTION FACTOR 1:10							

*NOTE: * RUN AT 1:500 DILUTION*

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
MS HERITAGE LABORATORIES, INC. 01 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	07-MAR-91	A225136
	Complete 19-MAR-91	PO Number PROJ # 90B403C-1
	Printed 20-MAR-91	Sampled

Report To	Bill To
WOODWARD CLYDE CONSULTANTS DEJONNETT KING SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206	WOODWARD CLYDE CONSULTANTS ACCOUNTS PAYABLE SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206

Sample Description

DESCRIPTION: ~~RINSATE~~ BLANKET DRAIN EFFLUENT (NON-SPIKED) DUPLICATE

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: T. BILLE Analysis Date: 12-MAR-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	498.1		Grams
LIQUID PORTION	493.9		mL
LIQUID FRACTION (GRAMS)	493.9		Grams
EXTRACTED SAMPLE	0.00		Grams
PHASE ONE VOLUME (REP 0)	493.9		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: T. WIEGAND Analysis Date: 15-MAR-91 Instrument: GC/MS VOA Test: 0513.7. 0

Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	0.00	0.00	106
CARBON TETRACHLORIDE	44000	2500	ug/L	* 48000	0.00	0.00	108
CHLOROBENZENE	BDL	50	ug/L	BDL	0.00	0.00	106
CHLOROFORM	13000	2500	ug/L	* 12000	0.00	0.00	92
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	0.00	0.00	120
1,1-DICHLOROETHYLENE	BDL	50	ug/L	BDL	0.00	0.00	106
METHYL ETHYL KETONE	BDL	100	ug/L	BDL	0.00	0.00	142
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL	0.00	0.00	114
TRICHLOROETHYLENE	770	50	ug/L	770	0.00	0.00	100
VINYL CHLORIDE	BDL	100	ug/L	BDL	0.00	0.00	98
SURROGATE RECOVERY							
DICHLOROETHANE-D4			% Rec	97			
TOLUENE-D8			% Rec	95			
BROMOFLUOROBENZENE			% Rec	93			
DILUTION FACTOR 1:10							

*NOTE: * RUN AT 1:500 DILUTION*

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A225136

Sample Comments

* *See Note for Parameter Below Detection Limit*

Quality Assurance Officer: _____

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
MS HERITAGE LABORATORIES, INC. 01 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	07-MAR-91	A225137
	Complete	PO Number
	19-MAR-91	PROJ # 90B403C-1
	Printed	Sampled
	20-MAR-91	05-MAR-91 15:10

Report To	Bill To
WOODWARD CLYDE CONSULTANTS DEJONNETT KING SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206	WOODWARD CLYDE CONSULTANTS ACCOUNTS PAYABLE SUITE 520 460 BRIARWOOD DRIVE JACKSON, MS 39206

Sample Description

DESCRIPTION: BLANKET DRAIN EFFLUENT (NON-SPIKED)

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: T. BILLE Analysis Date: 12-MAR-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	501.2		Grams
LIQUID PORTION	496.3		mL
LIQUID FRACTION (GRAMS)	496.3		Grams
EXTRACTED SAMPLE	0.00		Grams
PHASE ONE VOLUME (REP 0)	496.3		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: T. WIEGAND Analysis Date: 15-MAR-91 Instrument: GC/MS VOA Test: 0513.7. 0

Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	0.00	0.00	106
CARBON TETRACHLORIDE	39000	2500	ug/L	* 42000	0.00	0.00	108
CHLOROBENZENE	BDL	50	ug/L	BDL	0.00	0.00	106
CHLOROFORM	10000	2500	ug/L	* 9500	0.00	0.00	92
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	0.00	0.00	120
1,1-DICHLOROETHYLENE	BDL	50	ug/L	BDL	0.00	0.00	106
METHYL ETHYL KETONE	BDL	100	ug/L	BDL	0.00	0.00	142
TETRACHLOROETHYLENE	BDL	50	ug/L	52	0.00	0.00	114
TRICHLOROETHYLENE	800	50	ug/L	800	0.00	0.00	100
VINYL CHLORIDE	BDL	100	ug/L	BDL	0.00	0.00	98
SURROGATE RECOVERY							
DICHLOROETHANE-D4			% Rec	98			
TOLUENE-D8			% Rec	100			
BROMOFLUOROBENZENE			% Rec	95			
DILUTION FACTOR 1:10							

*NOTE: * RUN AT 1:500 DILUTION*

APPENDIX C

QA/QC REVIEW SUMMARY

Woodward-Clyde Consultants

DATE: March 4, 1991

TO: Caleb Dana

FROM: DeJonnette Grantham-King

SUBJECT: Analytical Data Review for Pond Sediments
EMS Heritage Laboratories, Inc.
TCLP Testing of Pond Sediments at Cedar Chemical
WCC Project No. 90B403CC-1

The results of the laboratory analysis of samples collected January 19, 1990 at the Cedar Chemical Site referenced above have been reviewed. EMS Heritage Laboratory provided the analytical results for 11 soils, 2 waters, 1 rinsate, and 1 field blank to be analyzed for the complete Toxicity Characteristic Leaching Procedure (TCLP).

The Quality Assurance/Quality Control (QA/QC) information consisted of matrix spike/matrix spike duplicate (MS/MSD) recoveries, surrogate recoveries, field duplicate results, and method blank results. The available QA/QC information indicates that, the data met the requirements of Woodward-Clyde Consultants.

Matrix Spike/Matrix Spike Duplicate Sample

Two matrix spike/matrix spike duplicate sample pairs were analyzed with these samples. The accuracy of the samples were determined by a measure of average percent recovery. The average percent recovery of the MS/MSD samples was within acceptible limits or criteria. The results are accepted without further qualifiers.

Surrogate Recoveries

Surrogates were performed on the following groups for TCLP: semivolatile organics, organochlorine pesticides, herbicides, and volatile organics. The average percent recovery of the surrogate samples ranged from 0 to 105. When a zero percent recovery is reported, the compound is reanalyzed for conformation. If the same results are obtained on the reanalysis, then a zero percent surrogate recovery is reported. This is not an uncommon problem, low recoveries for surrogates are due to matrix interferences. The results are accepted without further qualifiers.

Field Duplicate Samples

Two field duplicates (one soil and one water) were analyzed with this sampling. The results of the soil analyses contained traces of copper and chromium; the water sample contained amounts of arsenic, chromium, selenium, carbon tetrachloride, chloroform, 1,1 dichloroethylene, and methyl ethyl ketone. The average precision of the duplicate was measured using the matrix spike recoveries which was reported to be 82, 78, and 62. The results are accepted and used in conjunction with other QA/QC results as a measure of overall field and laboratory precision.

Laboratory Method Blank

One laboratory method blank was analyzed with each group of samples. The laboratory method blanks were contaminant-free for TCLP.

Rinsate Sample

One rinsate sample was collected with these samples. The rinsate was contaminant-free for TCLP.

Field Blank

One field blank was analyzed with the volatile organic samples. The field blank was contaminant-free for the TCLP Volatiles.

Summation of Analyses

Inorganic Compounds

Arsenic was reported in all of the samples except CEDR-B-04.
Barium was reported in sample CEDR-B-02.
Cadmium was reported in samples CEDR-C-01, CEDR-B-01, CEDR-B-02, and CEDR-B-03.
Chromium was reported in all samples.
Lead was reported in sample CEDR-D-01 and CEDR-D-04D.
Selenium was reported in samples CEDR-L-01 and CEDR-L-01D.

Organic Compounds

Carbon Tetrachloride was reported in samples CEDR-L-01 and CEDR-L-01D.
Chloroform was reported in samples CEDR-L-01 sand CEDR-L-01D.
1,1 Dichloroethylene was reported in samples CEDR-L-01 and CEDR-L-01D.
Methyl ethyl ketone was reported in samples CEDR-L-01 and CEDR-L-01D.
Trichloroethylene was reported in sample CEDR-L-01.
Further testing was performed using the Gas Chromatography/Mass Spectrophotometer (GC/MS) to identify any compounds that could not be identified on the Gas Chromatography (GC). The results of the analyses reported that Gamma-BHC (lindane) could not be reported due to matrix interference; the high spike recovery is due to matrix intereference. Atrazine was one of the compounds detected in the sample at high levels.

DATE: April 8, 1991

TO: Caleb H. Dana, Jr.

FROM: DeJonnette Grantham-King

SUBJECT: Analytical Data Review for Pond Sediments
EMS Heritage Laboratories, Inc.
TCLP Volatile Testing, Surface Impoundment at Cedar Chemical
WCC Project No. 90B403C-1

The results of the laboratory analysis of five water samples (Pond "A", Inlet, Leachate, Leachate duplicate and Leachate spike) collected February 20, 1991, and two water samples (Blanket Drain Effluent and Blanket Drain Effluent Spiked) collected March 5, 1991 at the Cedar Chemical Site referenced above have been reviewed. EMS Heritage Laboratory provided the analytical results for a total of seven waters, one rinsate and two field blanks.

The Quality Assurance/Quality Control (QA/QC) information consisted of matrix spike/matrix spike duplicate (MS/MSD) recoveries, surrogate recoveries, field duplicates, and method blanks. The available QA/QC information indicates that, the data met the requirements of Woodward-Clyde Consultants.

Matrix Spike/Matrix Spike Duplicate Sample

Two matrix spike/matrix spike duplicate sample pairs were analyzed with these samples. The accuracy of the samples were determined by a measure of average percent recovery. The average percent recovery of the MS/MSD samples was within acceptible limits. The results are accepted without further qualifiers.

Surrogate Recoveries

Surrogates were performed on the volatile organics. The average percent recovery of the surrogate samples ranged from 93 to 108 percent. The results are accepted without further qualifiers.

Field Duplicate Sample

One field duplicate was analyzed with the samples collected on February 20, 1991. The results of the analysis were contaminant-free for TCLP volatiles. The average precision of the duplicate was measured using the matrix spike recoveries. The results are accepted and used in conjunction with other QA/QC results as a measure of overall field and laboratory precision.

Laboratory Method Blank

One laboratory method blank was analyzed with each group of samples. The laboratory method blanks were contaminant-free for TCLP volatiles.

Rinsate Sample

One rinsate sample was collected on March 5, 1991. The rinsate was contaminant-free for TCLP volatiles.

Field Blank

One field blank was analyzed with this sampling. The field blank was contaminant-free for TCLP volatiles.

Summation of Analyses

A. Carbon Tetrachloride was reported in Pond "A" at a concentration of 120 μg/l.

B. Carbon Tetrachloride was reported in the Inlet at a concentration of 75 μg/l.

C. Benzene, Carbon Tetrachloride, Chloroform, 1,1 Dichloroethylene and Methyl Ethyl Ketone was reported in the Leachate at concentrations of 64 μg/l, 1200 μg/l, 190 μg/l, 65 μg/l and 830 μg/l, respectively.

D. Carbon Tetrachloride, Chloroform, 1,1 Dichloroethylene and Methyl Ethyl Ketone was reported in the Leachate Duplicate at concentrations of 1100 μg/l, 190 μg/l, 51 μg/l and 830 μg/l, respectively.

E. Carbon Tetrachloride, Chloroform, 1,1 Dichloroethylene and Methyl Ethyl Ketone was reported in the Leachate Spike at concentrations of 1200 μg/l, 200 μg/l, 62 μg/l and 710 μg/l, respectively.

F. Carbon Tetrachloride, Chloroform and Trichloroethylene was reported in the Blanket Drain Effluent (Spiked) at a concentration of 37000 μg/l, 11000 μg/l and 820 μg/l, respectively.

G. Carbon Tetrachloride, Chloroform and Trichloroethylene was reported in the Blanket Drain Effluent (Non-Spiked) at concentrations of 39000 μg/l and 10000 μg/l, respectively.

H. Carbon Tetrachloride, Chloroform and Trichloroethylene was reported in the Rinsate at concentrations of 44000 μg/l, 13000 μg/l and 770 μg/l, respectively. Per conversation with Steve Boswell on April 1, 1991, it was noted that the sample identified as rinsate on the chain of custody form and on the sample container was labeled incorrectly. The corrected sample identification description is Blanket Drain Effluent (Non-Spiked) Duplicate; this change is referenced in the data package.

INTERNATIONAL TECHNOLOGY CORPORATION

RECEIVED
SEP - 2 1988
Dept. of Natural Resources
Bureau of Pollution Control

August 30, 1988

Project No. 435361

Mr. Jack McCord
Mississippi Department of Natural Resources
Bureau of Pollution Control
P. O. Box 10385
Jackson, Mississippi 39289-0385

Responses to Questions
Closure/Retrofit Plan
Surface Impoundments
Vicksburg Chemical Division
Vicksburg, Mississippi

Dear Mr. McCord:

Enclosed herein are the responses to several questions which arose concerning the closure/retrofit plan of the existing surface impoundment system at Vicksburg Chemical Division (VCD). The questions were voiced during your August 22, 1988 meeting with Mr. Steve Boswell of VCD.

The responses to the questions are being sent directly to you at Mr. Boswell's request. Should you have any questions concerning these responses, please contact Mr. Boswell at VCD.

Sincerely,

Michael J. Richardson, M.S., P.E.
Project Manager

Enclosures

MJR:cag

DIVISION OF SOLID WASTE
REVIEWED BY JM
DATE 9-8-88
COMMENTS Sent to EPA in weekly Mail

CED/MCCORD830

1150 LeBlanc Road ▪ Port Allen, LA 70767 ▪ (504) 344-8530

RESPONSES TO QUESTIONS
SURFACE IMPOUNDMENT CLOSURE/RETROFIT PLAN
CEDAR CHEMICAL CORPORATION
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

The responses to the questions noted by the Mississippi Bureau of Pollution Control (BPC) to Vicksburg Chemical Division (VCD) for the closure/retrofit of the surface impoundment system follow herein.

Question

What level of decontamination for equipment will be met?

Response

It is proposed that rinsate samples be taken during decontamination procedures. These samples shall be analyzed for dinitrobutyl phenol (DNBP). Concentrations of DNBP of less than 100 ppb will be considered as an acceptable level of decontamination for equipment.

Question

At what point (presumably a flow rate) will action be taken in terms of investigation and repairs when a liner leak is detected?

Response

A proposed EPA document entitled "Liners and Leak Detection for Hazardous Waste Land Disposal Units" (52 FR 20218; May 29, 1987) discusses Action Leakage Rate (ALR) and Response Action Plans (RAP) for waste units and surface impoundments under RCRA. Although this surface impoundment system is not under RCRA, the ALR and RAP is still useful as guidance for this situation.

The ALR is the rate of leakage from the top liner into the Leakage Detection/Removal System (LD/RS) that triggers interaction between VCD and BPC to determine the response action for the leakage. The proposed ALR for VCD is within the range set by the EPA and will be a maximum of 20 gallons per acre per day.

If leakage exceeds the ALR, a RAP will be submitted to BPC no later than 90 days after the ALR is first noted to be exceeded in accordance with the EPA document. The RAP will be in accordance with the EPA document mentioned herein.

Question

If this unit were a RCRA facility, post closure monitoring would be required for at least 30 years. BPC would like to have more than three years as proposed.

Response

The order by the Mississippi Commission required quarterly groundwater monitoring for an indefinite period. VCD will petition the Commission for reduced frequency of monitoring (i.e., semi-annual) after the work is finished. The three year period of groundwater monitoring was meant strictly for the closed waste consolidation area and not the continually operating impoundments.

Question

How many gas vents will there be from each section of the ponds and landfill?

Response

All vents to be placed are indicated on the drawings. The number of vents (a total of five) indicated are considered sufficient to vent gas from the impoundments and waste consolidation area to the surface.

Question

What safety features will be provided in the event that someone falls into the impoundments?

Response

Ropes or nets will be placed down the inner slope of the impoundments at approximately 100 foot intervals around the perimeter of the impoundments. These ropes/nets will be anchored into the dikes and marked such that they would be readily spotted by an individual in the impoundment.

Question

Can the exposed sections of liner withstand exposure to the elements for the life of the pond?

Response

Liner manufacturer's representatives state that exposed sections of liner should not lose structural integrity for a period of thirty years (i.e., the design life of the impoundment). Additionally, the impoundment system is constructed such that one impoundment may be closed while the others are operational. This being the case, any defects that are noted in the liner during routine inspections can be repaired without taking the system out of operation.

Question

Explain detail drawing in Figure 11.

Response

Detail 7 on Figure 11 reflects the interface between the LC/DS pipes and the bottom liner. The pipes transport the leachate from the LCS and LDS to the collection sumps. The detail shows the interface between the lining system and the LC/DS pipes to include the 4 inch HDPE collection/detection pipes and the 6 inch HDPE secondary containment pipes. These secondary containment pipes are used between the landfill and the entrance to the collection sumps. The welds and clamps indicate the connection between the bottom liner system and the pipes. Previous experience with these types of connections have indicated that the interface between the liner and the pipes can be sealed so as to be free of leaks.

Question

Why does the control shaft on the valve between ponds penetrate the liner?

Response

Locating the valve in the middle of the dike puts it in the middle of a roadway and increases the possibility of damaging the valve. Additionally, the control shaft penetrates the liner in a location which will not be under impoundment water and, therefore, is not subject to possible leakage from the impoundment.

Question

What is DGA Roadmix?

Response

Dense Gravel Aggregate. Other acceptable roadmixes include sand-clay-gravel, shell, or limestone.

Question

Can the liners be sealed to the culverts passing through the dike successfully? What QA/QC will there be?

Response

Yes, the liners can be sealed to the culverts by use of heat extrusion welding and prefabricated boots around the pipes. This is accepted technology and has been used successfully in Mississippi before. The QA/QC for the culvert/liner interface is included in the QA/QC section of Attachment 4.

Question

Is there any way to avoid the use of culverts passing through the dikes?

Response

There are ways to avoid this, but some would require the cessation of impoundment operation which would eliminate this important treatment phase and are not as cost effective. The culverts can, however, be successfully sealed to the liner as addressed above, so it is not considered necessary to seek alternative solutions at this time.

Question

What are that set points of the high-level alarms in the leachate collection and leak detection sumps? Should it be set lower? At what level does the sump pump activate?

Response

The set points of the high-level alarms are included on Figure 14, Tables 2 and 3. The high-level alarm is set at an adequate height. The high-level alarms are to be set at least 0.1 feet below the invert elevation of the collection/detection pipe at the SWCA. The tables, in this instance, shows an inconsistency. The high water alarm in Table 2 should indicate 93.9 feet, and in Table 3, 93.4 feet. This will allow the alarm to trigger before leachate can back into the landfill. The pumps will activate at an elevation about one (1) foot above the bottom of the pump (i.e., 93.0 feet for the SWCA collection sump and 92.5 feet for the SWCA Detection Sump).

CLOSURE/RETROFIT PLAN
SURFACE IMPOUNDMENT SYSTEM

Prepared for:

CEDAR CHEMICAL CORPORATION
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

Prepared by:

IT CORPORATION
1160 LEBLANC ROAD
PORT ALLEN, LOUISIANA 70767

Michael J. Richardson, M.S., P.E.

Mark L. Morgan, P.E.
Mississippi Registration No. 9998

TABLE OF CONTENTS

	PAGE
LIST OF TABLES	iv
LIST OF FIGURES	v
1.0 INTRODUCTION	1-1
1.1 CONTENT	1-1
1.2 PURPOSE AND SCOPE OF WORK	1-2
1.3 ORGANIZATION	1-4
2.0 BACKGROUND	2-1
2.1 FACILITY DESCRIPTION	2-1
2.1.1 Construction and Operational Information	2-1
2.1.2 Physical Description	2-2
2.2 TOPOGRAPHY AND GENERAL LAND USE	2-3
2.3 CLIMATOLOGICAL AND FLOOD DATA	2-4
2.4 SITE HYDROGEOLOGY	2-4
2.4.1 Site Geology	2-4
2.4.2 Site Hydrology	2-5
2.5 WASTE CHARACTERIZATION	2-6
3.0 SITE CHARACTERIZATION ACTIVITIES	3-1
3.1 GEOTECHNICAL TESTING	3-1
3.2 SOLIDIFICATION TESTING	3-1
3.2.1 Strength Testing	3-2
3.2.2 Volume Increase	3-2
4.0 DESIGN CRITERIA	4-1
4.1 VCD REQUIREMENTS	4-1
4.2 FEDERAL AND STATE REQUIREMENTS	4-2
4.3 CONSTRUCTION, OPERATION, AND MAINTENANCE REQUIREMENTS	4-2
4.4 OTHER REQUIREMENTS	4-2
4.4.1 Surface Limitations	4-2
4.4.2 Subsurface Limitations	4-3
5.0 CLOSURE/RETROFIT DESIGN	5-1
5.1 FACILITY CONFIGURATION	5-2
5.2 MOBILIZATION	5-2

TABLE OF CONTENTS
(Continued)

		PAGE
5.3	SITE PREPARATION	5-3
	5.3.1 Construction of Temporary Drainage Swales	5-3
	5.3.2 Clearing and Grubbing	5-3
	5.3.3 Impoundment Operation Relocation	5-4
	5.3.4 Impoundment Dewatering	5-4
	5.3.5 Removal of Impoundment Structures	5-5
5.4	SOLIDIFICATION ACTIVITIES	5-5
5.5	SOLIDIFIED WASTE CONSOLIDATION AREA CONSTRUCTION	5-6
	5.5.1 Solidified Sediment Relocation	5-6
	5.5.2 Dike and Foundation Preparation	5-6
	5.5.3 Secondary Synthetic Liner	5-8
	5.5.4 Primary Synthetic Liner	5-8
	5.5.5 Leachate Detection and Collection System	5-9
	5.5.6 Waste Placement Protection System	5-10
5.6	PLACEMENT OF SOLIDIFIED MATERIAL INTO SWCA	5-10
5.7	SWCA COVER SYSTEM	5-11
	5.7.1 Gas Collection/Venting System	5-12
	5.7.2 Clay Liner	5-12
	5.7.3 Synthetic Liner	5-13
	5.7.4 Synthetic Drainage Layer	5-13
	5.7.5 Geotextile Filter Materials	5-14
	5.7.6 Topsoil Layer	5-15
	5.7.7 Erosion Protection	5-15
	5.7.8 Run-on/Run-off Control	5-15
	5.7.9 Cover System Effectiveness	5-16
5.8	IMPOUNDMENT RETROFIT CONSTRUCTION	5-17
	5.8.1 Solidified Sediment Removal	5-17
	5.8.2 Dike and Foundation Preparation	5-18
	5.8.3 Bottom Gas Relief System	5-19
	5.8.4 Secondary Synthetic Liner	5-19
	5.8.5 Leachate Detection/Removal System	5-19
	5.8.6 Primary Synthetic Liner	5-20

TABLE OF CONTENTS
(Continued)

	PAGE
5.9 REVEGETATION AND RECLAMATION	5-20
5.10 SEQUENCE OF CONSTRUCTION	5-21
5.11 DECONTAMINATION PROCEDURES	5-23
5.12 HEALTH AND SAFETY	5-24
5.13 CONSTRUCTION QUALITY CONTROL	5-25
6.0 POST-CLOSURE/OPERATION PLAN	6-1
6.1 GROUNDWATER MONITORING/DETECTION SYSTEM	6-1
6.1.1 Monitoring Parameters	6-2
6.1.2 Monitor Well Locations	6-2
6.1.3 Groundwater Sampling Procedures	6-2
6.1.4 Chain-of-Custody and Recordkeeping	6-4
6.2 LEACHATE COLLECTION	6-5
6.3 FINAL COVER INSPECTION AND MAINTENANCE	6-5
6.4 SECURITY REQUIREMENTS	6-6
6.5 NOTICE IN DEED TO PROPERTY	6-6
6.6 NOTICE TO LOCAL LAND AUTHORITY	6-7
6.7 CERTIFICATION	6-7
7.0 ESTIMATED CLOSURE/RETROFIT COSTS	7-1
REFERENCES	

VCDCP-TOC

LIST OF TABLES

TABLE NO.	TITLE
1	Water Well Locations
2	Sediment Chemical Analysis
3	Geotechnical Results
4	Estimated Closure Costs

CED/VCDCP-TOC

LIST OF FIGURES
ATTACHMENT 4

FIGURE NO.	TITLE
T	Title Sheet
1	Site Facilities Map
2	Plan View, Existing Conditions
3	Plan View, Initial Grading and Construction
4	Plan View, Final Grading Closure
5	Construction Schedule
6	Geologic Cross Section
7	Potentiometric Contour Map
8	Cross Sections, Initial Grading
9	Cross Section, Final Grading Closure
10	Detail Sheet; 1 of 6
11	Detail Sheet; 2 of 6
12	Detail Sheet; 3 of 6
13	Detail Sheet; 4 of 6
14	Detail Sheet; 5 of 6
15	Detail Sheet; 6 of 6

1.0 INTRODUCTION

Vicksburg Chemical Division (VCD), a subsidiary of Cedar Chemical Corporation, is located in Vicksburg, Mississippi and presently operates a surface impoundment system to retain rainwater runoff. The water is treated prior to disposal in the Mississippi River (Figure 1). VCD has elected to remove the sediments in the surface impoundment system (Figure 2) to a Solidified Waste Consolidation Area (SWCA) and retrofit the existing surface impoundments with a double liner system. This section includes:

- Content (Section 1.1),
- Purpose and Scope of Work (Section 1.2), and
- Organization (Section 1.3).

1.1 CONTENT

This section identifies the activities associated with the construction and closure of the SWCA and the retrofitting of the impoundments. The plan view of the existing conditions in the vicinity of the impoundments is shown on Figure 2 and the plan views for the post-construction area are shown on Figures 3 (prior to placement of the solidified waste) and 4 (after closure of the SWCA). The sequencing/construction schedule for the construction/retrofit activities of the facility is provided on Figure 5.

This report includes:

- A historical background and description of the facility to include hydrogeology in the vicinity and a discussion on waste characterization (Section 2.0),
- The results of site characterization activities which include geotechnical investigations in the vicinity of the facility and sediment solidification activities (chemical and physical) (Section 3.0),
- The closure/retrofit design criteria and design based upon removal of the sediments in the impoundments to the SWCA and retrofit of the impoundments (Section 4.0 and 5.0),
- A discussion of post-closure activities (Section 6.0), and
- Estimated closure/retrofit costs for the facility (Section 7.0).

Sediment samples were collected from the impoundments and tested for the parameters indicated in Section 2.5. Additionally, sediment samples were tested to define appropriate solidification agents and ratios. The test results indicate that a lime kiln dust or cement solidifying agent will solidify the sediments such that (1) the free moisture in the sediment is removed and (2) the solidified material will provide sufficient support for the SWCA cover system.

The selected method for retrofit of the impoundment system includes solidification of the sediments, construction of the SWCA, placement of the solidified sediment in the SWCA, closure of the SWCA, and retrofit of the impoundments.

The sediments will be solidified with either 15 percent cement by weight or 25 percent lime kiln dust and moved to the SWCA. The SWCA will have of a double liner system to include a recompacted natural soil foundation, two synthetic liners (geomembranes), Leakage Detection System (LDS) and Leachate Collection System (LCS). The SWCA cover system will include a gas collection/venting geonet, a top liner consisting of one foot of compacted clay and synthetic liner, a synthetic drainage net, and topsoil. The SWCA cover system will be sloped to promote drainage to natural drainage paths.

After removal of the sediments, the impoundments will be retrofitted with a double liner system to include a recompacted natural soil foundation, two synthetic liners, and a Leachate Detection/Removal System (LD/RS).

Details of the closure and post-closure activities in addition to other relevant issues are presented in the text of this report.

1.2 PURPOSE AND SCOPE OF WORK

The closure performance standards for the SWCA are that the owner must manage the closure to: 1) eliminate free liquids by solidifying the sediments, 2) stabilize the sediments to a bearing capacity sufficient to support the cover system, and 3) place a final cover over the SWCA that is designed and constructed to:

- Provide long-term minimization of the migration of liquids through the closed area,
- Function with minimum maintenance,
- Promote drainage and minimize erosion or abrasion of the cover system,
- Accommodate settling and subsidence to maintain the integrity of the SWCA, and
- Have a permeability less than or equal to the permeability of the bottom liner system.

To achieve the above objectives, the closure plan presented herein consists of:

- Solidification of the sediments with cement or lime kiln dust to remove free liquids and provide adequate bearing capacity to support the cover system,
- Construction of the SWCA to include a double liner system,
- Placement of the solidified material into the SWCA, and
- Construction of a cover system over the SWCA.

The purpose for the retrofit of the impoundments is to: 1) provide leak detection capability, 2) continue operation of the surface impoundment system during construction activities, and 3) protect groundwater.

To achieve the above objectives, the retrofit plan presented herein consists of:

- Solidification and removal of the sediments in the impoundments,
- Construction of a double liner system in the impoundments, and
- Sequencing the construction activities so that one impoundment is in operation at all times.

Each of the items described are detailed in subsequent sections of this report.

1.3 ORGANIZATION

The organization of this report including sections, tables, attachments, and figures follow:

- Background (Section 2.0)
- Site Characterization Activities (Section 3.0)
- Design Criteria (Section 4.0)
- Closure/Retrofit Design (Section 5.0)
- Post-Closure Plan (Section 6.0)
- Estimated Closure/Retrofit Costs (Section 7.0)

- Tables
  (1) Water Well Locations
  (2) Sediment Chemical Analyses
  (3) Geotechnical Results
  (4) Cost Estimates

- Attachments
  (1) Calculation Brief
  (2) Subsurface Field Investigation
  (3) Ruling from Mississippi Department of Natural Resources
  (4) Construction Package
    a) Construction Drawings
    b) Technical Construction Specifications
    c) Construction Quality Control Specifications

- Figures
  (1) Site Facility
  (2) Plan View, Existing Conditions
  (3) Plan View, Initial Grading
  (4) Plan View, Final Grading
  (5) Construction Schedule
  (6) Geologic Cross Section
  (7) Potentiometric Contour Map
  (8) Cross Sections, Initial Grading
  (9) Cross Section, Final Grading
  (10) Detail Sheet 1
  (11) Detail Sheet 2
  (12) Detail Sheet 3
  (13) Detail Sheet 4
  (14) Detail Sheet 5
  (15) Detail Sheet 6

2.0 BACKGROUND

The background information consists of:

- Facility Description (Section 2.1),
- Topography and General Land Use (Section 2.2),
- Climatological and Flood Data (Section 2.3),
- Site Hydrogeology (Section 2.4), and
- Waste Characterization (Section 2.5).

2.1 FACILITY DESCRIPTION

The facility description consists of:

- Construction and Operational Information (Section 2.1.1) and
- Physical Description (Section 2.1.2).

2.1.1 Construction and Operational Information

The Vicksburg Chemical Division, a subsidiary of Cedar Chemical Corporation is located in Warren County, Mississippi along the Mississippi River immediately on the south limits of the City of Vicksburg. The plant site is divided physically and functionally into a "north plant" and a "south plant".

Both plants are approximately thirty years old. Each was constructed under separate corporate ownership. The surface impoundment system was originally constructed as a part of the south plant operation. Both plants were acquired by one corporation, Vertac Chemical Corporation, approximately fifteen years ago and merged into one operating facility. In 1986 Cedar Chemical Corporation acquired the facility and continues to be the owner and operator.

The north plant is and has been throughout its operating life a manufacturer of potassium nitrate, chlorine, and nitrogen tetroxide. The south plant now consists of an operating nitric acid plant. Various specialty agricultural products have been produced throughout the history of the south plant; however, that activity has been discontinued. The list of products manufactured in the past at the south plant include:

- ammonium nitrate,
- atrazine,
- cyazine,
- monosodium methane arsonate,
- dinitro orthocresol,
- dinitrobutyl phenol,
- toxaphene, and
- methyl parathion.

The surface impoundment system was constructed by the original owners of the south plant to collect by gravity the rainwater runoff from that plant. The impoundment was constructed between Stouts Bayou and a natural hill. Materials of construction were soils native to the area. The location is unique in that it is the only place that can receive by gravity the rainwater runoff from the south plant. The value of the surface impoundment is due to the uniqueness of the location.

Throughout the history of the impoundment it was from time to time the receptor of pretreated wastewater from various specialty agricultural chemical operations. All such discharges were non-hazardous. In the mid-1970's a multi-column carbon adsorption system was constructed at the site so that the surface impoundment could be pumped to the Mississippi River through the carbon system. The discharge was fully permitted.

The impoundment continues to be a receptor of rainwater runoff from the south plant even though the specialty agricultural chemical operations have been discontinued. De-minimis losses of various chemicals adhered to soils and continue to be washed by rainwater into the impoundment. The impoundment water continues to be discharged to the Mississippi River through the carbon adsorption system. The impoundment also serves as a standby retention basin to receive water diverted from the north plant when that water does not meet pH guidelines for discharge to the Mississippi River. The impoundment is a vital link in the NPDES strategy for the north and south plant.

2.1.2 Physical Description

The impoundment system is located in the south plant area of VCD as shown on Figure 1. The impoundment system consists of three impoundments, A, B, and

C. Impoundment A is rectangular in shape with a length of 600 feet, and width of 150 feet and encompasses about 2.1 acres. Impoundment B is rectangular in shape with a length of 450 feet, a width of 150 feet and encompasses about 1.5 acres. Impoundment C is triangular in shape with a base of 150 feet, an altitude of 150, and encompasses about 0.3 acres. Therefore, the total area of the impoundment system encompasses approximately 3.9 acres.

In general, the natural impoundment bottoms are at an average elevation of about 95 feet Mean Sea Level (MSL). The average thickness of the sediments are about 4 to 5 feet and the average depth of the water in the impoundments is about 3 feet.

The quantity of sediments in the impoundments as determined by field activities is about 12,500 cubic yards. Additionally, as much as 2,500 cubic yards of soil with sediment-like consistency may be present. The calculations to determine these quantities are included in the Calculation Brief (Attachment 1).

2.2 TOPOGRAPHY AND GENERAL LAND USE

The VCD facility is located in Warren County, Mississippi along the Mississippi River immediately on the south limits of the city of Vicksburg. The features which follow are illustrated on Figure 1 and are important due to potential interaction with the closure/retrofit of the impoundment system:

- The ground surface elevation in the vicinity of the impoundment system ranges from 140 feet above MSL to the west to 85 feet above MSL in the vicinity of Hennesseys and Stouts Bayou,
- Surface drainage is generally to the east,
- The surface elevation of the dikes range from approximately 105 feet above MSL on the interior dike to 108 feet above MSL on the exterior dikes,
- Hennesseys Bayou is to the south and Stouts Bayou is to the east,
- An inactive (closed) disposal area exists to the west,
- The Mid-South System Railroad is to the north,
- The influent line to the impoundment system is located in the north end of Impoundment A and the effluent line to the treatment system is in Impoundment C, and

- Several power poles and monitoring wells screened in the shallow formation are in the vicinity of the impoundment system.

2.3 CLIMATOLOGICAL AND FLOOD DATA

The climate in Vicksburg can be characterized as (1) cool, wet winters and (2) hot, humid summers. The average precipitation is about 50 inches annually. Monthly rainfall tends to be greater during the winter and spring months than during the summer and fall months.

For closure calculation purposes (i.e., determination of infiltration and surface runoff), a 1-hour 25-year design storm is utilized. The 1-hour 25-year storm has a mean precipitation of 3.2 inches. The calculations in which this storm was used is presented in Attachment 1. The mean precipitation was obtained from Technical Publication No. 40 (Reference 1).

The impoundment system has existing perimeter dikes with an elevation of 108.0 feet above MSL. The perimeter dikes will be raised to an elevation of 109.5 feet above MSL. Previous studies indicate that the dikes have sufficient factors of safety against failure (Reference 2). As determined by the U. S. Army Corps of Engineers, the 100-year flood elevation at the intersection of Hatcher and Stouts Bayou is 109.0 feet above MSL. This elevation will be lower than the final dike configuration elevation of 109.5 feet above MSL.

2.4 SITE HYDROGEOLOGY

This section consists of:

- Site Geology (Section 2.4.1) and
- Site Hydrology (Section 2.4.2).

2.4.1 Site Geology

Geologic conditions to about 50 feet below VCD can be grouped into three primary zones. Field geologic descriptions of site soil conditions are shown on boring logs in Attachment 2. A geologic cross section across the impoundments to about 50 feet in depth is shown on Figure 6. Geotechnical testing was performed on several soil samples (Section 3.1) and confirms the field geologic conditions shown below:

- From the surface to less than 10 feet in depth, the soil consists primarily of silty clay fill material. The material varies in color, hardness, and contains gravel at some locations;

- Approximately 10 feet to 50 feet below the surface, there exists a pleistocene loess, characterized primarily as a silty clay to clayey silt. This zone varies in color and hardness and the color change (tan to brown underlain by gray to greenish-gray) led to earlier postulations that this zone was in fact two separate layers. The color change was uniformly detected; however, the soil is the same homogeneous, massive silt with variable clay content which is typical of pleistocene loess;

- Below approximately 50 feet in depth, the soil consists of a marl which studies indicate to be the Byram member of the Vicksburg formation. At most locations, this Byram marl is overlain by one to three feet of sandy clay to clayey sand and/or gravel. The marl is primarily greenish-gray in color. The Byram marl has been characterized as a hard, indurated rock unit which does not yield water near VCD.

The geologic unit of primary concern near the surface impoundment is the pleistocene loess and the thin sandy clay to clayey sand and/or gravel layer overlying the Byram marl. The depositional environment of this unit overlying the Byram marl is not defined as clearly but is either an erosional remnant of terrace deposits or the product of weathering of the exposed Tertiary bedrock or perhaps a combination of both. The somewhat impervious overlying silty clay fill material and underlying Byram marl act basically as confining units to the more pervious unit.

2.4.2 Site Hydrology

Hydrology conditions discussed in this section are only those pertaining to the surface impoundment. The unit from which the groundwater data has been collected and studied is the 40-foot thick (10 feet to 50 feet below the surface) Pleistocene loess.

The slightly artesian groundwater elevations (elevations above the fill-loess contact) measured in the loess indicate that the aquifer is under pressure from above and below. The loess is confined at the top by the silty clay fill material and at the base by the underlying Byram marl.

Groundwater data collected during the past few years indicates that the horizontal flow generally is toward Stouts and/or Hennesseys Bayous. This pattern is indicative of an overall southeasterly flow. Groundwater gradients increase as they approach the bayous from the plant area. The potentiometric map is shown on Figure 7.

Hydraulic gradients at the site are relatively low ranging from 0.011 feet per foot to 0.11 feet per foot. This, in combination with the aquifer soil types (silty clay to clayey silt) produce relatively low flow velocities within the aquifer ranging from 0.01 feet per day to 0.184 feet per day. Hydraulic conductivity in the loess ranges from 1.93 to 5.52 gallons per day (foot^2) and transmissivity ranges form 40 to 232 gallons per day (foot).

Details of the aquifer characteristics listed above are presented in a previous Groundwater Assessment Program Report in January, 1986 (Reference 3) and aquifer properties are consistent with those reported by the earlier investigations.

There are five public or private water wells within a three-mile radius of the facility. Table 1 indicates the owner and well number of the wells.

2.5 WASTE CHARACTERIZATION

The impoundment system collects rainwater run-off from the confines of the plant and once-through cooling water. Previous owners of the plant manufactured atrazine, toxaphene, dinitrobutyl phenol (dinoseb), and other chemicals. The atrazine and toxaphene processes were discontinued in about 1982. The dinoseb process was last manufactured in 1986. Rainwater run-off from these areas were collected in the impoundment system.

Nineteen sediment samples were collected from the ponds and analyzed for constituents. The laboratory results are presented in Table 2. These results indicate the constituents found (and their average concentrations) were:

- Arsenic (63 mg/kg),
- Toxaphene (271 mg/kg),
- Atrazine (9,500 mg/kg),
- Bladex (2,300 mg/kg), and
- Dinoseb (579 mg/kg).

EP Toxicity and Toxicity Characteristic Leaching Procedure (TCLP) extraction tests were performed and the leachate was analyzed for arsenic, atrazine, bladex, and dinoseb. The results indicated:

- Arsenic (maximum concentration 1.6 mg/l),
- Atrazine (average concentration 46 mg/l),
- Bladex (average concentration 3.0 mg/l), and
- Dinoseb (average concentration 4.4 mg/l).

The impoundment system was determined by the Mississippi Department of Natural Resources (DNR), Bureau of Pollution Control, to not be a hazardous waste storage facility pursuant to state and federal regulations. This finding is presented in the Commission's Order No. 1253-87 dated August 5, 1987 and presented in Attachment 3.

Pursuant to the ruling of the DNR, the SWCA, which contains the sediment from the non-hazardous impoundment system, can also be considered a non-hazardous facility.

3.0 SITE CHARACTERIZATION ACTIVITIES

The site characterization activities include:

- Geotechnical Testing (Section 3.1), and
- Solidification Testing (Section 3.2).

3.1 GEOTECHNICAL TESTING

Geotechnical analyses from prior investigations of the impoundment system and the dikes, consisting of strength testing, Atterberg Limits, moisture contents, grain-size distribution tests (minus #200 sieve), hydraulic conductivity tests, and consolidation tests were performed to determine the general geotechnical properties in the area.

Generally the data indicates:

- The clays and silts are generally medium in stiffness with torvane measurements of 0.5 to 1.6 tons/ft^2 (tsf) and penetrometer measurements of 1.0 to 2.5 tsf;
- The clays and silts are of low to high plasticity with plasticity indices ranging from 5 to 45 and liquid limits from 29 to 70 percent;
- Natural moisture contents of the clays and silts range from 20 to 32 percent;
- The percent soil fraction finer than the number 200 sieve range from 30 to 99 percent;
- The hydraulic conductivities of the natural underlying soils are an average of approximately 2.6 x 10^{-6} cm/sec; and
- The clays and silts are generally normally consolidated with maximum past consolidation pressures of 1 to 2 tsf and coefficients of consolidation of about 0.15.

The data has been summarized on Table 3. The logs of the borings from which the samples were collected are included in Attachment 2.

3.2 SOLIDIFICATION TESTING

The testing of the solidified sediment included:

- Strength Testing (Section 3.2.1), and
- Volume Increase

3.2.1 Strength Testing

Three solidification agents were chosen to solidify the sediments and ascertain the approximate strength of the various mixtures. The three agents chosen for solidification strength testing were (by weight) (1) cement (10 and 20 percent), (2) lime kiln dust (20 and 30 percent), and (3) fly ash (50 and 75 percent).

The test agents were mixed with the sediments at the appropriate percentages and allowed to cure. After six days of curing, the strengths of the solidified sediments as determined by a penetrometer were:

- cement (10 percent) - 4.5(+) tsf,
- cement (20 percent) - 4.5(+) tsf,
- lime kiln dust (20 percent) - 4.5(+) tsf,
- lime kiln dust (30 percent) - 4.5(+) tsf,
- fly ash (50 percent) - 4.5(+) tsf, and
- fly ash (75 percent) - 4.5(+) tsf.

Based upon strength requirements, any of the above mixtures are suitable for sediment solidification.

3.2.2 Volume Increase

Several agents were considered for solidification of the sediments. The criteria for selection was based upon availability in the Vicksburg area and lack of volume increase. Lime kiln dust was the solidification agent chosen for testing based upon availability and lack of volume increase. Cement was not tested because it was considered a probable successful option for solidification based upon previous experience. Therefore, two options for effective solidification are lime kiln dust and cement.

The lime kiln dust was shown to increase a volume of sediment by about 12 percent. Cement, based upon prior experience, would increase the sediment by about 5 to 7 percent. The chosen mixture percentages for addition to the sediments are 15 percent by weight for cement and 25 percent by weight for lime kiln dust.

4.0 DESIGN CRITERIA

The closure/retrofit design was based on the following criteria:

- VCD Requirements (Section 4.1),
- Federal and State Requirements (Section 4.2),
- Construction, Operation, and Maintenance Requirements (Section 4.3), and
- Other Requirements (Section 4.4).

The closure/retrofit design for the SWCA and surface impoundments has been prepared consistent with these major requirements. These criteria are detailed in the following paragraphs.

4.1 VCD REQUIREMENTS

VCD stipulates that the closure/retrofit of the impoundment system be such that the impoundment system and the SWCA have double liner systems consisting of geomembranes over the underlying natural soils. The SWCA was designed to minimize land area (placement in impoundment A) and to handle about 15,000 to 18,000 cubic yards of solidified sediment. The upgrade of the impoundments are to be such that the capacity of the new impoundment system exceeds current capacity. The impoundments capacity at present is about 4 million gallons. The upgraded impoundments capacity will be approximately 12 million gallons or an increase of 300 percent.

Other designs considerations included:

- Current federal and state regulations,
- Most cost-effective configuration possible,
- Landfill location and alignment,
- Continuing operation of impoundment system during closure/retrofit,
- Construction quality assurance,
- Limited construction area,
- Construction, operation, and maintenance requirements, and
- Sound engineering practices.

4.2 FEDERAL AND STATE REQUIREMENTS

All appropriate federal and state requirements were considered in the final design of the closure/retrofit and are addressed in this report. These requirements include bottom liners, leachate collection/detection systems, runon/runoff control, dike and slope stability, final cover requirements, and others.

4.3 CONSTRUCTION, OPERATION, AND MAINTENANCE REQUIREMENTS

The design of the closure/retrofit has addressed that ease of construction will enhance the cost-effectiveness and completion time of the overall project. To this end, such items as horizontal projections of the clay liner, dikes, and other earthwork were made wide enough to allow the use of heavy equipment to achieve desired grades and compaction. The side slopes of the final cover have been designed to be relatively flat (4 horizontal to 1 vertical) so that they will be stable when placed against the synthetic liner (Attachment 1).

Other considerations such as synthetic liner selection, installation and stresses on the liner (Attachment 1), leachate collection/detection piping installation, sump design, staging area for equipment, and final exterior slopes were incorporated into the design in a manner which will minimize operational and maintenance requirements.

4.4 OTHER REQUIREMENTS

Other requirements include:

- Surface Limitations (Section 4.4.1), and
- Subsurface Limitations (Section 4.4.2).

4.4.1 Surface Limitations

Surface limitations included the topography of the site, existing adjacent plant facilities, and access requirements.

The topography of the site, addressed in Section 2.0, consists of steep grades to the east and west of the impoundment system. The limited access limitations were overcome by placing the SWCA partially on the slope of the

steep area to the west. The possible runon/runoff problems were addressed by providing a drainage system to handle a 25-year 1-hour rainfall (Attachment 1). Because of the heavy rainfall typical of the area, it was necessary to minimize exterior slopes in order to avoid excessive erosion and promote maximum surface runoff. The 100-year flood plain is located at elevation 109.0 feet above MSL. The exterior dikes are to be constructed to an elevation of 109.5 feet above MSL. The surface drainage around the SWCA will be routed to Hennesseys Bayou.

A road to be constructed on the west side of the impoundment system will provide access to the SWCA and the SWCA collection/detection sumps. A road on the eastern exterior dike will be used to access the impoundment's leakage detection/removal sump.

4.4.2 Subsurface Limitations

Design criteria based on the subsurface requirements include allowable bearing capacities, settlements, and subsoil permeabilities.

Engineering analyses indicate the allowable bearing capacity of the in-situ materials is in the range of about 5,000 pounds per square foot with a safety factor of 3.0 (Attachment 1). The total settlement of the SWCA is about 4 inches (Attachment 1). The bearing capacity and settlement are within allowable tolerances for the SWCA configuration.

Permeability testing of the subsurface soils indicates a hydraulic conductivity of about 2×10^{-6} cm/sec. For a closure/retrofit of a non-hazardous landfill and impoundment with primary and secondary synthetic liners, this hydraulic conductivity is adequate for the foundation soil as well as minimizing infiltration of groundwater into the impoundment during construction of the double liner systems.

5.0 CLOSURE/RETROFIT DESIGN

The closure/retrofit design of the impoundment system involves the following:

- Facility Configuration (Section 5.1),
- Mobilization (Section 5.2),
- Site Preparation (Section 5.3),
- Solidification Activities (Section 5.4),
- Solidified Waste Consolidation Area Construction (Section 5.5),
- Placement of Solidified Material (Section 5.6),
- SWCA Cover System (Section 5.7),
- Impoundment Retrofit (Section 5.8),
- Revegetation and Reclamation (Section 5.9),
- Sequence of Construction (Section 5.10),
- Decontamination Procedures (Section 5.11),
- Health and Safety (Section 5.12), and
- Construction Quality Control (Section 5.13).

The design configuration and specifications which govern the closure/retrofit of the impoundment system are based upon (1) solidification requirements of the sediment, (2) geotechnical requirements to accommodate the SWCA site characteristics and sediment volumes, (3) climatic conditions, (4) regulatory requirements, and (5) costs associated with the construction, operation, and maintenance requirements of the facility. The closure/retrofit specifications are presented in Attachment 4.

The Construction Quality Assurance (CQA) plan is also presented in Attachment 4. The CQA plan documents the specific technical requirements of the regulatory agencies to verify and document the materials used in the closure/retrofit and the manner and condition of placement. The CQA plan will provide assurance that the construction specifications and drawings are followed and allows for independent verification testing and certification of the integrity of the closure/retrofit.

The design calculations document the pertaining criteria of the closure/retrofit and are presented in Attachment 1. All assumptions and justifications are discussed in each calculation. These calculations have been prepared in accordance with recognized engineering practices using standards and formulas accepted by the profession.

5.1 FACILITY CONFIGURATION

The facility configuration during initial grading phases and the final configuration are illustrated on Figures 3 and 4. Cross sections of the initial and final grading configurations are included on Figures 8 and 9. Figures 10 through 16 include the details associated with the construction.

The sediments will be solidified and consolidated into the south end of impoundment A. The SWCA bottom slopes have been designed to promote drainage of leachate into the LCS and LDS. The LCS and LDS will include collection sumps located adjacent to the SWCA on the western boundary. The SWCA has been designed to contain the anticipated 15,000 to 18,000 cubic yards of solidified sediments and other impoundment structures.

The LD/RS of the impoundments will slope to a central area as shown on Figure 3 and drain to a common sump.

As documented in Attachment 1, the settlement of the SWCA is small (about 4 inches). The SWCA has been designed such that the settlement will not effect its integrity. Additionally, construction provisions have been specified to accommodate unexpected, unpredictable settlements.

The SWCA cover has been designed with 4 horizontal to 1 vertical exterior slopes in order to promote runoff. Slope protection has been placed to minimize erosion. A ditch system along the closure perimeter will transport the runoff to existing drainage.

The dike slopes of the impoundments are between 2 horizontal to 1 vertical and 3 horizontal and 1 vertical.

5.2 MOBILIZATION

The first phase of construction is for the contractor to mobilize equipment to the area to prepare the equipment staging area and temporary access roads. The staging area and access roads will be at the locations indicated in Figure 3. The means of construction of the staging area and access roads will be at the discretion of the contractor depending on the equipment to be used by the contractor in the closure/retrofit activities.

After preparation of the equipment staging area and access roads the contractor may mobilize equipment to the area. Mobilized equipment will be kept in designated areas and decontaminated prior to movement from the plant area in accordance with Section 5.11.

5.3 SITE PREPARATION

Site preparation activities will include:

- Construction of Temporary Drainage Swales (Section 5.3.1),
- Clearing and Grubbing (Section 5.3.2),
- Impoundment Operation Relocation (Section 5.3.3),
- Impoundment Dewatering (Section 5.3.4), and
- Removal of Impoundment Structures (Section 5.3.5).

5.3.1 Construction of Temporary Drainage Swales

Prior to removal of the vegetative cover, temporary drainage swales will be constructed to minimize or prevent excess erosion and surface water from entering or leaving the site. The swales will be installed with a consistent slope to prevent ponding of water and graded to existing drainage to provide a smooth transition of surface water runoff around the area. After the completion of construction activities, the swales will be filled with soil and compacted as necessary or upgraded to a permanent drainage ditch.

Drainage control will be implemented at access roads and the equipment staging area as necessary to prevent ponding of water. Temporary drainage swales will be placed as necessary. Final drainage systems will be placed in accordance with this document.

5.3.2 Clearing and Grubbing

Prior to initiation of closure/retrofit activities, all areas where construction occurs will be subjected to clearing and grubbing of existing vegetation. Special care will be taken to remove stumps and large roots, if necessary. Scarifying and recompaction will then be applied to the remaining soils, with fill material being placed and compacted, if necessary, to establish the required subgrade elevations and slopes. Vegetation removed from the area will be disposed or stored in a location designated by VCD.

5.3.3 Impoundment Operation Relocation

A requirement of VCD is to continue operation of the impoundment system during closure/retrofit. Several activities are required to accomplish this objective.

Sheet piling will be driven at the gap in the central dike between impoundments A and B (near the south end of the impoundments). This is necessary to prevent water from flowing into impoundment A after dewatering of impoundment A.

High Density Polyethylene (HDPE) pipes will be installed between the impoundments. The existing concrete tile pipes will be removed. These pipes will have shutoff valves to prevent water flow, as necessary. These pipes will be installed as specified in the construction specifications in the dikes between the impoundments at the locations shown on Figure 3. These pipes will be used to assist in dewatering activities and to equalize the water levels in the impoundments after the completion of construction activities.

The inflow currently entering impoundment A will be routed to impoundments B and C via a new gravity-flow pipeline to be constructed during the first part of construction. After the SWCA is built and impoundment A is retrofitted, the inflow will be rerouted to impoundment A and impoundments B and C will be retrofitted.

The discharge and pH adjustment platform will be moved to a permanent location to the north of impoundment C. The platform will be placed on a concrete slab and the appropriate piping reconnected to the system.

The sequence of construction is presented in Section 5.10.

5.3.4 Impoundment Dewatering

After transfer of the influent line to impoundment C, all influent and effluent to and from impoundments A will be stopped. Impoundment A will then be dewatered by pumping the water into impoundments B and C. The impoundment

will be continuously dewatered (as necessary) prior to implementation of closure/retrofit activities to promote dewatering of the sediments and remove any rainfall which accumulates during construction activities.

Impoundments B and C will be dewatered after the retrofit of impoundments A is complete. The water will be routed to impoundment A in part by pumps and also through the previously installed HDPE pipes.

5.3.5 Removal of Impoundment Structures

All structures within the impoundments which are not necessary to impoundment system operation will be removed after the impoundments are dewatered. The structures will either be reclaimed for use by VCD or placed in the SWCA. Any structures placed in the SWCA will be inspected to ensure that no sharp edges or protrusions exist which could puncture the liners of the SWCA. The final decision for the disposition of the structure will be the responsibility of VCD.

5.4 SOLIDIFICATION ACTIVITIES

The sediments within each impoundment will be solidified with either cement or lime kiln dust. Studies indicates that 15 percent cement (by weight) and 25 percent lime kiln dust (by weight) will eliminate free liquids in the sediments and provide sufficient strength to support the final cover. Both mixtures yielded a compressive strength of greater than 4.5 tons/ft^2 (penetrometer) within 6 days.

The solidification agent will be mixed with the sludge to obtain a homogeneous mixture. Mixing will start from the north of each impoundment and progress southward. The solidification agent will be mixed using conventional earthmoving techniques or other techniques chosen by the contractor. A written plan describing the exact method to be used will be presented to VCD by the contractor. The solidification agent will be mixed with the sediment to the depth at which natural subsoil is encountered (approximately 5 to 6 feet in depth).

The solidification agent will be mixed with the sediments in accordance with the Construction Specifications, Attachment 4. The mixture will be visually

inspected in the field to verify the mixture consistency. The verification testing program is discussed in the CQA plan for solidification, Attachment 4.

5.5 SOLIDIFIED WASTE CONSOLIDATION AREA CONSTRUCTION

Construction of the SWCA will begin after the sediment solidification operations for impoundment A are completed and consists of the following items:

- Solidified Sediment Relocation (Section 5.5.1),
- Dike and Foundation Preparation (Section 5.5.2),
- Secondary Synthetic Liner (Section 5.5.3),
- Primary Synthetic Liner (Section 5.5.4),
- Leachate Detection/Collection Systems (Section 5.5.5), and
- Waste Placement Protection System (Section 5.5.6).

5.5.1 Solidified Sediment Relocation

Following the completion of the solidification operations of impoundment A, the solidified sediment will be relocated to allow the construction of the SWCA to begin. The solidified sediment will be moved to the designated area located in the north end of impoundment A. The solidified sediment will be spread evenly throughout the area to maintain a height of material as low as possible and contain slopes no greater than 2 horizontal to 1 vertical (2:1). Collected precipitation shall be removed to impoundments B and C.

The solidified sediment shall be completely excavated to insure all sediment has been removed. VCD shall monitor these operations and verify and document that all sediment has been excavated to the depths where the solidified material interfaces with the natural subsurface soils as per the Construction Specifications and the Quality Control Specifications presented in Attachment 4.

5.5.2 Dike and Foundation Preparation

Following the removal of the solidified sediment, construction of the SWCA dikes and foundation will be necessary. The area of the SWCA will be constructed to the elevations and grades specified on the Construction Drawings presented in Attachment 4 and to the requirements of the Construction Specifications and Quality Control Specifications.

The foundation areas that are above the specified elevations will be excavated to the prescribed grade. The top six (6) inches will be scarified and then recompacted to obtain the bearing strength required in the Construction Specifications. Areas which are initially at the approximate required elevations, will be scarified six (6) inches and then recompacted. Foundation areas that are below the specified elevations will be filled with a predetermined backfill source. The fill will be placed in lifts not exceeding ten (10) inches, measured loose, and compacted to ninety-five percent of the Standard Proctor density and within the moisture requirements stated in the Construction Specifications.

The dikes of the SWCA will be built to the elevations and slopes as shown on the Construction Drawings. The north dike will be built with materials from a predetermined backfill source. The east dike will be constructed in lifts not to exceed a height of ten (10) inches, measured loose, and compacted in accordance with the Construction Specifications. Calculations in Attachment 1 show that the east dike, having been built to the elevations, slopes, and requirements mentioned above, will have a slope stability with a factor of safety exceeding the recommended value of 1.5.

The south and east dikes will be partially constructed from existing dikes. Prior to placement of any fill, the top six (6) inches will be scarified and recompacted as specified. The remaining dike will then be constructed in the same manner as the north dike.

A slope stability calculation was performed on the north dike to determine the factor of safety (FS) against slope failure. The FS was calculated to be 1.5 for the north dike which is the same as the accepted industry standard for non-catastrophic failure of 1.5. Therefore, the dike is considered to be stable if placed as shown on the Construction Drawings and in the Construction Specifications. The calculations for the slope stability are included in Attachment 1.

The west slope of the SWCA will be built to the grades and elevations shown on the Construction Drawings. Any areas of the north slope that are above grade

will be excavated to the required elevations scarified six (6) inches, and recompacted as required in the Specifications. Areas which are initially at the required elevations shall be scarified and recompacted. Areas of the north slope that required fill will be brought to grade using a predetermined fill source and placed according to the Specifications.

After all dike and foundation construction is complete, a survey shall be completed and certified by a registered land surveyor or engineer to verify that elevations, grades, and slopes meet the requirements of the Construction Drawings.

5.5.3 Secondary Synthetic Liner

The secondary synthetic liner consists of a sixty (60) mil HDPE geomembrane. This synthetic liner material has been chosen based upon strength and general waste compatibility characteristics. A geomembrane thickness of 60 mil was selected because of its durability and resistance to tearing during construction operations from equipment. Other criteria for the selection of the synthetic liner material included the required strength characteristics based upon expected settlements and waste, cover and equipment loading, installation requirements, and cost. Placement of the synthetic liner will be carefully monitored to verify that proper anchoring, seaming, integrity, and allowance for expansion and contraction of the material is obtained. The secondary liner underlies the leachate detection system and provides back-up for the primary synthetic liner. Cross-sections and details for the secondary synthetic liner are presented on Figure 8 and the Detail Sheets of the Construction Drawings.

5.5.4 Primary Synthetic Liner

The primary synthetic liner (60 mil HDPE) provides the initial and most critical protection against leachate migration from the SWCA. This liner will be installed and monitored in such a manner that its integrity is maintained. The primary synthetic liner overlies the LDS and underlies the LCS. The synthetic drainage media of the collection and detection systems will serve as bedding material for the liner. The synthetic liner material chosen was based upon the same criteria as described in the previous section. Placement and quality assurance requirements are detailed in Attachment 4.

5.5.5 Leachate Detection and Collection System

The SWCA contains a LDS and a LCS as detailed on the Construction Drawings in Attachment 4.

The LDS is designed to detect any migration of leachate through the primary synthetic liner. The detection system overlies the secondary synthetic liner, underlies the primary synthetic liner, and is designed to detect and collect leakage from any areas subject to leachate generation (i.e., all areas over which solidified sediment is placed).

The LCS is designed to remove leachate generated from the SWCA. As shown in calculations presented in Attachment 1, the collection system is designed in a manner that will not allow the depth of leachate over the primary synthetic liner to exceed one (1) foot. The drainage medium underlies all areas subject to eventual waste placement. The collection system overlies the primary synthetic liner and underlies the waste placement protection system.

Leachate collection and detection manholes will be constructed of HDPE material and are used to provide access to both systems. This is required to facilitate removal of the leachate from the SWCA. The manholes also provide access for inspection and testing of the collection and detection systems. The collection and detection manholes have been kept separate to prevent the possibility of cross contamination. The details for the leachate collection and detection manholes are presented in the Construction Drawings.

The leachate collected in the manholes will be routed via a four (4) inch HDPE pipe to impoundment A. The 4 inch HDPE pipe will be constructed with its own secondary containment system. Construction details of the discharge pipes, the piping support system, and location of pumps being utilized are presented in the Construction Drawings. Material and pump specifications are presented in the Specifications.

The LCS and LDS for the SWCA are constructed utilizing a synthetic drainage net which will promote flow and thus reduce the leachate head acting on the underlying synthetic liner. Perforated collection pipes will be installed in trenches to collect and transport the leachate to the manholes, which will

facilitate pumping of the leachate to the treatment areas. A geotextile filter fabric will be placed around the collection pipes to prevent clogging. The materials utilized to construct these systems must have sufficient strength to withstand the loadings imposed by the overlying sediment, equipment, and cover. Specifications and details for the synthetic drainage net, collection pipes and trenches, and geotextile fabric are presented in Attachment 4.

5.5.6 Waste Placement Protection System

The waste placement protection system consists of a geotextile filter fabric and solidified sediment. The geotextile fabric will be placed directly on the synthetic drainage net of the LCS. A minimum height of one (1) foot, measured loose, of the solidified sediment to be placed in the SWCA, will be carefully laid on the geotextile in a manner as to prevent any damage to the primary liner, LCS, or the underlying geotextile filter fabric from occurring. The 1 foot of sediment will then be carefully compacted to obtain the necessary bearing capacity. This combination of geotextile material and 1 foot of sediment should provide adequate protection for the underlying systems.

5.6 PLACEMENT OF SOLIDIFIED MATERIAL INTO SWCA

Subsequent to completion of construction of the SWCA, the solidified sediment will be placed into the SWCA. The solidified material will be excavated to the depth where it interfaces with the natural subsurface soils. The actual depths of the excavation will be monitored and documented by VCD to verify that all the solidified sediment is removed. Placement of the solidified material within the SWCA will be accomplished in a careful and controlled manner. A minimum depth of solidified sediment will be placed into the SWCA to provide a protective layer to the underlying leachate systems as described in Section 5.5.6.

The solidified material will be spread in uniform lifts not to exceed ten (10) inches, measured loose. Each lift will be compacted to obtain the bearing strength as specified in the Construction Specifications. The lifts of solidified material will be compacted to ninety-five percent of the Standard Proctor compactive effort and within the moisture requirements stated in the Construction Specifications.

The materials will be installed to the lines and grades shown in the Construction Drawings (which is approximately 2.5 feet below the final elevations of the SWCA cover system). These elevations (may vary depending upon actual quantity of sediment), lines, and grades will be surveyed and certified by a registered land surveyor or engineer before installation of the SWCA cover system can begin. All excavation and placement of the solidified sediment will be monitored and tested as stated in the Construction Specifications and the Construction Quality Control Specifications.

A slope stability calculation was performed on the solidified sediment as placed in the SWCA to check the FS against slope failure. The FS was calculated to be 2.8 which is higher than the accepted industry standard for non-catastrophic failure of 1.5. Therefore, the solidified sediment as placed in the SWCA is considered to be stable before the placement of the cover system if placed as shown in the Construction Specifications and Construction Drawings. The calculations for the slope stability of the solidified sediment are included in Attachment 1.

5.7 SWCA COVER SYSTEM

The cover system (cap) provides three primary functions. These functions are to (1) minimize long-term migration of liquid through the SWCA, (2) control drainage (runoff) and minimize erosion, and (3) collect and vent gases that may be generated by the covered material.

The cover system is designed to minimize the infiltration and migration of liquids into and through the cap. The cover system has been designed to have a hydraulic conductivity less than that of the primary synthetic liner beneath the wastes based on the the hydraulic conductivity of 60 mil HDPE liner alone. This design will prevent the accumulation of liquids within the landfill following closure and minimize or prevent the development of a "bathtub" condition.

A relatively permeable synthetic drainage net is also provide to intercept and direct any infiltration internally away from the waste material to allow subsequent surface discharge from the SWCA area.

The cover system installation consists of the following elements:

- Gas Collection/Venting System (Section 5.7.1),
- Clay Liner (Section 5.7.2),
- Synthetic Liner (Section 5.7.3),
- Synthetic Drainage Layer (Section 5.7.4),
- Geotextile Filter Materials (Section 5.7.5),
- Topsoil Layer (Section 5.7.6)
- Erosion Protection (Section 5.7.7), and
- Runon/Runoff Control (Section 5.7.8).

The effectiveness of the cover system is addressed in Section 5.7.9.

5.7.1 Gas Collection/Venting System

The gas collection/venting system consists of a synthetic drainage net (geo-net) placed between two layers of geotextile filter fabric. The first geotextile will be placed directly on the solidified sediment with the geo-net placed on the geotextile. A second geotextile will be placed on the drainage net before the clay liner is installed.

Gases generated by the solidified sediment will be collected by the geo-net and routed to three (3), 6-foot long, 4-inch diameter perforated polyvinyl chloride (PVC) pipes, wrapped in geotextile material and surrounded by coarse grain sand. These perforated pipes will be placed at the highest points of the solidified sediment to minimize the occurrence of gases from accumulating in the system. A 4-inch diameter stainless steel riser pipe will connect to the perforated pipe and rise through cover system to an elevation of approximately three (3) feet above the topsoil layer, thus providing a venting system for the gases. The specifications and details for the construction of the gas collection/venting system are included in the Construction Specifications and Construction Drawings (Attachment 4).

5.7.2 Clay Liner

The cover system contains a clay liner which will act as secondary protection against infiltration of liquid into the SWCA wastes. Additionally, the clay layer will act as a foundation for the overlying synthetic liner and will provide (1) a stable base for the installation of the liner, and (2) a relatively smooth and uniform surface on which to place the synthetic liner

thus protecting it against punctures from roots and protrusions. The clay liner will consist of one foot of recompacted clay (finished thickness) constructed to the lines and grades shown on the Construction Drawings (Attachment 4). The clay liner will be placed on top of the geotextile fabric in such a manner as not to compromise the integrity of the fabric. The clay used for construction of the clay liner will be natural clay, free of roots, gravel, or other debris. The specifications for the selection of the clay are included in Attachment 4.

The clay will be placed in uniform lifts, with each lift not exceeding eight inches in thickness, measured loose. Each lift will extend over the full surface of the working closure area as shown on Figure 8. The construction will proceed in lifts until the compacted clay thickness is greater than one foot. The clay liner will then be trimmed to conform with the final slopes and configurations shown on Figure 8 and in the Figures detailing the cross sections of the remediated area.

5.7.3 Synthetic Liner

The cover system design provides for a synthetic liner to be placed on top of the clay liner. The synthetic liner will act as the primary protection against infiltration of liquid into the landfill. The synthetic liner selected for use is a 60 mil HDPE liner. This synthetic liner has a tensile strength of 2,200 psi and an elongation before failure of 325 percent (both meeting ASTM standards of 2,200 psi and 300 percent elongation before failure). The synthetic liner is designed to accommodate possible settling of the solidified sediment while the integrity of the cap is maintained. The specifications for the selection and installation of the synthetic liner are included in Attachment 4.

5.7.4 Synthetic Drainage Layer

The cover design also contains a synthetic drainage layer which overlies the HDPE liner and underlies the topsoil. The drainage layer is constructed using a synthetic drainage net designed to enhance in-plane flow of liquid. This net is covered on top with a geotextile fabric (Section 5.7.5), designed to minimize or prevent the introduction of fine grained topsoil into the net which could clog the net and impede the lateral flow of liquid. This layer is

provided to intercept infiltration. The layer will inhibit accumulation of liquid in the cap which minimizes the effect of hydraulic head on the synthetic liner. Approximately one-third of the layer drains into a 4-inch PVC located west of the SWCA cover which contain downchutes draining into the ditch at about 100 foot centers drainage pipes (Detail Sheets; Attachment 4). Eventually, the drainage from this portion of the layer enters the site surface drainage systems.

The remaining portion of the drainage layer drains into the retrofitted impoundment B. The placement of the drainage layer is specified in Construction Drawings and Construction Specifications of Attachment 4.

5.7.5 Geotextile Filter Materials

Three separate layers of synthetic filter fabric (geotextile) will be utilized in the SWCA cover system design. The first layer will be placed directly on top of the solidified sediment. This geotextile layer will perform three functions. These functions are (1) to prevent the possibility of material from the solidified sediment infiltrating into the gas collection system causing possible clogging, (2) provide an extra layer of material that will reduce the overall permeability of the cover system and further minimize the potential for migration of surface infiltration into the landfill, and (3) minimize any contact of personnel and equipment with the underlying sediment.

The second layer of filter fabric will be placed on top of the gas collection system. This layer of fabric will provide generally the same functions as the first layer as it will prevent the possibility of material from the clay liner infiltrating into the gas collection system and reduce the overall permeability of the cover system.

The third layer of filter fabric will be placed on top of the synthetic drainage layer. The purpose of this geotextile layer is to prevent materials from the topsoil layer (Section 5.7.6) from infiltrating into the synthetic drainage layer and clogging it. The geotextile selected for use in this design has opening sizes small enough to prevent soil particles from entering the lower layer. The procedure for selecting the proper geotextile material is presented in the Calculation Brief (Attachment 1). The specifications and

details for installation of the synthetic filter media are included in the Construction Specifications and the Construction Drawings (Attachment 4).

5.7.6 Topsoil Layer

Topsoil, a minimum of eighteen inches, shall be placed on the cap. The topsoil will be lightly compacted and will provide both protection for the underlying liners and a growth medium for the final vegetative cover. The specifications for the placement of the topsoil are included in Attachment 4.

5.7.7 Erosion Protection

Erosion and slope protection provisions will be made on areas of the SWCA cover where slopes have a ratio of less than four (4) horizontal to one (1) vertical (4:1). A slope protection material (geomat), consisting of an Enkamat or equivalent, shall be installed and will reduce surface erosion and allow for growth of a vegetative cover within itself.

This protection material will prevent excessive erosion of topsoil. Calculations in Attachment 1 show that erosion from the cap without erosion protection provisions would be slightly higher than the EPA recommended erosion rate of 2 tons per acre per year (2.1 tons per acre per year). Therefore placement of the protection material is needed to meet this standard and protect the SWCA cover against slope decay from stormwater runoff.

5.7.8 Runon/Runoff Control

A perimeter ditch will be constructed west of the SWCA to prevent any runon from entering the closed area. This drainage ditch is shown in the Construction Drawings in Attachment 4. This ditch is designed with a capacity to divert stormwater drainage from the areas west of the SWCA and the portion of the SWCA cover in which rainfall runs off to the west. Calculations in Attachment 1 show that the designed ditch contains this capacity. The perimeter ditch will direct the runon/runoff it collects to natural site drainage routes which eventually drain into Stouts Bayou. Details for construction of the perimeter ditch are presented in the Construction Specifications and Construction Drawings of Attachment 4.

The portion of the stormwater runoff that does not flow toward the perimeter ditch will be routed to the surrounding retrofitted impoundments A and B. The amount of runoff diverted to these ponds should not impair the operations of the impoundments. The final grading plans of the SWCA and the surrounding areas are presented in Figure 4 of the Construction Drawings, Attachment 4.

5.7.9 Cover System Effectiveness

This section presents the cover system effectiveness including information which details how the cover design impacts the overall SWCA closure design.

The runon/runoff control for the closure area will conform to the Construction Specifications and Construction Drawings of Attachment 4. The cover system and the slope of the area will be sufficiently designed to divert all runon and runoff from the closed SWCA.

The erosion of soil from the cover will be less than the allowable amount of 2 tons per acre per year as specified in EPA guidance documents if erosion protection provisions are provided to prevent any excessive erosion or slope decay. Calculations for the amount of soil erosion expected from the final cover system are included in Attachment 1.

The efficiency of the SWCA cover system was determined using the Hydraulic Evaluation of Landfill Performance (HELP) Model. HELP is a hydrologic computer model of water movement across, into, through, and out of landfills utilizing climatologic (several years), soil and design data. The efficiency of landfill covers obtained from this model approximate the actual amount of infiltration expected into the cover via surface infiltration. The efficiency of the final cover design using the HELP model program was calculated to be approximately 99.98 percent. Based upon the calculated efficiency, only 0.001 inches of infiltration per year is expected to enter the SWCA. The input and output for these calculations is presented in Attachment 1.

A slope stability calculation was performed on the cap to check the factor of safety (FS) against slope failure. The FS calculated was 1.54 which is higher than the accepted industry standard for non-catastrophic failure of 1.5. Therefore, the cap is considered to be stable if placed as shown on

Construction Drawings and properly maintained in accordance with the Post-Closure Plan. The calculations for the slope stability are included in Attachment 1.

In conclusion, based on the above results, it can be stated that the cover design of the SWCA meets or exceeds the industry, state and federal regulatory standards that are used in landfill cover designs and will adequately meet the requirements of this project.

5.8 IMPOUNDMENT RETROFIT CONSTRUCTION

Retrofit construction of impoundment A will begin subsequent to construction of the SWCA. Impoundment C retrofit operations will proceed following retrofit completion of impoundment A and completion of its respective sediment solidification procedures. The retrofit construction of impoundment B will begin after impoundment C is operational and its own solidification activities are complete.

Though the sequencing of retrofit construction for impoundment A, B, and C are slightly different, the actual retrofit construction procedures are basically identical and will consist of the following items:

- Solidified Sediment Removal (Section 5.8.1),
- Dike and Foundation Preparation (Section 5.8.2),
- Bottom Gas Relief System (Section 5.8.3),
- Secondary Synthetic Liner (Section 5.8.4),
- Leakage Detection/Removal System (Section 5.8.5), and
- Primary Synthetic Liner (Section 5.8.6).

5.8.1 Solidified Sediment Removal

Following the completion of the construction sequence which is specific to each pond, the solidified sediment will be removed to the SWCA to allow the retrofit construction to begin. The solidified sediment will be moved to the SWCA in accordance with Section 5.6 and the Construction Specifications.

The solidified sediment shall be removed to the limits of the natural impoundments. VCD shall monitor these operations and verify and document that all sediment has been excavated to the depths where the solidified material

interfaces with the natural subsurface soils as per the Construction Specifications and the Quality Control Specifications presented in Attachment 4.

5.8.2 Dike and Foundation Preparation

Following the removal of the solidified sediment, construction of the impoundment dikes and foundation will be necessary. The area of each impoundment will be constructed to the elevations and grades specified on the Construction Drawings presented in Attachment 4 and to the requirements of the Construction Specifications and Quality Control Specifications.

Any areas of the foundation that are above grade will be excavated to the specified elevations. The top six (6) inches will be scarified and then recompacted to obtain the bearing strength required in the Construction Specifications. Areas which are initially at the approximate required elevations, will be scarified six (6) inches and then recompacted. Foundation areas that are below the specified elevations will be filled with a predetermined backfill source. The fill will be placed in lifts not to exceed ten (10) inches, measured loose, and compacted to ninety-five percent of the Standard Proctor compactive effort and within the moisture requirements stated in the Construction Specifications.

The dikes of each impoundment will be built to the elevations and slopes as shown on the Construction Drawings. After vegetation is removed and prior to the placement of any fill, the top six (6) inches will be scarified and recompacted as specified. The remaining dike will then be constructed in lifts not to exceed a height of ten (10) inches, measured loose, and compacted in accordance with the Construction Specifications. As indicated in the Construction Drawings, the dikes will be built to an intermediate elevation and the synthetic liners tied in. After the liners are in place, the dikes will be built to final elevations.

A slope stability calculation was performed on the dikes to check the factor of safety (FS) against slope failure. The FS was calculated to be 1.9 which is greater than the accepted industry standard for non-catastrophic failure of 1.5. Therefore, the dike is considered to be stable if placed as shown on the

Construction Drawings and in the Construction Specifications. The calculations for the slope stability are included in Attachment 1.

After all dike and foundation construction is complete, a survey shall be completed and certified by a registered land surveyor or engineer to verify that elevations, grades, and slopes meet the requirements of the Construction Drawings.

5.8.3 Bottom Gas Relief System

A bottom gas relief system will be placed beneath the synthetic liner system to prevent bulges in the liner system due to possible gas pressure beneath the liner. The gas relief system will consist of a geotextile and a synthetic drainage net placed directly on the prepared foundation. The drainage net will be connected to vent pipes to vent any gas generation to the air. Details for the system are presented in the Construction Specifications.

5.8.4 Secondary Synthetic Liner

The secondary synthetic liner consists of a sixty (60) mil HDPE geomembrane. Placement of the synthetic liner will be carefully monitored to verify that proper anchoring, seaming, integrity, and allowance for expansion and contraction of the material is obtained. The secondary liner underlies the LD/RS and provides back-up for the primary synthetic liner. Cross-sections and details for the secondary synthetic liner are presented in the Construction Drawings.

5.8.5 Leakage Detection/Removal System

Each impoundment contains a LD/RS which will drain to a centralized leachate sump as detailed on the Construction Drawings in Attachment 4.

The LD/RS is designed to detect and remove any leachate that migrates through the primary synthetic liner (Section 5.8.5). The detection system overlies the secondary synthetic liner, underlies the primary synthetic liner, and is designed to detect and remove leakage from any areas subject to leachate generation (i.e., all areas over which water is stored).

The LD/RS sump will be constructed of HDPE material and is used to provide access to the systems of impoundments A, B, and C. This will facilitate removal of the leachate from the detection systems. The sump also provides access for inspection and testing of the detection systems if necessary. The details for the LD/RS sump are presented in the Construction Drawings.

The leachate collected in the sump will be routed via a four (4) inch diameter HDPE pipe to impoundment C for eventual discharge under the NPDES permit. The 4 inch HDPE pipe will be constructed with its own secondary containment system. Construction details of the discharge pipes, the piping support system, and location of pumps being utilized are presented in the Construction Drawings. Material and pump specifications are presented in the Construction Specifications.

The LD/RS for the impoundments are constructed utilizing a synthetic drainage net which will promote flow and thus reduce the leachate head acting on the underlying synthetic liner. Perforated HDPE collection pipes will be installed in trenches to direct the leachate from the impoundments to the sump, which will facilitate pumping of the leachate to the treatment areas. A geotextile filter fabric will be placed around the collection pipes to prevent clogging. Specifications and details for the synthetic drainage net, collection pipes and trenches, and geotextile fabric are presented in Attachment 4.

5.8.6 Primary Synthetic Liner

The primary synthetic liner (60 mil HDPE) provides the initial and most critical protection against leachate migration from the impoundments. This liner will be installed and monitored in such a manner that its integrity is maintained. The primary synthetic liner overlies the LD/RS. The synthetic drainage media of the detection system will serve as bedding material for the liner. The synthetic liner material chosen was based upon the same criteria as described in Section 5.8.3. Placement and quality assurance requirements are detailed in Attachment 4.

5.9 REVEGETATION AND RECLAMATION

The revegetation of the area will occur after the placement of the SWCA topsoil layer and after construction (earthwork) activities have ceased. The

revegetation will consist of the removal of any construction debris and placement of seed and fertilizer on the topsoil. The areas to be revegetated will be broadcast seeded and conditioned by the use of a rake or harrow to provide proper seed coverage with soil. The seeded areas will have erosion protection placed thereon to minimize or prevent erosion and seed loss during germination. Erosion netting will be placed upon those areas designated by this document and mulched hay or straw on other areas. Any areas which have been stripped of their vegetative cover due to construction activities shall be revegetated. The specifications for revegetation are included in Attachment 4.

After all construction activities are completed, the entire area will be checked and cleared of all debris, construction materials, stockpiled soils, equipment, or other foreign material before post-closure activities begin.

5.10 SEQUENCE OF CONSTRUCTION

The construction schedule is shown as Figure 5. The closure/retrofit of the impoundment system will be accomplished in accordance with the Construction Package (Construction Drawings, Construction Specifications and Quality Control Specifications). The construction activities will proceed in the following major phases:

Phase 1: Mobilization

- Construction of the equipment staging area,
- Construction of temporary access roads, and
- Mobilization of other equipment not needed in the above tasks.

Phase 2: Site Preparation

- Construction of temporary drainage swales,
- Clearing and grubbing,
- Relocation of impoundment operation,
  - install sheet piling between A and B;
  - install HDPE pipes between A, B, and C;
  - route influent pipeline to C; and
  - isolate and cease discharge to A.
- Dewater A,

- Remove structures in A and stockpile for subsequent placement in the SWCA, and

- Begin construction of permanent pump station facility (north of C).

Phase 3: Sediment Solidification in A

Phase 4: Removal of Solidified Sediment in SWCA Area to Impoundment A

Phase 5: Construction of SWCA

- Construction of LCS and LDS sumps,
- Preparation of SWCA subgrade and dikes
- Placement of secondary liner,
- Placement of LDS and sump piping,
- Placement of primary liner,
- Placement of LCS and sump piping, and
- Placement of protective system.

Phase 6: Place Solidified Sediment from A into SWCA

Phase 7: Retrofit A

- Construction of sump,
- Prepare subgrade and dikes,
- Placement of influent piping,
- Placement of gas relief system,
- Placement of secondary liner,
- Placement of LD/RS,
- Placement of piping to sump, and
- Placement of primary liner.

Phase 8: Switch Operation to A, Place Permanent Pump Station into Operation

Phase 9: Dewater B and C to A; Remove Structures from B and C including Sheet Piles

Phase 10: Sediment Solidification in B and C

Phase 11: Placement of Sediment in SWCA

Phase 12: Retrofit B and C and; Close SWCA

- Retrofit B and C as per A (no sump construction)

- Close SWCA

  - install gas venting system
  - place one foot of compacted clay on SWCA
  - placement of synthetic liner
  - placement of drainage layer
  - placement of topsoil

Phase 13: Revegetate Areas and Place Erosion Protection

Phase 14: Place B and C into Operation

Phase 15: Site Reclamation and Demobilization

5.11 DECONTAMINATION PROCEDURES

During implementation of the closure activities, the decontamination procedures outlined herein will be used. All equipment and personnel shall be decontaminated before leaving the site.

The first step in decontamination is to minimize contact with the sediments and, thus, the potential for contamination. The following guidelines should be observed:

- Contact with the sediments should be minimized (i.e., do not walk through areas of obvious contamination);
- Wear disposable outer garments and use disposable equipment whenever possible while working with the sediment; and
- Cover equipment and tools, if possible, with a strippable coating which can be removed during decontamination.

All personnel, clothing, equipment, and samples leaving the site must be decontaminated. Decontamination will be accomplished by both physical and chemical means. VCD shall designate an area to be used for decontamination.

The following procedures are to be used for heavy equipment decontamination:

- Long-handled brushes, rods, or shovels shall be used to dislodge contaminated soil caught in tires, tracks, and the undersides of vehicles and equipment;
- Brooms and brushes shall be used to clean the operator areas inside the vehicles or equipment;
- The exterior of the vehicle or equipment shall be washed with a surfactant by using a long-handled brush;
- The operation area of the vehicle or equipment shall be washed as necessary to remove contamination;

- The vehicles will be rinsed with a pressurized sprayer; and
- The decontamination area will be policed of gross contamination before the vehicle or equipment is allowed to leave to prevent the vehicle from tracking contaminated soil out of the area.

Personnel and personal equipment will be decontaminated as follows:

- Heavily contaminated equipment and disposable clothing will be deposited on disposable drop cloths for further decontamination;
- Clothes and personal equipment will have contaminated soil removed by use of soft bristle brushes;
- The equipment shall then be washed with a soft bristled brush with soap and water and rinsed thereafter;
- Coveralls or disposable clothing will be placed in a drum for later disposal;
- Equipment will be dried as necessary to remove the rinse water and prevent rusting; and
- Personnel will wash exposed areas of skin with soap and water before leaving the site.

5.12 HEALTH AND SAFETY

The contractor will provide a health and safety plan specifically for each phase of construction and will comply with any required VCD safety rules. The contractor will adhere to all safety rules established by the Occupation Safety and Health Administration (OSHA).

In addition to these health and safety plans to be established by the contractor, the site personnel will be required to have:

- hard hat,
- safety glasses or goggles,
- construction-grade work boots,
- disposable coveralls, if necessary,
- gloves,

- half-face respirators with
  - dust/mist filters
  - organic vapor cartridges, and
- other equipment as specified by VCD.

5.13 CONSTRUCTION QUALITY CONTROL

During the closure/retrofit operations, a Construction Quality Control (CQC) Specification will be implemented to verify that the completed construction activities meet or exceed the criteria outlined in the plans and specifications.

The following Quality Assurance/Quality Control (QA/QC) activities are included in the CQC Specification:

- Inspection and Data Documentation, and
- Analysis.

The data collection and analysis described in the CQC Specifications, Attachment 4, shall be performed to supplement data provided by the contractor. The specification describes individual components in the construction activities which require independent verification and describes the actions to be followed for each component.

6.0 POST-CLOSURE/OPERATION PLAN

The post-closure/operation plan will be implemented following construction and, as a minimum, will have the following elements:

- Groundwater Monitoring/Detection System (Section 6.1),
- Leachate Collection (Section 6.2),
- Final Cover Inspection and Maintenance Plan (Section 6.3),
- Security Requirements (Section 6.4),
- Location of Post-Closure Plan (Section 6.5),
- Notice of Deed to Property (Section 6.6),
- Notice to Local Land Authority (Section 6.7), and
- Certification (Section 6.8).

Cost estimates for the Post-Closure Plan and the Post-Closure Certification are provided in Table 4.

6.1 GROUNDWATER MONITORING/DETECTION SYSTEM

This section outlines the procedures in the collection, shipment, analysis of groundwater samples and the documentation procedures to verify sample integrity. VCD has been operating a groundwater monitoring program to monitor the surface impoundment system. The existing assessment program will be integrated into the post-closure groundwater monitoring plan.

The groundwater monitoring plan includes the following:

- Monitoring Parameters (Section 6.1.1),
- Monitor Well Locations (Section 6.1.2.),
- Groundwater Sampling Procedures (Section 6.1.3), and
- Chain-of-Custody and Recordkeeping (Section 6.1.4).

The monitor wells by virtue of the construction of a leachate detection system no longer are the primary mechanism for detection of migrating constituents. As such they will be monitored through the three (3) year post-closure period and/or such period of time that assessment of these units is necessary.

TABLES

TABLE 1

WATER WELLS WITHIN A THREE MILE RADIUS
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

OWNER	WELL NUMBER(1)
U. S. Corps of Engineers	72
U. S. Corps of Engineers WGC 2	73
Jack B. Smith	78
George Lee	82
U. S. Corps of Engineers WES	83

NOTE: (1) Locations of well by number may be obtained by U. S. Geological Survey.

TABLE 2

SEDIMENT CHEMICAL ANALYSIS
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

SAMPLE[1]	ARSENIC	EPS TOXAPHENE	TOXAPHENE	ATRAZINE	BLADEX	DINOSEB	METHYL PARATHION	1,2-DICHLORO-BENZENE	4-NITRO PHENOL	2,4-DINITRO PHENOL	PENTA-CHLORO-PHENOL
A	43.8	334	536	21,000	1,700	64	400	20	--[4]	--	--
B	7.1	244	223	3,000	--	40	--	--	--	--	--
C	14.5	167	680	9,000	3,000	770	--	--	--	--	--
D	9	--	322	8,000	900	170	--	--	--	--	--
E	143	487	2,320	3,900	8,000	5,910	400	--	--	--	--
F	66.9	56	541	78,000	--	330	--	--	--	--	--
G	40.1	62	381	30,000	--	1,100	--	--	5	--	--
H	7.9	--	6.3	15,000	--	25	--	--	Trace	Trace	--
I	114	84	17.5	8,000	--	1,600	--	--	70	--	--
J	216	--	18.1	2,000	--	160	--	--	--	--	--
K	108	--	1.8	360	--	620	--	--	30	--	--
L	93.5	--	1.2	220	--	15	--	--	Trace	--	--
M	29.2	10	0	13	--	11	--	--	--	--	--
N	41	--	0	230	--	10	--	--	--	--	--
O	57.8	--	0	1,500	142	4	--	--	--	--	--
P	16.9	0.2	22	1,000	--	6	--	--	Trace	--	1.2
Q	46.2	--	29	300	20	92	--	--	--	--	--
R	50.3	0.2	4.6	5	--	60	--	--	--	--	--
S	96.5	--	42.9	800	--	23	--	--	--	--	--
Average	63	144	271	9,596	2,294	579	--	--	--	--	--
B[2]	0.07	--	--	37	5	3.7	--	--	--	--	--
F[2]	0.86	--	--	51	3	4	--	--	--	--	--
F[3]	1.4	--	--	45	0.9	6.3	--	--	--	--	--
J[2]	1.6	--	--	49	--	3.7	--	--	--	--	--
Average	0.98	--	--	46	3.0	4.4	--	--	--	--	--

NOTES: (1) All quantities in milligrams/kilogram.
(2) EP Toxicity.
(3) Toxicity Characteristic Leaching Procedure.
(4) -- (Not analyzed).

CED/VCDCP-TAB

TABLE 3

GEOTECHNICAL RESULTS
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

BORING	DEPTH	PENETROMETER (tons/sf)	TOLUENE (tons/sf)	MOISTURE CONTENT	DENSITY (psf)	LL	PI	FINER -200	PERMEABILITY (cm/sec)	COEFFICIENT OF CONSOLIDATION	USCS CLASSIFICATION
MW-9	8 - 10	--	--	--	--	--	--	99	--	--	ML
	28 - 30	--	--	--	--	--	--	99	--	--	ML
	43 - 45	2.25	--	20	101	29	13	80	6.5×10^{-6}	0.16	CL
MW-10	8 - 10	1.5	1.6	--	--	--	--	98	--	--	ML
	28 - 30	1.75	--	--	--	--	--	99	--	--	ML
	38 - 40	1.0	0.43	22	92	31	10	95	4.3×10^{-7}	0.16	CL
MW-11	5 - 6.5	--	--	--	--	--	--	97	--	--	ML
	28 - 30	2.5	--	22	102	--	--	96	--	0.06	ML
	43 - 45	2.5	--	--	--	70	45	99	--	--	CH
MW-12	8 - 10	1.25	--	--	--	--	--	99	--	--	ML
	29 - 29.5	1.1	--	21	101	--	--	98	1.0×10^{-6}	0.05	ML
	45 - 46.5	1.25	--	--	--	29	8	30	--	--	CL
B-1	10 - 12	--	--	30	--	32	5	--	--	--	--
B-2	10 - 12	--	--	32	--	32	5	--	--	--	--
B-3	10 - 12	--	--	32	--	33	5	--	--	--	--

CED/VCDCP-TAB

TABLE 4

ESTIMATED CLOSURE COSTS
SOLIDIFIED WASTE CONSOLIDATION AREA
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

ITEM	QUANTITY	UNIT COST DOLLARS	SUBTOTAL DOLLARS
Site Preparation	--	--	25,000
Sediment Solidification	12,500 cy	18.00	225,000
Subsoil Solidification	2,500 cy	18.00	45,000
Relocation of Sediment	3,000 cy	2.00	6,000
Dike and Foundation Preparation	5,500 cy	5.00	27,500
Synthetic Liners	135,000 sf	0.65	87,500
Drainage Nets	135,000 sf	0.22	29,700
Geotextiles	180,000 sf	0.12	21,600
LCS/LDS Piping	--	--	10,000
LCS/LDS Sumps	--	--	40,000
Sediment Placement	18,000 cy	2.00	36,000
Gas Venting System	--	--	5,000
Clay Liner	1,700 cy	10.00	17,000
Drainage Trenches	--	--	2,500
Topsoil Layer	2,500 cy	7.50	18,750
Erosion Protection	40,000 sf	0.25	10,000
Ditch System	--	--	2,000
Revegetation	1 acre	1,500	1,500
		Subtotal	610,350
	Contingency,	10% (+/-)	60,650
		TOTAL	671,000

CED/VCDCP-TAB

TABLE 4 (Continued)

ESTIMATED RETROFIT COSTS
IMPOUNDMENT SYSTEM
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

ITEM	QUANTITY	UNIT COST DOLLARS	SUBTOTAL DOLLARS
Health and Safety	--	--	2,500
Decontamination	--	--	5,000
Site Preparation	--	--	41,000
Relocation of Impoundment Operation	--	--	50,000
Dike and Foundation Preparation	3,500 cy	3.00	10,500
Place Influent Piping	--	--	2,500
Synthetic Liners	300,000	0.65	195,000
Geotextile	150,000	0.12	18,000
Drainage Nets	300,000	0.22	66,000
LD/RS Piping	--	--	20,000
LD/RS Sump	--	--	65,000
Revegetation	0.5 acre	1,500	750
		Subtotal	476,250
	Contingency, 10% (+/-)		47,750
		TOTAL	524,000

CED/VCDCP-TAB

TABLE 4 (Continued)

ESTIMATED POST-CLOSURE COSTS PER YEAR
CLOSURE/RETROFIT PLAN
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

ITEM	QUANTITY	UNIT COST DOLLARS	SUBTOTAL DOLLARS
Groundwater Sampling	13 wells semi-annually	100	2,600
Inspection and Maintenance of Cover System	See text	2,000	2,000
Inspection and Maintenance of Monitor Wells	semi-annually	1,000	1,000
Annual Report	Annually	2,000	2,000
		Subtotal	7,600
	Contingency, 10% (+/-)		750
		TOTAL	8,350

CED/VCDCP-TAB

ATTACHMENT 1

CALCULATION BRIEF

CLOSURE/RETROFIT PLAN

SURFACE IMPOUNDMENT SYSTEM

VICKSBURG CHEMICAL DIVISION

VICKSBURG, MISSISSIPPI

INTERNATIONAL TECHNOLOGY CORPORATION

(i)

By MJR Date 7/27/88 Subject VICKSBURG CHEMICAL Sheet No. 1 of 1

Chkd. By ____ Date ____ Proj. No. 435361

0.5cm. X 0.5cm.

CALCULATION BRIEF

CLOSURE / RETROFIT PLAN

PREPARED FOR:

VICKSBURG CHEMICAL DIVISION

VICKSBURG, MISSISSIPPI

Prepared By:

IT Corporation

INTERNATIONAL TECHNOLOGY CORPORATION

By MJR Date 7/27/82 Subject VCD Sheet No. 1 of 1

Chkd. By ___ Date ___ Proj. No. 435361

0.5cm. X 0.5cm.

TABLE of CONTENTS

SECTION	PAGE
OBJECTIVE	1
REFERENCES	1
PERSONNEL	1
VOLUME CALCULATIONS	2
SETTLEMENT ANALYSIS	8
BEARING CAPACITY	17
SLOPE STABILITY	20
STABILITY of GEOSYNTHETICS ON SLOPE	32
LINER STRESSES	35
STRUCTURAL DESIGN FOR COLLECTION PIPES	46
LEAKAGE DETECTION SYSTEM DESIGN	50
HELP MODEL	60
EROSION POTENTIAL of CAP	78
CAP STABILITY	80
RUNOFF VELOCITY	81
PERIMETER DITCH DESIGN	83

INTERNATIONAL TECHNOLOGY CORPORATION

(1)

By MJR Date 7/27/88 Subject VCD Sheet No. 1 of 1

Chkd. By ____ Date ____ Proj. No. ____

0.5cm. X 0.5cm.

OBJECTIVE: The objective of these calculations is to perform the necessary computations to develop design features for the closure/retrofit of the impoundment system. The calculations are in accordance with applicable guidelines and regulations and meet or exceed industry standards.

References: References are presented in each individual calculation of this brief.

Personnel:
MJR - Michael J. Richardson
AMS - Amanda M. Sullivan
CBJ - C. Blaine Johnson
LH - Laique Haider

INTERNATIONAL TECHNOLOGY CORPORATION

(2)

By CBS Date 7-25-88 Subject Vicksburg Chemical Sheet No. 1 of 6
Chkd. By AS Date 7/25/88 Closure / Retrofit Design Proj. No. 435361
0.5cm. X 0.5cm.

Volume Calculations

Objective: To determine to the volume of sludges that will be solidified to be placed in the SWCA and to determine the capacity of the SWCA

References: ① Computer Program designated "Cut and Fill by the Average End Method". Written by Peter J Singhofen P.E., December 1983

② Cross-Sections provided to I.T. from Vicksburg Chemical Division which were generated by Neel Schaffer, Inc., Jackson, Mississippi.

- Data obtain from Reference ② was utilized with the Cut and Fill program to determine the sludge quantity. The flowing 3 Tables show the sludge volumes for ponds A, B, and C respectively. as volumes of cut. The total quantity of sludges from the 3 pond is computed to be approximately 12,510 cubic yards.

INTERNATIONAL TECHNOLOGY CORPORATION

(3)

By CBJ Date 7-25-88 Subject Vicksburg Chemical Sheet No. 2 of 6
Chkd. By AB Date 7/25/88 Closure / Retrofit Design Proj. No. 435361
0.5cm. X 0.5cm.

*** CUT & FILL BY AVERAGE END AREA METHOD *** CF85105 VER 1.2
(C) Copyright 1983, Peter J. Singhofen, P.E.

PROJECT: VICKSBURG CHEMICAL DIVISION - Pond A.

SUMMARY TABLE

UNITS: SECTION DATA -- SQFT
REACH DATA -- CUYD
TOTAL DATA -- CUYD
NET DATA -- CUYD

STATION -- FT

	SECTION		REACH		TOTAL		
STATION	CUT	FILL	CUT	FILL	CUT	FILL	NET MASS
0	250	0	0	0	0	0	0
50	436	0	634	0	634	0	-634
100	362	0	739	0	1373	0	-1373
150	516	0	813	0	2186	0	-2186
200	591	0	1024	0	3210	0	-3210
250	333	0	855	0	4065	0	-4065
300	365	0	646	0	4711	0	-4711
350	196	0	520	0	5231	0	-5231
400	59	0	236	0	5467	0	-5467
450	31	0	84	0	5550	0	-5550
500	46	0	72	0	5622	0	-5622
550	10	0	52	0	5674	0	-5674

INTERNATIONAL TECHNOLOGY CORPORATION

(4)

By CBJ Date 7-25-88 Subject Vicksburg Chemical Closure / Retrofit Design Sheet No. 3 of 6

Chkd. By PB Date 7/25/88 Proj. No. 435361

0.5cm. X 0.5cm.

*** CUT & FILL BY AVERAGE END AREA METHOD *** CF85105 VER 1.2
(C) Copyright 1983, Peter J. Singhofen, P.E.

PROJECT: VICKSBURG CHEMICAL DIVISION-POND B

S U M M A R Y T A B L E

UNITS: SECTION DATA -- SQFT
REACH DATA -- CUYD
TOTAL DATA -- CUYD
NET DATA -- CUYD

STATION -- FT

	SECTION		REACH		TOTAL		
STATION	CUT	FILL	CUT	FILL	CUT	FILL	NET MASS
50	21	0	0	0	0	0	0
100	111	0	122	0	122	0	-122
150	212	0	299	0	422	0	-422
200	213	0	393	0	815	0	-815
250	338	0	510	0	1325	0	-1325
300	426	0	707	0	2032	0	-2032
350	445	0	806	0	2838	0	-2838
400	576	0	945	0	3783	0	-3783
450	660	0	1144	0	4927	0	-4927
500	253	0	845	0	5772	0	-5772
550	46	0	277	0	6049	0	-6049
580	0	0	26	0	6075	0	-6075

INTERNATIONAL TECHNOLOGY CORPORATION

(5)

By CBJ Date 7-25-88 Subject Vicksburg Chemical Sheet No. 4 of 6
Chkd. By B Date 7/25/88 Closure/Retrofit Design Proj. No. 435361
0.5cm. X 0.5cm.

*** CUT & FILL BY AVERAGE END AREA METHOD *** CF85105 VER 1.2
(C) Copyright 1983, Peter J. Singhofen, P.E.

PROJECT: VICKSBURG CHEMICAL DIVISION-POND C

S U M M A R Y T A B L E

UNITS: SECTION DATA -- SQFT STATION -- FT
REACH DATA -- CUYD
TOTAL DATA -- CUYD
NET DATA -- CUYD

	SECTION		REACH		TOTAL		
STATION	CUT	FILL	CUT	FILL	CUT	FILL	NET MASS
0	0	0	0	0	0	0	0
45	250	0	209	0	209	0	-209
95	135	0	357	0	566	0	-566
145	54	0	175	0	741	0	-741
165	0	0	20	0	761	0	-761

Pond A = 5674 cys
Pond B = 6075 cys
Pond C = 1761 cys

Total Sludge = 12,510 cys

- SWCA Capacity -

The Cut and Fill program was utilized in conjunction with cross-sections of the SWCA to determine the capacity. The following table shows a total SWCA capacity (Fill) of 22,722 cubic yards. Including the cover system (1.0' clay, 1.5' topsoil) the SWCA area = 1 acre, Thus

$$1\ \text{acre} \times \frac{43560\ ft^2}{1\ \text{acre}} \times 2.5\ ft = 108900\ ft^3 \cdot \frac{1\ yd^3}{27\ ft^3} = \underline{4033\ yd^3}$$

Total Volume of SWCA = 22,722 − 4033

= $\underline{18,689\ yd^3}$

This capacity is comparable to the sludge volume due to the expansion factor of the sludge after solidification and the addition of other structures to the SWCA

INTERNATIONAL TECHNOLOGY CORPORATION

(7)

By CBS Date 7-25-88 Subject Vicksburg Chemical Sheet No. 6 of 6
Chkd. By RB Date 7/25/88 Closure/Retrofit Design Proj. No. 435361
0.5cm. X 0.5cm.

*** CUT & FILL BY AVERAGE END AREA METHOD *** CF85105 VER 1.2
(C) Copyright 1983, Peter J. Singhofen, P.E.

PROJECT: VICKSBURG CHEMICAL DIVISION-SWCA VOLUME

S U M M A R Y T A B L E

UNITS: SECTION DATA -- SQFT STATION -- FT
REACH DATA -- CUYD
TOTAL DATA -- CUYD
NET DATA -- CUYD

	SECTION		REACH		TOTAL		
STATION	CUT	FILL	CUT	FILL	CUT	FILL	NET MASS
0	0	938	0	0	0	0	0
32	0	1375	0	1370	0	1370	1370
64	0	1750	0	1852	0	3222	3222
96	0	2213	0	2348	0	5570	5570
128	0	2474	0	2777	0	8347	8347
160	0	2856	0	3158	0	11506	11506
192	0	3161	0	3566	0	15071	15071
224	0	3510	0	3953	0	19024	19024
256	0	2814	0	3747	0	22772	22772

INTERNATIONAL TECHNOLOGY CORPORATION

(8)

By LH Date 7/15/88 Subject Settlement Analysis Sheet No. 1 of 9

Chkd. By AS Date 7/25/88 Vicksburg Chemical Proj. No. 435361-01

0.5cm. X 0.5cm.

OBJECTIVE: To calculate total settlement (immediate plus consolidation) at the base of the pond due to the waste disposal and cover.

REFERENCE

(1) Construction Drawings

(2) "Groundwater Assessment Program," Final Report Jan 1986 for Vertac Chemical Corporation, IT Project No. 846545-02

(3) NAVFAC, Design manual, DM 7.1, "SOIL MECHANICS," May 1982.

(4) "An engineering manual for settlement studies" by Duncan J. M, and Buchignani, A. L; Dept. of Civil Engineering, Univ. of Calif., Berkeley, June 1976.

ASSUMPTIONS

① The generalized subsurface geology, as shown in Fig. 1, is used for calculations.

② Water table is taken at 10 feet from the ground surface, at the base of the pond.

③ The compression coefficient from the available foam consolidation tests ranges from 0.05 to 0.16 for depth ranging from 27 to 45 feet below ground. A value of 0.12 is used for calculation purposes.

④ The 40 feet clayey silt (loess) deposits is assumed to have one way drainage (top) only.

⑤ The preconsolidation pressure from the available data ranges from 1.0 to 1.85 tons/ft². An average value of 2800 psf is used for the calculation

⑥ The initial void ratio values ranges from 0.73 to 0.925. A value of 0.80 is used for calculation purposes.

⑦ The unit weight of sludge and cover material is taken as 80 and 115 pcf respectively.

INTERNATIONAL TECHNOLOGY CORPORATION

By LH Date 7/15/88 Subject Settlement Analysis Sheet No. 2 of 9
Chkd. By AB Date 7/25/88 Vicksburg chemical Proj. No. 435361-01

0.5cm. X 0.5cm.

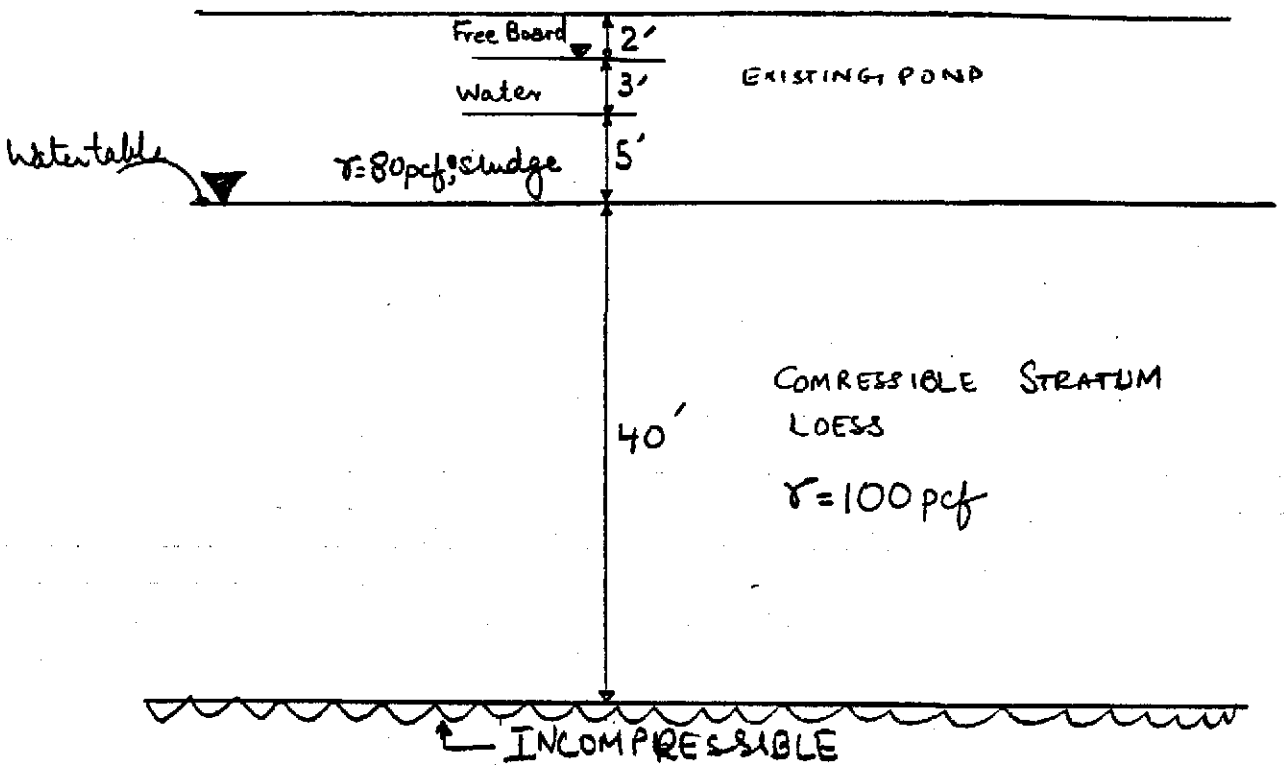


FIGURE 1

Generalized Subsoil stratification

(I) CALCULATION OF LOADS

The loads are calculated at the midpoint of the compressible stratum, see Figure 1.

(A) Existing Overburden (P_o)

(i) Water = 3 × 62.4 = 187.2
(ii) Sludge = 5 × 80.0 = 400.0
(iii) Compressible stratum = 20 × (100-62.4) = 752.0

Total = 1340 psf

(B) Extra load after waste and cover (ΔP)

The waste and cover is upto a height of 30 ft (EL. 127), maximum taking bottom surface elevation at 97 M.S.L.

Thus:

Waste = 80 × 27 = + 2160.0
Cap = 120 × 3 = + 360.0
(−) Water = − 187.2
(−) Sludge = − 400.0

Total ≅ 1935 psf

(II) SETTLEMENT CALCULATION

(A) Immediate Settlement

The immediate settlement will be calculated for total load at the base of the excavation (after closure). The total load after closure will be equal to load due to waste plus the cap. This is equal to:-

$$2160 + 360 = 2520 \cong \underline{2.52} \text{ ksf}$$

The following formula (Ref. 4); will be used:-

$$\rho_i = I_0 I_1 \frac{qB}{E_u}(1-\nu^2)$$

where; ρ_i = immediate settlement (average value)

q = average bearing pressure = 2.52 ksf

B = Foundation width, ($B \cong 100$ ft, average width at middle of triang. area).

E_u = Young's modulus of foundation soil, (Fig. 3)

ν = Poisson's ratio of foundation soil, $\nu = 0.5$ for sat. clay.

I_0 and I_1; factors from Fig. 2

From Fig. 2:

For $H = 40$ ft ; $D = 11$ ft, + $L = 250'$ (approx.).
+ $B = 100$ ft

or $L/B = 2.5$

$H/B = 0.4$

$D/B = 0.1$

$\therefore \quad I_1 = 0.25 \quad , \quad I_0 = 0.99$

Also, from Fig. 3

For $S_U \cong 3.5$ Ksf + $P.I \cong 10$ [Ref. 2] → average values

$OCR \cong 1$

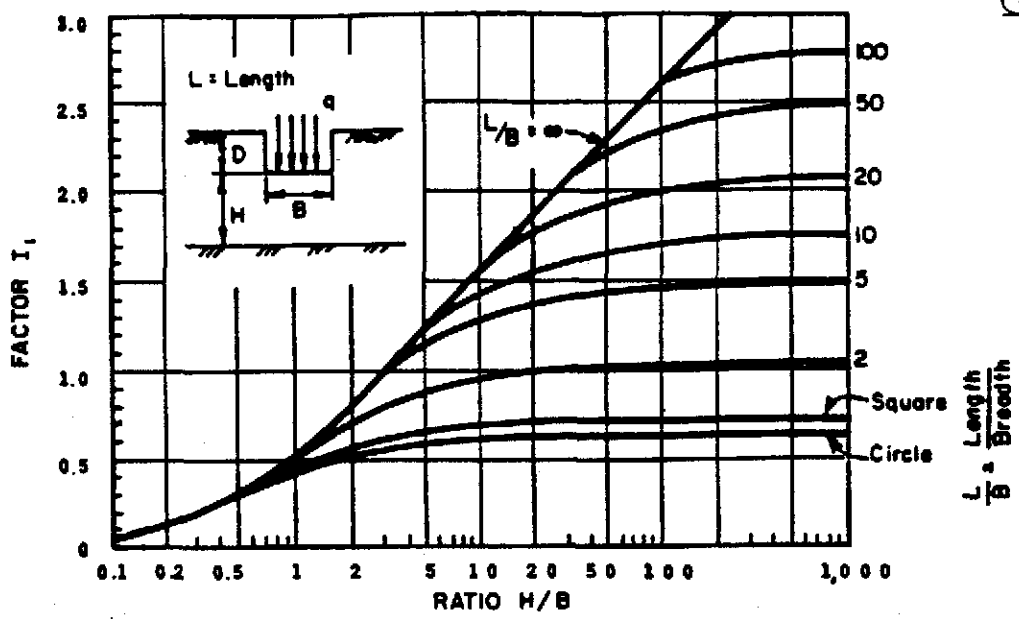
$\Rightarrow K = 1200$

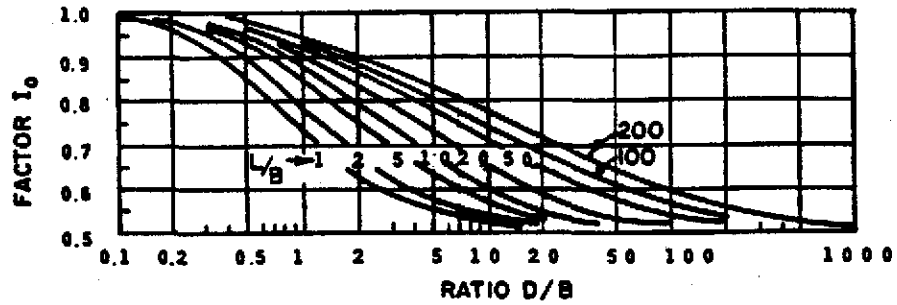
or $E_U = 1200 \times 3.5 = 4200$ ksf

$$\therefore \rho_i = \frac{(0.99)(0.25)(2.52)(100)(1-(0.5)^2)}{4200}$$

$= 0.011$ ft

$= \underline{\underline{0.14 \text{ inches}}}$ O.K.





$$\rho_i = I_0 I_1 \frac{qB}{E} (1 - \nu^2)$$

ρ_i = IMMEDIATE SETTLEMENT (AVERAGE VALUE)

q = AVERAGE BEARING PRESSURE

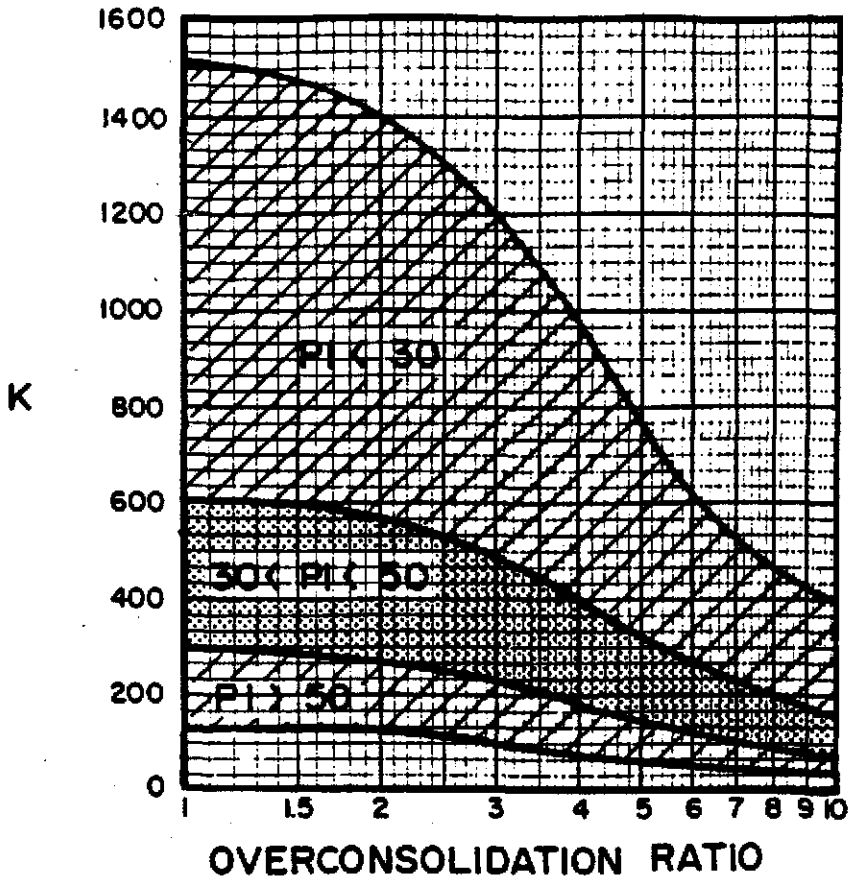
B = FOUNDATION WIDTH

E = YOUNG'S MODULUS OF FOUNDATION SOIL

ν = POISSON'S RATIO OF FOUNDATION SOIL

I_0 & I_1 = FACTORS FROM CHART ABOVE

Fig. 12. CHART FOR ESTIMATING IMMEDIATE SETTLEMENTS OF FOUNDATIONS ON CLAY (FROM JANBU, BJERRUM AND KJAERNSLI, 1956)



$E_u = KS_u$

E_u = UNDRAINED MODULUS OF CLAY

K = FACTOR FROM CHART ABOVE

S_u = UNDRAINED SHEAR STRENGTH OF CLAY

Fig. 3. CHART FOR ESTIMATING UNDRAINED MODULUS OF CLAY

B. Consolidation Settlement.

(i) Negative Settlement (Heave) due to excavation;

$P_o = 1340$ psf

$\Delta P = -587$ psf

$C_r = (\frac{1}{5} \text{ to } \frac{1}{10})$ of C_c ; say $0.2 C_c = 0.2 \times 0.12 \simeq 0.03$ (Ref 3)

$$S_A = C_r \left(\frac{H}{1+e_o}\right) \log\left(\frac{P_o + \Delta P}{P_o}\right) \longrightarrow \text{(Ref 3)}$$

$H = 40$ ft, $e_o = 0.80$

$$\therefore S_A = 0.03\left(\frac{40 \times 12}{1+0.8}\right) \log\left(\frac{1340 - 587}{1340}\right)$$

$S_A = -2.0$ inches

(ii) Settlement, considering total loads as one-step loading.

here, $P_o = 1340$, $\Delta P = 1935$ + $P_c = 2800$ psf

$$\therefore S_B = C_r\left(\frac{H}{1+e_o}\right) \log\left(\frac{2800}{1340}\right) + C_c\left(\frac{H}{1+e_o}\right) \log\left(\frac{1935+1340}{2800}\right)$$

$$= 0.03\left(\frac{40 \times 12}{1+0.8}\right) \log\left(\frac{2800}{1340}\right) + 0.12\left(\frac{40 \times 12}{1+0.8}\right) \log\left(\frac{3275}{2800}\right)$$

$= 2.56 + 2.2$

$S_D = 4.76$ inches

Total settlement, is equal to immediate plus consolidation

$S = 0.14 + 4.76$

$= \underline{4.90 \text{ inches}}$ O.K

Net settlement = Total − Heave

$= 4.90 - 2.0$

$= \underline{2.90 \text{ inches}}$ O.K.

The waste height on the other end of the excavation is 8 feet, which would result in considerable less settlement. Since consolidation settlement is the significant mode in this case, the consolidation settlement needs to be checked on the other end,

Here, Waste = $80 \times 8 = 640$

cap = $120 \times 3 = 360$

$1000 \cong \underline{1.0 \text{ ksf}}$

or $\Delta P = 410$ psf (less water and sludge)

$\therefore S = C_r \frac{H}{1+e_0} \log\left(\frac{P_0 + \Delta P}{P_0}\right) = 0.03\left(\frac{40 \times 12}{1+0.8}\right) \log\left(\frac{410+1340}{1340}\right)$

or $S = 0.92$ inches compared to 4.76 on the other end resulting in 3.84 inches of differential settlement.

INTERNATIONAL TECHNOLOGY CORPORATION

(17)

By LH Date 8/18 Subject Bearing Capacity — Vicksburg Chemical Sheet No. 1 of 3

Chkd. By AS Date 7/25/88 Proj. No. 435361

0.5cm. X 0.5cm.

OBJECTIVE: To determine if the foundation soil is strong enough to support the new backfilling and cover.

REFERENCE: 1. "Foundation Design", Wayne C. Teng, Prentice Hall, New Jersey, 1962.

2. "Engineering Report for surface impoundment dike improvements, Vertac Chemical Corp., Vicksburg, Mississippi," prepared by: MCI/ Consulting Engineers, Inc. P.O. Box 23010, 10628 Dutchtown Road, Knoxville, TN, July 1983.

ASSUMTION: 1. Unit weight of the foundation soil is taken as 100 pcf.

2. The strength parameters is taken as follows $c = 0$, & $\phi = 34°$ (13-15 oft, Ref. 2)

3. Factor of Safety = 3.0

PROCEDURE: Hansen's formula for bearing pressure for granular soils is used to calculate the bearing pressure

The allowable bearing pressure is taken as 1935 psf (max.) from the settlement calculation.

From, Ref. 1;

$$q_{ult} = \frac{1}{2}\gamma N_\gamma B\left(1-0.3\frac{B}{L}\right) + \gamma D N_q\left(1+0.2\frac{B}{L}\right)$$

$D = 0$ (conservative)

or $q_{ult} = \frac{1}{2}\gamma N_\gamma B\left(1-0.3\frac{B}{L}\right)$

$B = 100$ (avg.) $L = 250'$ (max.)

$\gamma = 100 - 62.4 = 37.6$ pcf

For $\phi = 34°$,

$N_\gamma = 33$, (Fig 1, Ref. 1)

or $q_{ult} = \frac{1}{2}(37.6)(33)(100)\left(1-0.3\frac{100}{250}\right)$

$= 39706$ psf

$q_{all} = \frac{q_{ult}}{F.S} = \frac{39706}{3} = 13235 \gg 1935$

O.K.

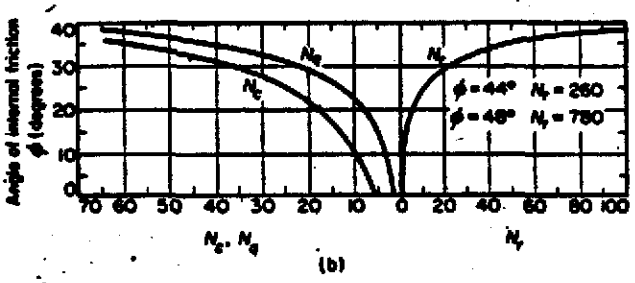


Fig. 1 Terzaghi bearing capacity theory: (a) slip surface; (b) bearing capacity factors in Eqs. (3-1a) and (3-1b).

SLOPE STABILITY

Objective: To Analysis the Factor of Safety Against slope failure for the different slopes in question.

Reference: Computer Program Designation - UTEXAS2 Originally coded by Stephen G. Wright. Version No. 1208, Last Revision Date 8-22-86 Serial No. 00010, Copyright 1985 Stephen G. Wright.

Procedures: The computer program calculates the Factor of Safety using Spencer's Method.

The input was organized by the following "Command Words"

- PROfile line data: defines the geometry of the soil profile and the slope cross-section
- MATerial property data: defines the material properties including the unit weight, shear strength, friction angles, and pore water pressures.
- ANAlysis /computation data: designates the automatic search to be performed to locate a most critical shear surface having a minimum Factor of Safety
- Failures calculated are Toe Failures.

The following cases were analyzed

1. East dike of closed SWCA
   A.) Short term stability
   b.) Long term stability

2. North dike of closed SWCA
   A.) Short term stability
   b.) Long term stability

3. Solidified Sediment in staging area of Pond A at a 2:1 slope, 15 feet high

The Following Material Data is Used

Foundation – $\gamma = 115$ pcf
East Dike < $C_{ST} = 1000$ psf, $C_{LT} = 500$ psf, $\phi_{ST} = 0°$, $\phi_{LT} = 25°$
North Dike < $C_{ST} = 750$ psf, $C_{LT} = 375$ psf

Solidified Sediment – $\gamma = 100$ pcf, $C_{ST} = 500$ psf, $C_{LT} = 250$ psf, $\phi_{ST} = 0°$, $\phi_{LT} = 18°$

Dike – $\gamma = 120$ pcf, $C_{ST} = 1000$ psf, $C_{LT} = 500$ psf, $\phi_{ST} = 0°$, $\phi_{LT} = 20°$

Clay Liner – $\gamma = 120$ pcf, $C_{ST} = 1500$ psf, $C_{LT} = 750$ psf, $\phi_{ST} = 0°$, $\phi_{LT} = 10°$

Existing Slope – $\gamma = 115$ pcf, $C_{ST} = 1000$ psf, $C_{LT} = 1000$ psf, $\phi_{ST} = 25°$, $\phi_{LT} = 25°$

Topsoil Layer – $\gamma = 110$ pcf, $C_{ST} = 250$ psf, $C_{LT} = 125$ psf, $\phi_{ST} = 0°$, $\phi_{LT} = 15°$

INTERNATIONAL TECHNOLOGY CORPORATION

(22)

By CBJ Date 7-21-88 Subject Vicksburg Chemical Closure / Retrofit Design Sheet No. 3 of 12

Chkd. By AB Date 7/25/88 Proj. No. 435361-01

0.5cm. X 0.5cm.

Input for East dike - Short Term Stability

```
HEAding follows
VICKSBURG CHEMICAL DIVISION-SWCA SLOPE STABILITY
CLOSURE AND RETROFIT DESIGN

PROfile line data
  1 1 Foundation Layer
      -1000 0 0 0 77 2.5 137 4 1000 4

  2 2 Dike
      0 0 42 14 52 14 77 2.5

  3 3 Existing Slope
      137 4 157 11 226 26 271 41 321 46 1000 46

  4 4 Solidified Sediment
      57 11.5 133 30.5 186 30.5 214.5 23.5

  5 5 Clay Liner
      55 12.5 131 31.5 191 31.5 219 24.5

  6 6 Topsoil Layer
      52 14 128 33 198 33 226 26
```

Input continued -

```
MATerial property data
  1 Foundation Layer
    115
    Conventional
    1000 0
    No
  2 Dike
    120
    Conventional
    1000 0
    No
  3 Existing Slope
    115
    Conventional
    1000 25
    No
  4 Solidified Sediment
    100
    Conventional
    500 0
    No
  5 Clay Liner
    120
    Conventional
    1500 0
    No
  6 Topsoil Layer
    110
    Conventional
    250 0
    No

ANAlysis/computation data
    Circle Search
    45 75 1 -40
    Point passes through
    0 0

COMpute
```

INTERNATIONAL TECHNOLOGY CORPORATION

(24)

By CBJ Date 7-21-88 Subject Vicksburg Chemical Closure/Retrofit Design Sheet No. 5 of 12

Chkd. By AB Date 7/25/88 Proj. No. 43 5361-01

0.5cm. X 0.5cm.

Input for East dike - Long Term Stability

```
HEAding follows
VICKSBURG CHEMICAL DIVISION-SWCA SLOPE STABILITY
CLOSURE AND RETROFIT DESIGN

PROfile line data
  1 1 Foundation Layer
      -1000 0 0 0 77 2.5 137 4 1000 4

  2 2 Dike
      0 0 42 14 52 14 77 2.5

  3 3 Existing Slope
      137 4 157 11 226 26 271 41 321 46 1000 46

  4 4 Solidified Sediment
      57 11.5 133 30.5 186 30.5 214.5 23.5

  5 5 Clay Liner
      55 12.5 131 31.5 191 31.5 219 24.5

  6 6 Topsoil Layer
      52 14 128 33 198 33 226 26
```

0.5cm. X 0.5cm.

Input continued:

```
MATerial property data
  1 Foundation Layer
    115
    Conventional
    500 25
    No
  2 Dike
    120
    Conventional
    500 20
    No
  3 Existing Slope
    115
    Conventional
    1000 25
    No
  4 Solidified Sediment
    100
    Conventional
    250 18
    No
  5 Clay Liner
    120
    Conventional
    750 10
    No
  6 Topsoil Layer
    110
    Conventional
    125 15
    No

ANAlysis/computation data
    Circle Search
    45 75 1 -40
    Point passes through
    0 0

COMpute
```

INTERNATIONAL TECHNOLOGY CORPORATION

(26)

By CBJ Date 7-21-88 Subject Vicksburg Chemical Closure / Retrofit Design Sheet No. 7 of 12

Chkd. By RS Date 7/25/88 Proj. No. 435361-01

0.5cm. X 0.5cm.

Output for East dike-

Short Term Stability: F.S. = 1.9

VICKSBURG CHEMICAL DIVISION-SWCA SLOPE STABILITY
CLOSURE AND RETROFIT DESIGN

TABLE NO. 15
***** FINAL CRITICAL CIRCLE INFORMATION *****

X Coordinate of Center - - - - - - - -	47.000
Y Coordinate of Center - - - - - - - -	77.000
Radius - - - - - - - - - - - - - - - -	116.156
Factor of Safety - - - - - - - - - - -	~~1.868~~ 1.9
Side Force Inclination - - - - - - - -	5.01

Long Term Stability - F.S. = 3.3

VICKSBURG CHEMICAL DIVISION-SWCA SLOPE STABILITY
CLOSURE AND RETROFIT DESIGN

TABLE NO. 15
***** FINAL CRITICAL CIRCLE INFORMATION *****

X Coordinate of Center - - - - - - - -	32.000
Y Coordinate of Center - - - - - - - -	191.000
Radius - - - - - - - - - - - - - - - -	193.662
Factor of Safety - - - - - - - - - - -	~~3.349~~ 3.3
Side Force Inclination - - - - - - - -	11.41

INTERNATIONAL TECHNOLOGY CORPORATION

(27)

By CBJ Date 7-21-88 Subject Vicksburg Chemical Closure / Retrofit Design Sheet No. 8 of 12

Chkd. By [illegible] Date 7/25/88 Proj. No. 435361-01

0.5cm. X 0.5cm.

Input for North dike - Short Term Stability

```
HEAding follows
VICKSBURG CHEMICAL DIVISION-SWCA SLOPE STABILITY
CLOSURE AND RETROFIT DESIGN

PROfile line data
  1 1 Foundation Layer
      -1000 0 75.0 325 3.5 1000 3.5

  2 2 Dike
      0 0 39 13 49 13 75 0

  3 3 Solidified Sediment
      54 10.5 112 27.5 187 29.5 1000 29.5

  4 4 Clay Liner
      52 11.5 110 28.5 187 30.5 1000 30.5

  5 5 Topsoil Layer
      49 13 107 30 187 32 1000 32
MATerial property data
  1 Foundation Layer
    115
    Conventional
    750 0
    No
  2 Dike
    120
    Conventional
    1000 0
    No
  3 Solidified Sediment
    100
    Conventional
    500 0
    No
  4 Clay Liner
    120
    Conventional
    1500 0
    No
  5 Topsoil Layer
    110
    Conventional
    250 0
    No

ANAlysis/computation data
    Circle Search
    90 50 1 -40
    Point passes through
    0 0
```

INTERNATIONAL TECHNOLOGY CORPORATION

(28)

By CBJ Date 7-21-88 Subject Vicksburg Chemical Closure/Retrofit Design Sheet No. 9 of 12

Chkd. By HS Date 7/21/88 Proj. No. 435361-01

0.5cm. X 0.5cm.

Input for North dike - Long Term Stability

```
HEAding follows
VICKSBURG CHEMICAL DIVISION-SWCA SLOPE STABILITY
CLOSURE AND RETROFIT DESIGN

PROfile line data
  1 1 Foundation Layer
      -1000 0 75 0 325 3.5 1000 3.5

  2 2 Dike
      0 0 39 13 49 13 75 0

  3 3 Solidified Sediment
      54 10.5 112 27.5 187 29.5 1000 29.5

  4 4 Clay Liner
      52 11.5 110 28.5 187 30.5 1000 30.5

  5 5 Topsoil Layer
      49 13 107 30 187 32 1000 32

MATerial property data
  1 Foundation Layer
    115
    Conventional
    375 25
    No
  2 Dike
    120
    Conventional
    500 20
    No
  3 Solidified Sediment
    100
    Conventional
    250 18
    No
  4 Clay Liner
    120
    Conventional
    750 10
    No
  5 Topsoil Layer
    110
    Conventional
    125 15
    No

ANAlysis/computation data
    Circle Search
    90 50 1 -40
    Point passes through
    0 0
```

INTERNATIONAL TECHNOLOGY CORPORATION

By CBS Date 2-21-88 Subject Vicksburg Chemical Sheet No. 10 of 12
Chkd. By AR Date 2/25/88 Closure / Retrofit Design Proj. No. 435361-01

0.5cm. X 0.5cm.

Output for North Dike -

Short Term Stability : F.S.s = 1.5

VICKSBURG CHEMICAL DIVISION-SWCA SLOPE STABILITY
CLOSURE AND RETROFIT DESIGN

TABLE NO. 15
***** FINAL CRITICAL CIRCLE INFORMATION *****

X Coordinate of Center - - - - - - - -	53.000
Y Coordinate of Center - - - - - - - -	91.000
Radius - - - - - - - - - - - - - - - -	130.581
Factor of Safety - - - - - - - - - - -	~~1.462~~ 1.5
Side Force Inclination - - - - - - - -	4.11

Long Term Stability : F.S.l = 3.0

VICKSBURG CHEMICAL DIVISION-SWCA SLOPE STABILITY
CLOSURE AND RETROFIT DESIGN

TABLE NO. 15
***** FINAL CRITICAL CIRCLE INFORMATION *****

X Coordinate of Center - - - - - - - -	31.000
Y Coordinate of Center - - - - - - - -	143.000
Radius - - - - - - - - - - - - - - - -	146.322
Factor of Safety - - - - - - - - - - -	~~3.014~~ 3.0
Side Force Inclination - - - - - - - -	12.04

INTERNATIONAL TECHNOLOGY CORPORATION

By CJJ Date 7-21-88 Subject Vicksburg Chemical Closure/Retrofit Design Sheet No. 11 of 12
Chkd. By AB Date 7/25/88 Proj. No. 435361-01

0.5cm. X 0.5cm.

Input for Solidified Sediment in staging area

```
HEAding follows
VICKSBURG CHEMICAL DIVISION-CLOSURE AND RETROFIT DESIGN
SOLIDIFIED SEDIMENT SLOPE STABILITY

PROfile line data
  1 1 Foundation Layer
      -1000 0 1000 0

  2 2 Solidified Sediment
      0 0 30 15 126 15 156 0


MATerial property data
  1 Foundation Layer
    115
    Conventional
    750 0
    No
  2 Solidified Sediment
    100
    Conventional
    500 0
    No

ANAlysis/computation data
    Circle Search
    50 90 1 -40
    Point
    0 0

COMpute
```

Output of Solidified Sediment : F.S. = 2.8

```
VICKSBURG CHEMICAL DIVISION-CLOSURE AND RETROFIT DESIGN
SOLIDIFIED SEDIMENT SLOPE STABILITY


TABLE NO. 15
***** FINAL CRITICAL CIRCLE INFORMATION *****
X Coordinate of Center - - - - - - -    14.000
Y Coordinate of Center - - - - - - -    32.000
Radius - - - - - - - - - - - - - - -    31.529
Factor of Safety - - - - - - - - - -    ~~2.789~~ 2.8
Side Force Inclination - - - - - - -     8.64
```

Conclusion: All conditions which were analyzed contain factors of safety against slope failure of 1.5 or greater. The recommended value for non-catastrophic slope failures is no less than 1.5, therefore, the conditions for which these analyses were made are considered to be acceptable.

INTERNATIONAL TECHNOLOGY CORPORATION

By LH Date 7/22/88 Subject SWCA Sheet No. 1 of 3
Chkd. By PB Date 16/88 Vicksburg Chemical Proj. No. 435361-01
0.5cm. X 0.5cm.

STABILITY OF GEOSYNTETICS ON SLOPE WITH AND WITHOUT PROTECTIVE SOIL LAYER

OBJECTIVE: To do stability calculations for checking the integrity of synthetic liner by itself and with the protective soil on it.

REFERENCES: 1. "Engineering Design Report in response to NOD to LADEQ, No. LAD 008086506", prepared for Rollins Environmental Inc. by Geoservices Inc.
2. "Designing with geosynthetics", R.M. Koerner, Prentice Hall, 1986.

ASSUMPTIONS: 1) For analysis with geomembrane only, it's conservatively assumed that all interface friction coefficients are zero.

2) The properties of geomembrane (Gundline HDPE 60 mil), Density, $\gamma_g = 59$ lb/ft^3; thickness, $t_g = 0.06$ inch tensile strength at yield, $T_y = 140$ lb/in [Ref 2]

3) The properties of geonet drains are: Mass per unit area, $M_g = 210$ g/yd^2; tensile strength, $T_f = 23$ lb/in; [Ref 1]

4) The properties of geotextile are: Mass per unit are, $M_g = 4.5$ oz/yd^2, tensile strength, $T_f = 20$ lb/in

5) Side slope angle = 14.0° (4H:1V)

6) Side slope length = 80 ft

7) Height of slope = 19 ft (max.m)

(i) Geosynthetics alone

The maximum value of the force per unit width in geosynthetic, is given by.-

$$T_{max} = M_g g H_s = \gamma_g t_g H_s$$

where; M_g = mass per unit area of the geosynthetic
g = acceleration due to gravity
H_s = height of slope

For;

Geomembrane; $T_{max} = \left(59 \times \frac{0.06}{12} \times 19\right)/12$

$= 0.5 \text{ lb/in} < 140$ O.K

Geotextile; $T_{max} = \left(\frac{4.5}{16 \times 9} \times 19\right)/12$

$= 0.05 \text{ lb/in} < 200$ O.K

Geonet; $T_{max} = \left(\frac{21}{16 \times 9} \times 19\right)/12$

$= 0.23 \text{ lb/in} < 23 \text{ lb/in}$ O.K

ii.) Geotextile with Topsoil

F.S. Factor of Safety Against Sliding is given from Ref (2) as

$$F.S = \frac{\tan \phi_i}{\tan \beta_s}$$

where ϕ_i = friction Angle between topsoil and geotextile

β_s = slope angle = 14°

from Ref (2) $\phi_i = 25°$

$$F.S. = \frac{\tan 25°}{\tan 14°} = 1.87 > 1.5 \text{ OK}$$

LINER STRESSES CALCULATION

OBJECTIVE: The objective of these calculations is to evaluate liner stresses under various conditions.

REFERENCES:
1) Designing with Geosynthetics, Robert M. Koerner, Prentice Hall, 1986.
2) "Responses to Louisiana Department of Environmental Quality, Notice of Deficiency No. LAD008086506, Part I. Conceptual approach and description of Responses Related to design of leachate control systems, lining systems and cover systems at existing cell 901," GeoServices Inc., Consulting Engineers, Report prepared for Rollins Environmental Services, Inc., June 1987.

1.0 Anchor Trench Stability

For top liner, compute required depth of trench for a factor of safety of 2 using Rankine's condition, given by:

$$T \cos\beta \, (F.S) + P_A = P_P + F_U + F_L \qquad \text{[Ref. 1]}$$

where; F.S. = Factor of safety = 2
$T = \sigma_y t$;

σ_y = yield stress of liner material = 2900 psi (Gundline HD) Ref. 1
t = thickness = 60 mil = 0.06 inch.

$wT = (2900 \times 0.06) \times 12 = \underline{2088}$ lb/ft.

β = Slope Angle = $\underline{26.6°}$ (2H:1V Slope)
γ = unit weight of anchor trench backfill = $\underline{120}$ pcf
ϕ = Angle of internal friction of anchor trench backfill = $\underline{34°}$

K_A = coefficient of active earth pressure $= \tan^2\left(45 - \frac{34}{2}\right)$
$= 0.283$

$P_A = 0.5\gamma d_{AT}^2 K_A + \cancel{q}^{0} d_{AT} K_A$ (q = surcharge cover soil)
$= 0.5\gamma d_{AT}^2 K_A = 0.5 \times 120 \times d_{AT}^2 (0.283) = 17 d_{AT}^2$

where 'd_{AT}' is depth of the anchor trench
K_P = Coefficient of passive earth pressure
$= \tan^2\left(45 + \frac{\phi}{2}\right) = \tan^2\left(45 + \frac{34}{2}\right) = 3.54$

$P_P = 0.5\gamma d_{AT}^2 K_P + \cancel{q}^{0} d_{AT} K_A = 0.5 \times 120 \times d_{AT}^2 \times 3.54 = 212.4 d_{AT}^2$

F_U = Friction force on top of liner $= \cancel{q}^{0} \tan\delta (L_{RO}) = 0$

L_{RO} = Run out length = 95 feet

δ = angle of shearing resistance of backfill soil to liner material = 12° [Ref. 2].

$F_L = \left(\cancel{q}^{0} + \frac{0.5 T \sin\beta}{L_{RO}}\right)(\tan\delta)\cancel{L_{RO}} = \frac{0.5 \times 2088 \times \sin 26.6}{\cancel{95}} (\tan(12))(\cancel{95})$
$= 99.4$ lb/ft

$T\cos\beta(F.S) + P_A = P_P + \cancel{F_U}^{0} + F_L$

$2088 \cos(26.6)(2.0) + 17 d_{AT}^2 = 212.4 d_{AT}^2 + 99.4$

or $195.4 d_{AT}^2 = 3634.6$

$d_{AT} = \underline{\underline{4.32}}$ feet

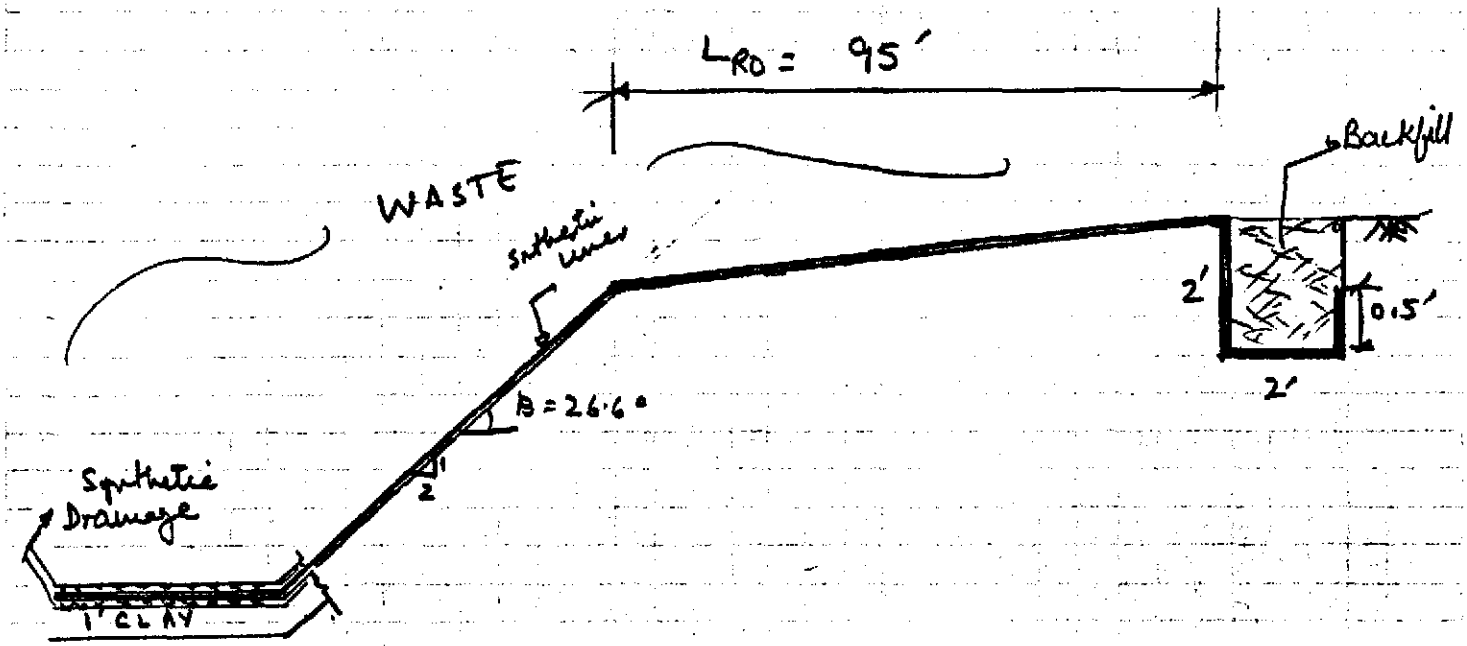
Use 2′ × 2′, as shown in the configuration;

INTERNATIONAL TECHNOLOGY CORPORATION

By LH Date 7/20/88 Subject SWCA Sheet No. 3 of 11

Chkd. By AS Date 7/23/88 Vicsburg Chemical Proj. No. 435361-01

0.5cm. X 0.5cm.



CONFIGURATION

2.0 Stresses due to Construction Equipment

Parameters and Assumptions:

(1) Considerations of the following situations will be utilized in the computations: [Ref. 2, V-5, 89-125].

- Dozers on upto 3ft. of soil for composite liner as critical.
- Compactors on 3ft (or less).
- Scrapers and trucks are not anticipated to be used.

(2) The burst strength for geotextile (Mirafi 140N) is 210 psi and tensile strength at yield for 60 mil Gundle is 2900 psi [R

(3) Contact stresses are uniformly distributed over the contact area and this area is rectangular and assume worst conditions due to breaking (dynamic conditions)

(a) Bottom of Landfill:

(i) Stresses due to dozers:

Clay thickness ≤ 1 foot : Dozer for the first lift of material will be considered at ground surface, thus no attenuation of stresses is considered.

Contact pressure X 2 for dynamic stresses shall not exceed the burst strength/F.S (F.S ≅ 10 Ref. 2) of the geotextile and tensile strength at yield/F.S (F.S ≅ 5, Ref. 2) of the geo membrane.

The limiting contact pressure will be $21/2 = 10.5$ psi. The dozers which fall this category are D-3 thru D-6 and all low-ground-pressure dozers D3-LGP thru D7-LGP

Clay thickness > 1ft.

If the thickness of the clay is greater than 1 foot and not less than 2 foot than D7 can be used too. D8 can be used if clay thickness is greater than 2 foot

(ii) Stresses due to Compactors

For Rubber tire compactors with contact stresses less than limiting pressure (21.0psi) may be used (Attenuation factor = 1, and no dynamic effects is considered).

For smooth drum, the line load is given as follows [Ref. 2V-5]

$$f_N = P/W = \frac{14,663 \text{ lbs}}{82.7 \text{ in}} = 177.3 \text{ lb/in}$$

Stress at depth z is : $\sigma_z = 4 f_N \frac{K_b}{W}$

z(ft)	K_b	σ_z
0.5	2.2	19.0
1.0	1.0	8.5
1.5	0.75	6.5
2.0	0.53	4.5

All pressures presented above are below the limiting pressure.

(iii) Stresses on the slopes

For Landfill slopes, only dozers (D-6) will be used, and the analysis performed in Ref. 2, indicates that a D6 or D6LGP are acceptable on slopes

Equivalent soil thickness for stability analysis can be calculated using:-

$$\sigma_z L_t = \gamma D_p' L \qquad \text{(Ref. 2)}$$

where 'σ_z' stresses cause by the dozer = 9.8 psi (@ z=0')

'L_t' = length of dozer track = 2.36 m = 7.7 ft

γ = Unit weight of soil layer = 120 pcf

'L' = length of slope = 25 feet

D_p' = soil depth required to be add on to the slope to replace a D6 Dozer working on a slope.

$$144 \times 9.8 \times 7.7 = 120 \times D_p' \times 25$$

$$\text{or } \underline{D_p' = 3.60 \text{ ft}}$$

Summary

Stresses due to dozers at bottom of the landfill	Clay ≤ 2ft; D3 thru D7 can be used, alongwith all LGP dozers Clay ≥ 2ft, D3 thru D8 can be used.
Stresses due to compactors at bottom of the landfill	Rubber tire, contact pressure < 10.5 psi and smooth drum can be used.
Stresses due to dozers on slopes	Dozers upto D-6 and all LGP dozers.

3.0 Stresses due to Landfill operations (Waste Placement)

Most critical cases: The normal stresses on geosynthetic caused by the weight of waste truck at the base of the landfill, and, the stresses normal to the geosynthetic caused by trucks applying the brakes. Burst strength will be the design criteria

Assumptions and Parameters

1. Worst case will be a waste truck on 1 ft. of cover at base of landfill.
2. Stone size (maximum) = 0.5 inch
3. Maximum tire pressure = 100 psi
4. Factor of Safety = 3.0

Burst Strength Calculation

(i) Geotextile

$$P' = 0.75\, P_{tire} \qquad [\text{Ref. } 1]$$

$$P' = 75 \text{ psi}$$

where P' is the pressure forcing the geotextile into the void

The 'max min void diameter' $d_v = 0.4\, d_a$, where 'd_a' is the average stone size = 0.5 inches;

$$\therefore\ d_v = 0.4 \times 0.5 = 0.2 \text{ inch}$$

From Fig. 2.14 for stone size = 0.5" & $P' = 75$ psi, burst pressure = 12 psi, and for a F.S = 3, required

0.5cm. X 0.5cm.

burst strength = 36psi < 210psi (Ref. 1) for Mirafi 140N.

(ii) Geomembrane

From Ref. 2, the required puncture strength 'Fp' is given by:-

$$F_p = C_p r_c \sigma d_p$$

where, C_p = dimensionless factor, C_p (Table 3.2-16) = 5.0, at 15% strain [yield elongation for GUNDLINE HD]

r_c = radius of curvature of probe = 1/8 in.

d_p = depth of protrusion = 0.5 inch

σ = stress applied = 100psi

$$\therefore F_p = 5.0 \times (1/8) \times 0.5 \times 100 = \underline{31.0 \text{ lbs}}$$

For F.S. = 3, F_p = 93.0 << 350 lbs (Ref 1) For HD Gundline 60mil.

4.0 Stresses due to Protrusions and Voids

Effects on liner due to large particles or pressure gradients (voids).

Assumptions and Parameters

1. Assume 2 inch diameter protrusion and void.
2. Protrusion is a hemispherical condition.
3. Overburden pressure = 2520 psf
4. Geomembrane properties (Gundline HD 60mil) [Ref. 1]
5. Geotextile properties (Mirafi 140N) [Ref. 1]
6. Geonet will resist some stresses.

Puncture resistance due to protrusion

(i) Geomembrane

$$F_p = C_c r_c \sigma d_p \longrightarrow \text{(Ref. 2)}$$

here, $C_c = 5.0$
$r_c = 1/8''$
$d_p = 2''$
& $\sigma = 2520$ psf

$$F_p = 5.0 \times (1/8) \times 2 \times 2520/144$$
$$= 22 \text{ lbs}$$

for a F.S = 3.0

$F_p = 66$ lbs << 350 [Ref 1] O.K for GUNDLINE HD, 60mil

(ii) Geotextile

$$F_p = C_c r_c \sigma d_p$$

here $C_c = 2.6$, $r_c = 5/32''$ (Ref. 2)
$\sigma = 2520$ psf
$d_p = 2.0$

$$F_p = 2.6 \times \left(\frac{5}{32}\right) \times \frac{2520}{144} (2.0)$$
$$= 14.2$$

for a F.S. = 3

$F_p = 43 < 70$ lbs [Ref. 1] for Mirafi 140N,

O.K

Tension due to voids

(i) Geomembrane

Required Geosynthetic tension at yield is given by:

$T_Y = 0.5 \sigma d_v f(e_y)$ [Ref. 2]

$\sigma = 2520$ psf

$d_v = 2.0''$

$f(e_y) = 0.64$; → Table 3.2-15

$$T_Y = 0.5 \times \frac{2520}{144} \times (2.0)(0.64)$$
$$= 11.2 \text{ lb/in} < 140 \text{ (For GUNDLINE HD, 60 mil)}$$

O.K

(ii) Geotextile

$P_b = \sigma \frac{d_v}{d_b}$ (Ref. 2)

$d_v = 20''$

$d_b = 1.22''$ [Ref. 2, ASTM D3786].

INTERNATIONAL TECHNOLOGY CORPORATION

(45)

By LH Date 7/21/88 Subject SNCA Sheet No. 11 of 11

Chkd. By AS Date 7/23/88 Vicksburg Chemical Proj. No. 435361-01

0.5cm. X 0.5cm.

$$\therefore P_b = \frac{2520}{144} \times (2)/(1.22)$$

$$= 28.7 \text{ psi} < 210 \text{ psi} \quad \text{O.K} \quad [\text{Ref. } 1].$$

——— x ——— x ———

Structural Design for Collection pipes

OBJECTIVE: To determine the structural characteristics of the collection pipes to resist clogging, structural failure, and to provide adequate flow with the worst case leakage.

REFERENCES: 1. "ORISCO Pipe Piping Systems", Phillips 66
2. "NOD to LADEQ, No LAD008086506", prepared Rollins by Geoservices Inc., 1987.

ASSUMPTIONS: 1) Collector pipe characteristics

(a) 4" nominal dia. HDPE pipe
(b) SDR = 32.5 (or ADS equivalent)
(c) $D_{outer} = 4.5$ in
(d) $D_{inner} = 4.22$ in
(e) mean radius = 2.18 in.

2) Maximum allowable pipe deflection = 8.1% of nominal d.

3) E(pipe) = 14,000 psi

4) $I_{(pipe)} = 1.83 \times 10^{-3}$ in^4/in

5) Initial loading due to small trucks with wheel load of 7000 lbs. After closing, loads are due to overburden = 2520 psf.

(i) Filtration

The maximum allowable slot size in the collection pipes to provide retention of the gravel particles is

$$SS_{max} = \frac{d_{85}}{F}$$

where; d_{85} is the particle size for which 85% of the soil is finer = 1.2 inches
'F' is Factor of safety = 2;

$\therefore SS_{max} = \frac{d_{85}}{F} = \frac{1.2}{2} = 0.6$ in

Provide a slot size of 0.25 inches.

(ii) Flow Capacity of the collection pipe

The rate of flow entering the collection pipe can be expressed as follows:-

$$Q_{cp} = Q_{RW} A_d$$

where Q_{RW} = Worst cases impingement rate (2.0×10^{-8} fps)
A_d = Area drained by collection pipe = (25,000

or $Q_{cp} = 2.0 \times 10^{-8} \times 25000 = \underline{0.0005}$ ft³/sec.

Flow rate available, Q_p, by manning formula:

$$Q_{cp} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$R = D/4 = \frac{4.22}{4} = 0.088$ ft [Pipe full]

$A = 0.097$ ft²

$n = 0.013$

$i_p = 0.014$

$$Q_{cp} = \frac{1.49}{.013}(0.097)(.088)^{2/3}(.014)^{1/2}$$

$= 0.26$ cfs $>> 0.0005$ O.K

(iii) Structural Stability

The loads due to equipment is anticipated to be less than the overburden. The overburden stress of 2520 will induce a load on the pipe as:

$$W_o = P_o \times D_{(overlin)} = 2520 \times \frac{4.5}{12} = 945 \text{ lb/ft} \quad \text{(Ref. 2)}$$

The increase in load due to the pipe being perforated can be calculated as:

$$W_{os} = W_o / (1 - f_s t_s)$$

where: f_s = slot frequency = 3/ft

& t_s = slot width = 0.25" = 0.02 ft

$$\therefore W_{os} = 945/(1 - 3 \times 0.02)$$

$$= \underline{1005.3} \text{ lb/ft}$$

For a 7000 lb (14,000 lb axle load) wheel load, the load on the pipe will be about 800 lb/ft -- [Ref. 2]

Thus the design load is 1005 lb/ft

The deflection of the pipe can be calculated as:-

$$\Delta_x = \frac{D_e K W_{os} r_m^3}{EI + 0.061 E' r^3} \longrightarrow \text{[Ref. 2]}$$

where 'Δx' = pipe deflection

'D_e' = deflection lag factor = 1.5 [Ref. 2]

INTERNATIONAL TECHNOLOGY CORPORATION

By LH Date 7/21/88 Subject SWCA Sheet No. 4 of 4

Chkd. By AS Date 7/25/88 Vicksburg Chemical Proj. No. 435361-01

0.5cm. X 0.5cm.

K = bedding constant = 0.1 [Ref. 2]

W_{OS} = 100 lb/ft = 8.4 lb/in

r_m = mean pipe radius = 2.18 inches

E = 14,000 psi

I = 1.83×10^{-3} in^4/in

E' = Modulus of Elasticity of soil ≅ 4000 psi

$$\therefore \Delta_x = \frac{1.5 \times 0.1 \times 84 \times (2.18)^3}{(14{,}000)(1.83 \times 10^{-3}) + (4000)(2.18)^3(0.061)}$$

Δ_x = 0.05 in

$$\% \Delta_x = \frac{0.05}{4} = 1.2\% < 8.1\% \text{ allowable}$$

O.K.

INTERNATIONAL TECHNOLOGY CORPORATION

(50)

By LH Date 7/21/88 Subject SWCA Sheet No. 1 of 10

Chkd. By AS Date 7/25/88 Vicksburg Chemical Proj. No. 435361-01

0.5cm. X 0.5cm.

LEAKAGE DETECTION SYSTEM

OBJECTIVE: The Objective of this calculation is to evaluate several factors which govern the design of a leakage detection system.

REFERENCES:

1. "Geotechnical Fabrics Report", May - June 1988.
2. "Designing with Geosynthetics", Koerner, R.M., Prentice Hall, 1987.
3. "Responses to LADEQ Notice of Deficiencies", Prepared for Rollins Environmental NOD No. LAD008086506, by Geoservices Inc. 1987.
4. USEPA, "Background document: Proposed liner and leak detection rule", EPA/530-SW-87015; Prepared by Geo Services Inc., May 1987, 526p.

ASSUMPTIONS: Assumption will be stated in individual section.

CONTENTS:

1) Filter Design
2) Leachate head above bottom liner
3) Leakage into the ground.

1.0 Filter Design

OBJECTIVE: To determine the size of the geotextile required to act as a filter between the clay (recompacted) and the drainage medium, and determine the effect of stress on the filter geotextile.

ASSUMPTIONS: (1) The clay has an apparent opening size (AOS) of less than 210 microns. The permeability of the clay layer is 3.28×10^{-9} ft/sec (1×10^{-7} cm/sec).

(2) The geotextile is non woven, Mirafi N140 or equal.

(3) The drainage medium is Geonet

(4) Class B drainage condition is assumed, which implies that fabric is used with smooth graded surfaces having no sharp angular projections, no sharp angular aggregate is used, compaction requirements are light and trenches are 10 feet or less deep.

CRITERIAS (1) A retention criterion to ensure that the geotextile will prevent migration of clay particles.

(2) A permeability criterion to ensure that liquids can pass freely through the fabric.

(3) A clogging criterion to ensure that the geotextile has a sufficient number of openings so that the blockage of a few will not impair the flow of the liquid

(4) A strength criterion such that geotextile will withstand the stresses during installation and design life of the landfill

In order to satisfy the above criterias, the following specifications from Ref. 1, are to be met.

	PROPERTIES OF MIRAFI 140N [Ref. 2]	
1) AOS > Equivalent opening size (EOS)		
AOS = 210 microns >	149+ micros	O.K.
2) $K_{soil} < K_{geotextile}$		
$K_{soil} = 3.28 \times 10^{-7}$ fps <	6.3×10^{-1} fps	O.K.
3) Grab strength > 80 lbs	120 lbs	O.K
4) Tear Strength > 25 lbs	50 lbs	O.K
5) Puncture strength > 25 lbs	70 lbs	O.K
6) Burst strength > 130 psi	210 psi	O.K

The geotextile exceeds the criteria and therefore can be used as a filter medium. Any geotextile which passes the above criteria can be used and IT reserves the right to substitute with another acceptable brand when construction is initiated.

2.0 Leachate head above the bottom liner

OBJECTIVE: To determine the hydraulic head acting on the bottom liner for average case and worst case. This will be used later to evaluate the leakage into the ground.

ASSUMPTION: 1) Free flow under steady state conditions from a concentrated or semi-concentrated source

(i) Average Case

The average leachate head can be determined from:

$$h_{av} = (N\, Q_{tsa}/b_w)/(K_{db} \tan\beta) \qquad [Ref. 3]$$

where h_{av} = average hydraulic head acting on the bottom liner

N = No of leaks (holes) in series = 2

b_w = width of the drainage path = 3.3ft at base, 6.6ft on side slopes.

K_{db} = hydraulic conductivity of drainage layer = 1ft/s. on b 0.06 fps on slope.

$\tan\beta$ = slope of the drainage layer = 1.4% = 0.014 at bas on slope. $\tan\beta = 0.5$

and Q_{tsa} = average flow corresponding to average liner leakage rate;

$$Q_{tsa} = C_B\, a \sqrt{2gh}$$

where $C_B = 0.6$

a = area of geomembrane defect = 10 mm²

and h = hydraulic head on the base and sideslope

At base.

$h_{bb} = q\,(L_s + L_b)(K_{dtb} \tan \beta_b)$

here 'q' is the uniform rate of impingement = 0.0032 in/day

or $q = 0.31 \times 10^{-8}$ ft/sec (Help model calc)

L_s = Plan length of the side slopes = 25 ft.

L_b = Plan length of base from toe of side slope to collector pipe = 50 ft.

K_{dtb} = hydraulic conductivity of the drainage layer = 1 ft/sec

β_b = angle the base slopes make with the horizontal = 0.80°

$h_{bb} = 0.31 \times 10^{-8} (50 + 25) / (1 \cdot \tan 0.8°)$

$= 0.0002$ inches

$\therefore Q_{tsa} = \dfrac{0.6 \times 10}{100 \times (2.54)^2 \times 144} \sqrt{2 \times 32.2 \times \frac{0.0002}{12}}$

$Q_{tsa} = 2.7 \times 10^{-6}$ ft³/sec. — (at base) —

On Slope

$h_{bs} = q L_s / K_{dts} \tan \beta_s$

$K_{dts} = 1.8 \times 10^{-2}$ m/sec $= 6.0 \times 10^{-2}$ ft/sec.

$\tan \beta_s = 0.5$

$h_{bs} = 0.31 \times 10^{-8} \times 25 / 60 \times 0.5 \times 10^{-2}$

$= 0.000031$ inch

$$Q_{tsa} = 0.6 \times \frac{10}{100\,(2.54)^2 \times 144} \sqrt{2 \times 32.2 \times \frac{3.1 \times 10^{-5}}{12}}$$

$$Q_{tsa} = 8.3 \times 10^{-7}. \quad \text{– (at slope) –}$$

~~therefore~~:

At base;

$$h_{av} = \left(2 \times 2.1 \times 10^{-6} / 3.3\right) / 1 \times 0.014$$

$$= \underline{9.1 \times 10^{-5}} \text{ ft.}$$

At Slope.

$$h_{av} = \left(2 \times 8.3 \times 10^{-7} / 6.6\right) / 0.06 \times 0.5$$

$$= \underline{8.4 \times 10^{-6}} \text{ ft}$$

(ii) Worst Case

For worst case $q = 2 \times 10^{-8}$ ft/sec; [~6 × average, Ref. 2]

$$h_{bb} = q\,(L_s + L_b) / (k d t_b \tan\beta_b) \quad ; \quad Q_{t_{sw}} = \frac{0.6 \times 10}{100(2.54)^2(144)} \sqrt{2 \times 32.2 \times \frac{.0001}{12}}$$

$$= 2 \times 10^{-8}\,(25+50) / (1 \times 0.014)$$

$$= 0.0013 \text{ inches.}$$

$$= 5.36 \times 10^{-6} \text{ ft}^3/\text{sec}$$

$$h_{bs} = 2 \times 10^{-8}(25) / 6.0 \times 10^{-2} \times 0.5; \quad Q_{tsw} = \frac{0.6 \times 10}{100(2.54)^2(144)} \sqrt{2 \times 32.2 \times \frac{.0001}{12}}$$

$$= \underline{0.00018 \text{ inches}}$$

$$= \underline{2.0 \times 10^{-6}} \text{ ft}^3/\text{sec}$$

therefore;

at base; $h_{av} = (2 \times 5.36 \times 10^{-6}) / 3.3 / 1 \times 0.014$

$= 2.3 \times 10^{-4}$ ft

at slope $h_{av} = (2 \times 2.0 \times 10^{-6}) / 66 / 0.06 \times 0.5$

$= 2.0 \times 10^{-5}$ ft

CONCLUSIONS:

Design Condition	Hydraulic head (ft)	
	Side Slope h_{bs}	Base Slope h_{bb}
Average	8.4×10^{-6}	9.1×10^{-5}
Worst case	2.0×10^{-5}	2.3×10^{-4}

The thickness of the drainage net (0.02 ft) is greater than the leachate head, thus allowing free flow conditions in the drainage layer.

3.0 Leakage into the ground

OBJECTIVE: To determine the possible leakage into the subsurface under normal operating conditions.

METHOD: The basic considerations will be bottom liner leakage through a hole in the base geomembrane under average leakage rate conditions. The head on the base is greater than the side and therefore is more critical. The worst case condition is a short term transient condition and does not reflect the average long-term condition at the site.

Two leakage mechanisms are employed
① Permeation of liquid through an intact liner.

② Flow of liquid through holes.

REFERENCE: Table 2.2-1 from Ref. 3.

ASSUMPTIONS: ① Construction Quality control was high
② Assume a 0.016 in^2 hole for the average with 1 to 2 holes per acre.
③ The hydraulic conductivity of the clay is 1×10^{-7} cm/s.
④ Assume average contact between the clay and synthetic.

Permeation of liquid through an intact liner

Based on Ref. 4, USEPA indicates that on an HDPE liner and a hydraulic head of less that 1 foot (the head in this case is lot less than 1 foot); the leakage due to permeation is less than 0.001 gallons/acre/day. Because this rate is so small, it will not be considered further.

Flow of liquid through holes

The flow of liquid through holes is dependent upon the head, the size of the hole, the thickness and permeability of the compacted soil, and the contact between the liner and the clay.

The head of the base slope was calculated to be 9.1×10^{-5} ft. This value is for perfectly smooth geomembrane. To account for localized ponding by wrinkles, conservatively multiply the head by 100.

therefore, h_{bb}, the head $= 9.1 \times 10^{-3}$ ft.

Figure 2.2-1, [Ref. 3] gives the leakage through geomembrane on the base slope, Q_{bb}

$$Q_{bb} = 5 \times 10^{-9} \ m^3/s$$

$$\sim Q_{bb} = 1.8 \times 10^{-7} \ ft^3/sec$$

This 'Q_{bb}' is based on $h_{bb} = 0.1$ ft, $a = 0.16 \ in^2$, which has to be reduced for design value for $h_{bb} = 9.1 \times 10^{-3}$ ft; and $a = 0.016 \ in^2$;

$$(Q_{bb})_{design} = 1.8 \times 10^{-7} \left[\frac{0.016}{0.16}\right]^{0.1} \left(\frac{9.1 \times 10^{-3}}{0.1}\right)$$

$$= 1.3 \times 10^{-7} \ ft^3/sec$$

$$= 0.084 \text{ gallons/acre/day}$$

INTERNATIONAL TECHNOLOGY CORPORATION

(57)

By LH Date 7/21/88 Subject SWCA Sheet No. 10 of 10

Chkd. By AS Date 7/25/88 Vicksburg Chemical Proj. No. 435361-01

0.5cm. X 0.5cm.

The total leakage will be 'Q_{66}' times the number of holes in the geomembrane per unit area. However, not the whole area will be covered with liquid and have a design head of 9.1×10^{-3} ft. Therefore it will be realistic to assume that one hole per 5 acres will be subjected to 9.1×10^{-3} ft of head, thus $Q_{66}(\text{actual}) = (Q_{66})\text{design}/5$

or $(Q_{66})\text{actual} = \frac{0.084}{5} = \underline{0.017}$ gallons/day/acre

INTERNATIONAL TECHNOLOGY CORPORATION

(60)

By LH Date 7/18/88 Subject HELP MODEL Sheet No. 1 of 19

Chkd. By AS Date 7/25/88 Vicksburg Chemical Proj. No. 435361-1

0.5cm. X 0.5cm.

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE MODEL (HELP).

OBJECTIVE: To evaluate the efficiency and performance of the landfill by the use of climatological, soil and design characteristics.

REFERENCES: 1. "HELP" Model Version I, by Schroeder and et al; U.S. Army Engineer Waterway's Experimental Station, Vicksburg, MS.

2. Climatological data from NOAA weather station in EL Dorado, Arkansas.

3. Figure 1.

4. Construction Drawings

PROCEDURE: Climatological Data received from NOAA (Ref. 2) and the design soil data from Ref 1, 3 and 4 were utilized to input for the program. The input and output from the program is attached here. The output gives the percolation from the cover and bottom of the landfill. The output shows the percolation from the cover and base of the landfill on monthly and annual basis for the year 1984 thru 1987, as percentage of the precipitation. It also gives the average monthly and annual percolation plus the peak daily percolation for the last 5 years (1983-1987).

CONCLUSIONS: The percolation from the base of the cover and landfill is about 3% or less of the total precipitation. The efficiency of the final cover system is computed as 99.97%. The values which indicate the efficiency (100-*(100)), is noted as '*', on the output results.

INTERNATIONAL TECHNOLOGY CORPORATION

By LH Date 7/20/88 Subject HELP MODEL Sheet No. 2 of 19

Chkd. By AB Date 7/25/88 VICKSBURG CHEMICAL Proj. No. 435361-01

0.5cm. X 0.5cm.

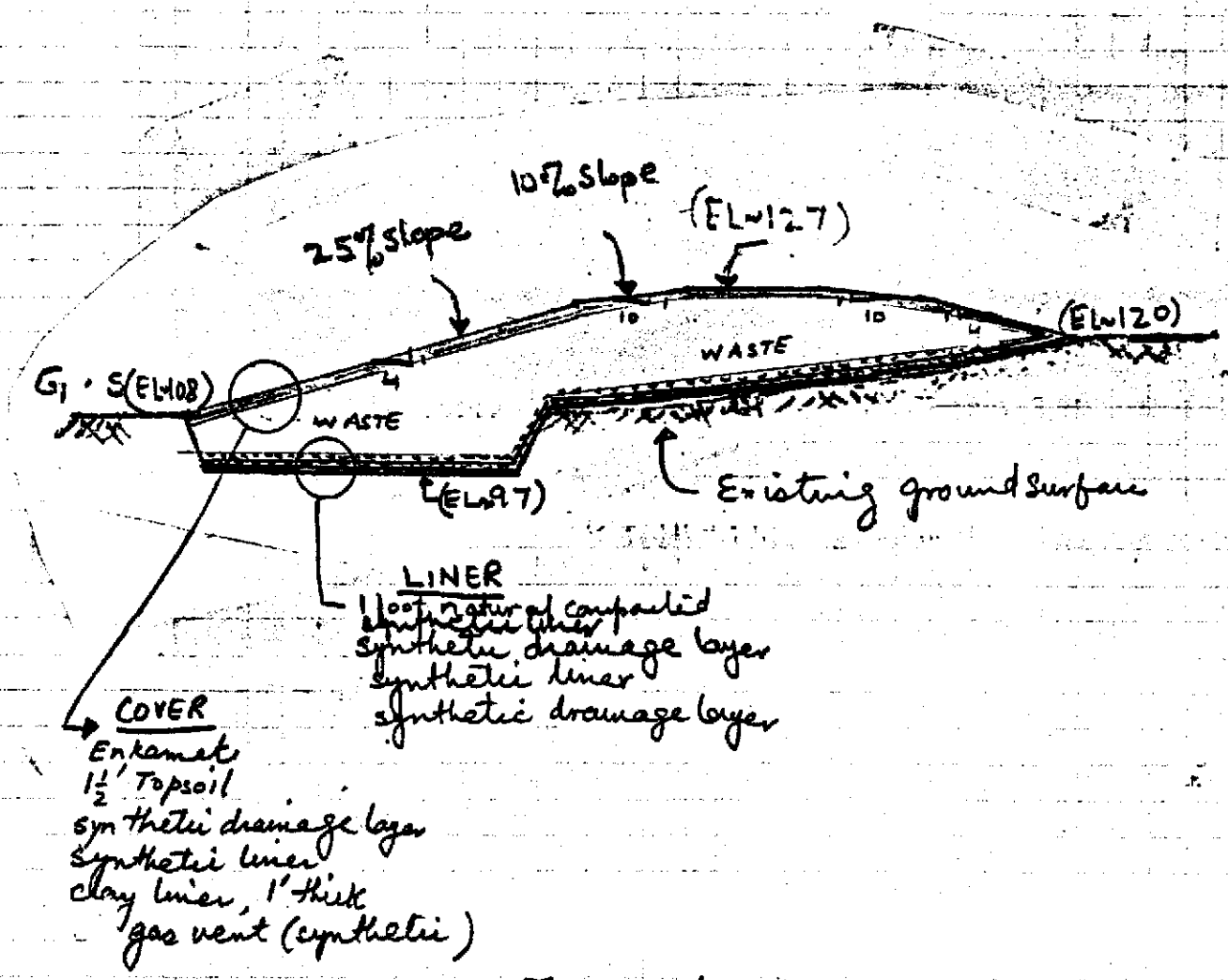


FIGURE. 1

INTERNATIONAL TECHNOLOGY CORPORATION

(62)

By LH Date 7/20/88 Subject HELP MODEL Sheet No. 3 of 19

Chkd. By LL Date 7/25/88 VICKSBURG, MISSISSIPPI Proj. No. 435361-01

0.5cm. X 0.5cm.

```
*****************************************************************************
*****************************************************************************

SOLID WASTE CONSOLIDATION AREA(SWCA)
VICKSBURG, MISSISSIPPI
JULY 20TH, 1988

*****************************************************************************
*****************************************************************************
```

FAIR GRASS

LAYER 1

```
VERTICAL PERCOLATION LAYER
THICKNESS                          =    18.00 INCHES
EVAPORATION COEFFICIENT            =     3.900 MM/DAY**0.5
POROSITY                           =     0.5820 VOL/VOL
FIELD CAPACITY                     =     0.4520 VOL/VOL
WILTING POINT                      =     0.3250 VOL/VOL
EFFECTIVE HYDRAULIC CONDUCTIVITY   =     0.19499999 INCHES/HR
```

LAYER 2

```
LATERAL DRAINAGE LAYER
SLOPE                              =    22.00 PERCENT
DRAINAGE LENGTH                    =    95.0 FEET
THICKNESS                          =     0.25 INCHES
EVAPORATION COEFFICIENT            =     3.300 MM/DAY**0.5
POROSITY                           =     0.3500 VOL/VOL
FIELD CAPACITY                     =     0.1740 VOL/VOL
WILTING POINT                      =     0.1070 VOL/VOL
EFFECTIVE HYDRAULIC CONDUCTIVITY   =  9999.00000000 INCHES/HR
```

0.5cm. X 0.5cm.

LAYER 3

BARRIER SOIL LAYER WITH LINER

THICKNESS	=	12.00 INCHES
EVAPORATION COEFFICIENT	=	3.100 MM/DAY**0.5
POROSITY	=	0.5235 VOL/VOL
FIELD CAPACITY	=	0.4365 VOL/VOL
WILTING POINT	=	0.3780 VOL/VOL
EFFECTIVE HYDRAULIC CONDUCTIVITY	=	0.00325000 INCHES/HR

LAYER 4

VERTICAL PERCOLATION LAYER

THICKNESS	=	0.25 INCHES
EVAPORATION COEFFICIENT	=	3.300 MM/DAY**0.5
POROSITY	=	0.3500 VOL/VOL
FIELD CAPACITY	=	0.1740 VOL/VOL
WILTING POINT	=	0.1070 VOL/VOL
EFFECTIVE HYDRAULIC CONDUCTIVITY	=	9999.00000000 INCHES/HR

LAYER 5

WASTE LAYER

THICKNESS	=	192.00 INCHES
EVAPORATION COEFFICIENT	=	3.300 MM/DAY**0.5
POROSITY	=	0.5200 VOL/VOL
FIELD CAPACITY	=	0.3200 VOL/VOL
WILTING POINT	=	0.1900 VOL/VOL
EFFECTIVE HYDRAULIC CONDUCTIVITY	=	0.28299999 INCHES/HR

LAYER 6

LATERAL DRAINAGE LAYER

SLOPE	=	1.40 PERCENT
DRAINAGE LENGTH	=	250.0 FEET
THICKNESS	=	0.25 INCHES
EVAPORATION COEFFICIENT	=	3.300 MM/DAY**0.5
POROSITY	=	0.3500 VOL/VOL
FIELD CAPACITY	=	0.1740 VOL/VOL
WILTING POINT	=	0.1070 VOL/VOL
EFFECTIVE HYDRAULIC CONDUCTIVITY	=	9999.00000000 INCHES/HR

LAYER 7

BARRIER SOIL LAYER WITH LINER

THICKNESS	=	12.00 INCHES
EVAPORATION COEFFICIENT	=	3.100 MM/DAY**0.5
POROSITY	=	0.5178 VOL/VOL
FIELD CAPACITY	=	0.4202 VOL/VOL
WILTING POINT	=	0.3250 VOL/VOL
EFFECTIVE HYDRAULIC CONDUCTIVITY	=	0.00325000 INCHES/HR

INTERNATIONAL TECHNOLOGY CORPORATION

By LH Date 7/20/88 Subject HELP MODEL Sheet No. 6 of 19

Chkd. By AB Date 7/25/88 VICKSBURG CHEMICAL Proj. No. 435361-01

0.5cm. X 0.5cm.

GENERAL SIMULATION DATA

SCS RUNOFF CURVE NUMBER	=	85.74
TOTAL AREA OF COVER	=	45000. SQ. FT
EVAPORATIVE ZONE DEPTH	=	10.00 INCHES
LINER LEAKAGE FRACTION	=	0.030000
EFFECTIVE EVAPORATION COEFFICIENT	=	3.900 MM/DAY**0.5
UPPER LIMIT VEG. STORAGE	=	5.8200 INCHES
INITIAL VEG. STORAGE	=	3.8850 INCHES

MONTHLY MEAN TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
45.53	48.15	55.13	64.62	74.07	80.93
83.39	80.77	73.78	64.29	54.85	47.98

MONTHLY MEANS SOLAR RADIATION, LANGLEYS PER DAY

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
216.01	269.43	355.85	452.11	532.42	575.26
569.15	515.73	429.32	333.06	252.75	209.91

LEAF AREA INDEX TABLE

DATE	LAI
1	0.00
69	0.00
94	1.84
120	3.00
146	3.00
172	3.00
197	3.00
223	3.00
249	2.70
275	1.96
301	0.96
326	0.50
366	0.00

WINTER COVER FACTOR = 0.60

INTERNATIONAL TECHNOLOGY CORPORATION

(65)

By LH Date 7/20/88 Subject HELP MODEL Sheet No. 7 of 19
Chkd. By AR Date 7/25/88 VICKSBURG CHEMICAL Proj. No. 435361-01

0.5cm. X 0.5cm.

****

MONTHLY TOTALS FOR 83

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	1.01	7.03	3.52	2.51	6.70	3.74
	1.14	3.46	2.29	0.39	5.73	10.92
RUNOFF (INCHES)	0.000	1.226	0.111	0.021	0.791	0.008
	0.000	0.196	0.028	0.000	0.750	3.508
EVAPOTRANSPIRATION (INCHES)	1.385	2.194	3.168	2.700	4.761	3.394
	1.306	2.559	2.602	0.390	1.896	2.085
PERCOLATION FROM BASE OF COVER (INCHES)	0.0003	0.0006	0.0005	0.0005	0.0037	0.0005
	0.0033	0.0004	0.0034	0.0001	0.0006	0.0010
PERCOLATION FROM BASE OF LANDFILL (INCHES)	0.0002	0.0007	0.0005	0.0005	0.0032	0.0005
	0.0029	0.0004	0.0028	0.0004	0.0005	0.0011
DRAINAGE FROM BASE OF COVER (INCHES)	0.021	3.052	0.743	0.082	1.145	0.124
	0.043	0.175	0.182	0.005	1.926	5.670
DRAINAGE FROM BASE OF LANDFILL (INCHES)	0.000	0.000	0.000	0.000	0.001	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

****

INTERNATIONAL TECHNOLOGY CORPORATION

(66)

By LH Date 7/20/88 Subject HELP MODEL VICKSBURG CHEMICAL Sheet No. 8 of 19

Chkd. By AB Date 7/25/88 Proj. No. 435361-01

0.5cm. X 0.5cm.

****

ANNUAL TOTALS FOR 83

	(INCHES)	(CU. FT.)	PERCENT
PRECIPITATION	48.44	181650.	100.00
RUNOFF	6.638	24893.	13.70
EVAPOTRANSPIRATION	28.439	106648.	58.71
PERCOLATION FROM BASE OF COVER	0.0148	56.	0.03
PERCOLATION FROM BASE OF LANDFILL	0.0137	51.	0.03
DRAINAGE FROM BASE OF COVER	13.169	49384.	27.19
DRAINAGE FROM BASE OF LANDFILL	0.001	6.	0.00
SOIL WATER AT START OF YEAR	81.57	305877.	
SOIL WATER AT END OF YEAR	81.75	306547.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	-2.	0.00

****

INTERNATIONAL TECHNOLOGY CORPORATION

(67)

By LH Date 7/20/88 Subject HELP MODEL Sheet No. 9 of 19

Chkd. By AS Date 7/25/88 VICKSBURG CHEMICAL Proj. No. 435361-01

0.5cm. X 0.5cm.

****

MONTHLY TOTALS FOR 84

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	2.65	5.37	6.59	4.79	3.90	5.13
	3.07	7.39	2.04	12.98	5.76	1.10
RUNOFF (INCHES)	0.200	1.078	0.513	0.556	0.003	1.009
	0.009	0.692	0.034	2.619	1.815	0.000
EVAPOTRANSPIRATION (INCHES)	1.758	2.060	3.889	4.584	3.775	2.431
	4.022	5.191	1.924	3.904	2.003	1.649
PERCOLATION FROM BASE OF COVER (INCHES)	0.0004	0.0006	0.0006	0.0005	0.0006	0.0004
	0.0005	0.0006	0.0003	0.0011	0.0005	0.0003
PERCOLATION FROM BASE OF LANDFILL (INCHES)	0.0006	0.0006	0.0007	0.0005	0.0006	0.0004
	0.0005	0.0007	0.0003	0.0010	0.0005	0.0005
DRAINAGE FROM BASE OF COVER (INCHES)	0.697	1.934	2.449	0.456	0.159	0.622
	0.107	1.507	0.079	5.913	1.393	0.078
DRAINAGE FROM BASE OF LANDFILL (INCHES)	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

****

INTERNATIONAL TECHNOLOGY CORPORATION

(68)

By LH Date 7/20/88 Subject HELP MODEL Sheet No. 10 of 19

Chkd. By AB Date 7/25/88 VICKSBURG CHEMICAL Proj. No. 435361-01

0.5cm. X 0.5cm.

****

ANNUAL TOTALS FOR 84

	(INCHES)	(CU. FT.)	PERCENT
PRECIPITATION	60.77	227888.	100.00
RUNOFF	8.527	31977.	14.03
EVAPOTRANSPIRATION	37.190	139462.	61.20
PERCOLATION FROM BASE OF COVER	0.0065	24.	0.01
PERCOLATION FROM BASE OF LANDFILL	0.0068	26.	0.01
DRAINAGE FROM BASE OF COVER	15.394	57729.	25.33
DRAINAGE FROM BASE OF LANDFILL	0.000	0.	0.00
SOIL WATER AT START OF YEAR	81.75	306547.	
SOIL WATER AT END OF YEAR	81.40	305241.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	-1.	0.00

****

INTERNATIONAL TECHNOLOGY CORPORATION

(69)

By LH Date 7/20/88 Subject HELP MODEL Sheet No. 11 of 19

Chkd. By AB Date 7/25/88 Vicksburg Chemical Proj. No. 435361-01

0.5cm. X 0.5cm.

****

MONTHLY TOTALS FOR 85

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	3.80	3.96	5.17	2.97	1.35	1.71
	3.31	2.01	3.42	10.46	4.98	4.05
RUNOFF (INCHES)	0.280	0.159	0.598	0.335	0.000	0.047
	0.113	0.018	0.025	4.313	0.752	0.807
EVAPOTRANSPIRATION (INCHES)	1.566	2.149	3.046	3.444	1.480	1.598
	3.042	1.932	2.428	2.780	2.345	1.716
PERCOLATION FROM BASE OF COVER (INCHES)	0.0005	0.0005	0.0006	0.0034	0.0003	0.0027
	0.0004	0.0003	0.0003	0.0007	0.0006	0.0004
PERCOLATION FROM BASE OF LANDFILL (INCHES)	0.0004	0.0006	0.0006	0.0029	0.0005	0.0024
	0.0005	0.0003	0.0004	0.0006	0.0006	0.0006
DRAINAGE FROM BASE OF COVER (INCHES)	1.115	2.004	1.282	0.240	0.013	0.062
	0.155	0.060	0.131	2.766	2.226	2.145
DRAINAGE FROM BASE OF LANDFILL (INCHES)	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

****

INTERNATIONAL TECHNOLOGY CORPORATION

(20)

By LH Date 7/20/88 Subject HELP MODEL Sheet No. 12 of 19

Chkd. By AB Date 7/25/88 Vicksburg Chemical Proj. No. 435361-01

0.5cm. X 0.5cm.

****

ANNUAL TOTALS FOR 85

	(INCHES)	(CU. FT.)	PERCENT
PRECIPITATION	47.19	176962.	100.00
RUNOFF	7.448	27932.	15.78
EVAPOTRANSPIRATION	27.526	103224.	58.33
PERCOLATION FROM BASE OF COVER	0.0107	40.	0.02*
PERCOLATION FROM BASE OF LANDFILL	0.0104	39.	0.02
DRAINAGE FROM BASE OF COVER	12.196	45734.	25.84
DRAINAGE FROM BASE OF LANDFILL	0.001	3.	0.00
SOIL WATER AT START OF YEAR	81.40	305241.	
SOIL WATER AT END OF YEAR	81.41	305274.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	-2.	0.00

****

INTERNATIONAL TECHNOLOGY CORPORATION

(71)

By LH Date 7/20/88 Subject HELP MODEL Sheet No. 13 of 19

Chkd. By AR Date 7/25/88 Vicksburg Chemical Proj. No. 435361-01

0.5cm. X 0.5cm.

****

MONTHLY TOTALS FOR 86

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	0.73	3.03	2.91	4.01	1.68	15.60
	0.57	1.89	7.28	8.29	11.51	5.04
RUNOFF (INCHES)	0.000	0.477	0.269	0.144	0.000	7.597
	0.000	0.000	0.669	2.014	3.323	0.737
EVAPOTRANSPIRATION (INCHES)	0.752	1.502	2.373	3.613	1.641	4.648
	1.539	1.768	4.975	3.433	2.502	2.056
PERCOLATION FROM BASE OF COVER (INCHES)	0.0002	0.0003	0.0003	0.0058	0.0029	0.0006
	0.0001	0.0002	0.0006	0.0006	0.0010	0.0007
PERCOLATION FROM BASE OF LANDFILL (INCHES)	0.0003	0.0004	0.0004	0.0034	0.0031	0.0016
	0.0004	0.0003	0.0006	0.0007	0.0009	0.0008
DRAINAGE FROM BASE OF COVER (INCHES)	0.024	1.047	0.699	0.248	0.036	2.375
	0.011	0.038	1.234	2.639	5.392	2.382
DRAINAGE FROM BASE OF LANDFILL (INCHES)	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

****

INTERNATIONAL TECHNOLOGY CORPORATION

(72)

By LH Date 7/20/88 Subject HELP MODEL Sheet No. 14 of 19

Chkd. By AB Date 7/25/88 Vicksburg Chemical Proj. No. 435361-01

0.5cm. X 0.5cm.

****

ANNUAL TOTALS FOR 86

	(INCHES)	(CU. FT.)	PERCENT
PRECIPITATION	62.54	234525.	100.00
RUNOFF	15.229	57108.	24.35
EVAPOTRANSPIRATION	30.803	115512.	49.25
PERCOLATION FROM BASE OF COVER	0.0133	50.	0.02*
PERCOLATION FROM BASE OF LANDFILL	0.0128	48.	0.02
DRAINAGE FROM BASE OF COVER	16.124	60466.	25.78
DRAINAGE FROM BASE OF LANDFILL	0.001	4.	0.00
SOIL WATER AT START OF YEAR	81.41	305274.	
SOIL WATER AT END OF YEAR	81.78	306663.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	-2.	0.00

****

INTERNATIONAL TECHNOLOGY CORPORATION

(73)

By LH Date 7/20/88 Subject HELP MODEL Sheet No. 15 of 19

Chkd. By AS Date 7/25/88 Vicksburg Chemical Proj. No. 435361-01

0.5cm. X 0.5cm.

****

MONTHLY TOTALS FOR 87

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	3.08 3.92	9.84 0.42	1.86 1.41	0.36 0.94	3.14 11.88	3.67 6.41
RUNOFF (INCHES)	0.176 0.254	1.472 0.000	0.005 0.107	0.000 0.000	0.029 4.740	0.245 1.746
EVAPOTRANSPIRATION (INCHES)	1.962 3.461	2.408 0.420	3.039 0.837	0.357 1.177	3.033 2.054	3.239 1.766
PERCOLATION FROM BASE OF COVER (INCHES)	0.0005 0.0033	0.0009 0.0000	0.0003 0.0001	0.0002 0.0001	0.0003 0.0008	0.0036 0.0008
PERCOLATION FROM BASE OF LANDFILL (INCHES)	0.0006 0.0037	0.0008 0.0002	0.0006 0.0002	0.0003 0.0003	0.0003 0.0007	0.0022 0.0007
DRAINAGE FROM BASE OF COVER (INCHES)	1.098 0.202	4.862 0.000	0.595 0.061	0.009 0.011	0.078 4.209	0.183 2.532
DRAINAGE FROM BASE OF LANDFILL (INCHES)	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

****

INTERNATIONAL TECHNOLOGY CORPORATION

(74)

By LH Date 7/20/88 Subject HELP MODEL Sheet No. 16 of 19

Chkd. By AB Date 7/25/88 Vicksburg Chemical Proj. No. 435361-01

0.5cm. X 0.5cm.

****

ANNUAL TOTALS FOR 87

	(INCHES)	(CU. FT.)	PERCENT
PRECIPITATION	46.93	175987.	100.00
RUNOFF	8.775	32905.	18.70
EVAPOTRANSPIRATION	23.751	89067.	50.61
PERCOLATION FROM BASE OF COVER	0.0109	41.	0.02*
PERCOLATION FROM BASE OF LANDFILL	0.0105	39.	0.02
DRAINAGE FROM BASE OF COVER	13.841	51902.	29.49
DRAINAGE FROM BASE OF LANDFILL	0.001	3.	0.00
SOIL WATER AT START OF YEAR	81.78	306663.	
SOIL WATER AT END OF YEAR	82.33	308735.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	-3.	0.00

****

INTERNATIONAL TECHNOLOGY CORPORATION

(75)

L H Date 7/20/88 Subject HELP MODEL Sheet No. 17 of 19

Chkd. By Date 7/25/88 Vicksburg Chemical Proj. No. 435361-01

0.5cm. X 0.5cm.

****

AVERAGE MONTHLY TOTALS FOR 83 THROUGH 87

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	2.25 2.40	5.85 3.03	4.01 3.29	2.93 6.61	3.35 7.97	5.97 5.50
RUNOFF (INCHES)	0.131 0.075	0.882 0.181	0.299 0.173	0.211 1.789	0.164 2.276	1.781 1.359
EVAPOTRANSPIRATION (INCHES)	1.485 2.674	2.062 2.374	3.103 2.553	2.940 2.337	2.938 2.160	3.062 1.854
PERCOLATION FROM BASE OF COVER (INCHES)	0.0004 0.0015	0.0006 0.0003	0.0005 0.0009	0.0021 0.0005	0.0016 0.0007	0.0016 0.0006
PERCOLATION FROM BASE OF LANDFILL (INCHES)	0.0004 0.0016	0.0006 0.0004	0.0005 0.0009	0.0015 0.0006	0.0016 0.0006	0.0014 0.0007
DRAINAGE FROM BASE OF COVER (INCHES)	0.591 0.103	2.580 0.356	1.154 0.337	0.207 2.267	0.286 3.029	0.673 2.561
DRAINAGE FROM BASE OF LANDFILL (INCHES)	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

****

INTERNATIONAL TECHNOLOGY CORPORATION

(76)

By LH Date 7/20/88 Subject HELP MODEL Sheet No. 18 of 19

Chkd. By AS Date 7/25/88 Vicksburg Chemical Proj. No. 435361-01

0.5cm. X 0.5cm.

****

AVERAGE ANNUAL TOTALS FOR 83 THROUGH 87

	(INCHES)	(CU. FT.)	PERCENT
PRECIPITATION	53.17	199402.	100.00
RUNOFF	9.323	34963.	17.53
EVAPOTRANSPIRATION	29.542	110783.	55.56
PERCOLATION FROM BASE OF COVER	0.0112	42.	0.02*
PERCOLATION FROM BASE OF LANDFILL	0.0108	41.	0.02
DRAINAGE FROM BASE OF COVER	14.145	53043.	26.60
DRAINAGE FROM BASE OF LANDFILL	0.001	3.	0.00

****

INTERNATIONAL TECHNOLOGY CORPORATION

(77)

By LH Date 7/20/88 Subject HELP MODEL Sheet No. 19 of 19

Chkd. By AB Date 7/25/88 Vicksburg Chemical Proj. No. 435361-01

0.5cm. X 0.5cm.

****

PEAK DAILY VALUES FOR 83 THROUGH 87

	(INCHES)	(CU. FT.)
PRECIPITATION	8.77	32887.5
RUNOFF	5.522	20707.9
PERCOLATION FROM BASE OF COVER	0.0032	11.9
PERCOLATION FROM BASE OF LANDFILL	0.0008	2.8
DRAINAGE FROM BASE OF COVER	1.407	5275.2
DRAINAGE FROM BASE OF LANDFILL	0.000	0.6
HEAD ON BASE OF COVER	2.0	
HEAD ON BASE OF LANDFILL	0.0	
SNOW WATER	0.00	0.0

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.5385

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.3250

****
****

INTERNATIONAL TECHNOLOGY CORPORATION

By LH Date 7/18/88 Subject Erosion Potential of Cap Sheet No. 1 of 2
Chkd. By HS Date 7/25/88 Vicksburg Chemical Proj. No. 435361

0.5cm. X 0.5cm.

OBJECTIVE: To assess the erosion potential of the cap, and to assure that the cap is safe from excessive erosion

REFERENCE: 1. "Evaluating cover Systems for Solid and Hazardous Wastes", USEPA SW-867, Sept. 1980.
2. Construction drawings.

ASSUMPTIONS: 1. The cap soil is assumed to be clay loam with 2% organic content
2. Slope is taken as 0.25 (25%), most steep from construction drawings (Ref. 2)

PROCEDURE: The Universal soil loss equation is used and the limit criteria of 2 tons/acre/yr, is utilized.

Erosion potential is given by:—

$$A = RKLSCP \quad \rightarrow (\text{Ref. } 1)$$

where;

A: average annual loss in tons/acre/year

R = rainfall an runoff erosivity index = 350 (Fig. 20)

K = soil Erodibility factor, tons/acre = 0.25 (Table 5)

LS = Slope length and steepness factor, LS = 5.9, L = 100'

C = Cover-management factor, (grass & legume, high Prodne) = 0.004, (Table 7)

P = Practice factor = 1.0 (Table 8)

$$A = 350 \times 0.25 \times 5.9 \times 0.004 \times 1.0$$

$$= \underline{2.1} \text{ tons/acre/yr.} \not< 2.0$$

It is recommended that slope protection, such as, Enkamat be placed on the slope to reduce erosion capacity of the cap.

INTERNATIONAL TECHNOLOGY CORPORATION

(80)

By CBS Date 7-25-88 Subject Vicksburg Chemical Sheet No. 1 of 1
Chkd. By AZ Date 7/25/88 Closure/Retrofit Design Proj. No. 425061
0.5cm. X 0.5cm.

CAP STABILITY

Objective: To verify that the Factor of Safety, F.S., Against sliding of the cover is greater than 1.5.

References: ① Designing with Geosynthetics, Robert M. Koerner, Prentice Hall, 1985

Assumptions: Calculations are made assuming as if topsoil rests directly on HDPE liner which is conservative because of geonet between topsoil and liner.

Angle of friction between topsoil and HDPE = $21^\circ = \phi_{cc}$

Material properties of Topsoil –

$c = 250$ $\phi_T = 15^\circ$ $\gamma_T = 110$

From Ref ①

$F.S. = \frac{R}{F}$ where

$R = L \gamma t \cos\beta \tan\phi_{cc}$
$L = 1$
$\gamma = 110$ pcf
$t = 1.5'$
$\beta = 14^\circ$
$F = L \gamma t \sin\beta$
$L = 1$

thus: $F.S = \frac{(110)(1.5)(\cos 14^\circ)(\tan 21^\circ)}{(110)(1.5)(\sin 14^\circ)}$

$F.S = 1.54$

$1.54 > 1.5$ ie. the slope of the cap is stable

INTERNATIONAL TECHNOLOGY CORPORATION

By LH Date 7/19/88 Subject Runoff Velocity Sheet No. 1 of 2
Chkd. By [illegible] Date [illegible] Vicksburg chemical Proj. No. 435361-01

0.5cm. X 0.5cm.

OBJECTIVE: To compute the run-off velocity for assessing the erosion potential of the top soil.

REFERENCES: 1. "Erosion and Sediment Control, surface mining in Eastern US" EPA-625/3,76-006
2. "Soil Mechanics", Design Manual, NAVFAC DM7.2, 1982
3. "Applied Fluid dynamics handbook," by R.D. Belwins, Van Nostrand Co, N

PROCEDURE: Sheet flow is considered over the cap. The flow rate is calculated by using the formula $Q = CiA/T$, and then the velocity is calculated for the same flow rate, using Manning's equation.

ASSUMPTIONS: 1. The wetted perimeter is taken as 1 foot for a unit width (1 foot) flow, by neglecting the thickness (sheet flow)

2. The permissible velocity is taken as 2.5 fps (Ref. 2).

INTERNATIONAL TECHNOLOGY CORPORATION

By CBJ Date 7-26-88 Subject Vicksburg Chemical Sheet No. 2 of 2
Chkd. By ____ Date ____ Closure / Retrofit Design Proj. No. 435361

0.5cm. X 0.5cm.

Rational formula – $Q = CiA$ where $C = 1.0$ (conservative)
$i = 3.1$ in/hr (25 yr, 1 hr storm)

$A = 100 \times 1$ ft^2
$= 0.0023$ acres

$Q = (1.0)(3.1)(0.0023)$

$Q = 0.00713$ cfs

Using Manning's Eq. for sheet flow:

$Q = \frac{1.49}{n} R^{2/3} S^{1/2} A$

$A = d \times 1 = d$
$WP = 1$ (sheet flow)
$R = A/WP = d/1 = d$
$n = 0.027$
$S = 25\% = .25$

$0.00713 = \frac{1.49}{0.027} (d)^{2/3} (.25)^{1/2} (d)$

$d = \left[\frac{(0.00713)(0.027)}{(1.49)(.25)^{1/2}}\right]^{3/5}$

$d = 0.00704$

$V = Q/A = \frac{0.00713}{0.00704} = 1.01$ f/s < 2 f/s OK

INTERNATIONAL TECHNOLOGY CORPORATION

(83)

By CBJ Date 7/26/88 Subject PERIMETER DITCH, VICKSBURG CHEMICAL Sheet No. 1 of 3

Chkd. By AK Date 7/27/88 Proj. No. 435361-01

0.5cm. X 0.5cm.

OBJECTIVE: To design the ditches for collecting the runoff leaving the pond cap and intercepting the run on.

REFERENCES: 1. "Erosion and Sediment Control Surface mining in Eastern US." [EPA-625/3, 76-006].

2. "Applied Fluid Dynamics Handbook" Robert D. Blevins, Van Nostrand Reinhold Co. New York, 1984.

3. "Evaluating Cover Systems for Solid and Hazardous Wastes," EPA, SW-867, 1982

ASSUMPTIONS: 1. The runoff coefficient is taken as 0.7 for clay at 17% slope (avg) (Ref 3).

2. Precipitation for 25 yr, 24 hr period is taken as 7.9 inches.

PROCEDURE: The ditches are designed using Mannings formula for open channel flow based on the runoff calculated using the formula, $q = CiA$.

Runon Area

The area for run on is approx. 225' x 300' (See Fig. 1)

$= \underline{67500 ft^2}$

Run-off Area = 350' x 42' = $\underline{14,700 ft^2}$

Total Area = $82,200 ft^2 / \frac{1 ACRE}{43560 ft^2} = \underline{1.89 ACRES}$

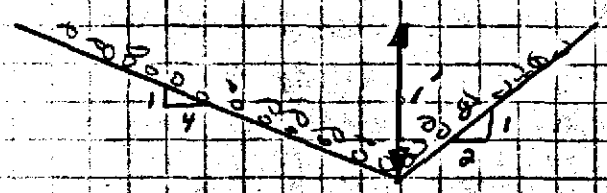
Rational Formula – $Q = CiA$ where

$C = 1.0$ (conservative)
$i = 3.1$ in./hr (25 year 1 hr. Storm)
$A = 1.89$ acres

$Q = (1.0)(3.1)(1.89)$

$Q = 5.9$ cfs

Using the following section – Rip-Rap Placed ditch



$A = 3$ ft²
$WP = 6.47$ ft
$R = A/WP = 1.93/6.4 = 0.47$ ft
$S = 0.005$
$n = 0.025$

Using Mannings Equation

$Q = \frac{1.49}{n} R^{2/3} S^{1/2} A$

$= \left(\frac{1.49}{0.025}\right)(0.47\,ft)^{2/3}(0.005)^{1/2}(3)$

$Q = 7.64$ cfs > 5.9 cfs O.K.

Ditch has adequate capacity

INTERNATIONAL TECHNOLOGY CORPORATION

(85)

By LH Date 7/18/88 Subject Permeter Ditch Sheet No. 3 of 3

Chkd. By RB Date 7/25/88 Vicksburg chemical Proj. No. 435361-01

0.5cm. X 0.5cm.

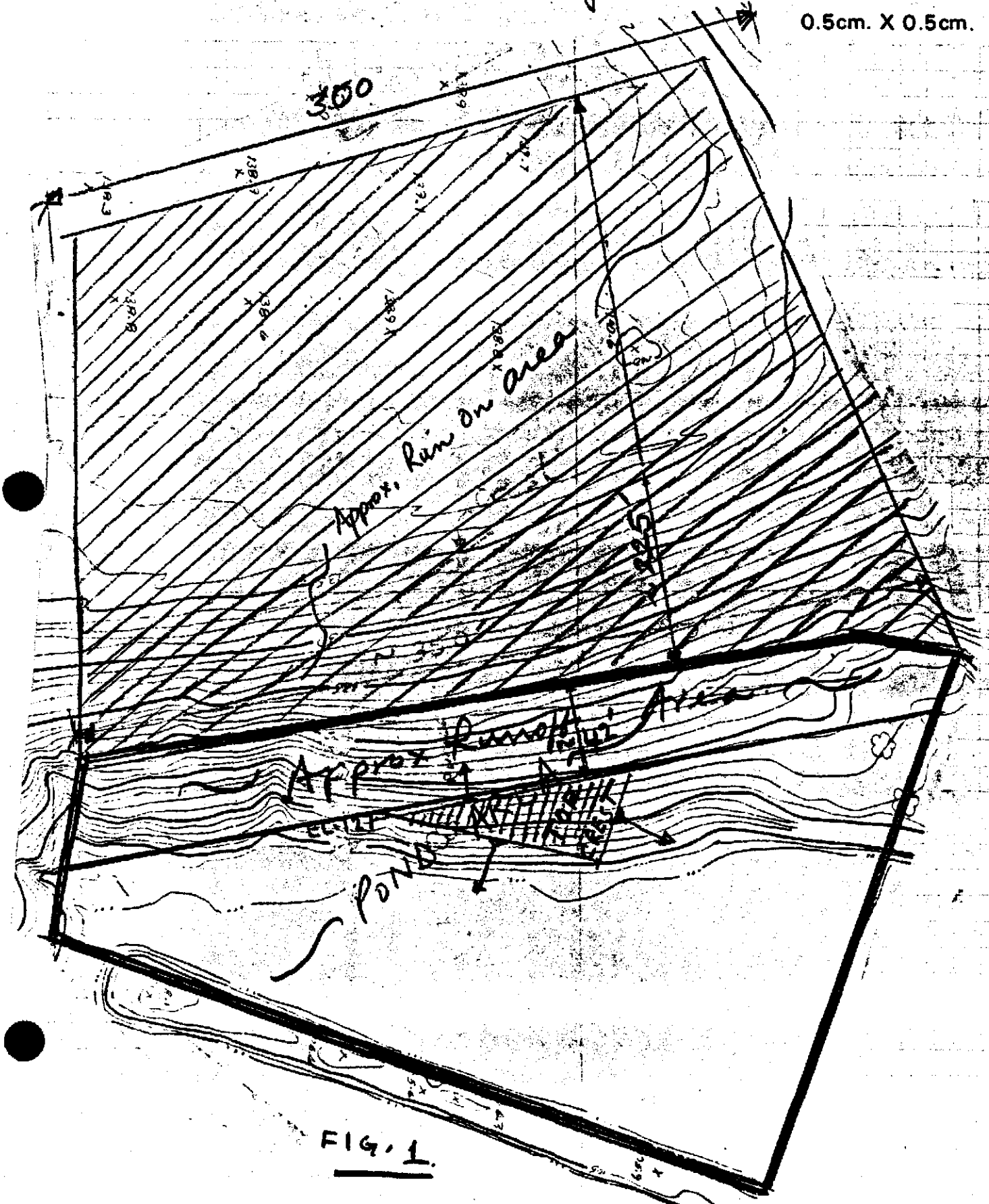


FIG. 1

ATTACHMENT 2

SUBSURFACE INVESTIGATION

CLOSURE/RETROFIT PLAN

SURFACE IMPOUNDMENT SYSTEM

VICKSBURG CHEMICAL DIVISION

VICKSBURG, MISSISSIPPI

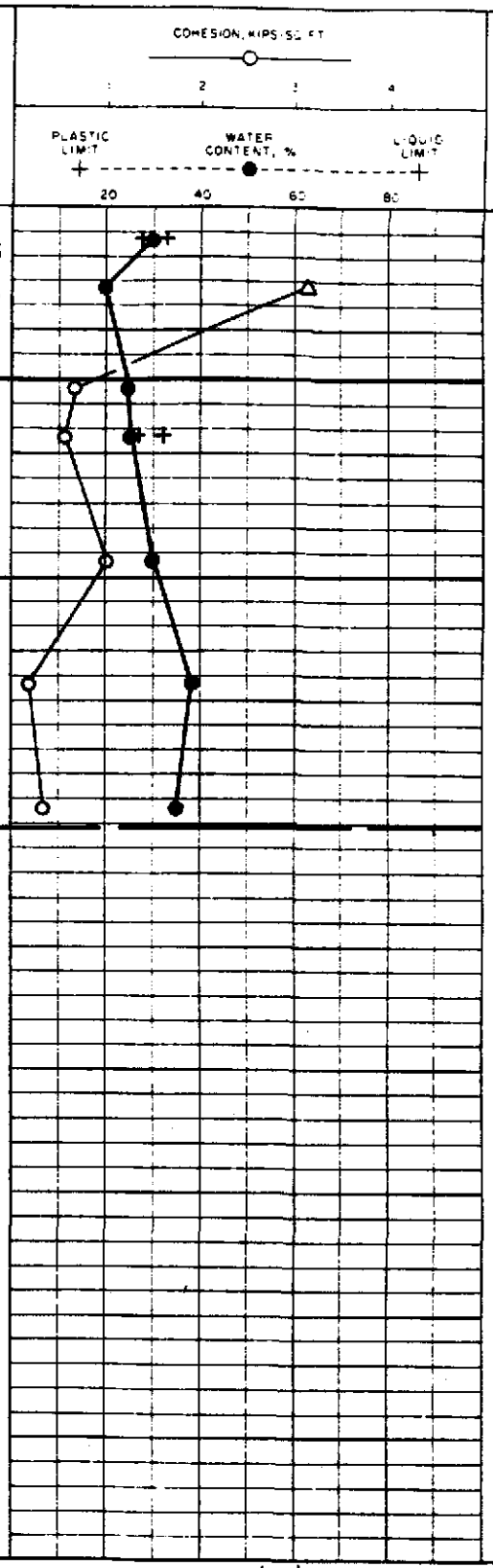
LOG OF BORING NO. 1
CEDAR CHEMICAL CORPORATION
VICKSBURG, MISSISSIPPI

TYPE: Shelby tube & Rotary wash

LOCATION See Plate 1

SURFACE EL.: 105±

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT LB/CU FT
5			Loose to medium dense tan clayey silt (fill) -with organic matter to 2.5' -medium dense 2.5'-4'		88 106
10			Medium dense tan clayey silt -gray below 13.5'		97 92
15					91
20			Soft gray very silty clay		79
25					
30					
35					
40					
45					
50					



ELEVATION, FT

COMPLETION DEPTH: 25 ft

DATE: 4/29/88

DEPTH TO WATER IN BORING grouted

DATE:

WARE LIND ENGINEERS

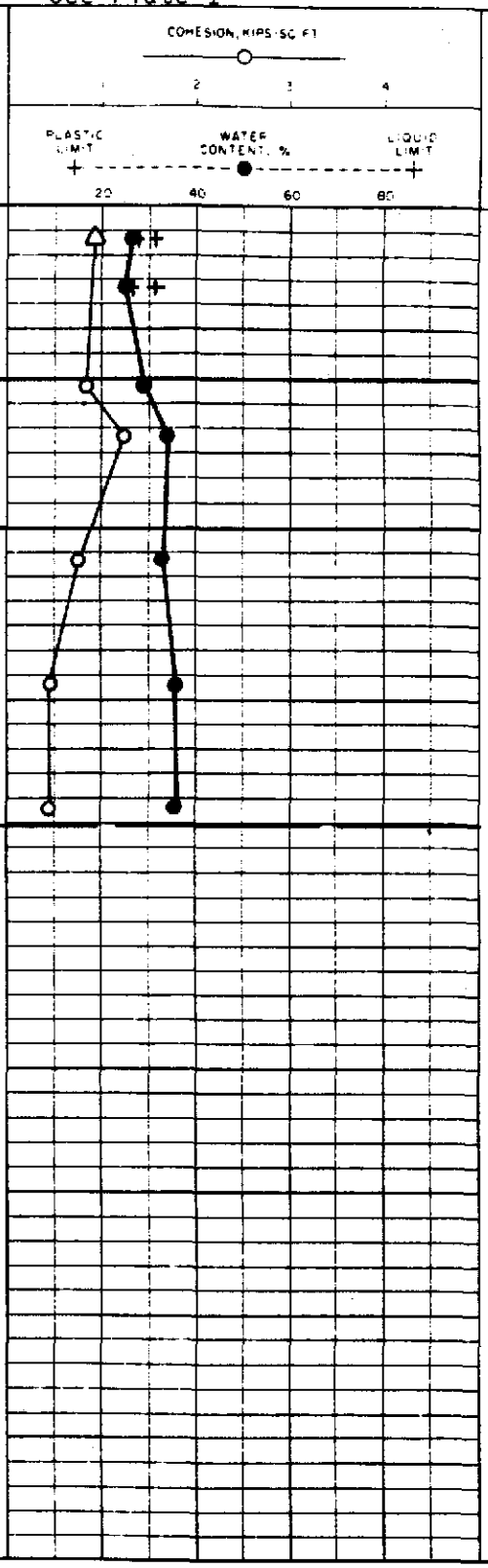
LOG OF BORING NO. 2
CEDAR CHEMICAL CORPORATION
VICKSBURG, MISSISSIPPI

TYPE: Shelby tube & Rotary wash

LOCATION: See Plate 1

SURFACE EL: 105±

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT LB/CU FT
5			Loose to medium dense tan clayey silt, with traces of organic matter (fill) -loose below 4'		94 98
10			Medium dense tan and gray clayey silt -few roots to 10' -gray and tan, very clayey below 11'		91 87
15			Firm gray very silty clay -soft to firm 17'-21'		87
20			-soft with clayey silt seams and traces of organic matter below 21'		82
25					81
30					
35					
40					
45					
50					



ELEVATION, FT

COMPLETION DEPTH: 25 ft
DATE: 4/27/88

DEPTH TO WATER IN BORING: grouted
DATE

WARE LIND ENGINEERS

LOG OF BORING NO. 3

CEDAR CHEMICAL CORPORATION
VICKSBURG, MISSISSIPPI

TYPE: Shelby tube & Rotary wash LOCATION See Plate 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL (SURFACE EL.: 105±)	BLOWS PER FT	UNIT DRY WEIGHT LB/CU FT	COHESION, KIPS/SQ FT / PLASTIC LIMIT / WATER CONTENT, % / LIQUID LIMIT	ELEVATION, FT
			Medium dense tan clayey silt (fill) -gravel to 0.5' -with gravel 0.5'-2' -with red sand pockets 4'-5' -gray and tan with organic matter below 6.5'		96		
5					99		
					67		
10					91		
			Medium dense gray clayey silt -with loose organic pockets to 10' -gray and tan below 10' -loose below 22'				
15					95		
20					87		
25					89		
30							
35							
40							
45							
50							

COMPLETION DEPTH 25 ft
DATE 4/27/88

DEPTH TO WATER IN BORING grouted
DATE

WARE LIND ENGINEERS

LOG OF BORING NO. MW-16
VICKSBURG CHEMICAL
VICKSBURG, MISSISSIPPI

TYPE: Rotary wash & Shelby tube

LOCATION: See Plate 1

DEPTH, FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT LB/CU FT	COHESION, KIPS/SQ FT (1, 2, 3, 4)	PLASTIC LIMIT / WATER CONTENT, % / LIQUID LIMIT (20, 40, 60, 80)	ELEVATION, FT
			Meduim dense tan silt					
10			Loose tan clayey silt -brown clayey silt, occasional wood below 12'					
15			Firm tan silty clay -stiff below 17'					
20								
25			Very stiff gray clay					
30			Medium dense tan clayey silt, with silty fine sand seams					
35			Stiff gray clay -light grayish green clay below 37'					
40								
50			Medium dense green silty fine sand w/shell fragments					
60			Hard light grayish green silty clay, w/shell fragments and occasional lithified ledges					

Note: Scale Change

COMPLETION DEPTH: 56 ft
DATE: 7/5/88

DEPTH TO WATER IN BORING: 7.4 ft after 20 min.
DATE: 7/5/88

MARE LIND FURLOW
ENGINEERS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 846545	PROJECT NAME: VERTAC Chemical	
BORING NUMBER: P2-1	COORDINATES:	DATE: 12/5/84
ELEVATION: 118.74 Ft. MSL (TofC)	GWL: Depth Date/Time	DATE STARTED: 12/5/84
ENGINEER/GEOLOGIST: JDD	Depth Date/Time	DATE COMPLETED: 12/5/84
DRILLING METHODS: Auger & Rotary Wash		PAGE 1 OF

DEPTH (FT)	SAMPLE TYPE & NO.	PROFILE	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0			Brown, Silty clay w/sl. gravel & sl. organics			Moist
5			Fill			
			Light gray-brown, Silt			
10			Mottled Red area @ 12.0'			
15			More gray color @ 15.0'			
			Mottled black area @ 17.0' & more broen color w/grey			
	ST-1		Tan		.75	Sample 18.5'-19.0', Moist
20			Gray 20.5'-48.0', Shell frag.'s 20.0'-28.0'			
25						
	ST-2				1.25	Sample 28.5'-29.0', shell frag.'s, moist
30						

NOTES:

Used 6" Auger from o'-25.0'. Rotary wash from 25.0'-54.0'. NO natural ground water was encountered. Cave-in occurred between 6.0'-8.0' where fill meets natural ground while augering to 25.0'.

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 846545	PROJECT NAME: VERTAC Chemical	
BORING NUMBER: P2-1	COORDINATES:	DATE: 12/5/84
ELEVATION: 118.74 Ft. MSL (TofC)	GWL: Depth Date/Time	DATE STARTED: 12/5/84
ENGINEER/GEOLOGIST: JDD	Depth Date/Time	DATE COMPLETED: 12/5/84
DRILLING METHODS: Auger & Rotary Wash		PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO	PROFILE	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30						
35			SILT			
	ST-3					
40					1.25	Sample 38.5'-39.0', shell frag's., Moist
45						
	ST-4		Greenish-gray, clayey-sand, w/sl. Brown mottled areas	SC	2.50	Sample 49.0'-49.5', Moist
50			Hit Marl @ 52.0'			
	SB-1		Greenish-gray, calcarcous clay w/sand and gravel (marl)			Blows 17-12-18
55			Bottom of boring @ 54.0'			

NOTES:

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 846545	PROJECT NAME: VERTAC Chemical	
BORING NUMBER: PZ-2	COORDINATES:	DATE: 12/7/84
ELEVATION: 112.45 Ft. MSL (ToFC)	GWL: Depth Date/Time	DATE STARTED: 12/7/84
ENGINEER/GEOLOGIST: JDD	Depth Date/Time	DATE COMPLETED: 12/7/84
DRILLING METHODS: Auger & Rotary Wash		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO	PROFILE	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0			Brown, silt, w/sl. clay, organics			Moist
5			FILL			
10						
15			Shell frag.'s @ 15.0'			
20			SILT, w/SL. CLAY			
25						
30						

NOTES:

Used 6" Auger from 0'-23'. Rotary wash from 23'-56'. Around 35' down, we noticed water leaking out of slope about 12' down off the side. Therefore, losing water 12'-15' down the hole horizontally.

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 846545	PROJECT NAME: VERTAC Chemical	
BORING NUMBER: PZ-2	COORDINATES:	DATE: 12/7/84
ELEVATION: 112.45 Ft. MSL (TofC)	GWL: Depth Date/Time	DATE STARTED: 12/7/84
ENGINEER/GEOLOGIST: JDD	Depth Date/Time	DATE COMPLETED: 12/7/84
DRILLING METHODS: Auger & Rotary Wash		PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO	PROFILE	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30			Wood cuttings 32.0'-38.0'			
35			SILT, w/SL. CLAY			
40			Wood cuttings @ 44.0'			
45						
	ST-1		Grey, SL. calc.		1.25	Sample 48.5'-49.0', very moist
50						
55			Hit marl @ 56.0'			
			Bottom of boring @ 56.0'			
60						

NOTES:

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 846545	PROJECT NAME: VERTAC Chemical	
BORING NUMBER: PZ-~~KK~~ 3	COORDINATES:	DATE: 12/6/84
ELEVATION: 113.03 Ft. MSL (TofC)	GWL: Depth Date/Time	DATE STARTED: 12/6/84
ENGINEER/GEOLOGIST: JDD	Depth Date/Time	DATE COMPLETED: 12/6/84
DRILLING METHODS: Auger & Rotary Wash		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	PROFILE	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0			Brown, Silty clay, Gravel			Moist
			Gray & chem. odor 4.0'-8.0'			
5			FILL			
			Brown color @ 8.0'			
10						
			SILTY CLAY	CL		
15						
20						
25						
30						

NOTES:

Used 6" Auger from 0'-18.0'. Rotary wash from 18.0'-52.0'. Water seeping in below 7.0' causing cave-in.

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 846545	PROJECT NAME: VERTAC Chemical	
BORING NUMBER: P2-~~XXX~~ 3	COORDINATES:	DATE: 12/6/84
ELEVATION: 113.03 Ft. MSL (TofC)	GWL: Depth Date/Time	DATE STARTED: 12/6/84
ENGINEER/GEOLOGIST: JDD	Depth Date/Time	DATE COMPLETED: 12/6/84
DRILLING METHODS: Auger & Rotary Wash		PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	PROFILE	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30			SILT			
35			Greenish-gray, med. to coarse sand, w/gravel 35.0'-38.0'	SP		
40			Gray, Silty clay	CL		
45	ST-1		Greenish-gray, clayey-sand, w/brown mottled areas, calc.	SC	2.25	Sample 44.0'-44.5'
50			Marl @ 50.5'			
55			Bottom of boring @ 52.0'			

NOTES:

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 846545	PROJECT NAME VERTAC Chemical	
BORING NUMBER P2-4	COORDINATES	DATE 12/7/84
ELEVATION 114.24 Ft. MSL (TofC)	GWL: Depth Date/Time	DATE STARTED 12/7/84
ENGINEER/GEOLOGIST JDD	Depth Date/Time	DATE COMPLETED 12/7/84
DRILLING METHODS Auger & Rotary Wash		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	PROFILE	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0			Gravel mixed w/shells 4.0'-5.0'			
5			Brown, Silty-clay, w/gravel	CL		
10						
15			Gray-tan color 12'-18' Clayey-Silt	ML		
20	ST-1		Dark gray, organics		.75	Sample 19.5'-20.0', moist, Light grey silt seams
25						
30						

NOTES:

Used 6" auger from 0'-15'. Rotary wash from 15'-49'. Lost water between 4.0'-5.0' and therefore used 6' of surface casing to block it off while drilling.

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 846545	PROJECT NAME VERTAC Chemical	
BORING NUMBER P2-4	COORDINATES	DATE 12/7/84
ELEVATION: 114.24 Ft. MSL (TofC)	GWL: Depth Date/Time	DATE STARTED 12/7/84
ENGINEER/GEOLOGIST JDD	Depth Date/Time	DATE COMPLETED 12/7/84
DRILLING METHODS Auger & Rotary Wash		PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO	PROFILE	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30			Wood & grass cuttings @ 30.0'			
35			Light gray, silt w/clay @ 37.0'			
40						
	ST-2		Gray, clayey-sand, very calc., brown mottled areas	SC	1.5	Sample 44.0'-44.5'
45			Hit marl @ 49.0'			
50			Bottom of boring @ 49.0'			

NOTES:

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 846545-2	PROJECT NAME: Vertac-Vicksburg	
BORING NUMBER: MW-9	COORDINATES:	DATE:
ELEVATION: 116.02 Ft. MSL (TofC)	GWL: Depth Date/Time	DATE STARTED: 10-9-85
ENGINEER/GEOLOGIST: L.W. Cronk	Depth Date/Time	DATE COMPLETED: 10-9-85
DRILLING METHODS: Rotary Wash		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO	PROFILE	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
			Gravelly clay fill at surface			
5						
10	QT-1		Brown & Gray Silt			
15			Shell fragments @ 14'			
20			Becoming Gray Silt @ 19' w/occasional Shell Fragments			
25						
	QT-3		Gray Silt			

NOTES:

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 846545-2	PROJECT NAME: Vertac-Vicksburg	
BORING NUMBER: MW-9	COORDINATES:	DATE:
ELEVATION: 116.02 Ft. MSL (TofC)	GWL: Depth Date/Time	DATE STARTED: 10-9-85
ENGINEER/GEOLOGIST: L.W. Cronk	Depth Date/Time	DATE COMPLETED: 10-9-85
DRILLING METHODS: Rotary Wash		PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	PROFILE	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30						
35						
40			Becoming Brown & Gray Silt w/Numerous Shell Fragments @ 41'			
45	QT-5		Dark Gray Clayey Silt @ 43.5'		2.25	Penetrometer
50			Marl @ 52'			
55						

NOTES:

Completion Depth @ 58'

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 846545-2	PROJECT NAME: Vertac-Vicksburg	
BORING NUMBER: MW-10	COORDINATES:	DATE:
ELEVATION: 114.73 Ft. MSL (TofC)	GWL: Depth Date/Time	DATE STARTED: 10-7-85
ENGINEER/GEOLOGIST: G. M. Combs	Depth Date/Time	DATE COMPLETED: 10-7-85
DRILLING METHODS: Rotary Wash		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO	PROFILE	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
			Clayey fill at surface			
5						
10	QT-1		Tan and Light Gray Slightly Clayey Silt		1.5 1.6	Penetrometer Torvane
15						
20						
			Becoming More Clayey @ 22'			
25						
	QT-3		Gray Silt w/Shell Fragments		1.75	Penetrometer

NOTES:

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 846545-2	PROJECT NAME: Vertac-Vicksburg	
BORING NUMBER: MW-10	COORDINATES:	DATE:
ELEVATION: 114.73 Ft. MSL (TofC)	GWL: Depth Date/Time	DATE STARTED: 10-7-85
ENGINEER/GEOLOGIST: G.M. Combs	Depth Date/Time	DATE COMPLETED: 10-7-85
DRILLING METHODS: Rotary Wash		PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	PROFILE	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31						
35						
40	QT-5		Dark Gray Slightly Clayey Silt w/shell Fragments		1.0 0.43	Penetrometer Torvane
45						
50			Marl below 48.5 Clayey Sand Seam 48.5'-49.5' Gravel from 49.0' to 52.0'			
55						

NOTES:

Completion Depth 52.0'

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 846545-2	PROJECT NAME: Vertac-Vicksburg	
BORING NUMBER MW-11	COORDINATES:	DATE:
ELEVATION 105.62 Ft. MSL (TofC)	GWL: Depth Date/Time	DATE STARTED: 10-8-85
ENGINEER/GEOLOGIST: L.W. Cronk	Depth Date/Time	DATE COMPLETED: 10-8-85
DRILLING METHODS Rotary Wash		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	PROFILE	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
			Dark Gray Clayey Silt to 5.0			
5	QT-1		Dark Gray Silt @ 5.0			
10						
15						
20						
25						
	QT-3		Tan & Gray Silt @ 29.5'		2.5	Penetrometer

NOTES.

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 846545-2	PROJECT NAME: Vertac-Vicksburg	
BORING NUMBER: MW-11	COORDINATES:	DATE:
ELEVATION: 105.62 Ft. MSL (TofC)	GWL: Depth Date/Time	DATE STARTED: 10-8-85
ENGINEER/GEOLOGIST: L.W. Cronk	Depth Date/Time	DATE COMPLETED: 10-8-85
DRILLING METHODS: Rotary Wash		PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO	PROFILE	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30						
35			Gray & Tan Sandy Clay @ 43.0' - 44.0'			
40						
45	QT-5		Gray and Tan Clay @ 44.0' to 51.0'		2.5	Penetrometer
50			Marl @ 51'			
55						

NOTES:

Completion Depth 56'

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 846545-2	PROJECT NAME: Vertac-Vicksburg	
BORING NUMBER: MW-12	COORDINATES:	DATE:
ELEVATION: 112.06 Ft. MSL (TofC)	GWL: Depth Date/Time	DATE STARTED: 10-8-85
ENGINEER/GEOLOGIST: G.M. Combs	Depth Date/Time	DATE COMPLETED: 10-8-85
DRILLING METHODS: Rotary Wash		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO	PROFILE	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
			Fill Material to 4'			
5			Tan Silt (Slightly Clayey) @ 4'			
10			Tan Silt		1.25	Penetrometer
15						
20						
25						
	QT-3		Becoming Gray & Tan Silt @ 27'		1.1	Penetrometer

NOTES:

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 846545-2	PROJECT NAME: Vertac-Vicksburg	
BORING NUMBER: MW-12	COORDINATES:	DATE:
ELEVATION: 112.06 Ft. MSL (TofC)	GWL: Depth Date/Time	DATE STARTED: 10-8-85
ENGINEER/GEOLOGIST: G.M. Combs	Depth Date/Time	DATE COMPLETED: 10-8-85
DRILLING METHODS: Rotary Wash		PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	PROFILE	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30						
35						
40			Shell Fragments @ 40'			
45	QT-5		Gray Clayey Sand w/Sand Pkts and Gravel 44'-46' Beginning of Marl @ 46'		1.24	Penetrometer
50						
55						

NOTES:

Completion Depth @ 48.5'

ATTACHMENT 3

RULING FROM THE MISSISSIPPI DEPARTMENT OF NATURAL RESOURCES

CLOSURE/RETROFIT PLAN

SURFACE IMPOUNDMENT SYSTEM

VICKSBURG CHEMICAL DIVISION

VICKSBURG, MISSISSIPPI

BEFORE THE MISSISSIPPI COMMISSION ON NATURAL RESOURCES
BUREAU OF POLLUTION CONTROL

IN THE MATTER OF:

MISSISSIPPI COMMISSION ON
NATURAL RESOURCES

COMPLAINANT

VS.

ORDER NO. 1253 87

CEDAR CHEMICAL CORPORATION

RESPONDENT

ORDER OF DISMISSAL

The above styled cause came on this date for consideration and the Mississippi Commission on Natural Resources (the "Commission"), having heard and considered same, finds as follows:

1.

Based upon investigation by the Mississippi Department of Natural Resources (the "Department"), with respect to a surface impoundment (the "facility"), located at the Respondent's Vicksburg Plant, written Complaint dated July 9, 1986 was issued by the Commission charging that the Respondent had failed to comply with Parts 264 and 265 of the Mississippi Hazardous Waste Management Regulations ("regulations") applicable to closure and post-closure plans, groundwater assessment, and liability insurance, all with respect to the facility.

2.

The Respondent contends that the facility is not properly designated a hazardous waste facility subject to the regulations and based upon said contentions, Respondent has filed its motion to dismiss asserting lack of jurisdiction over the subject matter of the Complaint.

By order of the Commission dated August 26, 1986, (Order No. 1046-86), the Respondent was ordered to carry out certain activities with respect to the facility, subject to final disposition of Respondent's aforesaid motion to dismiss. The Department staff initially concluded that the Respondent's facility was a hazardous waste facility subject to the regulations on the basis of dinoseb manufacturing operations. The Commission conducted a hearing on the Respondent's motion on Tuesday, September 16, 1986, and ultimately concluded that pursuant to the "deminimis exception" to the Mixture Rule codified in the regulations at Section 261.3(a)(2)(iv)(D), the facility was not a hazardous waste facility pursuant to the regulations. At the request of the staff, however, the issue of whether the facility could be a hazardous waste facility by virtue of other past operations at the plant was left to subsequent investigation and hearing. The Department staff then subjected the sediment in the facility to another round of sampling and analysis to determine if the settlement contained any of the "characteristics" of hazardous waste listed in the regulations pursuant to the EP toxicity test. Again, the facility was found not to be a hazardous waste facility on that basis. The Department staff finally asserted in April, 1987, based upon an advisory opinion which it had sought from EPA, that from November, 1980 until October, 1982, the prior owner of the Vicksburg Chemical Plant had discharged to the facility "untreated process wastewater from production of toxaphene" and that it had generated "wastewater treatment sludge from the production of toxaphene" and contended that these two waste streams constituted hazardous waste pursuant to Section 261.32 of the regulations, "K098" and "K041", respectively.

4.

The Respondent again denied that it was a RCRA regulated facility on the basis of toxaphene manufacturing operations of a previous owner and maintained that it had never generated K098 or K041 as the same ...

("LBD") for the two respective waste streams and further that any toxaphene found in the facility was a product of deminimis leaks and spills of the finished product toxaphene from packaging and shipping points located on the plant site. Accordingly, according to the Respondent, the deminimis exception granted for dinoseb was equally applicable to the toxaphene process.

5.

Mississippi's regulations for identifying hazardous waste were taken in toto from the federal regulations identifying the same. In this proceeding, this Commission had the unique opportunity of hearing from two men directly responsible for the development of those regulations, Gary Dietrich, who in 1980 served as Deputy Director of the Environmental Protection Agency and was directly responsible for the development of the hazardous waste listings under 40 CFR Part 261, including K098 and K041, and Matthew A. Strauss, presently Chief of the Waste Characterization Branch of the EPA in Washington, D.C., and one of Mr. Dietrich's primary assistants in the development of the regulations. Dietrich testified that EPA was operating with insufficient data at the time that the K098 and K041 listings were made, at least insofar as the Vicksburg facility is concerned. He pointed out that the LBD for K098 and K041 identified these waste streams solely on the basis of information generated from Hercules, Inc., at its Brunswick, Georgia, plant. Hercules' manufacturing process was substantially different from the Vicksburg Plant's process from manufacture of toxaphene. Hercules in its toxaphene process produced an impure chemical, camphene, from approximately 1,500 - 2,000 tons of pine stumps every day. Vicksburg did not produce camphene but instead bought pure camphene. The resulting waste streams and methods of manufacturing were substantially different. The Listing Background Document states that the basis for the K098 and K041 listings is the heavy concentration of toxaphene in the process wastewater and in sludge resulting from treatment of the process wastewater. Up to 140 pounds of toxaphene each day was generated at the Hercules, Inc., Brunswick, Georgia

stream generated at the Vicksburg Plant which the testimony of Plant Chemist, Dr. Bill Gastrock, showed contained no detectible level of toxaphene. In short, not only were the processes different, the toxaphene process waste streams generated were virtually incomparable. The affidavit testimony of Matthew A. Strauss was to the effect that while indeed the processes were different, the technical definition of K098 and K041 would include the Vicksburg waste streams despite the fact that they contained little or no toxaphene. Dietrich testified that in his opinion the K098 and K041 listings would have specifically excluded the Vicksburg wastes had they had the data which he presently has access to. Succinctly, Dietrich testified that the Vicksburg waste streams were not the type K098 and K041 were intended to cover. It is important to note that the present owner of the Vicksburg facility never manufactured toxaphene and the previous owner ceased operations in October, 1982.

6.

Equally important, aside from the technical regulatory interpretation issues, is the environmental impact that closing the surface impoundment would have. The Industrial Wastewater Section of the Bureau of Pollution Control recommended in 1983 that the impoundment should be kept open "to treat runoff from the plant and act as an emergency spill control impoundment" under the plant's water discharge permit. Dietrich testified that in his opinion the impoundment does serve an important environmental function and the closure of the impoundment would cause that function to be lost. He explained that the entire plant site which operated for many years prior to the adoption of the present environmental regulations is contaminated and the impoundment serves as a collection point for rain water runoff from the plant site. Dietrich further suggested that in the event of a large chemical spill, the impoundment would serve as a catch basin and without it, such a spill would quickly leak to navigable streams and waters. Because of its affinity for soil and low solubility in water, the toxaphene presently contained in sediments on the bottom of the

impoundment is not likely to leach from the impoundment. Indeed, analyses from the groundwater monitoring wells encircling the pond reveal no toxaphene.

7.

It is also significant to know the position of the staff of the Bureau of Pollution Control. The staff (and the Respondent) have conceded that continued groundwater monitoring, NPDES discharge reports, periodic inspections and sampling of the impoundment for possible leaching and necessary groundwater cleanup will be required regardless of whether the facility is designated a hazardous waste storage facility.

8.

This Commission is empowered by the statutes of the State of Mississippi to determine what material is hazardous and what material is not. Mississippi Code Annotated Section 17-17-27(1) authorizes this Commission to make determinations on whether any waste or any combinations of wastes is hazardous. The only restriction on the state statute is a provision that those regulations shall be "equivalent" to the EPA's Rules and Regulations. The EPA authorization of state hazardous waste programs requires only that the state programs be "consistent with the federal program" and that the state program adopt a list of hazardous wastes and characteristics for identifying hazardous wastes which are "equivalent to those under 40 CFR Part 261". Mississippi has done this. It has identified K098 and K041 as hazardous wastes. It did so on the basis of the EPA's Listing Background Document which identifies K098 and K041 as process waste streams with heavy concentrations of toxaphene. This record is clear, however, that the former owner of the Vicksburg Chemical Plant did not generate between 1980 and 1982 a process waste stream from the manufacture of toxaphene with "heavy concentrations of toxaphene". On the contrary, the record indicates, and indeed so does the Listing Background Document, that those waste streams

assume that the K098 and K041 in the regulations does not cover the process waste streams generated at the Vicksburg Chemical Plant in its manufacture of toxaphene between 1980 and 1982. Thus, insofar as the regulations are concerned, those waste streams identified would be limited solely to the Hercules Plant at Brunswick, Georgia. Such a finding is not in our opinion either inconsistent with the federal program or not equivalent to it. While testimony has been received that a technical interpretation of the federal program would require the waste streams at Vicksburg to be covered by the regulations, we believe that interpretation to be faulty. It is obvious from the Listing Background Document and from the testimony of Mr. Dietrich, one of the authors of that document, and we therefore find, that the basis on which each of the listings was promulgated has no application to wastes that were generated at the Respondent's Vicksburg Plant. We also find that, as in the case of dinoseb, toxaphene losses at the Vicksburg Plant were exempt from regulation under deminimis exception to the Mixture Rule, MHWMR Section 261.3(a)(2)(iv)(D).

9.

A determination that the facility is not a hazardous waste storage facility pursuant to the regulation, does not remove it from the entire environmental regulatory scheme which this Commission is charged with the responsibility to enforce. On the contrary, groundwater monitoring has been required of this facility pursuant not only to the regulations, but also on the basis of the Clean Water Act. The Respondent continues to have a responsibility to sample and analyze groundwater monitoring wells that have been installed on the perimeter of the surface impoundment on a regular basis and to report the analytical results of such samples to the Mississippi Department of Natural Resources on a quarterly basis. In the event the Department should determine on the basis of such analytical results the corrective action is necessary to protect human health or the environment, the Department still maintains the power and indeed the duty to require the Respondent to implement

such corrective action as shall be reasonably required. The Respondent maintains a closure trust fund for the Vicksburg Plant, which the Respondent is willing to maintain intact, in order to provide financial assurance that the surface impoundment will eventually be closed when it is no longer needed for waste management, including collection of contaminated storm water runoff. Moreover, the company maintains the responsibility of maintaining the integrity of the containment dikes around the surface impoundment. This obligation exists under both the Clean Water Act and RCRA. Further, the company must continue to comply with all provisions of its NPDES permit as it pertains to the treatment and discharge of a fluid from the surface impoundment, including not only non-hazardous wastewater discharge to the surface impoundment from inorganic production operations at the plant, but also surface and storm water runoff received from the surface impoundment.

IT IS THEREFORE ORDERED that the motion to dismiss filed by the Respondent is granted. This Commission's Order No. 1046-86 is hereby and forthwith vacated. Order No. 1153-86 is incorporated herein by reference.

ORDERED AND ADJUDGED, this the 5th day of August, 1987, by the Mississippi Commission on Natural Resources.

MISSISSIPPI DEPARTMENT OF
NATURAL RESOURCES

BY: CHARLIE L. BEALOCK
EXECUTIVE DIRECTOR

ATTACHMENT 4

CONSTRUCTION PACKAGE

1) Construction Drawings
2) Construction Specifications
3) Construction Quality Control Specifications

CLOSURE/RETROFIT PLAN

SURFACE IMPOUNDMENT SYSTEM

VICKSBURG CHEMICAL DIVISION

VICKSBURG, MISSISSIPPI

CONSTRUCTION DRAWINGS

CLOSURE/RETROFIT PLAN
SURFACE IMPOUNDMENT SYSTEM
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

CONSTRUCTION SPECIFICATIONS

CLOSURE/RETROFIT PLAN
SURFACE IMPOUNDMENT SYSTEM
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

TABLE OF CONTENTS

	PAGE
1.0 CONSTRUCTION CONTROL	1-1
1.1 GENERAL	1-1
1.2 REGULATIONS	1-1
1.3 DESCRIPTION OF WORK	1-1
1.4 BID INFORMATION	1-2
1.4.1 Project Requirements	1-2
1.4.2 Submittals	1-8
1.4.3 Temporary Facilities	1-12
1.4.4 Measurement and Payment	1-15
2.0 SPECIAL PROVISIONS	2-1
2.1 APPLICABLE PUBLICATIONS	2-1
2.2 COMMENCEMENT AND COMPLETION OF WORK	2-1
2.3 AREA AVAILABLE TO CONTRACTOR	2-1
2.4 CONDUCT OF WORK	2-1
2.5 PLANT RULES AND REGULATIONS	2-2
2.6 CONTRACTOR FURNISHED SAFETY EQUIPMENT	2-2
2.7 INSPECTION AND TESTING	2-2
2.8 EXCEPTIONS	2-2
3.0 TECHNICAL SPECIFICATIONS	3-1
3.1 SITE PREPARATION	3-1
3.1.1 Preparation of Equipment Staging Area	3-1
3.1.2 Site Drainage	3-1
3.1.3 Clearing and Grubbing	3-1
3.1.4 Impoundment Operation Relocation	3-2
3.1.5 Impoundment System Dewatering	3-4
3.1.6 Removal of Impoundment Structures	3-5
3.2 SOLIDIFICATION ACTIVITIES	3-5
3.2.1 Materials	3-5
3.2.2 Procedure	3-6
3.3 RELOCATION OF SOLIDIFIED MATERIAL	3-7

TABLE OF CONTENTS
(Continued)

	PAGE
3.4 SWCA FOUNDATION PREPARATION	3-7
3.4.1 SWCA Dikes	3-8
3.4.2 SWCA Bottom	3-8
3.5 BOTTOM AND SIDE LINER SYSTEM	3-10
3.5.1 Synthetic Liner System	3-10
3.5.2 Leachate Detection/Collection System	3-14
3.5.3 Leachate Detection/Collection System Cleanout Pipe	3-18
3.5.4 Leachate Detection/Collection System Manholes	3-19
3.6 PLACEMENT OF SOLIDIFIED MATERIAL INTO SWCA	3-20
3.6.1 Access Roads and Ramps	3-20
3.6.2 Placement of Solidified Material	3-22
3.7 SWCA FINAL COVER SYSTEM	3-23
3.7.1 Grading	3-23
3.7.2 Gas Collecting/Venting System	3-23
3.7.3 Clay Liner	3-25
3.7.4 Synthetic Liner	3-26
3.7.5 Synthetic Drainage Layer	3-26
3.7.6 Topsoil	3-27
3.7.7 Erosion Protection Material	3-28
3.8 IMPOUNDMENT RETROFIT AREA	3-28
3.8.1 Foundation and Dike Preparation	3-28
3.8.2 Structural Fill	3-29
3.8.3 Bottom Gas Relief System	3-29
3.8.4 Synthetic Liner System	3-29
3.8.5 Leakage Detection/Removal System	3-29
3.8.6 Leakage Detection/Removal System Sump	3-29
3.9 PERMANENT DRAINAGE DITCHES	3-29
3.10 REVEGETATION AND RECLAMATION	3-30
3.11 REINFORCED CONCRETE WORK	3-31

CONSTRUCTION SPECIFICATIONS

1.0 CONSTRUCTION CONTROL

1.1 GENERAL

As used in this specification, or as used in any standard specification referred to herein, the words "or equal" shall mean only those brand names and numbers which have been approved by VCD and incorporated into this contract prior to the time the contractor starts the performance of the work. The contractor shall propose no other brand names or numbers during the performance of the work, except as set forth in this document. Any provisions of these specifications which are in conflict with Provisions of VCD standard terms will be overrode.

1.2 REGULATIONS

All work shall conform to the codes and regulations of the statutory authorities having jurisdiction and shall comply with Federal Occupational Safety and Health Administration (OSHA) standards.

In the event that any of the requirements of the specifications are in violation of any of the applicable national, state, or local codes, such code requirements shall prevail. However, if any of the requirements of this specification call for a higher quality of materials or workmanship than the applicable codes, the requirements of this specification shall prevail.

1.3 DESCRIPTION OF WORK

Vicksburg Chemical Division (VCD), located in Vicksburg, Mississippi presently operates an impoundment system as part of its rainwater treatment system. VCD has elected to remove the sediment from the impoundments and place the sediment in a Solidified Waste Consolidation Area (SWCA). The SWCA and the impoundments will have double liner systems.

The impoundment system covers a total area of approximately 4 acres and is rectangular in shape. The dimensions of each impoundment are shown in the

Construction Drawings. The closure must provide removal of free liquids, solidification of sediment, placement of a final cover and post-closure maintenance. The retrofit must provide for the upgrade of the impoundments with a double liner system.

The work covered by this Specification consists of all labor, supervision, equipment, materials, and supplies for the Impoundment System Closure/Retrofit.

Work is tentatively scheduled to begin in Autumn 1988 and the total project is scheduled to be completed as per the Construction Schedule (Figure 5). The schematic sequencing of anticipated construction activities is attached as Figure 5.

1.4 BID INFORMATION

1.4.1 Project Requirements

Items Furnished by Contractor

Contractor shall be fully responsible for all materials and equipment which he has furnished, and shall furnish necessary replacements at any time prior to expiration of the post-closure.

Offsite Storage

Off-site storage arrangements shall be acceptable to VCD for all materials and equipment not incorporated into the work but included in Applications for Payment. Such off-site storage arrangements shall be presented in writing, and shall afford adequate and satisfactory security and protection. Off-site storage facilities shall be accessible to VCD.

Equivalent Materials and Equipment

Whenever a material or article is specified or described by using the name of a proprietary product or the name of a particular manufacturer or vendor, the specified item mentioned shall be understood as establishing the type, function, and quality desired. Other manufacturer's products will be accepted

provided sufficient information is submitted to allow VCD to determine that the products proposed are equivalent to those named. Such items shall be submitted for review by VCD.

Whenever the names of proprietary products or the names of particular manufacturers or vendors are used, it shall be understood that the words "or equal" following the enumeration, if not specifically stated, are implied.

Requests for review of equivalency will not be accepted from anyone except Contractor, and such requests will not be considered until after the contract has been awarded.

Preparation for Shipment

All materials shall be suitably packaged to facilitate handling and protect against damage during transit and storage. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. All painted surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of VCD.

Each item, package, or bundle or material shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment.

Easements and Rights-of-Way

All work is on private property. The easements and rights-of-way for the work will be provided by the limits indicated on the drawings, and shall use due care in placing construction tools, equipment, excavated materials, and pipeline materials and supplied, so as to cause the least possible damage to property and interference with traffic.

Work Within Rights-of-Way

Permits shall be obtained by VCD. All work performed and all operations of Contractor, his employees or Subcontractors, within the limits of railroad rights-of-way, shall be in conformity with the requirements and be under the control (through VCD) of the railroad authority owning, or having jurisdiction over and control of, the right-of-way in each case.

Notices to Owners and Authorities

Contractor shall notify owners of adjacent property and utilities when the work may affect them.

When it is necessary to temporarily deny access by owner or tenants to their property, or when any utility service connection must be interrupted, Contractor shall give notices sufficiently in advance to enable the affected persons to provide for their needs. Notices will conform to any applicable local ordinance and, whether delivered orally or in writing, will include appropriate information concerning the interruption and instructions on how to limit their inconvenience.

Utilities and other concerned agencies shall be contacted at least 24 hours prior to excavating near underground utilities or pole lines.

Lines and Grades

All work shall be done to the lines, grades, and elevations shown on the drawings.

Basic horizontal and vertical control points will be established or designated by VCD. These points shall be used as datum for the work. All additional survey, layout, and measurement work shall be performed by Contractor as a part of the work.

Contractor shall provide an experienced instrument man, competent assistants, and such instruments, tools, stakes, and other materials required to complete the survey, layout and measurement work. In addition, Contractor shall furnish, without charge, competent men from this force and such tools, stakes, and other materials as VCD may require in establishing or designating control points, or in checking survey, layout, and measurement work performed by Contractor.

Contractor shall keep VCD informed, a reasonable time in advance, of the times and places at which he wished to do work, so that horizontal and vertical control points may be established and any checking deemed necessary by VCD may be done with minimum inconvenience to VCD and minimum delay to Contractor.

Contractor shall remove and reconstruct work which is improperly located.

Unfavorable Construction Conditions

During unfavorable weather, wet ground, or other unsuitable construction conditions, the Contractor shall confine his operations to work which will not be affected adversely by such conditions. No portion of the work shall be constructed under conditions which would affect adversely the quality or efficiency thereof, unless special means or precautions are taken by Contractor to perform the work in a proper and satisfactory manner.

Cutting and Patching

As provided in General Conditions, Contractor shall perform all cutting and patching required for the work, and as may be necessary in connection with uncovering work for inspection or for the correction of defective work.

Contractor shall perform all cutting and patching required for the installation of improperly timed work, to remove samples of installed materials for testing.

Except when the cutting or removal or existing construction is specified or indicated, Contractor shall not undertake any cutting or demolition which may affect the structural stability of the work without VCD's concurrence.

Contractor shall provide all shoring, bracing, supports, and protective devices necessary to safeguard all work during cutting and patching operations.

Materials shall be cut and removed to the extent indicated on the drawings or as required to complete the work. Materials shall be removed in a careful manner with no damage to adjacent facilities or materials. Materials which are not salvageable shall be removed from the site by Contractor. Materials belong to VCD unless otherwise stated in writing.

All work and existing facilities affected by cutting operations shall be restored with new materials, or with salvaged materials acceptable to VCD, to

obtain a finished installation with the strength, appearance, and functional capacity required. If necessary, entire surfaces shall be patched and refinished.

Cleaning Up

Contractor shall keep the premises free at all times from accumulations of waste materials and rubbish. Contractors shall provide adequate trash receptacles about the site, and shall promptly empty the containers when filled.

Construction materials, such as concrete forms and scaffolding shall be neatly stacked by Contractor when not in use. Contractor shall promptly remove splattered concrete, asphalt, oil, paint, corrosive liquids and cleaning solutions from surfaces to prevent marring or other damage.

Wastes resulting from or produced by construction activities and not indigenous to the site shall not be buried or burned on the site or disposed of into storm drains, sanitary sewers, streams, or waterways. All wastes shall be removed from the site and disposed of in a manner complying with local ordinances and anti-pollution laws.

Adequate cleanup will be a condition for recommendation of progress payment applications.

Reference Standards

Reference to the standards of any technical society, organization, or association, or to codes of local or state authorities, shall mean the latest standard, code, specification, or tentative standard adopted and published at the date of receipt of bids, unless specifically stated otherwise.

Preconstruction Conference

Prior to the commencement of work at the site, a preconstruction conference will be held at a mutually agreed time and place. The conference shall be attended by:

Contractor and his superintendent

Principal Subcontractor(s)

Representatives of principal suppliers and manufacturers as appropriate

VCD and his Resident Project Representative

Governmental representatives as appropriate

Others as requested by Contractor or VCD

Unless previously submitted to VCD, Contractor shall bring to the conference a tentative schedule for each of the following:

Progress

Procurement

Values for progress payment purposes

Shop Drawings and other submittals.

The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda will include:

Contractor's tentative schedules

Transmittal, review, and distribution of Contractor's submittals

Processing applications for payments

Maintaining record documents

Critical Work sequencing

Field decisions and Change Orders

Use of premises, office and storage areas, security, housekeeping, and Owner's needs

Major equipment deliveries and priorities

Contractor's assignments for safety and first aid.

VCD will preside at the conference and will arrange for keeping and distributing the minutes to all persons in attendance.

Progress Meetings

Contractor shall schedule and hold regular progress meetings at least monthly and at other times as requested by VCD or required by progress of the work. Contractor, VCD, and all Subcontractors active on the site shall be represented at each meeting. Contractor may at his discretion request attendance by representatives of his suppliers, manufacturers, and other Subcontractors.

Contractor shall preside at the meetings and provide for keeping and distributing of the minutes. The purpose of the meetings will be to review the progress of the work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop.

1.4.2 Submittals

Construction Schedule

Before work is started, Contractor for each phase of the contract shall submit to VCD for review a schedule of the proposed construction operations. The construction schedule shall indicate the sequence of the work and time of starting and completion of each part.

At least every 30 days the schedule shall be revised as necessary to reflect changes in the progress of the work.

VCD may require Contractor to add to his plant, equipment, or construction forces, as well as increase the working hours, if operations fall behind schedule at any time during the construction period.

Schedule of Payments

Within 30 days after award of contract, Contractor shall furnish to VCD a schedule of estimated monthly payments. The schedule shall be revised and resubmitted each time an application for payment varies more than 10 per cent from the estimated payment schedule.

Survey Data

All field books, notes, and other data developed by Contractor in performing surveys required as part of the work shall be available to VCD for examination throughout the construction period. All such data shall be submitted to VCD with the other documentation required for final acceptance of the work.

Shop Drawings and Engineering Data

Engineering data covering all equipment and fabricated materials which will become a permanent part of the work under this contract shall be submitted to VCD for review. These data shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and operation of component materials and devices; performance characteristics; and dimensions needed for installation and correlation with other materials and equipment.

All submittals regardless of origin, shall be stamped with the approval of Contractor and identified with the name and number of this contract, Contractor's name, and references to applicable specification paragraphs and Construction Drawings. Each submittal shall indicate the intended use of the item which shall be clearly identified. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.

Contractor's stamp of approval is a representation to VCD that Contractor accepts full responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, and that he has reviewed or coordinated each submittal with the requirements of the work and the Contract Documents.

All deviations from the Contract Documents shall be identified on each submittal and shall be tabulated in Contractor's letter of transmittal. Such submittals shall, as pertinent to the deviation, indicate essential details of all changes proposed by Contractor (including modifications to other facilities that may be a result of the deviation).

Contractor shall accept full responsibility for the completeness of each submission, and, in the case of a resubmission, shall verify that all

exceptions previously noted by VCD have been taken into account. In the event that more than one resubmission is required because of failure of Contractor to account for exceptions previously noted, Contractor shall reimburse VCD for review of the additional resubmissions.

Resubmittals shall be made within 30 days of the date of the letter returning the material to be modified or corrected, unless within 14 days the Contractor submits an acceptable request for an extension of the stipulated time period, listing the reasons the resubmittal cannot be completed within that time.

Any need for more than one resubmission, or any other delay in obtaining VCD's review of submittals, will not entitle Contractor to extension of the Contract Time unless delay of the work is directly caused by a change in the work authorized by a Change Order or by failure of VCD to return any submittal within 21 days after its receipt in VCD's office.

Contractor's letter of resubmittal shall list the date of his original submittal letter, the date of VCD's letter returning the submittal, and the dates of submission and return of any previous resubmittals.

VCD's review of drawings and data submitted by Contractor will cover only general conformity to the drawings and specifications, external connections, and dimensions which affect the layout. VCD's review does not indicate a thorough review of all dimensions, quantities, and details of the material, equipment, device, or item shown. VCD's review of submittals shall not relieve Contractor from responsibility for errors, omissions, or deviations, nor responsibility for compliance with the Contract Documents.

Five copies (or one reproducible copy) of each drawing and necessary data shall be submitted to VCD. VCD will not accept submittals from anyone but Contractor. Submittals shall be consecutively numbered in direct sequences of submittal and without division by subcontracts or trades. Resubmittals shall bear the number of the first submittal followed by a letter (A, B, etc.,) to indicate the sequence of the resubmittal.

When the drawings and data are returned marked NOT ACCEPTABLE or RETURNED FOR CORRECTION, the corrections shall be made as noted thereon and as instructed by VCD and five corrected copies (or one corrected reproducible copy) resubmitted.

When corrected copies are resubmitted, Contractor shall in writing direct specific attention to all revisions and shall list separately any revisions make other than those called for by Engineer on previous submissions.

When drawings and data are returned marked EXCEPTIONS NOTED, NO EXCEPTIONS NOTED, or RECORD COPY, no additional copies need be furnished.

Layout Data

Contractor shall keep neat and legible notes of measurements and calculations made by him in connection with the layout of the work. Copies of such data shall be furnished to the Resident Project Representative for use in checking Contractor's layout as provided under Lines and Grades. All such data considered of value to VCD will be transmitted to VCD with other records upon completion of the work.

Construction Photographs

Contractor shall be responsible for the production of construction photographs as provided herein. VCD shall designate the subject of each photograph.

Six photographs shall be taken before the commencement of work and promptly submitted to VCD. The same views shall be rephotographed upon completion of all construction activities and submitted with Contractor's application for final payment. Three additional photographs shall be made each month throughout the progress of the work at such times as requested by VCD, and submitted with Contractor's application for progress payment.

All photographs shall be produced by a competent photographer, and shall be color photographs of commercial quality. All negatives and two 4 X 5 prints of each view shall be submitted. Negatives shall be identified with description of view and date. Prints shall be mounted on linen with flap for

binding or enclosed in clear plastic binders, and marked with the name and number of the contract, name of Contractor, description and location of view, and date photographed.

VCD shall retain one copies of each photograph and provide one copy to VCD's project representative.

Operation and Maintenance Plan

Contractor shall be responsible for startup, operation and maintenance (O&M) of all units incorporated in this document. The Contractor will submit along with other approvals previously mentioned a plan for startup operation and maintenance and backup procedures in case of failure. The O&M plan should be along the lines of the manufacturers guidelines and should incorporate his services into the O&M plan.

1.4.3 Temporary Facilities

Office at Site of Work

During the performance of this contract, Contractor shall maintain a suitable office at or near the site of the work which shall be the headquarters of his representative authorized to receive drawings, instructions, or other communication or articles. Any communication given to the said representative or delivered at Contractor's office at the site of the work in his absence shall be deemed to have been delivered to Contractor.

Copies of the drawings, specifications, and other contract documents shall be kept at Contractor's office at the site of the work and available for use at all times.

Water

All water required for and in connection with the work to be performed and for any specified tests of piping, equipment, devices, etc., for inundation or settling of backfill material or for any other use as may be required for proper completion of the work shall be provided by and at the expense of Contractor. No separate payment for water used or required will be made and all costs in connection therewith shall be included in the Bid.

Power

Contractor shall provide all power for heating, lighting, operation of Contractor's plant or equipment, or for any other use by Contractor. Temporary heat and lighting shall be maintained until the work is accepted.

Telephone Service

Contractor shall make all necessary arrangements and pay all installation charges for telephone lines in his offices at the site. The Contractor shall provide a separate telephone line in the office of the VCD Representative. Contractor shall provide all telephone instruments.

The telephone service and instrument in the office of the VCD Representative shall be touch-tone system if locally available.

The telephone service shall be in the name of VCD, and all charges after installation shall be billed to and paid by VCD.

Sanitary Facilities

Contractor shall furnish temporary sanitary facilities at the site, as provided herein, for the needs of all construction workers and others performing work or furnishing services on the Project.

Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least one toilet will be furnished for each 20 men. Contractor shall enforce the use of such sanitary facilities by all personnel at the site.

Maintenance of Traffic

Contractor shall conduct this work to interfere as little as possible with plant travel, whether vehicular or pedestrian. Whenever it is necessary to cross, obstruct, or close roads, driveways and walks, whether public or private, Contractor shall provide and maintain suitable and safe bridges, detours, or other temporary expedients for the accommodation of plant travel, and shall give reasonable notice to plant personnel before interfering with them.

Barricades

All open trenches and other excavations shall have suitable barricades, signs, and lights to provide adequate protection to personnel. Obstructions such as material piles and equipment shall be provided with similar warning signs and lights.

Security

Contractor shall be responsible for protection of the site, and all work, materials, equipment, and existing facilities thereon, against vandals and other unauthorized persons.

No claim shall be made against VCD by reason of act of an employee or trespasser, and Contractor shall make good all damage to property resulting from this failure to provide security measures as specified.

Access Roads

Contractor shall establish and maintain temporary access roads, as necessary, to various parts of the site as required to complete the Project. Such roads shall be available for the use of all others performing work or furnishing services in connection with the Project.

Noise Control

Contractor shall take reasonable measures to avoid unnecessary noise. Such measures shall be appropriate for the normal ambient sound levels in the area during working hours. All construction machinery and vehicles shall be equipped with practical sound muffling devices, and operated in a manner to cause the least noise consistent with efficient performance of the work.

Dust Control

Contractor shall take reasonable measures to prevent unnecessary dust. Earth surfaces subject to dusting shall be kept moist with water or by application of another approved dust suppresent. Dusty materials in piles or in transit shall be covered when practicable to prevent blowing.

Buildings or operating facilities which may be affected adversely by dust shall be adequately protected from dust. Existing or new machinery, motors,

instrument panels or similar equipment, shall be protected by suitable dust screens. Proper ventilation shall be included with dust screens.

Pollution Control

Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, contaminated stormwater/runoff, debris and other substances resulting from construction activities. No sanitary wastes will be permitted to enter any drain or watercourse other than sanitary sewers. No sediment, debris or other substance will be permitted to enter sanitary sewers and reasonable measures will be taken to prevent such materials from entering any drain or watercourse.

1.4.4 Measurement and Payment

Scope

This section covers methods of measurement and payment for items of work under this contract.

General

The total Bid Price for each section of the contract shall cover all work required by the Contract Documents. All costs in connection with the proper and successful completion of the work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction plants, equipment and tools; and performing all necessary labor and supervision to fully complete the work, shall be included in the unit and lump sum prices bid. All work not specifically set forth as a pay item in the Bid Form at the end of this section shall be considered a subsidiary obligation of Contractor and all costs in connection therewith shall be included in the prices bid.

Estimated Quantities

All estimated quantities stipulated in the Bid Form or other Contract Documents are approximate and are to be used only (a) as a basis for estimating the probable cost of the work and (b) for the purpose of comparing the bids submitted for the work. The actual amounts of work done and materials furnished under unit price items may differ from the estimated quantities. The basis of payment of work and materials will be the actual

amount of work done and materials furnished. Contractor agrees that he will make no claim for damages, anticipated profits, or otherwise on account of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts therefore.

Mobilization

Item 1. Mobilization will be paid for at the lump sum prices stipulated in the Bid Form. The sum allowed for mobilization is intended to include and cover all work for and in connection with:

a. The assembly and transportation to the site of all construction plant equipment, operational materials and supplies;

b. Preparation of plant, stockpile, and equipment storage areas, as required;

c. Equipment maintenance facilities, as required;

d. Temporary office facilities;

e. Bonds;

f. Insurance;

g. Licenses, permits, and certificates;

h. Sanitation facilities;

i. Water supply services;

j. Survey costs;

k. Safety provisions required by the US Environmental Protection Agency and other regulatory agencies;

l. Fire protection;

m. All other work not stipulated as subsidiary work or paid for directly under other items of the Bid Form.

n. Removal of all equipment, construction materials, and supplies from the work area at the completion of construction activities.

Except for bonds, insurance, licenses and other items which the Contractor can clearly demonstrate as being initial job costs, the amount stipulated for Item 1 shall be prorated throughout the Contract period.

Clearing and Grubbing

Item 2. Clearing and grubbing will be paid for at the Bid Form unit price per acre of land actually cleared, grubbed and stripped. The calculated areas will be based on surveys of the traverse of the disturbed areas including dikes, channels, borrow areas, and disposal sites.

Unnecessary clearing will not be permitted. The Contractor will be paid only for those areas where construction is indicated and over borrow areas if needed.

The Bid Form unit price shall include all costs of clearing, grubbing, stripping, excavating, hauling, handling, stockpiling of topsoil, and disposal of unsuitable or excess embankment materials in conformity with the drawings and specified requirements therefor.

The unit price shall include the cost of surveys to be performed by the Contractor. Any dewatering which may be required in conjunction with clearing, grubbing, and stripping shall be considered a subsidiary obligation and the Contractor will receive no additional compensation therefore.

Site Drainage

Item 3. This item includes construction of temporary drainage swales to prevent runon of rainwater into the construction site. This is a lump sum item prorated over the contract period.

Preparation of Equipment Storage Area

Item 4. This item includes construction of the equipment staging area in accordance with the Construction Drawings. This area shall be constructed to the elevations and grades shown utilizing, as much as possible, cut from the area as fill for other places within the area. This is a lump sum item to be paid at completion of the work.

Impoundment Operation Relocation

Item 5. Construction and subsequent removal of a sheet pile wall to prevent water from flowing between impoundments A and B. The pump station will be

relocated from its present position to an area shown on the Construction Drawings. These are lump sum items to be paid on a percentage complete basis.

Installation of High Density Polyethylene (HDPE) culverts within the dikes and a fibercast and HDPE influent line to impoundment C. This item will be paid by the unit price on a per foot basis installed.

Impoundment Dewatering

Item 6. Removal of water from the impoundment to be retrofitted to the operational impoundment. The amount of water varies with rainfall. An upper amount based upon the present capacity of the impoundments is about 4 million gallons. This item will be lump sum prorated over the contract period.

Removal of Structures

Item 7. This item includes removal of structures which could interfere with closure/retrofit activities. This item also includes replacement of the portion of the fibercast influent line which extends into impoundment A with HDPE pipe. This is a lump sum item and will be paid on a percentage complete basis.

Solidification Activities

Item 8. This item includes solidification of the sediment and subsoils with sediment-like consistency. This item will be paid by the unit price per cubic yard solidified.

Relocation of Solidified Material

Item 9. This item includes removal of the solidified material from the SWCA construction area to the northern portion of impoundment A. This item will be paid by the unit price per cubic yard material removed and verified by section.

Construction and Closure of the SWCA

Item 10. This item includes elements of the construction and closure of the SWCA:

- Foundations and dikes, sediment placement, clay liner, and topsoil. These will be paid by unit price on the cubic yard sectioned in place.

- Placement of HDPE liners, drainage nets, geotextiles, and erosion protection geomats. The final products will be measured by transverse or other conventional means and the unit price paid by the square foot.

- Placement of LCS/LDS trench and piping, LCS/LDS cleanout pipes, LCS/LDS manholes, access roads, cover system drainage layer piping, and gas venting system. These will be lump sum and paid on a percentage completion basis.

Retrofit of the Impoundments

Item 11. This item includes elements of the retrofit of the impoundments to include:

- Preparation of the formation and dikes. These will be paid by unit price on the cubic yards sectioned in place.

- Placement of HDPE liners, geotextiles and drainage nets. The final products will be measured by transverse or other conventional means and the unit price paid by the square foot.

- Placement of LD/RS trenches and piping, LD/RS sump and manhole to include construction and removal of sheet pile wall and placement of the gas relief system. These are all lump sum and will be paid on a percentage completed basis.

Construction of Drainage Ditches

Item 12. This item includes construction of permanent site drainage ditches as shown on the Construction Drawings. This item is lump sum and will paid on a percentage completed basis.

Revegetation

Item 13. This item includes placement of seed and fertilizer in all areas in which vegetation is required (SWCA) and other areas which have been stripped of vegetation by construction activities. This item will be paid for by unit price per acre of land actually vegetated. The calculated areas will be based on surveys of the traverse of the vegetated areas. The unit price shall include the cost of surveys to be performed by the Contractor.

Health and Safety

Item 14. This item includes the necessary items to maintain the health and safety of all individuals provided by the Contractor. The lump sum item will be prorated over the contract period unless the Contractor can clearly demonstrate costs at a particular time.

Decontamination Procedures

Item 15. This item includes the necessary items and personnel to maintain the level of decontamination as described in the closure/retrofit plan. The lump sum item will be prorated over the contract period unless the Contractor can clearly demonstrate costs at a particular time.

BID FORM
IMPOUNDMENT SYSTEM CLOSURE/RETROFIT
CEDAR CHEMICAL CORPORATION
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

ITEM NO.	DESCRIPTION	QUANTITY(1)	UNIT	UNIT PRICE ($)	ITEM TOTAL ($)
1.	Mobilization		Lump Sum	_____	_____
2.	Clearing and Grubbing	2	Acre	_____	_____
3.	Site Drainage		Lump Sum	_____	_____
4.	Preparation of Equipment Storage Area		Lump Sum	_____	_____
5.	Impoundment Operation Relocation				
	a. Sheet Pile		Lump Sum	_____	_____
	b. HDPE Culverts (18" w/value)	200	Foot	_____	_____
	c. Influent Line (Fibercast)	150	Foot	_____	_____
	d. Relocate Pump Station		Lump Sum	_____	_____
6.	Impoundment Dewatering		Lump Sum	_____	_____
7.	Removal of Structures		Lump Sum	_____	_____
8.	Solidification Activities				
	a. Sediment	12,500	Cubic Yards	_____	_____
	b. Underlying Soil	2,500	Cubic Yards	_____	_____
9.	Relocation of Solidified Material	3,000	Cubic Yards	_____	_____
10.	Construction and Closure of the SWCA				
	a. Foundation and Dikes	5,500	Cubic Yards	_____	_____
	b. 60 mil HDPE Liner	135,000	Square Feet	_____	_____
	c. Drainage Nets	135,000	Square Feet	_____	_____
	d. Geotextiles	180,000	Square Feet	_____	_____
	e. LCS/LDS Trench (4" HDPE pipe)		Lump Sum	_____	_____
	f. LCS/LDS Cleanout Pipe		Lump Sum	_____	_____
	g. LCS/LDS Manholes		Lump Sum	_____	_____
	h. Access Ramps		Lump Sum	_____	_____
	i. Sediment Placement	18,000	Cubic Yards	_____	_____

BID FORM (Continued)
IMPOUNDMENT SYSTEM CLOSURE/RETROFIT
CEDAR CHEMICAL CORPORATION
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

ITEM NO.	DESCRIPTION	QUANTITY(1)	UNIT	UNIT PRICE ($)	ITEM TOTAL ($)
	j. Gas Venting System		Lump Sum	_____	_____
	k. Clay Liner	1,700	Cubic Yards	_____	_____
	l. Topsoil	2,500	Cubic Yards	_____	_____
	m. Erosion Protection	40,000	Square Feet	_____	_____
	n. Drainage Layer Prep. (4" PVC pipe)		Lump Sum	_____	_____
11.	Retrofit of the Impoundments				
	a. Foundation and Dike Preparation	3,500	Cubic Yards	_____	_____
	b. 60 mil HDPE Liner	300,000	Square Feet	_____	_____
	c. Drainage Nets	300,000	Square Feet	_____	_____
	d. LD/RS Trench and Piping (4" HDPE and 6" HDPE)		Lump Sum	_____	_____
	e. LD/RS Sump and Manhole (w/sheet piles)		Lump Sum	_____	_____
	f. Gas Relief System		Lump Sum	_____	_____
12.	Construction of Permanent Drainage Ditches and Rip Rap		Lump Sum	_____	_____
13.	Revegetation	2	Acre	_____	_____
14.	Health and Safety		Lump Sum	_____	_____
15.	Decontamination Procedures		Lump Sum	_____	_____
			TOTAL BID	_____	

NOTE: (1) Contractor shall provide their own quantity estimates based upon the Construction Drawings. The quantities indicated here are approximate and are for bid purposes only.

2.0 SPECIAL PROVISIONS

2.1 APPLICABLE PUBLICATIONS

All work performed and all materials furnished shall conform to the codes and regulations of the Statutory Authorities having jurisdiction, including the Occupational Safety and Health Administration (OSHA), and shall be in accordance with this Specification and with the Construction Drawings, Standard Specifications and Codes listed hereinafter.

2.2 COMMENCEMENT AND COMPLETION OF WORK

The commencement and completion of work follows:

- Upon receipt of VCD's Notice of Contract Award, the Contractor shall commence immediately all work such as the preparation of working drawings, ordering of materials and equipment etc., excluding site work on VCD's premises. The Contractor shall commence site work on the date specified in VCD's written Notice to Proceed with Field Work and shall complete the various portions of the work within the number of calendar days set forth in the Construction Schedule. Completion of work for each of the intermediate completion requirements is as binding a contractual obligation as is the final completion date.

- The Contractor shall be required to work through inclement weather as best practices permit to keep the job on schedule. The Contractor shall be required to add men and equipment and work such hours as to complete the job on schedule.

- VCD anticipates that field work will start after approval by the regulatory agency (possibly Autumn 1988).

- All work under this specification shall be completed by the Contractor as soon as due diligence and good practice will permit but in no event later than the date proposed by VCD.

2.3 AREA AVAILABLE TO CONTRACTOR

Contractor shall confine his storage and other activities related to the work to the areas designated by VCD's Representative. Contractor shall maintain these areas in a clean, orderly, and safe manner. Contractor shall cooperate with other contractors and plant forces in the area.

2.4 CONDUCT OF WORK

The Contractor is advised that this work is one part of a project being undertaken by VCD and that other contractors or plant personnel may be working

on and about the site during the time the Contractor is performing his work. The Contractor shall cooperate fully with VCD's Representative in scheduling his work so as to avoid conflict with the work of other contractors.

2.5 PLANT RULES AND REGULATIONS

The Contractor and his employees shall comply with all rules and regulations concerning safety, protection of facilities, fire prevention, identification and general conduct established by VCD. Rules and Regulations will be made available to the Contractor at the plant site.

2.6 CONTRACTOR FURNISHED SAFETY EQUIPMENT

The Contractor shall maintain personnel protective equipment for his crews and any subcontractors at all times within the plant confines. Respirators, hard-hats, safety glasses, and construction grade foot wear are required items. The Contractor will be responsible for providing VCD with a Health and Safety Plan for the proposed work before construction begins.

2.7 INSPECTION AND TESTING

In addition to any tests and inspections (stated in the technical provisions and standard specification) to be performed by the Contractor under the contract, VCD reserves the right to conduct additional tests and inspections should VCD deem them necessary. VCD will retain and bear the costs of a testing laboratory to conduct such additional tests and inspections. The Contractor shall accept these test results. The Contractor shall cooperate with the laboratory technicians in making such tests.

2.8 EXCEPTIONS

The Contractor will take exception to any item of this specification (and include in his quotations thereto) that may, in his opinion, prevent him from completing the work in the time allowed.

3.0 TECHNICAL SPECIFICATIONS

3.1 SITE PREPARATION

Site preparation shall consist of the following:

- Preparation of Equipment Staging Area (Section 3.1.1),
- Site drainage (Section 3.1.2),
- Clearing and Grubbing (Section 3.1.3),
- Impoundment Operation Relocation (Section 3.1.4),
- Impoundment Dewatering (Section 3.1.5), and
- Removal of Impoundment Structures (Section 3.1.6).

3.1.1 Preparation of Equipment Staging Area

Before mobilization of all equipment to the site, the Contractor shall prepare the equipment staging area in accordance with the Construction Drawings. The Contractor will attempt to cut and fill to bring the area to grade. Compaction of the area will be at the discretion of the Contractor but, as a minimum, shall be such to sufficiently handle the loads of equipment.

3.1.2 Site Drainage

The Contractor shall construct, as necessary, temporary drainage swales to prevent rainwater runon from entering the site and to prevent rainwater runoff from leaving the impoundment system area.

Swales shall be tied to existing natural drainages to provide a smooth transition of surface water runoff around the closure area during construction. The outside slope of the swales shall be fertilized and seeded in accordance with the Specifications. Topsoil from the ditch excavation shall be stockpiled and reused to revegetate the completed ditch. Excess soil from the excavation shall be stockpiled and utilized for future fill placement. A typical temporary drainage swale is shown in the Construction Drawings.

3.1.3 Clearing and Grubbing

All debris and vegetation, including existing trees, stumps and large roots, concrete, fallen timbers, grasses, etc. shall be removed in areas within and proximate to earthwork construction. All materials from clearing and grubbing

shall be removed to a designated on-site area and disposed of in accordance with local and state regulations. Large depressions resulting from clearing and grubbing shall be filled with compacted, clean soils (i.e., free from foreign matter and other deleterious material which may be a hindrance to grading).

3.1.4 Impoundment Operation Relocation

The impoundment system is vital to continuing operations of the plant. Therefore, the impoundment system is to be kept operational during closure/retrofit activities. To accomplish this, a new influent line will be routed to impoundment C and pipes interconnecting the impoundments will be placed.

The gap in the dike at the south end of the system will be closed to prevent water from entering through the gap. This will be accomplished by the use of sheet piling driven into the gap. The sheet piles shall be driven at a location such that the wall will not interfere with dike construction. The sheet piles shall be of the interlocking variety, constructed of ASTM A 328 steel, and free of cuts, holes, warps, or any other defects that would allow the through-flow of water. The piles shall be driven to a depth sufficient to prevent overturning or pullout of the piles by the hydrostatic water pressure. The method and depth of driving shall be chosen by the Contractor.

Sheet piles shall be driven with hammers adequate to drive the piles to the required depths in satisfactory condition. Sheet piles shall be driven with approved vibratory hammers or impact hammers. If chosen, the piles shall be driven with an impact hammer developing an energy of not less than 1 foot-pound for each pound of weight driven. The minimum energy shall be developed at each full stroke of the piston. Total energy developed by the hammer shall be no less than 15,000 pounds per blow. If vibratory methods are chosen, the Contractor shall present the specifications for driving to VCD prior to initiation of driving operation. To maintain satisfactory alignment, sheet piles shall be driven in increments of penetration necessary to prevent distortion, twisting out of position or pulling apart at interlocks.

After the sheet piles are driven and impoundment A is dewatered, the sheet pile wall will be inspected for the water leaks. If water leaks occur, the Contractor shall seal the leaks with bentonite or other accepted sealing method to provide a wall that is as watertight as possible.

The sheet piles shall be removed in such a manner as to not compromise the integrity of the dike or other structures in the vicinity. The method of removal shall be at the discretion of the Contractor and shall be approved by VCD prior to removal.

HDPE pipes will be placed in the dikes between the impoundments before dewatering operations are initiated. The pipes are to consist of solid-wall HDPE plastic piping of eighteen (18) inch inside diameter (SDR 15.5) and shall be constructed of HDPE plastic resin compound manufactured in accordance with ASTM D1248 (Type III, C, 5, P34) (PPI Designation PE-3400). The pipe shall contain cut-off valves appropriate to stop the flow of water through the pipes. The cut-off valves shall be constructed such that the value can be operated by personnel on the dike. The value shall be prefabricated to assure a watertight seal when in operation and shall be rated to withstand at least 10 feet of pressure head. Specifications for the valve shall be presented to VCD before use (to include operation specifications).

A trench shall be excavated at the depth and locations shown on the Construction Drawings in which to place the pipes. The pipes shall be placed before the impoundments are dewatered. The method of trenching and water control shall be at the discretion of the Contractor. After the pipes are placed, the invert elevations of the pipes shall be surveyed with respect to established benchmarks to verify correct placement. The trench shall be carefully backfilled with the excavated dike material or select fill. The soil shall be carefully compacted, taking care not to damage the pipes, with hand held compaction equipment.

The inflow line to impoundment A is constructed of a fibercast material and is a gravity flow system. The inflow line must be routed to impoundment C to maintain operation of the impoundment system during construction. This shall be accomplished by the placement of a pipeline which "T's" into the influent

line at the location shown on the Construction Drawings. Two (2) values shall be installed as described above to allow influent water to be routed to impoundment A after retrofitting is complete. The influent pipeline and any other pipelines which could interfere with placement shall be located and marked by VCD. Any pipelines interferring with trenching operations pursuant to placement of the pipelines shall be rerouted by VCD or by the Contractor under the guidance of VCD.

The trench shall be excavated with equipment chosen by the Contractor. Bedding material (i.e., sand or pea gravel) shall be placed in the trench. The trench shall be surveyed for proper grade in accordance with the Construction Drawings before pipe placement. The pipe shall be constructed of fibercast material (specifications to be given by VCD). The length of pipe which enters the pond shall be HDPE pipe conforming to specifications for pipe in this section. The pipe tie-in to the influent line shall be handled by VCD personnel or by the Contractor under the direct supervision of VCD personnel. The trench shall be backfilled with the excavation spoil and shall be compacted in-place, taking care not to damage the pipe, with hand-held compaction equipment.

Additionally, the pump station will be permanently reconstructed in an area to the north of impoundment C. The station will be placed on a concrete pad constructed in accordance with the Specification. Piping attachments shall be made under the supervision of VCD plant personnel.

3.1.5 Impoundment System Dewatering

Prior to the initiation of closure activities, discharge into the system shall be routed to impoundment C. The Contractor shall remove the water from impoundment A. The water shall be pumped to impoundment B. The impoundment system shall be continuously dewatered prior to implementation of closure activities to promote dewatering of the sediments. The dewatering of impoundments B and C will progress in this same manner.

The Contractor shall provide VCD a written plan which describes the dewatering procedure. The Contractor shall make necessary provisions to prevent the water of the system from spilling onto the ground.

3.1.6 Removal of Impoundment Structures

After dewatering of each impoundment is complete, any structure within the impoundment which could interfere with closure/retrofit activities will be removed. VCD will determine if the material is to be placed in the SWCA or transported for use elsewhere. Any material to be placed in the SWCA will be inspected for sharp edges or protrusions which could penetrate the synthetic liners of the SWCA. Any sharp edges or protrusions shall be blunted or removed before placement. The material shall be stored temporarily in an area designated by VCD until the SWCA is constructed.

That portion of the influent pipeline which enters impoundment A will be removed and disposed. The removed portion of the pipeline will be replaced by HDPE pipe in accordance with this section. The HDPE pipe shall be connected to the existing fibercast line with a prefabricated connection sleeve similar to a Rockwell bolted transition coupling. The seal shall be watertight and shall be rated to withstand the operating pressures as stated by VCD.

3.2 SOLIDIFICATION ACTIVITIES

Solidification will be required to absorb the free water from the sediments and to improve the bearing capacity of the sediments and is specified as follows:

- Materials (Section 3.2.1) and
- Procedure (Section 3.2.2).

3.2.1 Materials

The sediment contained in each impoundment shall be solidified to absorb excess water and to provide the necessary shear strength to support construction of the final cover system of the SWCA. The solidification ratio based on previous testing shall be approximately 25 percent lime kiln dust or 15 percent cement. Adjustments shall be made to this mixture only if deemed necessary by VCD or the Contractor to support his construction activities. Previous bench scale studies indicate that this mixture will be of sufficient strength to support the final cover.

The Contractor shall attempt to schedule the solidification agent delivery such that it can be used directly in the solidification process. The Contractor shall provide weatherproof silos or tubs for temporary storage. Storage on the ground is not permitted.

Solidification mixing shall be accomplished using either injection/pump techniques or conventional earthmoving techniques in such a manner that particulate emissions are minimized. The Contractor shall provide VCD a written plan which describes the solidification procedure and handling and a schedule which details the mixing rate. Additionally, the Contractor shall address safety considerations and methods used to limit particulate emissions.

3.2.2 Procedure

Subsequent to the removal of all free standing water, the solidification agent will be applied directly to the sediment and mixed to obtain a homogeneous mixture. The Contractor shall visually inspect the mixture to verify the mixture is uniform in color and consistency.

The solidification process shall begin at the north end of each impoundment and proceed southwards from the sides to the center. The solidification agent shall be evenly mixed to the depth to which natural soil is present. This depth is deemed sufficient to solidify the sediments; however, soft subsoils may be encountered and the Contractor shall make necessary adjustments during solidification activities to accommodate field conditions. The underlying soil shall be visually inspected and areas which contain soils of sediment-like consistency shall be excavated and incorporated into the solidified material. The dike material shall be inspected by VCD's Representative and any sediment-like consistency dike soil shall be incorporated into the solidified material, otherwise, the dike system shall remain intact during waste solidification procedures. The Contractor shall pump the collected runoff into the impoundment which is operational at the time.

Subsequent to solidification mixing within each pond, test pits shall be excavated until the natural impoundment bottom is reached. Measurements shall be taken by the Engineer as discussed in the Construction Quality Assurance

Specifications, Attachment 4 on the bottom and sides of the excavation to verify strength consistency. Visual examination of the test pits will be made to determine possible seepage or leaching. The Contractor shall remix any areas which fail the test pit inspection with additional solidification agent. The location of the test pits shall be determined by VCD's Representative.

3.3 RELOCATION OF SOLIDIFIED MATERIAL

Subsequent to solidification of the impoundment system sediment in impoundment A, the solidified material shall be excavated from the south end of impoundment A as shown on the Construction Drawings and stockpiled in the designated area. Actual conditions may vary slightly and the Contractor shall make provisions to accommodate field conditions encountered. The material shall be stockpiled in a manner that promotes drainage into a collection area. The Contractor shall pump the collected water into the operational impoundment.

The solidified material and underlying soil shall be excavated using equipment the Contractor chooses based on efficiency and earthmoving capabilities. The Contractor shall prepare and present a plan to VCD which details the excavation procedure of the solidified material.

The Contractor shall determine the elevation of the bottom of the excavation by survey. The survey shall include, as a minimum, elevation measurements at the corners of the excavation and two measurements within the confines of the excavation. If the survey indicates that the excavation is not yet to the elevations indicated on the Construction Drawings, the Contractor shall continue the excavation until the survey defines the excavation as complete.

The solidification and removal of the sediment will be accomplished for impoundments B and C in a like manner as impoundment A.

3.4 SWCA FOUNDATION PREPARATION

The SWCA Foundation Preparation will include:

- SWCA Dikes (Section 3.4.1), and
- SWCA Bottom (Section 3.4.2).

3.4.1 SWCA Dikes

The SWCA dikes shall be constructed to the lines and grades shown on the Construction Drawings.

The dikes shall be constructed using clay material as specified in Section 3.7.3 of these specifications.

The existing dikes of impoundment A shall be stripped of vegetation and rock. The crest of the dikes shall be constructed to elevations shown on the Construction Drawings (based on the bench mark provided by VCD) and cut to a slope of two (2) feet horizontal to one (1) foot vertical. The interior toe of the dike shall be graded to elevation(s) shown on the Construction Drawings. The dikes shall be scarified and proofrolled with compaction equipment to locate any soft, unsuitable soils. Soils defined unsuitable by VCD shall be excavated and replaced with recompacted clay soils.

The north dike will be built from clays from a predetermined backfill source to the elevations and grades shown on the Construction Drawings. The dike will be constructed in lifts not to exceed a thickness of ten (10) inches, measured loose. the dike shall be compacted to a minimum of 95 percent of the maximum dry density attainable by the standard proctor density (ASTM D698) and at a moisture content +/- 3 percent of the optimum moisture content. The dike shall be placed oversize and trimmed to conform to the grades and slopes shown on the Construction Drawings.

3.4.2 SWCA Bottom

The SWCA foundation shall conform to all elevations as shown in the Construction Drawings.

Any areas of the foundation that are above the elevations indicated in the Construction Drawings will be excavated to the specified elevations. The soil shall be scarified by ripper shanks or other approved method to a depth of about six (6) inches. Areas of the foundation that are at the approximate elevations required shall have the top six (6) inches scarified.

The bottom soils shall be recompacted to a minimum of 90 percent of the maximum dry density attainable by the Standard Proctor level of compactive effort (ASTM D698). Compaction shall be performed at a moisture content greater than the optimum as determined by this compaction test method.

Fill areas shall be constructed using natural gravel, sands, silts and/or clays excavated from an on-site borrow area(s). Rocks or cemented soils having a diameter exceeding one inch shall not be allowed for use as fill material.

Excavated areas and areas requiring less than 6 inches of fill shall be scarified and then recompacted as specified in this Section for fill materials such that a minimum depth of 6 inches of recompacted structural fill is provided. This recompaction coupled with the controlled fill will provide a foundation over the area of the SWCA bottom.

Fill areas shall be constructed in uniform layers not to exceed eight inches thick, measured loose. Each lift shall extend the full width of the area being filled before starting the next lift. Each layer shall be uniform in thickness and shall be spread, moisture content adjusted, and compacted as specified before the next lift is started.

All fill, except coarse-grain fill having 15 percent or less soil particles by weight passing the No. 200 sieve, shall be compacted to 90 percent of the maximum dry density attainable by the Standard Proctor level of compactive effort (ASTM D698). Fine-grained soils shall be compacted with a padded wheel (sheeps foot) compactor having a minimum static weight of 23,000 pounds and providing a minimum dynamic force of 32,000 pounds.

Coarse-grained fill, having less than 15 percent soil particles by weight passing the No. 200 sieve, shall be compacted to a minimum of 85 percent relative density (ASTM D 4253). During placement and compaction of coarse-grained embankment fill, the moisture content of the soils being placed shall be adjusted to maximize handling characteristics and to attain adequate compaction. Coarse-grained soils shall be compacted with a smooth steel-

wheeled compactor having a minimum static weight of 20,000 pounds and providing a minimum dynamic force of 27,000 pounds.

Fill placed at densities lower than the specified minimum density or at moisture content outside the specified acceptable range or otherwise not conforming to the requirements of the Specifications shall be reworked by the Contractor to meet the requirements or removed and replaced.

The graded surface shall slope as indicated for the SWCA bottom subgrade and shall be compacted and sealed by proof-rolling with a minimum of three passes by a self-propelled smooth steel-wheeled vibratory compactor having a minimum static weight of 20,000 pounds and providing a minimum dynamic force of 27,000 pounds. The compacted surface shall be free of rocks or cemented soils having a diameter exceeding one inch.

3.5 BOTTOM AND SIDE LINER SYSTEM

The Bottom and Side Liner System will include:

- Synthetic Liner System (Section 3.5.1),
- Leachate Detection/Collection System (Section 3.5.2),
- Leachate Collection/Detection System Cleanout Pipes (Section 3.5.3), and
- Leachate Detection/Collection System Manholes (Section 3.5.4).

3.5.1 Synthetic Liner System

The synthetic liner system involves the placement of the secondary and primary synthetic liners of the SWCA bottom as shown on the Construction Drawings.

The synthetic liner shall consist of new, first-quality products designed and manufactured specifically for the purpose of this work, which shall have been satisfactorily demonstrated by prior use to be suitable and durable for such purposes. The synthetic liner shall be an unmodified high density polyethylene (HDPE) containing no plasticizers, fillers, chemical additives or extenders. Approximately 2 percent carbon black shall be added to the resin for ultra-violet resistance. The synthetic liner shall be supplied as a

continuous single sheet with no factory seams and in rolls that shall have a minimum width of 22 feet. The roll lengths shall be maximized to provide the longest manageable sheet for the best field seams. The lining system shall be as manufactured, furnished, and installed by Schlegal Lining Technology, Inc., Houston, Texas; Gundle Lining Systems, Inc., Kingwood, Texas; or approved equivalent. The liner thickness required is 60 mil.

The liner shall have a good uniform appearance. It shall be free to of holes, blocking, hardened nodules, delaminations, wrinkled edges and seams, or other defects.

All sheets shall be 100 percent visually inspected during fabrication for compliance with the foregoing and all indicated repairs shall be made by the manufacturer before the panel is packaged for shipment. Labels on each roll shall identify the thickness of the material, the length, the width of the roll and manufacturer's name.

The liner manufacturer shall warrant the material and seams for a period of 20 years against defects or failure due to exposure to weather or expected leachate constituents. This warranty shall be submitted for approval by VCD, and shall state all conditions and exclusions.

The following submittals are required:

1. Complete material specifications, descriptive drawings, literature and warranty in accordance with these Specifications.

2. Documented evidence of proven technical competence, past record of satisfactory performance on similar projects, and sufficient capacity to do the volume of work specified herein.

3. Factory test results of materials certified by the liner manufacturer as being similar shall be submitted showing conformance with the requirements of these Specifications. In addition, the Contractor shall submit the manufacturer's certification stating that the material proposed is similar and of the same formulation as that for which test results are submitted and which by actual usage has been demonstrated to be satisfactory for the intended application.

4. Recommended method for handling and storage prior to installation.

5. Samples of liner sheeting, and sheeting joints, and a complete description of seaming and patching by extrusion welding.

6. Before commencing the Work specified and prior to ordering the liner material, the Contractor shall submit to VCD for approval all installation drawings, procedures, sterilization requirements and a schedule for carrying out the work. Shop drawings shall have liner sheet layout with proposed size, number, position, and sequence of placing of all factory-fabricated sheets and indicating the location of all field joints and the direction of shop joints on each sheet. Shop drawings shall also show complete details and/or methods for anchoring the liner at the ends of the cover, making field joints, and making seals around pipes and structures penetrating the liner.

7. The liner fabricator shall certify that the factory joints conform to the specifications and shall submit certified test results from an approved independent testing laboratory. Certification that cleaning solvent is compatible with the surfaces on which it is to be used shall also be submitted.

   The liner manufacturer's representative shall inspect the subsurface for acceptability and provide on-site technical supervision and assistance at all times during the installation of the liner and placement of the overlying fill material. The manufacturer's representative shall furnish VCD with Certification that the liner was installed in accordance with manufacturer's recommendations.

   Pipes coming through the liner shall be sealed to the liner with factory fabricated boots. The factory fabricated boots shall be made to seal around the structures without folds or splicing. The flange portion of the boot shall be sealed to the liner and the pipes and fit smoothly without excess folds or stretching of the material. In addition, stainless steel clamps as shown on the Construction Drawings shall be provided. The factory fabricated boots shall be made of the same material and workmanship as the liner.

The synthetic component of the primary liner shall consist of 60 mil HDPE extending from the anchor trenches down the interior embankment slopes and covering the SWCA bottom. The synthetic component of the secondary liner shall consist of 60 mil HDPE overlain by the synthetic drainage net leachate collection system as shown in the Construction Drawings.

The synthetic liner shall extend up the slopes and terminate into a 2-foot deep by 2-foot wide anchor trench. The liner shall be folded in the trench to provide maximum anchorage and a protected, clean liner edge. The anchor trench shall be backfilled with clay liner quality soils, compacted and moisture-adjusted in accordance with the criteria set forth for clay in the

Specifications. Compaction shall be performed utilizing pneumatic or mechanical hand compactors (pogo-sticks or jumping jacks) maintaining care not to damage the HDPE liner material in the anchor trench. A one (1) foot accumulation of liner material shall be allowed to remain at the finished toe of each interior slope to accommodate thermal contractions of liner material.

The Contractor shall make necessary field measurements prior to start of fabrication to assure proper fit of the liner cover. No liner material shall be placed when air temperature is less than 50 degrees F, when it is raining, or when there is frost on the ground without special provisions to accommodate these conditions.

The ends of the liner sheeting shall be protected during placement to prevent uplift by wind or other damage to the liner prior to seaming.

Lap joints shall be used to seal factory-fabricated liner sheets together in the field. All field joints shall be made on a supporting smooth surface. The lap joints shall be formed by lapping the edges of sheets a minimum of 4 inches. The contact surfaces of the sheets shall be wiped clean to remove all dirt, dust, moisture, or other foreign materials.

Lap joints between the high density polyethylene liners shall be made using the manufacturer's extrusion or fusion welding system equipment and techniques.

After field joints have been made, up to four test samples per sheet shall be removed from the joints by the Contractor at locations selected by VCD. Samples shall have a width of 4 inches and a length of 10 inches plus the seam width, and shall be tested by the Contractor at the direction of the Engineer to determine the tensile strength of the field joint. The Contractor shall also test each joint for air leakage along the entire length of joints using a vacuum box or other joint testing device as approved by VCD. All factory and field seams (joints) shall have a seam strength exceeding that of the parent material. The cost of testing shall be borne by the Contractor.

Any necessary repairs to the liner shall be patched with a patch of the liner material. The patch size shall be 4 inches larger in all directions than the area to be patched. All corners of the patch shall be rounded with a minimum radius of 1 inch. The contact surfaces shall be prepared and the patch seamed in accordance with these Specifications.

All joints, on completion of work, shall be tightly bonded. Any liner, surface showing injury due to scuffing, penetration by foreign objects, or distress from rough subgrade shall be replaced or covered and sealed with an additional layer of liner material of the proper size.

Required synthetic liner sleeves shall be attached to respective penetrating structures as shown on the Construction Drawings and recommended by the manufacturer and approved by VCD.

3.5.2 Leachate Detection/Collection System

The Leachate Detection/Collection System (LD/CS) will include:

- Synthetic Drainage Layer,
- Leachate Collection Trench, and
- Geotextile Fabric.

Synthetic Drainage Layer

The synthetic drainage layer shall consist of synthetic drainage nets overlain by a geotextile fabric (for the LCS). Details of the synthetic drainage net are shown in the Construction Drawings.

The following materials will be required in constructing the synthetic drainage layer:

- The synthetic drainage layer forming the drainage medium for the LD/CS on the bottom and interior dike slopes shall consist of a net or mesh arrangement of HDPE strands designed to provide an in-plane hydraulic conductivity of no less than 30 cm/sec under the conditions illustrated in the Construction Drawings. Acceptable geonets include DN-1 manufactured by the Tensar Corporation and Gundnet manufactured by Gundle Lining Systems, Inc. The Contractor shall submit the manufacturer's data concerning the hydraulic conductivity of the proposed material for approval by VCD's Representative prior to

ordering the material. The synthetic layer shall meet or exceed the following specifications as supplied.

Test	Method	Requirement
Roll Length (maximum)	-	100 feet
Roll Width	-	78 inches
Roll Weight (average)	-	110 pounds
Weight per square foot	-	.16 lbs./sq. ft.
Specific Gravity (g/cm^3)	ASTM D1505	>.94
Melt Flow Index (g/10 min.)	ASTM D1238 Condition E	<.26
Thickness	Micrometer Measurement at Strand Intersection	5.0 - 6.5 mm 200 mil - 265 mil .200 in. - 2.65 in.
Percent Carbon Black	ASTM D1603	2 - 3 percent
Tensile Break Strength	(2 in. x 5 in. specimen pulled apart at 2 in./ minute)	
Machine/Roll Direction Cross Direction		70 ppi 55 ppi
UV Stability		Resistant to UV
Transmissivity (minimum) (Minimum)	10,000 psf compressive load between two layers; 0.25 Hydraulic	10 g/min. ft. or 2×10^{-3} m^2/sec

- The geotextile shall meet the requirements of this section.

The specified synthetic drainage layer (geonet) shall be installed as shown on the Construction Drawings. The geonet shall be placed on the bottom and interior dike slopes to termination as shown on the Construction Drawings. Adjacent panels of netting shall be butted together and tied with like synthetic strands for support as necessary.

Leachate Detection/Collection Trench

The leachate collection trench shall consist of a HDPE corrugated pipe placed at the bottom of the collection trench and the remaining portion of the trench backfilled with a select gravel material.

The following materials, as shown on the Construction Drawings, shall be required for construction of the leachate collection trench:

- The drainage pipe shall be 4-inch diameter Flexible High Density Corrugated Polyethylene (HDPE) pipe equivalent to that manufactured by Advance Drainage Systems, Inc. (ADS). The pipe will be perforated at the valleys of the corrugations at 106 perforations per foot. The pipe slots shall be manufactured to comply with industry standards ASTM F-405, ASTM F-667, and SCS Code 606 for maximum slot dimensions and minimum water inlet.

  The Technical Specifications for the 4-inch diameter HDPE pipe as provided by ADS include:

Inside Diameter (I.D.) (inches)	4.00
Outside Diameter (O.D.) (inches)	4.72
Flow Area (square inches)	12.57
Corrugations Per Foot	18
Turning Radius (90° bend) (feet)	10
Perforations Per Foot	106
Inlet Area (square inches/foot)	4.00

- The pipe will be placed in a knitted Polyester (100 percent) "sock envelope". The objective of the sock is to prevent the infiltration of fine sediments into the pipe. The Technical Specification for the sock drain as provided by ADS include:

Physical Properties	Minimum
Material:	100 percent polyester
Weight: (ASTM D1910)	2.5 ounces/square yard
Specific Gravity:	1.3
Mullen Burst Strength: (ASTM D1117)	75 pounds/square inch

Physical Properties	Minimum
Abrasion Resistance: (ASTM D1175-71)	1,500 cycles
Denier Per Fiber (dpf) 35 Filament Yarn	100
Fiber Length:	Continuous
Color:	White
Water Flow Rate: (ADS TM-100)	345 gallons/minute/square feet

- The select gravel material shall consist of stone conforming to the following gradations by weight passing the designated sieve sizes:

Sieve Size	Percent Passing
1-1/2"	100
3/4"	50 - 100
No. 4	25 - 65
No. 40	10 - 32
No. 200	0 - 5

The Contractor shall provide sieve analyses of the select gravel material prior to delivery of material to the site. Slight variances in gradation as indicated by the specified tolerances may be approved by VCD's Representative. The sieve analysis shall conform to ASTM D 422, "Particle-Size Analysis of Soils."

The LD/CS pipe shall be placed at the bottom of the trench and the remaining portion of the trench backfilled with the select gravel material. The piping shall connect to the respective sumps and the cleanout pipes as shown on the Construction Drawings.

Geotextile Fabric

The geotextile shall be placed at the locations shown in the Construction Drawings.

The geotextile for the leachate collection system shall be a stiff, non-woven polypropylene, polyethylene, polyester, and/or nylon fabric (such as Trevira

1135) with an equivalent opening size (E.O.S.) equal to or greater than the No. 70 sieve, a tensile strength (ASTM D 1682) greater than 200 pounds in both directions and an elongation at break greater than 20 percent in both directions. The geotextile width shall be a minimum of 10 feet. The Contractor shall furnish a mill certificate or affidavit signed by an official from the company manufacturing the fabric prior to ordering the material attesting that the fabric meets the requirements of these specifications. The mill certificate shall also state the length and width of fabric contained in each roll.

The specified geotextile shall be placed over the LCS and material prior to placement of any waste. Adjacent sections of geotextile shall have a minimum overlap of 1.5 feet. The geotextile shall extend up the face of the embankment over the collection system geonet and shall terminate in the anchor trench as shown on the Construction Drawings. Care shall be taken when placing material over the geotextile to prevent damage and excess movement.

3.5.3 Leachate Detection/Collection System Cleanout Pipe

The Leachate Collection System Cleanout pipe shall be located as shown on the Construction Drawings.

The following materials, as shown on the Construction Drawings, shall be required for construction of Leachate Collection System Cleanout pipe.

- Synthetic liner which meets the requirements of Section 3.5.4,
- Stainless steel pipe clamps,
- Four (4) inch diameter solid-wall HDPE SDR21 pipe shall be constructed of HDPE plastic resin compound manufactured in accordance with ASTM D1248 (Type 111, C, 5 P34) (PPI Designation PE-3408),
- Prefabricated HDPE Liner Sleeve, and
- Concrete anchor block shall have a minimum compressive strength of 3,000 psi at 28 days.

The piping trench along the interior dike shall be excavated with a backhoe or equivalent earthmoving equipment to the depths specified in the Construction

Drawings. The compaction of the clay within the trench shall be performed carefully with appropriate hand compactors, such as impact tampers. The cleanout pipe shall be placed at the centerline of the trench and connected to the leachate collection pipe as shown in the Construction Drawings. The remaining portion of the trench shall be backfilled with select sand or gravel material.

3.5.4 Leachate Detection/Collection System Manholes

The leachate collection and detection system manholes, along with the required pipe and casing, shall be installed within the perimeter dikes during construction of the dikes.

The following materials shall be required for construction of the leachate manholes:

- Reinforced concrete shall have a minimum compressive strength at 28 days of 3,000 pounds per square inch. Type 1 or 3 portland cement shall be used and, where appropriate, air entrainment shall be greater than 3 percent and less than 6 percent. Slump shall range between three and five inches. The concrete shall be ready-mixed in accordance with ASTM Specifications C-94. Concrete placement and all concrete work shall conform to the specifications outlined in Section 4.8 unless otherwise noted. Mix design is to be submitted to the Engineer for review prior to placement of concrete.

- The required reinforcing shall consist of No. 4 deformed bars placed as indicated on the Construction Drawings.

- The manhole shall be 3/8 inch HDPE minimum wall thickness with internal pipe nominal diameter of 48 inches. Joints shall be jointed by notch welding with full penetration. Testing shall be accomplished by a water head equivalent to 6 feet above joint for 24 hours before backfilling around field welded joints.

- The manhole shall have a stiffener bank attached at the location shown on the plans. The stiffener band will be attached at the manufacture location and be made of the same material as the manhole.

- All welding will be full penetration fillet in 45 degree levels. Welding shall be by standard methods and HDPE rods compatible with the HDPE resin. The method of welding shall be submitted to VCD for approval.

- Piping shall consist of high density polyethylene (HDPE) pipe with a dimension ratio (SDR) of 11 or DR 13.5 as specified in the Construction Drawings. The pipe shall meet the qualifications as required for Type III, Category 5, Class C, Grade P34 as specified in

ASTM D-1248. The cell classification shall be PE 3343-C per ASTM D-3350. Perforated pipe shall be 4-inch nominal diameter and blank pipe shall be 4-inch nominal diameter. Pipe casing shall be 8-inch nominal diameter. Slots shall be standard one inch slots at 0.125 inch spaces consisting of eight rows. Associated fittings, elbows, tees and angles shall be compatible and of an equal greater strength.

- Pump shall be an electric, surface mounted, self-priming pump capable of pumping 150 gpm with a head of 145 feet or an approved equivalent. Manufacturers data on the proposed pump shall be submitted to VCD's Representative for approval prior to installation.

The leachate collection and detection system manholes shall be constructed during dike fill activities in the locations, elevations, and configurations shown on the Construction Drawings. Construction shall include the placement and alignment of the leachate piping and casing in areas of dike construction.

Manhole foundations shall be excavated to the grades shown with maximum cut side slopes of 2 (horizontal) to 1 (vertical). Provisions shall be made to key and seal the manhole riser pipe to provide adequate structural support during filling operations.

The manhold riser pipe shall then be installed, slotted for installment of the leachate pipe, and continued to the required elevations as dike fill activities proceed. Appropriate anchors shall be installed as required and the monitoring stand pipe installed complete with pump and required controls.

3.6 PLACEMENT OF SOLIDIFIED MATERIAL INTO SWCA

Placement of solidified material into the SWCA will include:

- Access Roads and Ramps (Section 3.6.1), and
- Placement of Solidified Material (Section 3.6.2).

3.6.1 Access Roads and Ramps

The access road, as necessary, shall be constructed in accordance with the Construction Drawings.

The materials detailed below are required to complete the construction of the access road:

- The geotextile for the access ramp shall be a woven polypropylene, polyethylene, polyester, and/or nylon fabric (such as Mirafi 600X fabric) with an equivalent opening size (E.O.S.) between the Number 20 and Number 45 sieve, a tensile strength (ASTM D 1682) greater than 300 pounds in both directions and an elongation at break greater than 30 percent in both directions. The geotextile width shall be a minimum of 10 feet. The Contractor shall furnish a mill certificate or affidavit signed by an official from the company manufacturing the fabric prior to ordering the material attesting that the fabric meets the requirements of these specifications. The mill certificate shall also state the length and width of fabric contained in each roll.

- Fill material required shall meet the requirements of this specification.

- The select gravel material or dense gravel aggregate (DGA) or crushed limestone shall consist of stone conforming to the following gradations by weight passing the designated sieve sizes:

Sieve Size	Percent Passing
1-1/2"	100
3/4"	50 - 100
No. 4	25 - 65
No. 40	10 - 32
No. 200	3 - 12

  The fraction of stone passing the No. 40 sieve shall conform to the following requirements as measured by ASTM D4318.

Liquid Limit (Maximum)	25
Plasticity Index (Maximum)	6

- Circular pipe culverts, if necessary, shall be 16-gage, sized as shown on the construction drawings, bituminous coated corrugated metal pipe (AASHTO Specification M-190) with sealed seams and ends ground smooth. All pipe couplings shall be "dimple bands" with neoprene gaskets. Pipe inlet and outlets shall consist of prefabricated flared metal sections.

The access road shall be constructed to the lines and grades shown in the Construction Drawings. The solidified material contained within the road boundary shall be excavated according to this section and stockpiled within impoundment A. Following subgrade preparation, the specified geotextile shall be placed over the area. Adjacent sections of geotextile shall have a minimum overlap of 4.0 feet.

The access road fill shall be placed according to this specification. The select gravel backfill shall be placed as shown in the Construction Drawings in maximum 8 inch thick lifts measured loose. Each layer shall be uniform in thickness and shall be spread and compacted as specified before the next lift is started. Compaction of the select gravel fill shall be to a minimum of 85 percent relative density (ASTM D 4253, "Maximum Index Density of Soils Using a Vibratory Table" and ASTM D 4254 "Minimum Index Density of Soils and Calculation of Relative Density").

The Contractor shall construct access roads as deemed necessary. Only these dikes utilized as access roads shall have DGA placed upon them (hence, the word "optional" in the Construction Drawings).

The access ramp into the SWCA may be constructed of solidified material compacted to 95 percent of the density of the standard proctor test. The material shall be placed such that equipment has ease of access to and from the SWCA.

3.6.2 Placement of Solidified Material

Subsequent to construction of the SWCA bottom liner system and leachate collection system, the solidified material shall be placed into the SWCA.

The Contractor shall verify during excavation that the solidified material is a homogenous mixture and that all free water is removed. Samples shall be collected every 2,500 cubic yards and a paint filter test performed. The Contractor shall remix any areas which fail the visual inspection or the paint filter test with additional solidification agent.

The Contractor shall verify the excavation by visual inspection. The Contractor must remove all solidified material to a depth at which the natural sediment/soil interface occurs.

The solidified material shall be placed into the SWCA in two phases. The first lift (12 inches) of material shall be carefully placed over the LCS and will serve as a protective cover for the LCS. Care will be exercised in placement of this lift so as not to compromise the integrity of the LCS and underlying primary liner.

Subsequent lifts shall be placed in 10 inch lifts and compacted to 95 percent of the standard proctor density by approved compaction equipment. Any structures removed from the impoundments shall not be placed in the SWCA until at least 3 feet of sediment is placed in the bottom. The slopes of the sediment placement shall not exceed 4 horizontal to 1 vertical.

3.7 SWCA FINAL COVER SYSTEM

The SWCA Final Cover System will include:

- Grading (Section 3.7.1),
- Gas Collection/Venting System (Section 3.7.2),
- Synthetic Liner (Section 3.7.3),
- Clay Liner (Section 3.7.4),
- Synthetic Drainage Layer (Section 3.7.5),
- Topsoil (Section 3.7.6), and
- Erosion Protection (Section 3.7.7).

3.7.1 Grading

Any grading of the solidified sediment required to establish the design configuration shall be undertaken as directed by VCD's Representative.

3.7.2 Gas Collecting/Venting System

The following materials are required in construction of the gas collecting/venting system:

- The geotextile for the gas collecting/venting system shall be a non-woven polypropylene, polyethylene, polyester, and/or nylon fabric (such as Trevira 1135) with an equivalent opening size (E.O.S.) equal to or greater than the No. 70 sieve, a tensile strength (ASTM D 1682) greater than 200 pounds in both directions and an elongation at break greater than 80 percent in both directions. The geotextile width shall be a minimum of 10 feet. The Contractor shall furnish a mill certificate or affidavit signed by an official from the company manufacturing the fabric prior to ordering the material attesting that the fabric meets the requirements of these specifications. The mill certificate shall also state the length and width of fabric contained in each roll.

- The select sand shall consist of clean wash sand:

Sieve Size	Percent Passing	Maximum Tolerance Plus or Minus
3/8"	100	0
No. 4	99	10
No. 8	95	10
No. 16	65	15
No. 30	40	15
No. 50	15	5
No. 100	5	5
No. 200	1	0

- A synthetic drainage layer shall be used along the slope of the solidified material.
- Piping shall consist of 3-inch nominal diameter SCH 40 PVC pipe. Piping required shall include blank pipe and pipe containing two rows of standard perforations, and shall conform to ASTM D 1785, and shall be joined together by flush screw threads. Associated fittings, elbows, tees and angles shall be compatible and of an equal or greater strength and/or Schedule.
- Concrete shall not be reinforced and shall have a minimum ultimate compressive strength of 3,000 pounds per square inch. Concrete shall be ready-mixed in accordance with ASTM Specifications C-94.
- Stainless steel, Type 304, SCH 20 or 40 vent pipes with protective guard posts.

The specified geotextile shall be placed over the graded solidified material prior to the placement of the select sand. Adjacent sections of the geotextile shall have a minimum, overlap of 1.5 feet and shall terminate at the inside portion of the dike crest and at the bottom liner system. Care shall be taken when placing the sand over the geotextile to prevent damage, excess movement and exposure of the underlying solidified material. A geotextile shall be placed over the synthetic net before placement of the clay liner.

The perforated (PVC) collection and vent pipes (stainless steel) shall be constructed and placed as shown on the Construction Drawings. Perforated collection pipe shall be tightly wrapped with the specified geotextile. The vent pipes shall protrude 3.0 feet, plus or minus 0.25 feet, above the finished grade of the topsoil.

Following the top soil placement, the vent pipes shall be anchored by forming and placing the required concrete anchor blocks and around the vent pipes protective posts.

3.7.3 Clay Liner

Following placement of the gas collection/venting system, a one (1) foot thick clay liner (finished thickness) shall be placed and compacted to the configurations shown on Construction Drawings.

Onsite clay for constructing the compacted clay liner shall be natural clay free from roots, organic material, stones or cemented materials larger than one inch, debris, and other deleterious material. It shall be moist and pliable, and shall be protected from drying and cracking by daily sprinkling, cover or other means. Clay material that becomes hard, brittle, fissured, or cracked shall be removed from the site or thoroughly wetted and reworked to the satisfaction of the Owner's Representative.

The clay shall meet the following specifications:

1. It shall have a classification CH or CL when classified in accordance with the Unified Soil Classification System (ASTM D2487)
2. Less than 15 percent of the material by weight shall be coarser than the No. 200 sieve as measured by ASTM D422.
3. The liquid limit shall be between 40 and 90 as measured by ASTM D4318.
4. The plasticity index shall be greater than 15 as measured by ASTM D4318.

The onsite borrow clay shall be selectively excavated at the source to avoid the excavation of sand or silt seams and prevent contamination of the clay with sand, silt, debris or other unacceptable material. Shipping, handling, stockpiling, and/or placement of the material shall proceed in such a manner as to avoid mixing the clay with sand, silt, debris, or subgrade materials. The quality of the clay liner in-place shall conform in all requirements to the Specifications. The clay shall be thoroughly mixed prior to placement, if deemed necessary by the Engineer, to ensure homogeneity of the material.

The clay liners shall be constructed in uniform layers not to exceed eight inches thick, measured loose. Each lift shall extend to the full area of placement prior to starting the next lift. The soils shall be compacted to a minimum of 90 percent of the maximum dry density attainable by the Standard Proctor level of compactive effort (ASTM D 698), or to the density required to obtain an in-place hydraulic conductivity of 1×10^{-7} cm/sec whichever is greater. Compaction shall be performed at a moisture content greater than the optimum as determined by this compaction test method.

The imported clay liners shall be compacted with a static padded wheel (sheeps foot) compactor having a minimum static weight of 23,000 pounds of other equipment adequate to obtain the specified fill density and/or permeability properties. The compacted liner thickness shall be increased above the finished design thickness by the length of the compactor's tampering foot, or depth of the tire identification, then trimmed to conform to the same finished slope illustrated on the Construction Drawings.

Compaction of the clay around the leachate detection/collection pipes and in anchor trenches for the synthetic liner shall be performed carefully with appropriate hand compactors, such as impact tampers, to obtain the specified density.

3.7.4 Synthetic Liner

Following placement of the clay liner, a 60 mil synthetic liner shall be placed over the gas venting sand or synthetic drainage net and welded to the primary synthetic liner of the bottom liner system as shown in the Construction Drawings. The synthetic liner shall meet all the requirements of Section 3.5.1 for both materials and construction.

3.7.5 Synthetic Drainage Layer

The synthetic drainage layer shall conform to the Construction Drawings.

The materials required for the drainage layer construction are presented below:

- The geotextile for the synthetic drainage layer shall be a non-woven polypropylene, polyethylene, polyester, and/or nylor fabric (such as

Mirafi 140N fabric) with an equivalent opening size (E.O.S.) equal to or greater than the No. 100 sieve, a tensile strength (ASTM) D 1682) greater than 100 pounds in both directions and an elongation at break greater than 50 percent in both directions. The geotextile width shall be a minimum of 10 feet. The Contractor shall furnish a mill certificate or affidavit signed by an official from the company manufacturing the fabric prior to ordering the material attesting that the fabric meets the requirements of these specifications. The mill certificate shall also state the length and width of fabric contained in each roll.

- The pipes for the drainage layer shall be 4 inch OD schedule 40 PVC perforated pipe.
- The synthetic drainage layer shall conform to the Specifications in Section 3.5.2.

The specified drainage layer shall be placed over the synthetic liner. Adjacent panels of the geonet material shall be butted together and connected with HDPE tie-wraps at intervals specified by the manufacturer. The geonet will extend to the interior face of the perimeter run-off control drainage ditches. The top geotextile shall then be placed over the drainage layer as specified for the gas venting system. Care shall be taken when placing the topsoil over the drainage layer to prevent damage and excessive movement.

The drainage layer on the west slope shall be tied into the PVC pipe as shown on the Construction Drawings. PVC pipe downchutes shall be connected by a tee into the main drainage pipe on approximately 100 foot centers.

3.7.6 Topsoil

Topsoil (vegetative soil cover) shall consist of the previously stripped and stockpiled soils taken from the closure area and/or imported topsoils. Imported topsoil shall be a natural friable soils, representative of the productive soils in the vicinity. It shall be obtained from well-drained areas, free from admixture of subsoil and foreign matter, objects larger than 1 inch in diameter, toxic substance and any other deleterious material which may be harmful to plant growth and be a hindrance to grading, planting and maintenance.

The topsoil surface shall be uniformly, gradually graded towards the surface water drainage controls (swales) to preclude ponding of water, or depressions from occurring. Placement shall be in uniform lifts. The topsoil shall be replaced in a relatively dry condition to preclude excess compaction from occurring. The soil surface shall be left in a rough or furrowed condition perpendicular to the drainage contours to minimize water infiltration. The area shall then be fertilized according to Section 3.10.

3.7.7 Erosion Protection Material

Erosion protection material shall be placed on the SWCA cover on the 4H:1V slopes to protect against slope decay from stormwater runoff. The material shall be placed after revegetation activities.

The material (geomat) shall be an Enkamat (or equivalent) that will inhibit surface erosion and allow for growth of vegetation within its matrix. A one (1) foot deep trench shall be excavated at the top of the slope for use as an anchor trench for the geomat. The geomat shall be laid in strips snuggly installed with 4-inch overlaps and staked at three to five foot intervals. The geomat shall be staked in the anchor trench and the trench backfilled with topsoil and lightly compacted. Soil cover or rip rap shall be placed at the base of the geomat to protect against wind uplift and to provide a smooth surface water flow transition area.

3.8 IMPOUNDMENT RETROFIT AREA

The impoundment retrofit will include:

- Foundation Preparation (Section 3.8.1),
- Structural Fill (Section 3.8.2),
- Bottom Gas Relief System (Section 3.8.3),
- Synthetic Liner System (Section 3.8.4),
- Leakage Detection/Removal System (Section 3.8.5), and
- Leakage Detection/Removal System Sump (Section 3.8.6).

3.8.1 Foundation and Dike Preparation

After excavation of the solidified material and any underlying soils, the foundation shall be constructed to lines and grades shown on the Construction Drawings. The foundation and dikes shall be constructed using fill material as necessary as specified in Section 3.4.2. The dikes shall be constructed to

an intermediate height as shown in the Construction Drawings and the synthetic liners anchored therein. After placement of the synthetic liners the dike shall be constructed to the final lines and grades of the Construction Drawings.

3.8.2 Structural Fill

Structural fill, if needed, to improve the supporting capability of the base shall be placed in uniform loose lifts of eight (8) inches. Placement of the fill should be as specified in Section 3.4.2.

3.8.3 Bottom Gas Relief System

The gas relief system shall conform to the requirements of Section 3.7.2 with the exception of trenches and piping in the trenches. Vent riser pipes are still required.

3.8.4 Synthetic Liner System

The synthetic liner system shall conform to the requirements of Section 3.5.1.

3.8.5 Leakage Detection/Removal System

The LD/RS shall conform to the LDS requirements of Section 3.5.2.

3.8.6 Leakage Detection/Removal System Sump

The LD/RS sump shall conform to the requirements of Section 3.5.4.

The LD/RS sump excavation will, by necessity, be below the groundwater table. Because of this, construction of a sheet pile wall is necessary prior to excavation. The sheet piles shall be driven in accordance with Section 3.1.3. The sump area will then be excavated. A dry bottom of reinforced concrete will be poured for further protection against water infiltration and provide a footing for the sump. The excavation around the sump will be carefully backfilled and compacted.

3.9 PERMANENT DRAINAGE DITCHES

The permanent drainage ditches shall be placed in locations as shown in the Construction Drawings. In addition, the ditches shall be constructed in accordance with the details of the Construction Drawings and Section 3.1.1.

Rip rap shall be placed in the ditch bottom to protect against erosion of the ditch and facilitate self-cleaning of the ditch. The rip rap shall consist of a hard, durable stone such that it will not disintegrate under the elements or be easily broken in handling. It shall be clean and free from soil, dust or other refuse. The faces of individual pieces shall be roughly angular, not rounded, in shape. Field stone and broken concrete will be accepted provided the material meets the requirements herein and all rebar in concrete has been cut flush with the concrete face.

The stone shall have a minimum unit weight of 155 pounds per cubic foot, a minimum absorption of 2 percent, a percentage of wear of less than 35 percent for resistance to abrasion and shall conform to the following gradations by weight passing the designated sieve sizes:

Sieve Size	Percent Passing
8 inch	100
6 inch	70 - 80
4 inch	40 - 50
2 inch	5 - 10

The Contractor shall provide specific gravity, absorptions, abrasion, and sieve analysis prior to delivery of the material to the site. The tests shall be performed in accordance with pertinent ASTM methods.

3.10 REVEGETATION AND RECLAMATION

The revegetation seed mixture shall consist of the following, in pounds of pure live seed per acre:

Seed	Minimum Purity (Percent)	Minimum Germination (Percent)	Minimum Rate (Pounds/Acre)
Hulled Common Bermuda Grass	95	87	30
Bahia Grass	95	85	30
Cereal Rye	95	86	50

Mulch shall consist of 1,500 pounds per acre of cellulose wood fiber applied over the seeded area. Fertilizer shall be 13-13-13 applied at a rate of 500 pounds per acre.

Upon completion of construction, adjacent areas to be revegetated shall be scarified to a depth of two to three inches with a harrow, disc, ripper shanks, or other equivalent equipment in preparation for topsoil replacement.

Areas to be revegetated shall be broadcast seeded with the specified seed mixture. After seeding, the areas shall be conditioned by raking or harrowing to provide proper seed coverage with soil.

All seeded areas shall be mulched with 2,000 to 3,000 pounds per acre of straw or hay, or 1,500 pounds per acre of cellulose wood fiber. When hay or straw is used, it shall be anchored with a straw crimper or asphalt emulsion at the rate of 175 gallons/acre.

In lieu of mulching, any areas with slope erosion protection may simply be seeded, fertilized and the erosion protection material placed thereon.

3.11 REINFORCED CONCRETE WORK

A. General

This section covers the requirements to furnish all labor, material and equipment and perform all work for the forming, placing, finishing, and curing of all reinforced concrete indicated on the drawings and/or specified herein. Materials required include the following:

1) Regular Hardrock Concrete

   a. All concrete for construction and site work shall be regular "hard rock" sand and gravel concrete, except as noted otherwise, refer to Drawings.

   b. Required compressive strengths are scheduled on the Drawings or within the specifications.

2) Portland Cement.

3) Admixtures.

4) Water.

5) Steel Reinforcing Bars.

6) Welded Wire Fabric Reinforcing.

7) Expansion Joint Material.

8) Reinforcing Accessories.

B. Materials

Materials required include the following:

1) Regular Concrete Aggregates

a. Clean, hard, durable, uncoated grains.

b. ASTM Specification C-33.

c. Free of impurities other than nominal amounts of fine clay.

2) Portland Cement

a. ASTM Specification C-150, Type 1 or 5.

b. Type 3 subject to VCD's approval.

c. Use one brand only.

3) Admixtures

a. Regular Concrete -

(i) Plasticizing or densifying admixes "Pozzolith", "Plastiment", or equal, for all regular concrete.

(ii) Proportion: 1/4 pound per sack for normal use. Increased proportions subject to approval of Engineer.

4) Water

a. Municipal quality potable water or as approved by VCD to be used for mixing and finishing.

b. No surface water to be used.

5) Steel Reinforcing Bars

a. Reinforcing bars for all concrete work to be deformed new billet steel bars conforming to ASTM Specifications A-615, Grade 60, except stirrups and ties shall be Grade 40.

b. All reinforcing bars to be deformed with deformations conforming to ASTM Specifications A-305.

c. Bars shall be clean and free from rust, scale and coating.

d. Conform to the Concrete Reinforcing Steel Institute (CRSI) recommendations.

6) Welded Wire Fabric Reinforcing:

a. Reinforcing mesh to be cold-drawn, welded wire fabric conforming to ASTM Specifications A-185-68.

b. Minimum ultimate tensile strength of 60,000 psi.

c. All fabric reinforcing to be furnished in flat sheets; hinged sheets may be used if desired for ease of handling.

d. Mesh shall be furnished in largest practical sizes to provide minimum joints and splices.

e. A minimum 6 inch lap shall be provided at all joints and splices.

7) Premoulded Expansion Joint Filler:

a. ASTM Specification D-1751-65.

b. Non-extruding type.

c. Sizes and locations shown.

d. Conform to Details.

8) Reinforcing Accessories:

a. Furnish and install all necessary reinforcing steel chair supports, bolsters, spacers, hangers, insets, snap-off form ties, etc. for the completion of the work indicated.

b. All reinforcing accessories to be non-corrosive metal; chairs, bolsters to be hot dipped galvanized.

c. Provide all types, sizes and heights for work indicated.

d. The reinforcing shall conform to the drawings.

C. Construction

1) Regular Concrete Compressive Strengths: The minimum ultimate 28-day concrete shall conform to the Strength indicated on the Drawings and/or specified in other sections of the specifications.

a. Aggregate Sizes:

(i) 3/4 inch for formed concrete work up to 6 inch in the least dimension.

(1) 3/4 inch for formed concrete work up to 6 inches in the least dimension.

(2) 1-1/2 inch for formed reinforced work over 6 inch in the least dimension.

(ii) Slump Test:

Maximum range of slump for concrete shall be 3 to 5 inches.

2) Concrete Proportions and Mix Design:

a. All concrete to be "Control-Mix" produced using proportions determined by an independent testing laboratory, approved by VCD to produce the concrete specified herein.

b. Mix designs to be submitted for VCD's review.

c. Testing laboratory services to be performed at Contractor's expense.

3) Reference

Unless otherwise specified herein, all concrete materials, mixing and placing shall conform to the requirements covered by "Design and Control of Concrete Mixtures", published by the Portland Cement Association.

4) Mixing of Regular Concrete:

a. All regular sand and gravel concrete to be ready-mixed in accordance with ASTM Specification C-94.

b. Conform to Specifications of American Concrete Institute.

c. Mixing water shall not be added after truck has left plant unless approved by the Representative.

d. Hold concrete maximum of 1-1/2 hours in mixing truck.

e. Aggregates proportioned by weight or approved volumetric method.

f. Measure water accurately and account for aggregate moisture content.

g. Incorporated admixtures specified and/or as approved.

5) Contractor's Responsibility:

a. Provide and place all concrete with the minimum ultimate compressive strengths specified.

b. The strength of concrete, as determined from standard cylinder tests, shall be less than the compressive strength specified.

6) Testing Laboratory Services:

a. The Contractor shall make slump tests from samples taken from mixer and direct necessary changes that the slump tests may indicate.

b. Cylinder Tests:

(i) From each type or strength of concrete, make four (4) cylinder tests from each pouring operation and not less than four (4) cylinders from each 100 yards of concrete poured.

(1) Test two (2) cylinders at 7 days.

(2) Test two (2) cylinders at 28 days.

(ii) Conform to ASTM Specifications C-31 and 39.

(iii) Test reports, showing all data customarily listed by the laboratory, will be submitted to the Contractor.

7) Form Work:

a. The form work shall conform to the shapes, lines, grades and dimensions indicated.

b. Form Materials: The Contractor shall provide all forms, shoring, bracing, false work, etc. for the completion of the work indicated.

(i) Flat Surfaces: Slabs, beams, sides, soffits, etc. to be formed with 3/4 inch EXT, Grade B-B, "Ply form" or equal.

(ii) Slabs, walks, etc. on grade to be poured on compacted base material conforming to grades, lines, shapes, and dimensions indicated.

c. Bottom of beams, slabs, walls and continuous footings at or below grade level to bear on undisturbed excavations or sub-soil shall be compacted to maximum density.

d. Slabs, walks, etc. on grade shall be poured on compacted base material conforming to grades, lines, shapes, and dimensions indicated.

e. Necessary bracing to provided to adequately restrain concrete being placed.

f. All form joints to be constructed sufficiently tight to prevent mortar leakage.

g. All form work shall be erected true, rigid, plumb, level and adequately braced.

h. The Contractor shall clean and remove nails from all forms to be reused.

i. Forms in direct contact with finish surface to be free from loose knots, warps, nail holes and other defects, with joints vertical or horizontal.

j. Forms on surface exposed to view to be placed so that panels are symmetrical; i.e., long dimensions set in same direction. Horizontal joints to be level, straight, continuous and in same plane without off-sets; vertical joints to be plumb and straight.

k. Bolts, rods or similar metal ties shall be so arranged that when the forms are removed there will be no metal within one inch of exposed surfaces.

l. Before placing reinforcing, oil forms with non-staining oil.

m. Good form workmanship and properly placed concrete will eliminate the need for rubbing any work, except those items specifically listed herein.

8) <u>Reinforcing Steel</u>:

a. Reinforcing bars shall be accurately set and securely supported and fastened to prevent movement during concrete placement.

b. Reinforcement shall be accurately formed to size and shapes indicated.

c. Bars shall be supported with metal chairs, spacers or hangers; all reinforcing accessories shall be non-corrosive metal.

d. Reinforcement in slabs on earth fill shall be supported by masonry blocking.

e. All concrete shall be reinforced unless specified and shown otherwise.

f. All reinforcing steel shall have a minimum lap of 30 bar diameters or 24 inch whichever is larger at splices and at intersection.

9) Concrete Placement

a. No concrete shall be placed until foundations, forms, reinforcing, pipes, sleeves, hangers, anchors, conduit, etc. have been installed and approved by VCD.

b. No concrete should not be placed when the temperature is 45 degrees or less, or when there is reason to expect a drop below 45 degrees within 12 hours.

c. The forms and excavations shall be wetted before placing concrete.

d. All debris shall be removed prior to placing concrete.

e. All concrete shall be placed in continuous operation with construction joints as indicated or as approved by VCD.

f. The concrete shall be removed so as not to separate various ingredients.

g. Water shall be removed from excavations before placing concrete.

h. The concrete shall be placed thoroughly along forms and worked carefully into corners and surrounding reinforcing, anchors, plates, etc.

i. The concrete shall be tamped and screed to dense mass.

j. The concrete shall be vibrate concrete in all vertical placements.

10) Removal of Forms:

a. The contractor shall remove forms in such manner as to insure complete safety of structures.

b. The forms shall not be remove or disturb forms until concrete has acquired strength to support its weight and live load on it safely and never before concrete has attained 75 percent of design strength.

c. Form removal on all work subject to VCD's approval.

11) Patching Defective Work:

a. All defective surfaces to be repaired immediately on removal of forms.

b. Patch all minor defects and honeycombed areas before concrete is thoroughly dry.

c. Honeycombed surfaces shall be wire brushed, washed with water and filled with 1:2 mortar.

d. Fill form tie holes solidly with mortar and finish to match adjoining areas.

12) Concrete Finishes:

a. The Contractor shall set sufficient screeds in all slabs to provide proper leveling.

b. The entire surface of concrete slabs shall be screed and float entire surface of concrete slabs to proper elevation and slope where required.

c. All concrete surfaces shall be finished to gravitate large aggregates from surface.

d. Any surface water, lattace or dirt shall be removed.

e. Dusting of wearing surfaces with dry materials not permitted.

f. After tamping and screeding, the surfaces to be machine floated to smooth dense finish. Floating to be continued until sufficient mortar is brought to surface to fill all voids.

g. All exposed vertical and horizontal surfaces on structures, exclusive or paving, shall be hard finished to dense, smooth surfaces after repair of surface voids and form defects. The Contractor may use conventional methods or VCD approved finishing compounds.

13) Cast-In Anchors:

a. The Contractor shall carefully examine drawings, details, and other sections of the specifications to assure that all required anchors, hangers, plates, connections, etc. are provided and located accurately and installed in proper sequence.

b. All items shall be located in proper position and rigidly anchored in place.

14) Concrete Curing:

a. Immediately after placing and finishing, prevent all concrete from losing surface moisture for a minimum of seven (7) days.

b. All exposed concrete surfaces to be cured during this period with an approved clear resin base liquid curing compound.

c. Liquid Curing Compound: Grace and Company's "Horncure", Sonneborn "Hydrocide", or equal, applied coverage at 200 to 400 sq. ft. per gallon.

CONSTRUCTION QUALITY CONTROL SPECIFICATIONS

CLOSURE/RETROFIT PLAN
SURFACE IMPOUNDMENT SYSTEM
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

TABLE OF CONTENTS

		PAGE
1.0	INTRODUCTION	1-1
1.1	CONCEPT AND OBJECTIVES OF THE CONSTRUCTION QUALITY ASSURANCE PROGRAM	1-1
1.2	BASIS OF THE CONSTRUCTION QUALITY ASSURANCE PROGRAM	1-1
1.3	CQAP FORMAT	1-1
2.0	CONSTRUCTION PROGRAM ORGANIZATION	2-1
2.1	RESIDENT ENGINEERING GROUP	2-1
2.1.1	Resident Engineer	2-1
2.1.2	QA/QC Engineer	2-2
2.2	PRECONSTRUCTION MEETING	2-3
3.0	CALIBRATION AND MAINTENANCE OF TEST EQUIPMENT	3-1
3.1	CALIBRATION	3-1
3.1.1	Responsibilities	3-1
3.1.2	Calibration Procedures	3-1
3.2	MAINTENANCE	3-2
4.0	CONSTRUCTION CONTROL AND DOCUMENTATION	4-1
4.1	CONSTRUCTION VERIFICATION	4-1
4.1.1	Field Verification Testing	4-2
4.1.2	Field Sampling Associated with Verification Testing	4-2
4.1.3	Laboratory Verification Testing	4-3
4.1.4	Inspection	4-3
4.1.5	Performance Documentation	4-3
4.2	REVIEW OF CONSTRUCTION CONTROL DATA	4-5
4.3	AS-BUILT DOCUMENTATION	4-5
4.4	NONCONFORMANCE/CORRECTIVE ACTION	4-5
4.5	CHANGE CONTROL	4-6
5.0	CQA TESTING, SAMPLING AND OBSERVATIONS	5-1
5.1	SITE PREPARATION	5-1
5.1.1	Site Drainage	5-1

TABLE OF CONTENTS
(Continued)

		PAGE
	5.1.2 Clearing and Grubbing	5-1
	5.1.3 Impoundment Operation Relocation	5-2
	5.1.4 Impoundment System Dewatering	5-2
	5.1.5 Removal of Impoundment Structures	5-3
5.2	WASTE SOLIDIFICATION	5-3
	5.2.1 Inspection and Data Documentation	5-3
	5.2.2 Testing	5-3
5.3	RELOCATION OF SOLIDIFIED MATERIAL	5-4
	5.3.1 Inspection and Data Documentation	5-4
5.4	SWCA FOUNDATION PREPARATION	5-4
	5.4.1 SWCA Dikes	5-4
	5.4.1.1 Inspection and Data Documentation	5-5
	5.4.1.2 Testing	5-5
	5.4.2 SWCA Bottom	5-6
	5.4.2.1 Inspection and Data Documentation	5-6
	5.4.2.2 Testing	5-6
5.5	BOTTOM AND SIDE LINER SYSTEM	5-7
	5.5.1 Synthetic Liner System	5-7
	5.5.1.1 General	5-7
	5.5.1.2 Inspection and Data Documentation	5-8
	5.5.1.3 Testing	5-9
	5.5.2 Leachate Detection/Collection System	5-10
	5.5.2.1 Synthetic Drainage Layer	5-10
	5.5.2.2 Leachate Collection Trench	5-10
	5.5.3 Clean-out Pipes	5-11
	5.5.4 Leachate Collection System Sump	5-12
	5.5.4.1 Inspection and Data Documentation	5-12
5.6	PLACEMENT OF SOLIDIFIED MATERIAL INTO SWCA	5-12
	5.6.1 Access Roads and Ramps	5-12

TABLE OF CONTENTS
(Continued)

		PAGE
	5.6.2 Placement of Solidified Material	5-12
	5.6.2.1 Inspection and Data Documentation	5-12
	5.6.2.2 Testing	5-13
5.7	SWCA FINAL COVER SYSTEM	5-13
	5.7.1 Site Preparation	5-13
	5.7.2 Gas Collection/Venting System	5-13
	5.7.2.1 Inspection	5-13
	5.7.3 Synthetic Liner	5-14
	5.7.4 Clay Liner	5-14
	5.7.4.1 Inspection and Data Documentation	5-14
	5.7.4.2 Testing	5-15
	5.7.5 Synthetic Drainage Layer	5-16
	5.7.6 Topsoil	5-16
	5.7.7 Erosion Protection Material	5-17
5.8	IMPOUNDMENT RETROFIT AREA	5-17
	5.8.1 Foundation Preparation	5-17
	5.8.2 Structure Fill	5-17
	5.8.2.1 Inspection and Documentation	5-17
	5.8.2.2 Testing	5-18
	5.8.3 Bottom Gas Relief System	5-18
	5.8.4 Synthetic Liner System	5-18
	5.8.5 Leakage Detection/Removal System	5-18
	5.8.6 Leachate Detection/Removal System Sump	5-18
5.9	PERIMETER DITCH	5-18
	5.9.1 Inspection and Documentation	5-18
5.10	REVEGETATION AND RECLAMATION	5-19
5.11	REINFORCED CONCRETE WORK	5-19
	5.11.1 Inspection and Data Documentation	5-19
	5.11.2 Testing	5-19
6.0	RECORDS MANAGEMENT	6-1

1.0 INTRODUCTION

1.1 CONCEPT AND OBJECTIVES OF THE CONSTRUCTION QUALITY ASSURANCE PROGRAM

The governing concept for the CQAP undertaken for the Closure/Retrofit is to perform the activities in accordance with design specifications. To meet this concept, the following objectives will be met:

- The construction will be verified as it is performed by inspection and testing so that the design is implemented as intended;
- Changes to the design which occur during construction will be evaluated with regard to their work effect upon operational performance; and
- Documentation will be prepared and maintained during construction so that it can be demonstrated that the design has been implemented and that performance requirements have been met.

1.2 BASIS OF THE CONSTRUCTION QUALITY ASSURANCE PROGRAM

Several sources have been used as guidance or reference in the preparation of this Program, including:

- U.S. EPA, "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," QAMS-005/80, 1983,
- U.S. EPA, Technical Guidance Document, "Construction Quality Assurance for Hazardous Waste Land Disposal Facilities," OSWER Report No. EPA/530-SW-86-031, October 1986, and
- Code of Federal Regulations, 40 CFR 264.

1.3 CQAP FORMAT

As stated, the CQAP presents and defines the aspects of the Construction Quality Assurance Program which are applicable through the course of closure. This includes:

- Organization (Section 2.0) - reporting mechanism, responsibilities and authorities, and meetings;
- Calibration and Maintenance of Test Equipment (Section 3.0) - Overall requirements to verify and demonstrate that test equipment, field and laboratory, meet intended function;
- Construction Control (Section 4.0) - Overall requirements for inspections and verification testing, the means for resolving

nonconformances and verifying correction, change control, and as-built documentation;

- CQA Testing, Sampling and Observations (Section 5.0); and
- Records Management (Section 6.0) - All inspections and verification tests will be documented so that their performance and results can be demonstrated. This section discusses the types of records prepared, a description of the on-site records system and its maintenance, and the responsibility for preparing and maintaining records.

The CQAP fulfills two purposes: it (1) documents the specific technical requirements of the quality program for the closure/retrofit; and, (2) serves as a reference source for personnel performing and monitoring the construction.

The guidance for each inspection and verification test will be presented. Whenever possible, nationally recognized test methods such as published by the U.S. EPA and ASTM have been adopted. In general, recognized standards are cited only by reference and not included verbatim. If a test method is not a nationally recognized standard, the test method will be reviewed and approved by the Engineer of record prior to its implementation. The inspection/testing part of the overall quality program will be summarized in a table(s) for ready reference by personnel.

2.0 CONSTRUCTION PROGRAM ORGANIZATION

2.1 RESIDENT ENGINEERING GROUP

A Resident Engineering Group will be assigned to the construction activities to verify that construction meets design requirements. The function of this group is to provide independent "checks and balances" for the construction process.

Included in the group are:

- Resident Engineer who is responsible for the activities of the group and implementation of the Construction Quality Assurance Program; and
- QA/QC Engineer(s) to provide the necessary independent inspections and verification testing so that the on-site measurements of the design requirements are met.

The following are the responsibilities of the Resident Engineer and QA/QC Engineer(s).

2.1.1 Resident Engineer

The Resident Engineer's responsibilities include:

- Implementation of the requirements of this Program;
- Documentation and on-site approval changes to the Construction Drawings and Specifications;
- Supervision of the preparation of as-built drawings;
- Verification that inspections and verification tests performed by the QA/QC Engineer(s) are conducted at required intervals;
- Review of the results of inspections and field and laboratory verification testing;
- Preparation and distribution of summary reports of the activities and results of the work performed by the Resident Engineering Group;
- Supervision of the on-site records management system;
- Supervision of on-site laboratory for verification testing, if applicable; and

- Stop work if a nonconformance will affect the integrity of the closure/retrofit if not corrected before construction proceeds.

2.1.2 QA/QC Engineer

The ultimate responsibility for the implementation of the Construction Quality Assurance plan lies with VCD. In order to provide verification of the materials used and the condition and manner of their placement, VCD will employ an independent engineer to serve as QA/QC Engineer.

Day-to-day inspections and field verification tests will be provided by the Engineer(s). This role is critical to successful demonstration of construction procedures and required documentation. The responsibilities include:

- Performance of receiving inspections as prescribed and obtaining required samples of incoming materials for verification testing;
- Performance of inspections and in situ verification tests as prescribed and at the intervals required;
- Collection of samples in the field for subsequent verification testing by on-site or off-site laboratories;
- Reporting of nonconformances as appropriate to the Foremen, Superintendents, or Construction Manager if correction can be made during the normal course of work;
- Reporting of nonconformances to the Resident Engineer, if correction cannot be readily achieved to the satisfaction of the QA/QC Engineer, so that resolution can be accomplished by the Resident Engineer;
- Reporting to the Resident Engineer any activities which are adverse to overall quality and any nonconformances which are recurring, even though resolution is readily achievable;
- Documenting nonconformances;
- Reporting to the Resident Engineer changes in the construction drawings and specifications; and
- Documentation of inspections and verification testing activities by the completion of specified forms and daily logs.

2.2 PRECONSTRUCTION MEETING

Prior to the start of construction, a Preconstruction Meeting will be held to review and acquaint personnel with the requirements of the CQAP and the construction drawings and specifications. Attendance at the meeting should include: Design Manager, Resident Engineer, QA/QC Engineer(s), and Subcontractors. Meeting notes shall be prepared by the Resident Engineer and maintained in the on-site records system. Subcontractor personnel shall attend the meeting as appropriate to their scope of work. If subcontractors come on-site after construction begins (such as the lining installation subcontractor) and the preconstruction meeting has been held, the Resident Engineer shall meet with the subcontractors to review appropriate activities of their work and document these meetings.

The following will be presented at the preconstruction meeting:

- Documents pertinent to each group's activities during construction;
- Construction Organization;
- Review requirements of the Construction Drawings and Specifications;
- Responsibilities and authority of specific personnel such as the Resident Engineer, QA/QC Engineer, and Subcontractors;
- Review requirements of the Construction Quality Assurance Program;
- Inspection and verification testing methods, frequencies, and acceptance criteria;
- A review of required documentation and operation of the on-site records system;
- A discussion of the procedure for resolution of nonconformances and the responsibility of all personnel to bring attention to nonconformances; and
- A discussion of the procedure for change to Construction Drawings and Specifications and the means for review and approval.

3.0 CALIBRATION AND MAINTENANCE OF TEST EQUIPMENT

3.1 CALIBRATION

Measuring and test equipment used in field verification testing, an on-site laboratory, or off-site laboratory shall be controlled by a calibration program. The program shall provide equipment of the proper type, range, accuracy, and precision to provide data which meets specified requirements and desired results. Calibration of measuring and test equipment may be performed internally using in-house reference standards, or externally by agencies or manufacturers.

3.1.1 Responsibilities

Responsibility for the calibration of off-site laboratory equipment rests with each Laboratory Manager. The QA/QC Engineer(s) is responsible for the calibration of field and on-site laboratory equipment, and for verifying that field equipment provided by subcontractors is properly calibrated.

3.1.2 Calibration Procedures

Documented and approved procedures shall be used for calibrating measuring and test equipment. Whenever possible, widely accepted procedures, such as those published by the ASTM or EPA, or procedures provided by manufacturers shall be adopted. In general, calibration procedures will be specified as part of the test methods cited in this Attachment.

Reference standards (physical and chemical) shall be used only for calibration. Physical standards shall be stored separately from working measuring and test equipment. Equipment that fails calibration or becomes inoperable during use shall be removed from service and segregated to prevent inadvertent use, or shall be tagged to indicate it is out of calibration. Such equipment shall be repaired and recalibrated to the satisfaction of the Laboratory Manager or QA/QC Engineer, as applicable. Equipment that cannot be repaired shall be replaced.

Records shall be prepared and maintained for each piece of calibrated measuring and test equipment to indicate that established calibration

procedures have been followed. Calibration records shall be maintained by the QA/QC Engineer(s) for field testing and on-site laboratory equipment.

3.2 MAINTENANCE

Periodic preventive maintenance shall be performed as recommended by equipment manufacturers.

4.0 CONSTRUCTION CONTROL AND DOCUMENTATION

This section discusses the quality-related activities necessary for control of the closure. Aspects of the construction process discussed are:

- Construction verification (Section 4.1),
- Review of Construction Control Data (Section 4.2),
- As-built Documentation (Section 4.3),
- Nonconformance/Corrective action (Section 4.4), and
- Change control (Section 4.5).

The QA/QC Engineer(s) will be responsible for performing the work within the requirements of the construction drawings and specification.

4.1 CONSTRUCTION VERIFICATION

To verify that design requirements are properly incorporated into the closure activities, a specific program of field controls (e.g., inspections and verification tests) is provided. The program is documented in later sections of this CQAP and specifies the following:

- Inspections and verification tests to be performed,
- Inspection and verification test frequency,
  - Aperiodic (e.g., upon receipt of materials at the site)
  - Periodic (e.g., based on time interval or volume),
- Specific activities to be observed during inspections,
- Sampling and test methodologies and procedures for verification testing, and
- Records to be prepared (e.g., test data sheets and inspection reports) or obtained (e.g., manufacturers' certifications).

The overview provided during construction consists of:

- Field inspections are performed by the QA/QC Engineer. The inspections will be primarily visual examinations but may include measurements of materials and equipment being used, techniques employed, and the final products. Inspections will be performed for the purpose of verifying that a specification, or procedure for the

activity, is successfully completed. The results of visual inspections shall be documented in a daily log or field notebook.

- Verification (Field) testing will be performed on-site by the QA/QC Engineer according to the specified procedures contained in the CQAP. This testing will be performed primarily on samples or in situ portions of the as-built liner system to determine whether construction performance meets project requirements.

- Verification (Laboratory) testing will be performed by on-site or off-site laboratories on samples of materials used in the construction. Laboratory testing will be performed to characterize materials and confirm performance.

- Surveying includes establishment of horizontal and/or vertical position, as appropriate.

- Receiving inspections include, as necessary, a visual examination and measurements of materials obtained from suppliers. Receiving inspections will be performed to verify that the materials used meet specifications and are free of defects.

- Manufacturers certificates will be obtained from suppliers for selected shipments of materials received. They entail a statement that the materials meet required specifications and a definition of the quantity supplied. In specific cases such as synthetic liner placement, a manufacturer may be asked to certify the integrity of the in-place materials including field performance test results.

4.1.1 Field Verification Testing

Specific field verification testing will be performed in accordance with this CQAP and technical specifications. To provide prompt confirmation or rejection of the material or constructed work, field tests will be performed by the QA/QC Engineer as soon as possible after material receipt or completion of the portion of the constructed work which is to be tested. This minimizes the possibility of removing satisfactory work which has been added to defective material or work.

4.1.2 Field Sampling Associated with Verification Testing

Samples of materials and the constructed work will be obtained in the field for laboratory verification testing. Testing may be done in on-site or off-site laboratories. The QA/QC Engineer will collect the specified samples and

send them to the appropriate laboratory as soon as material is received or a portion of the constructed work is completed to obtain results as promptly as possible. The sampling program is specified in this CQAP.

To demonstrate that the samples tested are those obtained during construction, the QA/QC Engineer will log the sample collection and complete a Chain-of-Custody form for samples tested in off-site laboratories. In addition, for shipment to an off-site laboratory, a Request for Analysis form shall be completed. Alternate forms containing the same information may be used.

Samples shall be labeled to indicate location of collection and depth as appropriate. Samples shall be shipped in accordance with defined packaging and preservation methods to minimize deterioration of the characteristic to be tested.

4.1.3 Laboratory Verification Testing

Specific laboratory verification testing will be performed in accordance with the methods prescribed in this CQAP. Laboratory tests shall be performed as soon as possible after samples are obtained to provide prompt confirmation or rejection of material or the constructed work.

4.1.4 Inspection

Inspections will be performed during the course of construction to verify that the work meets the requirements of the construction specifications and drawings. They will be performed by the Resident Engineering Group, as specified in this CQAP. Receiving inspections shall be performed on materials obtained from suppliers at the time of delivery to provide verification that the material is free from defects and meets specifications. Field inspections shall be performed to verify that the constructed work adheres to specifications. The field inspections shall be performed either during the construction process or shortly after completion of the constructed work. The inspections will be documented on Field Activity Daily Logs or equivalent.

4.1.5 Performance Documentation

To provide evidence of satisfactory work performance, verification test data, data reduction, and results of field inspections and sampling, results shall

be completely documented. Whenever possible, information shall be recorded on a standardized form or in a bound field logbook. Documentation shall include a daily log of construction activities, the appropriate field test, laboratory test, and survey data forms, photographs, and field collection and sampling custody forms.

Construction inspection personnel shall keep a daily log of project activities. Each page of logbooks or daily activity logs shall be signed by the person preparing the log. Items to be included in the daily log, as appropriate, are:

- Project identification;
- Field activity subject;
- General work activity inspected and results;
- Unusual events;
- Approved changes required to plans and specifications; and
- Weather conditions.

Copies of the daily activity logs and checklists will be sent to the Resident Engineer and Construction Manager on a daily basis.

As part of the construction control activities, a photographic record shall be prepared. Photographs should be in color. Photographs will be taken of field tests, sampling locations, construction processes, and final constructed features. Photographs will be identified with date taken, and a brief description. This may be done individually on the back of the photographs or in an album in which the photographs are mounted.

Appropriate construction control test, survey, and material installation data forms shall also be prepared. They shall include, as appropriate, the activity location (e.g., station, elevation, and field coordinates). All requested information shall be addressed. If not applicable, requested information should be designated as such. Results of field and laboratory testing should be sent to the Resident Engineer, and QA/QC Engineer, as appropriate, as soon as available.

All field construction verification records shall be collected and maintained in the site record system. Laboratory verification testing records shall be

maintained by each off-site laboratory participating in the construction control program with eventual transfer to the site record system.

4.2 REVIEW OF CONSTRUCTION CONTROL DATA

The Resident Engineer will review construction control data to verify that construction specifications and the CQAP are met, to determine when defective material or work may require removal and/or reconstruction, and to determine when additional testing may be required to confirm the quality of the material or work. The results of field tests, laboratory tests, field inspections, receiving inspections, and surveys discussed in Section 4.1 will be reviewed. The review will be performed as soon as possible to prevent the construction of new work over material or work which is later determined to be defective. The Resident Engineer will sign and date all documents reviewed to indicate that the review has been complete.

4.3 AS-BUILT DOCUMENTATION

The records prepared will be retained in the site record system to provide documentation of how the closure/retrofit was accomplished. Final as-built drawings and specifications will be prepared by the Resident Engineering Group and Contractor utilizing this information and retained as a permanent record of the final configuration and dimensions of closure/retrofit features (e.g., clay liners, synthetic liners, drainage layers, filter fabric, subgrade, and pipes). As-built drawings and specifications must be reviewed and approved by the Engineer of Record.

4.4 NONCONFORMANCE/CORRECTIVE ACTION

Nonconforming items and activities which do not meet the Construction Drawings and Specifications, procurement document criteria, approved work procedures, or the CQAP will be detected and identified by:

- Resident Engineering Group - During construction operations by field inspections and verification testing;
- Laboratory Personnel - During the preparation for and performance of laboratory testing, and calibration of equipment; and
- Quality Assurance Personnel - During the performance of audits, surveillances, and other quality assurance activities.

Each nonconformance affecting quality shall be documented by the personnel identifying or originating it. For this purpose, the results of calibration, results of laboratory analysis quality control tests, audit reports, inspection reports, internal memorandum, or letter will be used as appropriate. Documentation shall, when necessary, include:

- Identification of individual(s) identifying or originating the nonconformance;
- Method(s) for completing corrective action and corrective action taken;
- Schedule for completing correction action and corrective action taken;
- Description of nonconformance; and
- Responsible individuals for correcting the nonconformance and, if verification is required, verifying satisfactory resolution.

Documentation shall be available to the project and laboratory management Quality Assurance personnel, and/or subcontractor management, as necessary.

Completion of corrective actions for significant nonconformances will be verified by Quality Assurance personnel as part of future activities.

Any significant, recurring nonconformance will be evaluated by Project, Laboratory, and/or Quality Assurance personnel to determine its cause and appropriate changes instituted to prevent future recurrence. When such an evaluation is performed, the results shall be documented.

4.5 CHANGE CONTROL

A continuous, up-to-date reporting and review system will be implemented for the closure/retrofit. Any change from original construction documents, procedures, and the Construction Quality Assurance Plan will be documented, evaluated, and reported as necessary.

5.0 CQA TESTING, SAMPLING AND OBSERVATIONS

Section 5.0 specifies the CQA Testing, Sampling and Observations necessary to control, verify, and document satisfactory work performance. The inspection and testing (field and laboratory testing) activities are described for the different phases of construction and the various materials of construction. A summary of the verification testing program for the Impoundment System Closure/Retrofit is shown on Table 6-1.

5.1 SITE PREPARATION

The site preparation activities will be monitored by the Engineer to verify that the Impoundment System area site is properly prepared for construction activities to follow.

5.1.1 Site Drainage

The QA/QC Engineer shall observe and assess site drainage measures undertaken throughout the duration of the project.

The QA/QC Engineer shall observe and document any dewatering operations.

The QA/QC Engineer shall observe the installation and assess the effectiveness of drainage swales to prevent surface run-on from entering construction areas.

The QA/QC Engineer shall observe and document the placement of rip rap in the ditches.

5.1.2 Clearing and Grubbing

The QA/QC Engineer shall monitor the removal of all debris, placing special emphasis on the removal of any stumps and large roots and the backfill installation to prevent potential conduits for contamination migration.

The QA/QC Engineer shall observe the placement of and document any fill required for depressions.

5.1.3 Impoundment Operation Relocation

The QA/QC Engineer shall monitor and document the sheet pile installation procedures. The QA/QC Engineer shall verify that the sheet piles are placed and driven in accordance with the Construction Specifications. The QA/QC Engineer shall determine if additional measures are necessary (i.e., placement of sealant) to assure a watertight seal and monitor the placement of such sealant. The QA/QC Engineer shall also monitor the removal of the sheet piles to verify that the integrity of the dike is not compromised due to such operations.

The QA/QC Engineer shall monitor and document that the piping between the impoundments is placed in accordance with the Construction Drawings and the Construction Specifications. The QA/QC Engineer shall verify by inspection or a manufacturer's certificate that the valves in the pipes will withstand 10 feet of hydrostatic head.

The QA/QC Engineer shall monitor the removal, abandonment, or routing of piping within the area of relocation of the impoundment inflow line and verify that such activities have eliminated construction hazards. The QA/QC Engineer shall monitor the trenching operation and document the line and grade survey for compliance with the Construction Drawings. The survey shall be certified by a professional land surveyor or engineer.

The QA/QC Engineer shall monitor and document the placement of new inflow pipeline into the trench to include placement, sealing of joints, and trench backfill operations.

The QA/QC Engineer shall monitor and document the movement of the pump station to its permanent location. The QA/QC Engineer shall perform and document appropriate tests for the concrete slab in accordance with Section 5.11.

5.1.4 Impoundment System Dewatering

The QA/QC Engineer shall observe and document the dewatering operations of the impoundment system.

5.1.5 Removal of Impoundment Structures

The QA/QC Engineer shall observe and document the removal of structures in the impoundments.

The QA/QC Engineer shall verify that any structures to be placed in the SWCA are prepared in accordance to the Construction Specifications.

The QA/QC Engineer shall monitor and document the replacement of the influent line to impoundment A with HDPE pipe.

5.2 WASTE SOLIDIFICATION

5.2.1 Inspection and Data Documentation

The QA/QC Engineer shall verify that the solidification agent is mixed to a homogeneous consistency and that all free water is removed.

The QA/QC Engineer shall verify that any underlying soil which has a sediment-like consistency will be excavated and incorporated into the solidified material.

The QA/QC Engineer shall inspect and document the type of equipment used to mix the solidification agent and sediments.

5.2.2 Testing

The following tests shall be performed during solidification:

(1) The QA/QC Engineer shall obtain test cylinders and verify the strength by pocket penetrometer of the stabilized material is greater than 4.5 tsf in 7 days. The cylinders shall be molded immediately after addition and mixing of the solidification agent. The samples shall be placed in 3-inch diameter by 6-inch long molds in three (3) equal lifts. Each lift shall be tamped 25 times prior to placing the next lift. The tamping rod should penetrate the receding lift by no more than one-half (½) inch. One set of three (3) cylinders shall be taken for every 1,000 cubic yards of solidified material or a minimum of one set for each impoundment. The cylinders shall be tested for strength at 48 and 72

hours and at 7 days. In addition, a paint filter test will be performed at the time a set of cylinders are taken to verify that all free liquids are removed.

(2) Prior to acceptance of an area, test pits will be excavated at 1-foot intervals until the natural pond bottom is reached. At each interval, pocket penetrometer measurements shall be taken by the QA/QC Engineer on the bottom and sides of the excavation to verify strength consistency. The average values of these readings will be reported. Visual examination of the test pit excavation will be made by the QA/QC Engineer for possible seepage or leaching. The observation shall also be documented. One test pit should be excavated for every 2,000 cubic yards of sediment solidified or a minimum of two (2) tests within each impoundment. A test pit area in which molded cylinders did not meet strength requirements shall be retested by obtaining an undisturbed sample which will be tested for unconfined compressive strength. If the unconfined compressive strength is greater than 1500 psf, the sample shall be considered as having passed the strength requirements.

5.3 RELOCATION OF SOLIDIFIED MATERIAL

5.3.1 Inspection and Data Documentation

The QA/QC Engineer shall verify during excavation that the solidified material is a homogeneous mixture and that all free water is removed.

The QA/QC Engineer shall verify that the solidified material is excavated to the sediment/natural soil interface.

The QA/QC Engineer shall verify that underlying soil which exhibits sediment-like consistency shall be excavated and incorporated with the solidified material.

5.4 SWCA FOUNDATION PREPARATION

5.4.1 SWCA Dikes

5.4.1.1 Inspection and Data Documentation

The QA/QC Engineer shall monitor and document the line and grade survey for compliance with specification tolerance. The survey shall be certified by a Licensed Land Surveyor or a Registered Civil Engineer certified to perform surveying in Mississippi.

The QA/QC Engineer shall monitor the removal of all debris, placing special emphasis on the removal of any grass and large roots to prevent potential seepage paths.

The QA/QC Engineer shall verify proper scarification and recompaction of the SWCA dikes.

The QA/QC Engineer shall verify by laboratory and/or field testing and document the distribution and general gradation of the embankment materials, such that relative uniform layers or a homogeneous mixture of clayey soils comprises the materials of the embankments. Visual inspection of the excavated materials shall be made by the construction personnel and QA/QC Engineer to detect the presence of organic matter, or irreducible matter greater than 1 inch in any dimension prior to placement.

The QA/QC Engineer shall inspect and document the type of compaction equipment and the uniformity of coverage made by compaction equipment.

The QA/QC Engineer shall measure the lift thickness to verify that the clayey soils are placed in uniform layers not to exceed eight inches thick, measured loose.

The QA/QC Engineer shall observe scarification after each completed lift.

The QA/QC Engineer will document after visual inspection any soft spots or other areas of non-homogeneous features.

5.4.1.2 Testing

The QA/QC Engineer shall test the soil borrow source. Prior to acceptance of a clay borrow source, the QA/QC Engineer shall obtain samples of the proposed

material and have it tested by laboratory. A minimum of three tests shall be performed per borrow area prior to its use as fill to determine the suitability with the moisture-density curves. In addition, the QA/QC Engineer shall have the following clay borrow source testing performed:

- Determination of liquid limit, plastic, limit, plasticity index, and moisture content in accordance with ASTM D 4318 at 3 per Borrow Area. The soil shall be classified either as CH or CL in accordance with the Unified Soil Classification System (ASTM D 2487).

The QA/QC Engineer shall perform density tests on the dikes at every 50 foot station.

The QA/QC Engineer shall direct sampling and perform and document relative density or Standard Proctor tests to obtain adequate construction control.

5.4.2 SWCA Bottom

5.4.2.1 Inspection and Data Documentation

The QA/QC Engineer shall visually inspect the soils as imported. Rocks or cemented soils which may be considered detrimental to proper placement and compaction shall be rejected.

The QA/QC Engineer shall verify proper scarification and recompaction of the foundation. The site shall be visually inspected to verify supportive properties, and to verify that the foundation surface is properly compacted, smooth, uniform, and consistent with design grades.

The QA/QC Engineer shall monitor and document the line and grade survey for compliance with specification tolerance. The survey shall be certified by a Licensed Land Surveyor or a Registered Civil Engineer certified to perform surveying in Mississippi.

5.4.2.2 Testing

The QA/QC Engineer shall perform and document field density tests on soils as placed. After scarification and recompaction, tests shall be performed from

each lift in accordance with Table 6-1. Procedure and acceptance criteria are in the Technical Specifications.

The QA/QC Engineer shall direct sampling and perform and document relative density or standard Proctor tests as required to obtain adequate construction control.

5.5 BOTTOM AND SIDE LINER SYSTEM

5.5.1 Synthetic Liner System

5.5.1.1 General

The synthetic liner system involves the placement of the synthetic liners as shown on the drawings. The synthetic liner shall meet the requirements of the Construction Specifications. The QA/QC Engineer shall review the following submittals from the manufacturer:

- Complete material specifications, descriptive drawings, literature and warranty in accordance with the Specifications;
- Documented evidence of proven technical competence, past record of satisfactory performance on similar projects, and sufficient capacity to do the volume of work specified;
- Factory test results of materials certified by the liner manufacturer as being similar shall be submitted showing conformance with the requirements of the Specifications. In addition, the Contractor shall submit the manufacturer's certification stating that the material proposed is similar and of the same formulation as that for which test results are submitted and which by actual usage has been demonstrated to be satisfactory for the intended application;
- Recommend method for handling and storage prior to installation;
- Samples of liner sheeting, and sheeting joints, and a complete description of seaming and patching by extrusion welding;
- Before commencing the Work specified and prior to ordering the liner material, the Contractor shall submit to the QA/QC Engineer for approval all installation drawings, procedures, sterilization requirements and a schedule for carrying out the work. Shop drawings shall have liner sheet layout with proposed size, number, position, and sequence of placing of all factory-fabricated sheets and indicating the location of all field joints and the direction of shop joints on each sheet. Shop drawings shall also show complete details and/or methods for anchoring the liner at the ends of the cover,

making field joints, and making seals around pipes and structures penetrating the liner;

- The liner fabricator shall certify that the factory joints conform to the specifications and shall submit certified test results from an approved independent testing laboratory. Certification that cleaning solvent is compatible with the surfaces on which it is to be used shall also be submitted; and

- The liner manufacturer's representative shall inspect the clay liner surface for acceptability and provide on-site technical supervision and assistance at all times during the installation of the liner and placement of the overlying protective cover. The manufacturer's representative shall furnish the Engineer with Certification that the liner was installed in accordance with manufacturer's recommendations.

5.5.1.2 Inspection and Data Documentation

QA/QC Engineer shall document the manufacturers certification that the liner meets the Technical Specifications for acceptance criteria. The liner shall be visually inspected upon receipt for damage and also for manufacturer's identification to verify that the proper material was received.

The QA/QC Engineer shall verify and document that during onsite storage, the liner is protected from ultraviolet light, heavy winds, precipitation, temperature extremes and vandals.

The QA/QC Engineer shall document weather conditions and verify that the conditions are acceptable for liner placement and seaming.

QA/QC Engineer shall visually inspect the subgrade (clay liner) prior to placement to verify that all materials adjacent to the liner are smooth and free of materials or conditions that may damage the membrane.

The QA/QC Engineer shall visually inspect each liner sheet for damage after it is unrolled during installation.

The QA/QC Engineer shall inspect the anchor trench and verify that the dimensions are as specified and that the trench soil is not desiccated and does not contain loose soil material.

The QA/QC Engineer shall verify that the liner penetrations and liner connections are installed as specified.

The QA/QC Engineer shall measure the overlap of the sheets composing the seam for conformance with specifications and shall verify that the area to be welded is cleaned and prepared according to the procedures laid down by the material manufacturer. If required, the QA/QC Engineer shall verify that proper temporary anchorage is used.

The QA/QC Engineer shall observe all seam testing to verify that the membrane is not damaged by equipment or personnel and shall visually inspect all seams for visible discontinuities in the seam or any other noticeable defects and shall check the gauges and dials during seaming to verify that the temperature, pressure and speed of seaming are as specified. Defective areas shall be marked on the liner and on the construction inspection form and repaired in accordance with HDPE repair procedures.

The QA/QC Engineer shall verify that the laboratory seam strength samples have a width of 4 inches and a length of 10 inches plus the seam width as specified in the Technical Specifications.

The QA/QC Engineer shall verify and document that at least a six (6) inch fold or accumulation of material remains at the finished toe of each interior slope to accommodate thermal contractions and any differential settlements which may occur.

After installation of the liner, the QA/QC Engineer shall inspect the entire surface of the liner for tears, punctures, and thin spots and shall also inspect all factory seams and field fabricated seams.

5.5.1.3 Testing

(1) The QA/QC Engineer shall monitor vacuum field testing of the field fabricated seams through the entire length of the seam. In addition the QA/QC Engineer shall review results of air lance testing of factory fabricated seams.

(2) The QA/QC Engineer shall review all laboratory testing. Seam samples for laboratory testing shall be collected every 500 feet and shall be large enough for the manufacturer to check, for an independent laboratory evaluation, and for site owner archiving. The testing shall include verification of thickness, determination of bonded seam strength in shear, and bonded seam strength in peel.

(3) Field seams which fail shall be repaired as quickly as possible in accordance with the specifications. Documentation of all repairs shall include location, type, and method of repair.

5.5.2 Leachate Detection/Collection System

5.5.2.1 Synthetic Drainage Layer

Inspection and Data Documentation

The QA/QC Engineer shall document geotextile manufacturers data, including a mill certificate or affidavit.

The QA/QC Engineer shall document manufacturer's data on the drainage net.

The QA/QC Engineer shall inspect the drainage net and geotextile after receipt for damage during shipment and also for manufacture's identification to verify that the proper material was received.

The QA/QC Engineer shall inspect the jointing of drainage net for compliance with the Technical Specifications.

5.5.2.2 Leachate Collection Trench

Inspection and Data Documentation

The QA/QC Engineer shall verify that the pipes are of the specified size and strength, are constructed of the specified material and that pipe perforations are sized as specified.

The QA/QC Engineer shall inspect and test the gravel and protective sand layers to verify the gradation and shall verify that specified provisions to keep the gravel clean during storage, handling, and placement are followed.

The QA/QC Engineer shall verify the dimensions of the collection trench and shall inspect all prefabricated structures.

The QA/QC Engineer shall monitor and document proper placement of the HDPE leachate collection pipe and verify joints are welded properly.

The QA/QC Engineer shall monitor and document the placement of the clean-out pipes and verify that the pipes and cover boxes are constructed as shown in the Construction Drawings.

The QA/QC Engineer shall monitor and document the placement of the protective layer over the leachate collection pipe and liner system.

The QA/QC Engineer shall monitor and document the line and grade survey for compliance with specification tolerance to verify that the leachate will flow toward the sump.

5.5.3 Clean-out Pipes

The QA/QC Engineer shall verify that the pipes are of the specified size and strength, and constructed of the specified material. Each pipe will be delivered with certification.

The QA/QC Engineer shall observe and document proper pipe placement as shown on the construction drawings.

The QA/QC Engineer shall verify the integrity of the HDPE liner sleeve and shall inspect the seams and welds according to Section 5.5.1.

The QA/QC Engineer shall verify and document the placement of the pipe cover system in accordance with Construction Drawings.

5.5.4 Leachate Collection System Sump

5.5.4.1 Inspection and Data Documentation

The QA/QC Engineer shall verify that the pipes are of the specified size and strength, are constructed of the specified material and that pipe perforations are sized as specified. Each pipe will be delivered with certification.

The QA/QC Engineer shall observe and document proper sump placement and shall verify the connection between sump and drainage pipe.

The QA/QC Engineer shall inspect the concrete sump foundation according to Section 5.11.

The QA/QC Engineer shall verify the integrity of the HDPE plate and shall inspect the seams and welds according to Section 5.5.4.

The QA/QC Engineer shall verify that the sump/plate is bolted to the concrete footer.

5.6 PLACEMENT OF SOLIDIFIED MATERIAL INTO SWCA

5.6.1 Access Roads and Ramps

The Construction Quality Assurance for the Access Roads and Ramp shall be the same as specified in Section 5.4.2.

5.6.2 Placement of Solidified Material

5.6.2.1 Inspection and Data Documentation

The QA/QC Engineer shall verify that placement of the solidified material into the SWCA is accomplished in a careful and controlled manner.

The QA/QC Engineer shall verify that a minimum of one foot of solidified material is placed on the SWCA to provide a protective layer to maintain the integrity of the SWCA liner system during compaction of the remaining solidified material.

The QA/QC Engineer shall verify during excavation that the solidified material is a homogeneous mixture and that all free water is removed.

5.6.2.2 Testing

The QA/QC Engineer shall have the following testing performed during placement of the solidified material:

- Determination of in-place density and moisture content by nuclear methods performed in accordance with ASTM D 2922 and ASTM D 3017. Testing shall be performed every lift at 100-foot centers;
- Determination of moisture content in accordance with ASTM D 2216 shall be performed per 20 nuclear gauge tests to verify the nuclear gauge tests; and
- Paint filter test shall be performed every 2,500 cubic yards or as deemed necessary by the QA/QC Engineer.

5.7 SWCA FINAL COVER SYSTEM

5.7.1 Site Preparation

The QA/QC Engineer shall verify the compaction of the foundation (solidified waste) and shall visually inspect the foundation to verify supportive properties, and to verify that the foundation is properly compacted, uniform, and consistent with design grades.

The QA/QC Engineer shall monitor the exposing of the primary synthetic liner to assure the liner is not damaged and is adequately cleaned and prepared prior to attachment to the top synthetic liner.

5.7.2 Gas Collection/Venting System

The gas collection system will be made of a synthetic drainage net.

5.7.2.1 Inspection

The QA/QC Engineer shall monitor and document the placement of the synthetic drainage net and geotextile according to Section 5.5.2.

The QA/QC Engineer shall monitor and document the installation of the vent pipes to verify that the pipes are installed according to the specifications and are not damaged during the filling process around the pipes.

The QA/QC Engineer shall monitor and document line and grade survey for compliance with specification tolerance.

5.7.3 Synthetic Liner

The construction quality assurance for the top synthetic liner shall be the same as specified for the bottom synthetic liners as specified in Section 5.5.1.

5.7.4 Clay Liner

5.7.4.1 Inspection and Data Documentation

The QA/QC Engineer shall monitor the handling, stockpiling and placement of clay. Visual inspections of the excavated materials shall be made to detect the presence of organic matter, or irreducible matter greater than one (1) inch in any dimension prior to placement in the stockpile.

The QA/QC Engineer shall monitor and document line and grade survey for compliance with specification tolerance. The survey shall be certified by a Licensed Land Surveyor or a Registered Civil Engineer certified to perform surveying in Mississippi.

The QA/QC Engineer shall inspect lift thickness to verify that the clay is placed in uniform layers not to exceed eight inches thick, measured loose.

The QA/QC Engineer shall inspect and document the type of compaction equipment, the uniformity of coverage by compaction equipment, and will verify that each lift is compacted to a maximum of 6 inches.

The QA/QC Engineer shall observe scarification after each completed lift.

The QA/QC Engineer shall inspect the clay liner for evidence of imperfections such as desiccation, lenses, cracks, channels, root-holes or other structural non-uniformities that may cause an increase in the permeability of the liner.

5.7.4.2 Testing

(1) Prior to acceptance of a clay borrow source, the QA/QC Engineer shall obtain samples of the proposed material and have it tested by laboratory. The testing shall consist of three permeability tests on compacted borrow samples, one each with 0%, +2% and +4% of the optimum moisture content at between 90% and 95% of maximum dry density attainable by standard Proctor procedures (ASTM D698). A minimum of three tests shall be performed per borrow area prior to its use as fill for the clay liner to determine the moisture-density curves. In addition, the QA/QC Engineer shall have the following clay borrow source testing performed:

- Determination of liquid limit, plastic limit, plasticity index, and moisture content in accordance with ASTM D 4318 at 5 per Borrow Area. The soil shall be classified either as CH or CL in accordance with the Unified Soil Classification System (ASTM D 2487);
- Determination of specific gravity per moisture density; and
- Unconfined Compression test on samples compacted at the optimum moisture content at between 90 percent and 95 percent of maximum dry density attainable by standard Proctor procedure, performed in accordance with ASTM D 2850 at 2 per Borrow Area.

(2) The QA/QC Engineer shall have the following clay testing performed during construction:

- Determination of the soil in-place density and moisture content by nuclear methods performed in accordance with ASTM D 2922 and ASTM D 3017. Testing shall be performed every lift at 50-foot centers. All holes in the clay liners resulting from nuclear gauge testing shall be backfilled with clay liner quality soil and hand tamped into place;
- Determination of moisture content in accordance with ASTM D 2216 shall be performed per 20 nuclear gauge tests to verify the nuclear gauge results;
- Grain size analyses in accordance with ASTM D 422, performed at a minimum frequency of two per week or one test per 2,500 cubic yards of clay soil, or when a change of material is noticed by the inspector;
- Determination of liquid limit, plastic limit and plasticity index in accordance with ASTM D 4318. These tests shall be performed at a minimum frequency of two tests per week or one test per 2,500 cubic yards. The soil shall be classified either as CH or CL in accordance with the Unified Soil Classification System (ASTM D 2487); and

- Unconfined Compression Test, on relatively undisturbed samples after clay placement. Sample locations shall be determined by the QA/QC Engineer. Four tests shall be performed on the clay liner.

(3) The QA/QC Engineer shall document the results of the clay testing and if required, the moisture content will be adjusted and the soil compacted as specified before the next lift is started.

(4) The QA/QC Engineer shall obtain five (5) undisturbed clay samples from the cap for each 6-inch lift of compacted clay (i.e. a total of 10 undisturbed clay samples shall be collected). The samples shall be at least 3 inches in diameter and 6 inches long. Laboratory hydraulic conductivity tests shall be performed in accordance with EPA Method 9100 on these samples to verify compliance with the permeability as specified in the Technical Specifications. The QA/QC Engineer shall document the results. Additional sampling and testing shall be performed as specified by the Resident Engineer adjacent to locations which yield permeability test values that exceed the design value within the clay liner. All sampling holes in the clay liner shall be backfilled with clay liner quality soil and hand tamped into place.

5.7.5 Synthetic Drainage Layer

The QA/QC Engineer shall document manufacturers data on the synthetic drainage layer and the geotextile fabric to demonstrate compliance to the Technical Specifications requirements.

The QA/QC Engineer shall observe and document the proper placement and anchoring of the drainage netting and associated geotextile fabric.

The QA/QC Engineer shall monitor and document the line and grade survey for compliance with Specification Tolerance.

5.7.6 Topsoil

The QA/QC Engineer shall verify that the topsoil is free of admixture of subsoil and foreign matter, objects larger than one (1) inch diameter, toxic

substance and any other deleterious material which may be harmful to plant growth.

The QA/QC Engineer shall verify that the topsoil is graded uniformly and gradually towards the perimeter drainage ditches.

The QA/QC Engineer shall monitor and document the line and grade survey for compliance with the specifications tolerance.

5.7.7 Erosion Protection Material

The QA/QC Engineer shall document the synthetic Erosion Protection (geomat) manufacturer's data as set forth by the Construction Specifications. The QA/QC Engineer shall also monitor and document placement of the geomat.

5.8 IMPOUNDMENT RETROFIT AREA

5.8.1 Foundation Preparation

The QA/QC Engineer shall verify the compaction of the foundation and shall visually inspect the foundation to verify supportive properties, and to verify that the foundation is properly compacted, uniform, and consistent with design grades.

The QA/QC Engineer shall perform and document tests as specified in Section 5.4.2.

5.8.2 Structural Fill

5.8.2.1 Inspection and Documentation

The QA/QC Engineer shall monitor and document the placement of the structural fill in accordance with the Specifications.

The QA/QC Engineer shall verify that the fill is placed in one uniform lift and the final thickness is a minimum of six inches.

5.8.2.2 Testing

The engineer shall test the compaction by determination of its in-place density by nuclear methods in accordance with ASTM D 2922. Testing shall be performed at 100-foot centers.

5.8.3 Bottom Gas Relief System

The Construction Quality Assurance for the bottom gas relief system shall be the same as specified in Section 5.7.2.

5.8.4 Synthetic Liner System

The Construction Quality Assurance for the synthetic liner system shall be the same as specified in Section 5.5.1.

5.8.5 Leakage Detection/Removal System

The Construction Quality Assurance for the leakage detection/removal system is the same as specified in Section 5.5.2.

5.8.6 Leachate Detection/Removal System Sump

The Construction Quality Assurance for the leakage detection/removal system sump is the same as specified in Section 5.5.4.

The Construction Quality Assurance from the sheet pile wall around the LD/RS sump shall be the same as specified in Section 5.1.3.

5.9 PERIMETER DITCH

5.9.1 Inspection and Documentation

The QA/QC Engineer shall monitor and document the excavation of the perimeter ditch.

The QA/QC Engineer shall verify dimensions and slope of perimeter ditch comply with specifications. The QA/QC Engineer shall monitor and document all placement of rip rap and corrugated metal pipe appurtenances associated with the perimeter ditch.

The QA/QC Engineer shall document that any rip rap placed is in accordance with the Construction Specifications.

5.10 REVEGETATION AND RECLAMATION

The QA/QC Engineer shall monitor and document placement and line and grade survey for compliance with the specifications tolerance.

The QA/QC Engineer shall monitor the top soil placement and subsequent seeding and fertilization to assure proper revegetation of the closure area.

5.11 REINFORCED CONCRETE WORK

This section covers the requirements of monitoring all work for the forming, placing, finishing, and curing of all reinforced concrete indicated on the drawings and/or specified herein.

5.11.1 Inspection and Data Documentation

The QA/QC Engineer shall observe and document the proper placement of reinforcement and concrete.

The QA/QC Engineer shall review and approve concrete mix designs prior to placement of concrete.

The QA/QC Engineer shall approve foundations, forms reinforcing, pipes, sleeves, hangers, anchors, and conduit, etc. prior to placement of concrete.

The QA/QC Engineer shall approve any construction joints.

Form removal on all work shall be subject to owner's representative approval.

5.11.2 Testing

(1) The QA/QC Engineer shall oversee retention of concrete cylinders for strength testing and shall document results. Reference the Technical Specifications.

(2) The QA/QC Engineer shall perform and document slump tests to assure compliance. The slump shall range between 3 and 5 inches on each load of concrete.

6.0 RECORDS MANAGEMENT

In addition to performing inspections and verification testing to determine that the requirements of the construction drawings and specifications have been met, it is necessary to document and maintain the records of the inspections and verification testing so that the construction of the landfill can be demonstrated. Records related to the landfill construction shall be collected and maintained on-site during construction in a Records Management System.

The records system shall be established as part of the construction administration and provide adequate control and retention of records. Records control shall include receipt from on-site and external sources, transmittal, and transfer to storage. Retention shall include receipt at the storage area, indexing and filing, storage and maintenance, and retrieval.

At the conclusion of construction activities, the construction records will be retained at VCD. During or at the end of construction, records developed off site (such as off-site laboratory records) which are related to the construction will be merged with the on-site records at the designated storage location.

TABLE 6-1 (SHEET 1 of 3)

SUMMARY OF VERIFICATION TESTING PROGRAM[1]
IMPOUNDMENT SYSTEM CLOSURE/RETROFIT
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

I. MATERIAL RECEIVING TESTING

MATERIAL	TEST PERFORMED	FREQUENCY	PURPOSE	ACCEPTANCE CRITERIA
Borrow Clay	Atterberg Limit	5 per Borrow Area	Design clay.	CH or CL
	Natural Water Content (Wc)	1 every Atterberg	Same as above.	None
	Unconfined Compression Test	2 per Borrow Area	Assess stability of SWCA.	None

II. SOLIDIFIED WASTE CONSOLIDATION AREA AND RETROFIT AREA FOUNDATION PREPARATION

MATERIAL	TEST PERFORMED	FREQUENCY	PURPOSE	ACCEPTANCE CRITERIA
Excavation and Separation of Excavated Material	Close visual inspection only	As necessary	Verify sediment removal.	No visual indications of soils with sediment-like consistency.

MATERIAL	TEST PERFORMED	FREQUENCY	PURPOSE	ACCEPTANCE CRITERIA
Placement of Structural Fill	In situ density moisture tests	1) One density test at every 50-foot station.	Assess adequacy of compaction.	90% of maximum Standard Proctor Density (ASTM D698)
	Moisture Content and Density	Confirmation of nuclear gauge, 1 per 20 nuclear tests	Assess reliability of field tests.	± 2% of moisture content and ± 3% for density

Notes are at the conclusion of the table.

CED/TABLE6-1

TABLE 6-1 (SHEET 2 OF 3)

SUMMARY OF VERIFICATION TESTING PROGRAM[1]
IMPOUNDMENT SYSTEM CLOSURE/RETROFIT
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

MATERIAL	TEST PERFORMED	FREQUENCY	PURPOSE	ACCEPTANCE CRITERIA
Placement of Structural Fill	Atterberg Limits	1 per 2,500 cy of fill or two tests per week	Assess material changes.	CH or CL per Specifications
	Grain size analyses	1 per 2,500 cy of fill or two tests per week	Assess material changes.	Per Specifications

III. FIELD VERIFICATION TESTING FOR THE CLAY LINER

MATERIAL	TEST PERFORMED	FREQUENCY	PURPOSE	ACCEPTANCE CRITERIA
Clay Liner	In situ density/ moisture test	Every lift at 50-foot centers.	Assess adequacy of compaction effort.	95 percent of maximum Standard Proctor Density (ASTM D698)
	Moisture Content	Confirmation of nuclear gage, 1 per 20 nuclear tests	Assess reliability of field tests	± 2% of moisture content
Clay Liner	Permeability	2 undisturbed samples for (1) foot layer of compacted soil	Assess compliance with design requirement.	$K<10^{-7}$ cm/sec
	Atterberg Limits	Minimum 1 per 2,500 cy or two tests per week	Assess material changes.	Per Specifications

Notes are at the conclusion of the table.

CED/TABLE6-1

TABLE 6-1 (SHEET 3 OF 3)

SUMMARY OF VERIFICATION TESTING PROGRAM[1]
IMPOUNDMENT SYSTEM CLOSURE/RETROFIT
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

IV. FIELD TESTING FOR SYNTHETIC LINER AND
LEACHATE COLLECTION AND REMOVAL SYSTEM (LCRS)

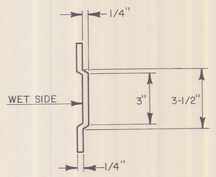
MATERIAL	TEST PERFORMED	FREQUENCY	PURPOSE	ACCEPTANCE CRITERIA
Synthetic Liner Seams	Shear strength and peel test	1 per 500 feet of field fabricated seams and 1 per 2,500 feet of factory fabricated seams.	Assess adequacy of seams.	Shear -70% of strength of parent material
	Thickness	1 per seam test specimen	Assess adequacy of seams. pounds per inch	Peel - 10
Granular Fill	Grain size	Tests performed as part of receiving inspection	To provide adequate flow capacity.	Meet design requirements
Geotextile	Per ASTM	Upon receiving shipment	Verify Certification by supplier.	Certification by supplier
Drainage Net	Per ASTM	Upon receiving shipment	Verify Certification by supplier.	Certifiation by supplier
Pipe	Per ASTM	Upon receiving shipment	Verify Certification by supplier.	Certification by supplier

NOTES: (1) Refer to Section 5.0 of the Construction Quality Assurance Program for further details of the Laboratory and Field verification testing.

ABBREVIATIONS: SWCA - Solidified Waste Consolidation Area
cm/sec - centimeters per second
cy - cubic yards
k - hydraulic conductivity

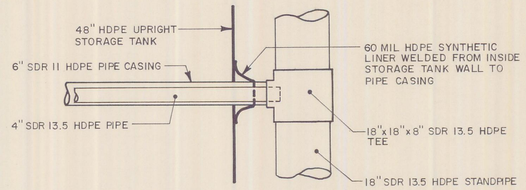
CED/TABLE6-1

DRAWN BY	C. LeBLANC 7/25/88	CHECKED BY	APPROVED BY	DRAWING NUMBER 435361-E10



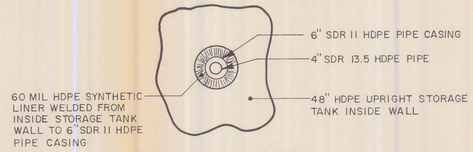
STIFFENER BAND

N.T.S.



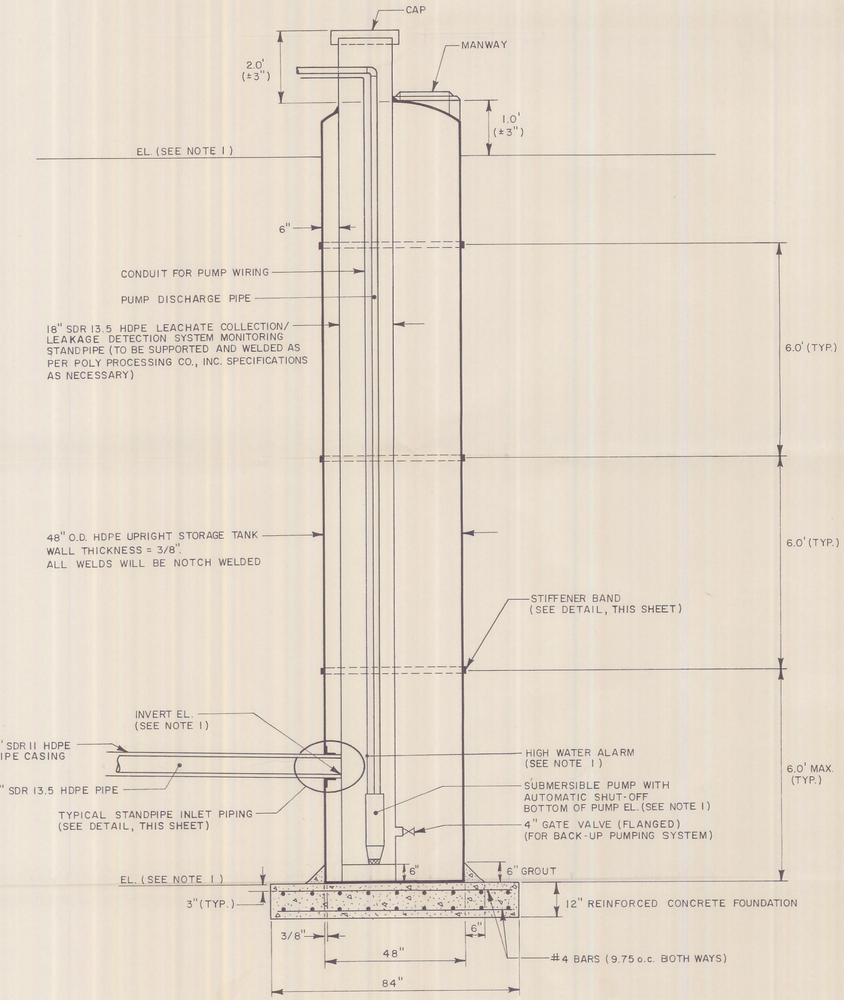
STANDPIPE INLET PIPING

N.T.S.



TYPICAL PIPING SLOT

N.T.S.

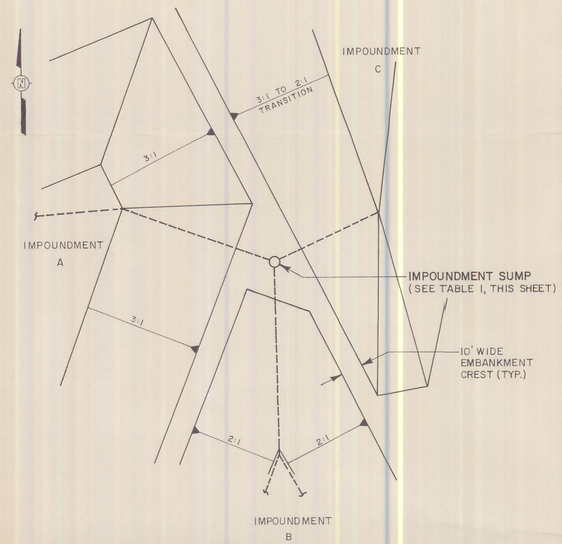


TYPICAL LEACHATE COLLECTION/LEAKAGE DETECTION SUMP

0 2 4 FEET
SCALE

DETAIL 12

NOTE: 1. FOR CONSTRUCTION ELEVATIONS OF THE IMPOUNDMENT SUMP, SWCA COLLECTION SUMP AND SWCA DETECTION SUMP SEE TABLES 1, 2 AND 3, THIS SHEET.



PLAN VIEW
IMPOUNDMENT DETECTION SUMP

0 30 60 FEET
SCALE

IMPOUNDMENT SUMP

LOCATION	ELEVATIONS
INVERT OF 4" LEAKAGE DETECTION PIPE AT IMPOUNDMENT A	91.5
INVERT OF 4" LEAKAGE DETECTION PIPE FROM IMPOUNDMENT A	91.1
INVERT OF 4" LEAKAGE DETECTION PIPE AT IMPOUNDMENT B	90.0
INVERT OF 4" LEAKAGE DETECTION PIPE FROM IMPOUNDMENT B	89.6
INVERT OF 4" LEAKAGE DETECTION PIPE AT IMPOUNDMENT C	90.5
INVERT OF 4" LEAKAGE DETECTION PIPE FROM IMPOUNDMENT C	90.3
GROUND SURFACE	109.5
BOTTOM OF SUMP	87.5
HIGH WATER ALARM	92.0
BOTTOM OF PUMP	88.0

* SLOPE OF PIPES FROM IMPOUNDMENTS A, B, AND C ARE AT APPROXIMATELY 0.5%.

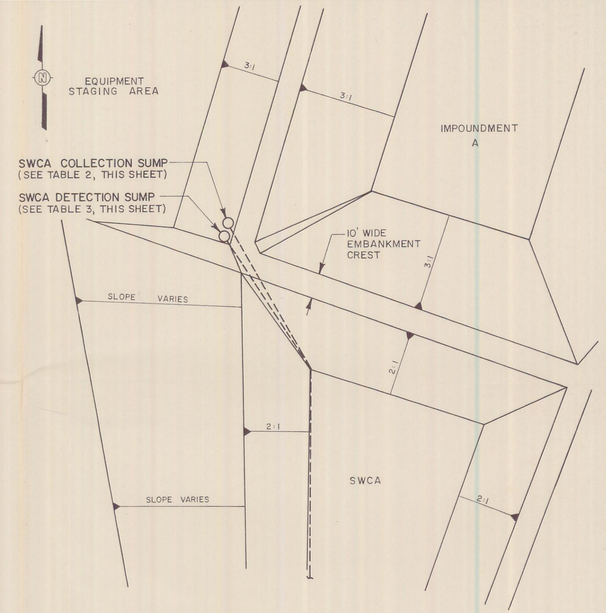
TABLE 1

SWCA COLLECTION SUMP

LOCATION	ELEVATIONS
INVERT OF 4" LEACHATE COLLECTION PIPE SWCA	94.0
INVERT OF 4" LEACHATE COLLECTION PIPE AT SUMP	93.6
GROUND SURFACE	111.0
BOTTOM OF SUMP	91.5
HIGH WATER ALARM	94.1
BOTTOM OF PUMP	92.0

* SLOPE OF PIPE FROM SWCA IS AT APPROXIMATELY 0.5%.

TABLE 2



PLAN VIEW
SWCA LEACHATE COLLECTION/ LEAKAGE DETECTION SUMPS

0 30 60 FEET
SCALE

SWCA DETECTION SUMP

LOCATION	ELEVATIONS
INVERT OF 4" LEAKAGE DETECTION PIPE AT SWCA	93.5
INVERT OF 4" LEAKAGE DETECTION PIPE AT SUMP	93.1
GROUND SURFACE	111.0
BOTTOM OF SUMP	91.0
HIGH WATER ALARM	93.0
BOTTOM OF PUMP (IF NECESSARY)	91.5

* SLOPE OF PIPE FROM SWCA IS AT APPROXIMATELY 0.5%.

TABLE 3

FIGURE 14

DETAIL SHEET 5 OF 6

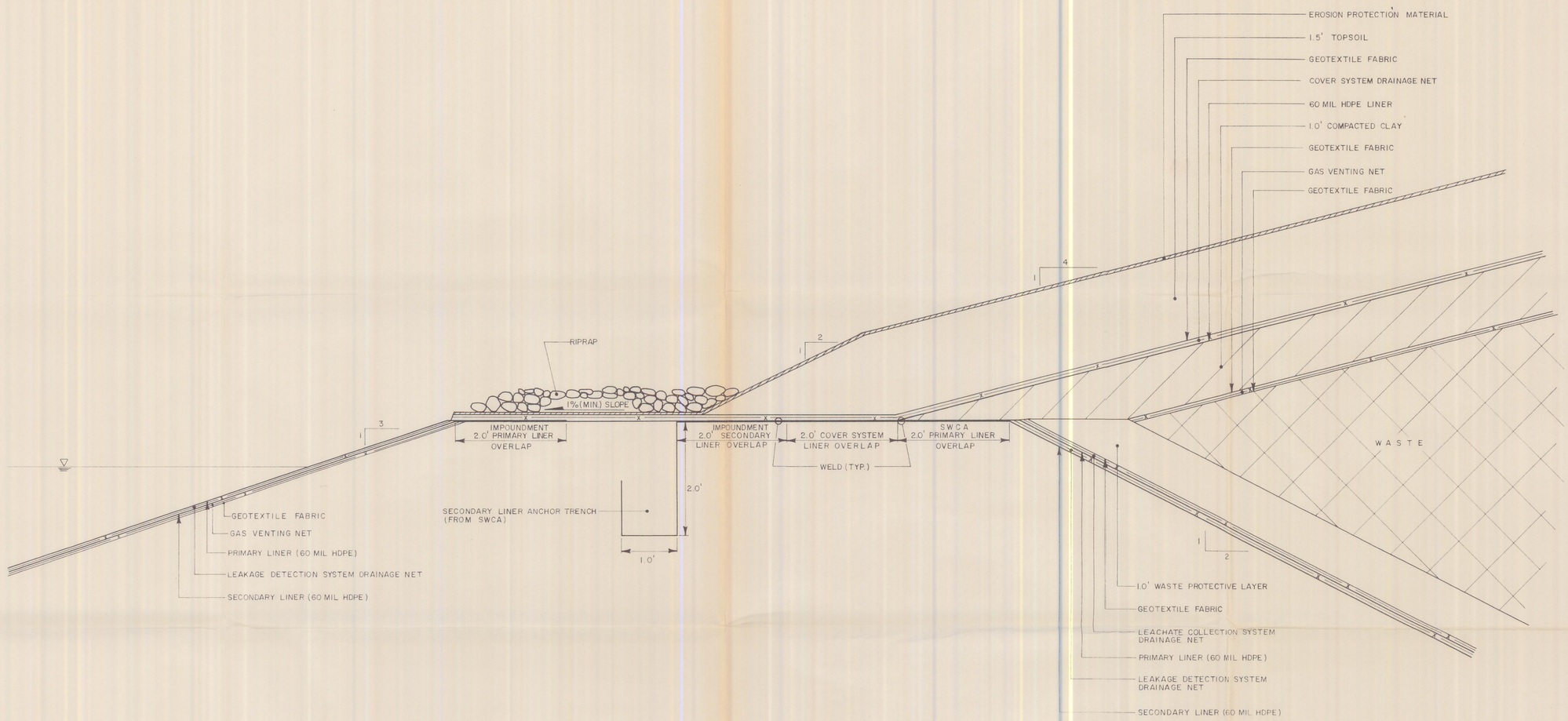
PREPARED FOR

VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

IT ... Creating a Safer Tomorrow

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
Do Not Scale This Drawing

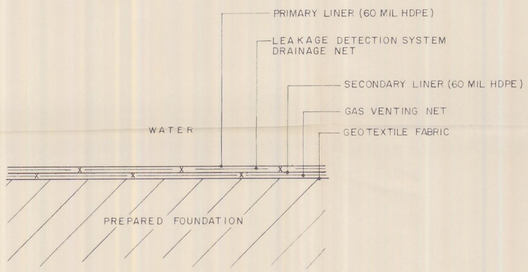
DRAWN BY	CHECKED BY	DRAWING NUMBER
CAL/TSB 7/27/88	APPROVED BY	435361-E9



SWCA CLOSURE/IMPOUNDMENT INTERFACE

0 1 2 FEET
SCALE

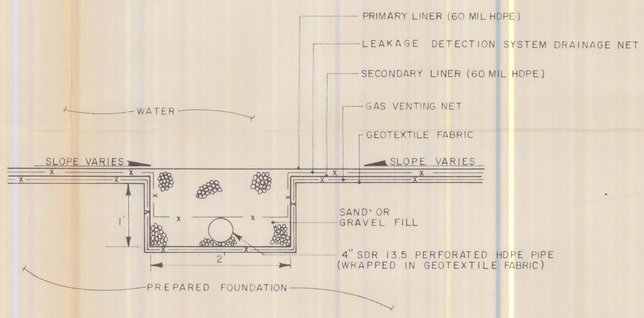
DETAIL 9



IMPOUNDMENT BOTTOM CONFIGURATION

N. T. S.

DETAIL 10



IMPOUNDMENT LEAKAGE DETECTION/REMOVAL SYSTEM TRENCH AND PIPING

N.T.S.

DETAIL 11

FIGURE 13

DETAIL SHEET 4 OF 6

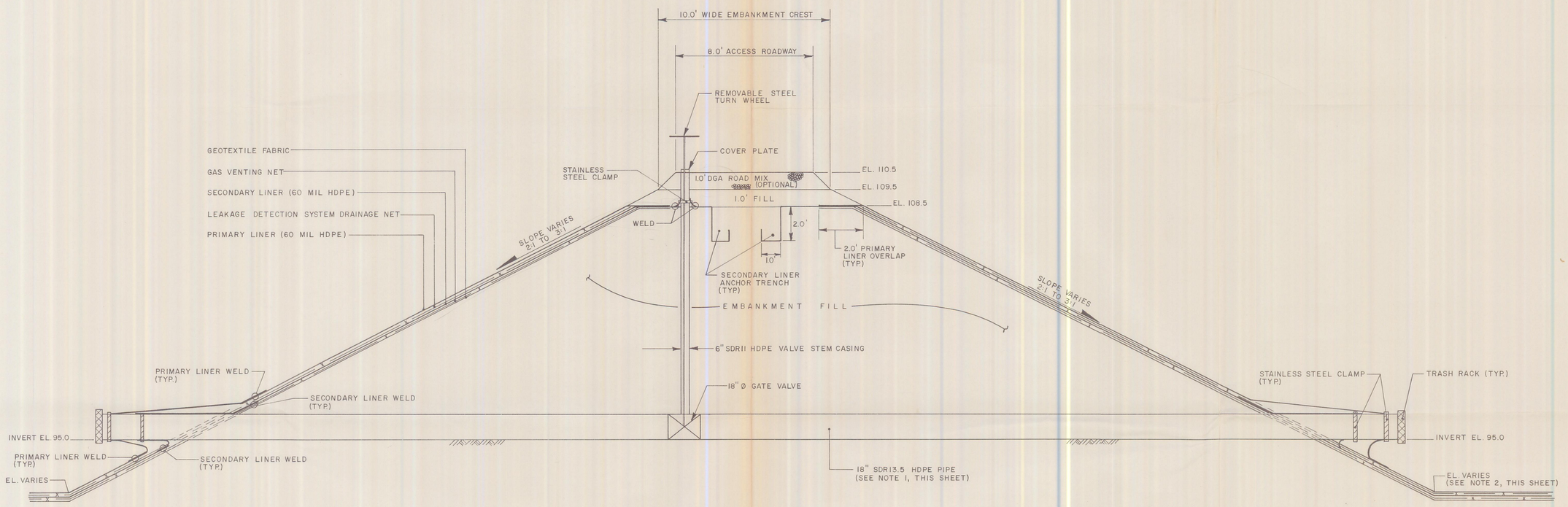
PREPARED FOR

VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

IT . . . Creating a Safer Tomorrow

130734 © 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
"Do Not Scale This Drawing

DRAWN BY	TSB 7/28/88	CHECKED BY	CJT	7-29-88	DRAWING NUMBER 435361-E8
		APPROVED BY			



TYPICAL IMPOUNDMENT EQUALIZATION CULVERT

0 3 6 FEET
SCALE

DETAIL 8

NOTES: 1. LENGTH OF 18"Ø HDPE PIPE TO VARY BASED ON FIELD DISTANCE BETWEEN IMPOUNDMENTS PRIOR TO CONSTRUCTION.

2. IMPOUNDMENT BOTTOM ELEVATION VARIES AT DESIGN LOCATIONS OF THE 18"Ø HDPE PIPE.

FIGURE 12

DETAIL SHEET 3 OF 6

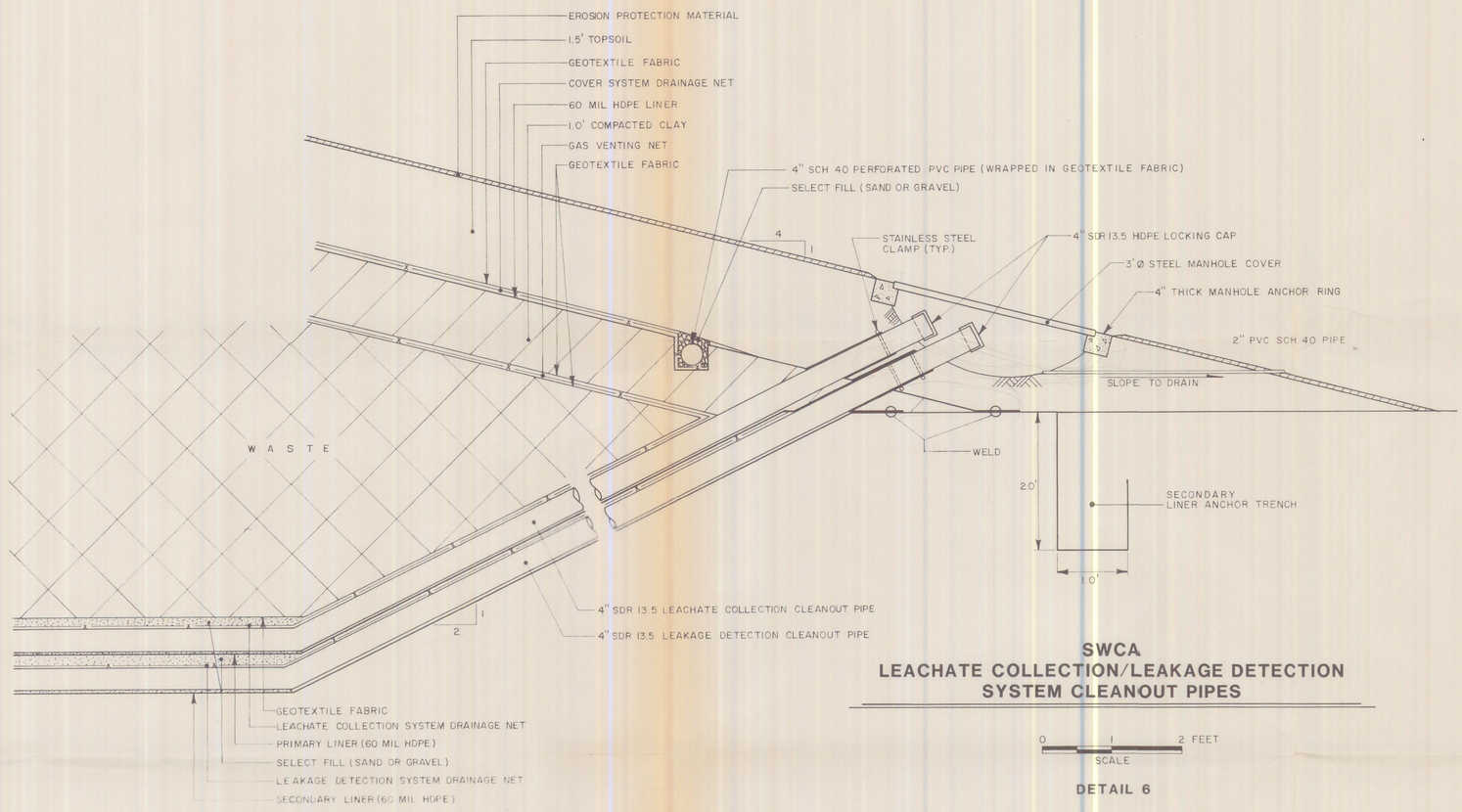
PREPARED FOR

VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

IT ... Creating a Safer Tomorrow

1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
"Do Not Scale This Drawing"

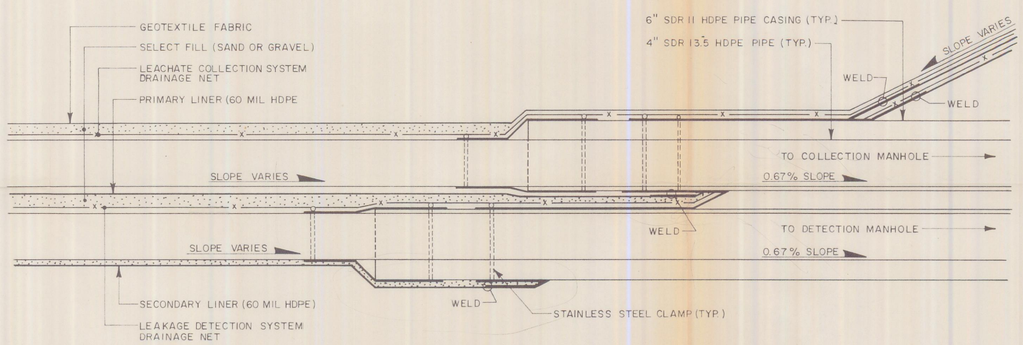
DRAWN BY	CHECKED BY	DRAWING NUMBER
CAL 7/28/88	APPROVED BY	435361-E7



SWCA
LEACHATE COLLECTION/LEAKAGE DETECTION SYSTEM CLEANOUT PIPES

0 1 2 FEET
SCALE

DETAIL 6



SWCA
TYPICAL LEACHATE COLLECTION/LEAKAGE DETECTION SYSTEM AND LINER INTERFACE

0 0.5 1.0 FOOT
SCALE

DETAIL 7

FIGURE 11

DETAIL SHEET 2 OF 6

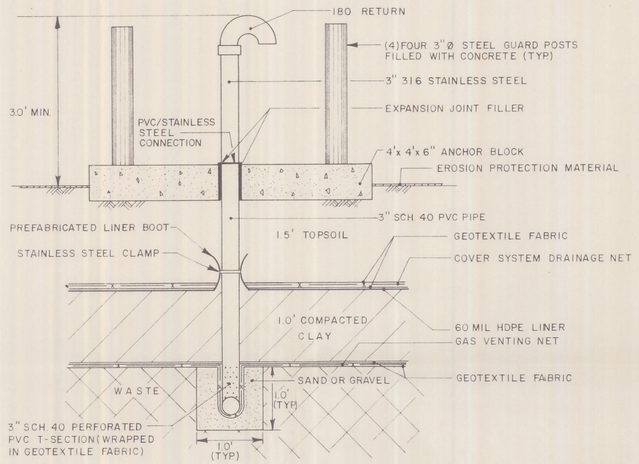
PREPARED FOR

VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

IT ... Creating a Safer Tomorrow

130724 © 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
"Do Not Scale This Drawing"

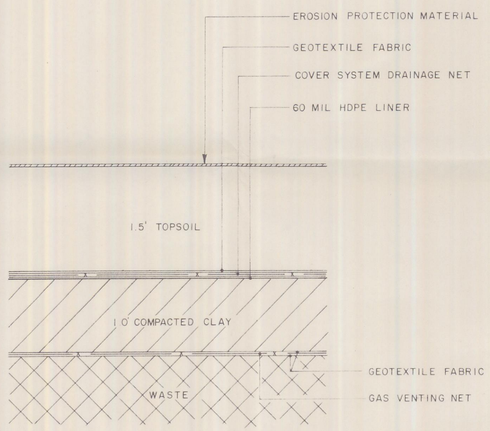
DRAWN BY	TSB/CAL	CHECKED BY	CJS	DRAWING NUMBER	435361-E6
	7/27/88	APPROVED BY			



SWCA GAS VENTING SYSTEM

0 1 2 FEET
SCALE

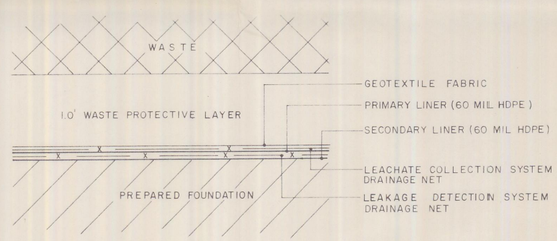
DETAIL 1



SWCA COVER SYSTEM

0 1 2 FEET
SCALE

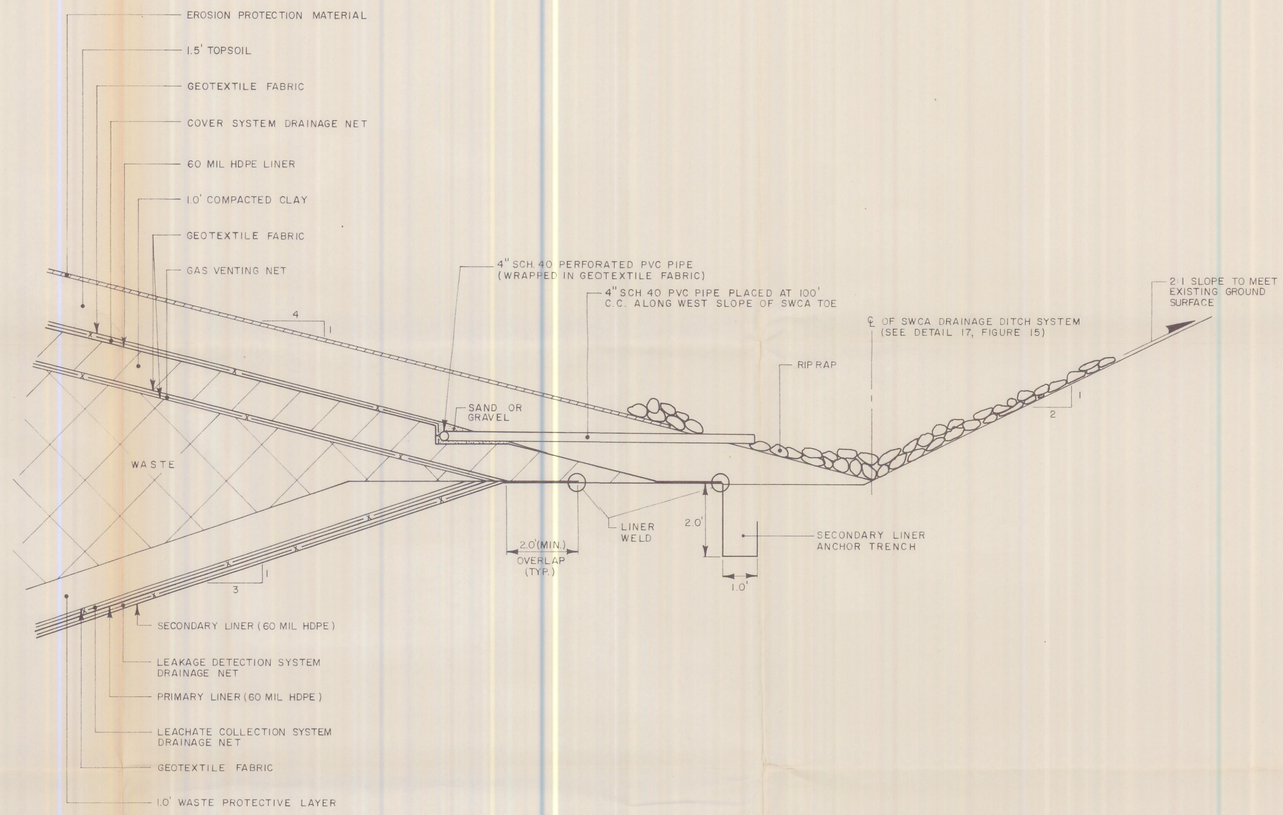
DETAIL 2



SWCA BOTTOM CONFIGURATION

0 1 2 FEET
SCALE

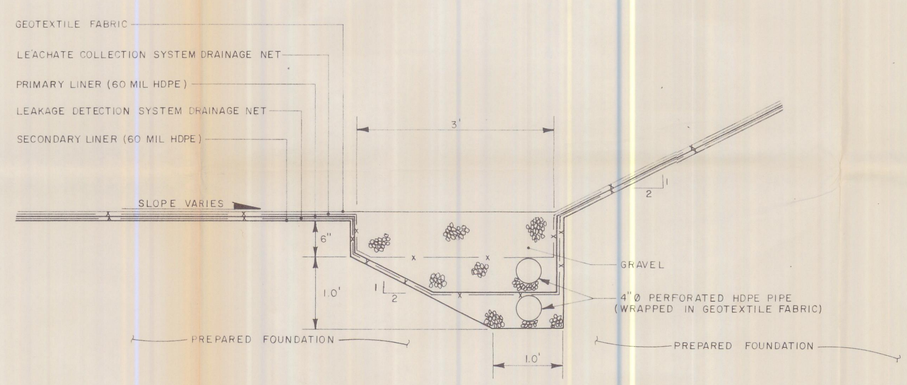
DETAIL 3



SWCA CLOSURE/DITCH INTERFACE

0 2 4 FEET
SCALE

DETAIL 4



SWCA LEACHATE COLLECTION/LEAKAGE DETECTION SYSTEM TRENCH AND PIPING

0 1 2 FEET
SCALE

DETAIL 5

FIGURE 10

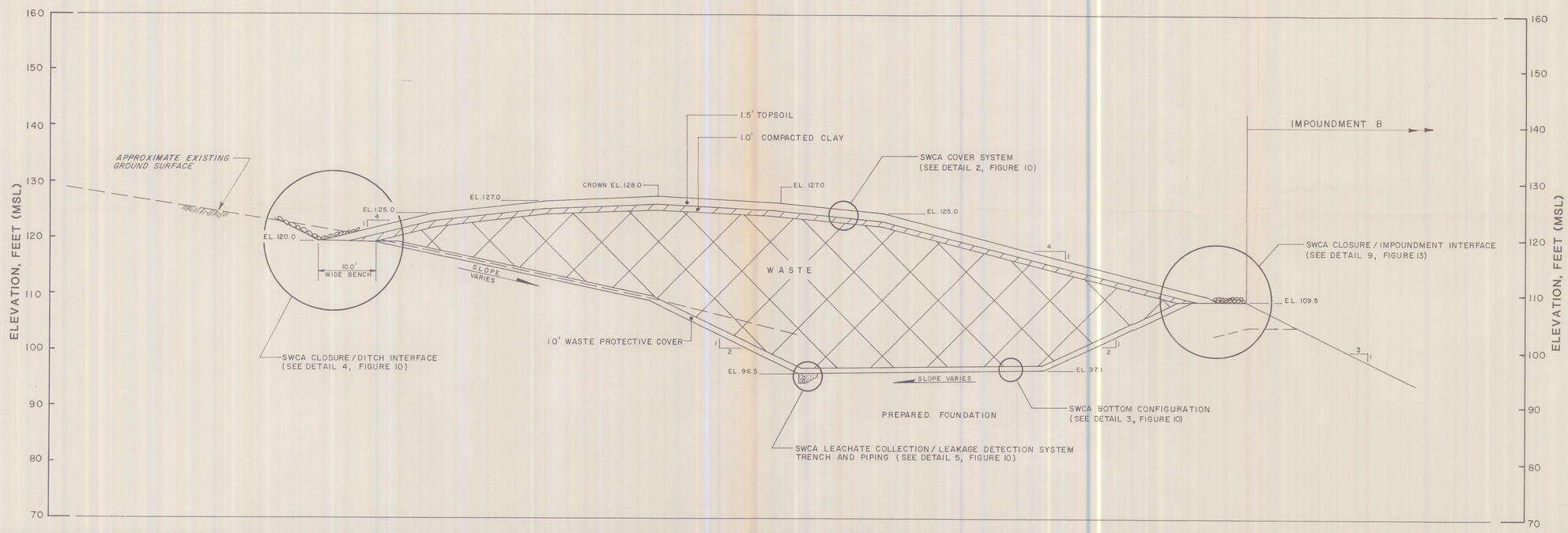
DETAIL SHEET 1 OF 6

PREPARED FOR

VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

IT ... Creating a Safer Tomorrow

1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
"Do Not Scale This Drawing"



CROSS-SECTION E-E'
FINAL CLOSURE CONFIGURATION

0 10 20 FEET
HORIZONTAL SCALE
VERTICAL SCALE AS SHOWN

NOTE: SEE FIGURE 4 FOR LOCATION OF CROSS-SECTION E-E'.

FIGURE 9

CROSS-SECTION, FINAL GRADING CLOSURE

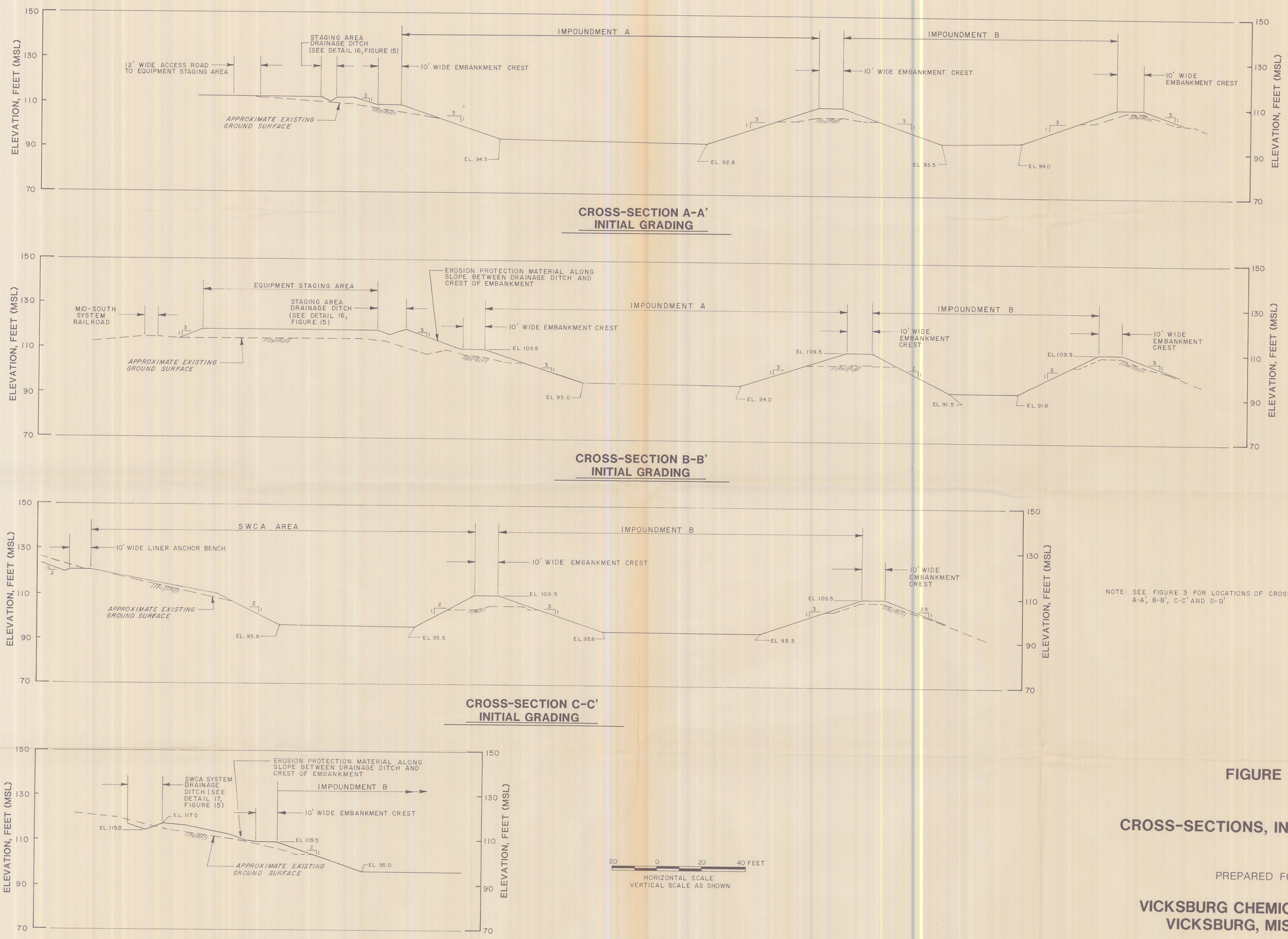
PREPARED FOR

VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

IT ... Creating a Safer Tomorrow

DRAWN BY	T. BURNS 7/27/88	CHECKED BY	CPJ	7-28-88	DRAWING NUMBER	435361-E5
		APPROVED BY	MJL	7/29/88		

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
"Do Not Scale This Drawing"



CROSS-SECTION A-A'
INITIAL GRADING

CROSS-SECTION B-B'
INITIAL GRADING

CROSS-SECTION C-C'
INITIAL GRADING

CROSS-SECTION D-D'
INITIAL GRADING

NOTE: SEE FIGURE 3 FOR LOCATIONS OF CROSS-SECTIONS A-A', B-B', C-C' AND D-D'.

FIGURE 8

CROSS-SECTIONS, INITIAL GRADING

PREPARED FOR

VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

IT ... Creating a Safer Tomorrow

DRAWN BY	T.S.BURNS 7/26/88	CHECKED BY	CBJ	7-29-88	DRAWING NUMBER	435361-E4
		APPROVED BY		7/29/88		

1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
"Do Not Scale This Drawing"

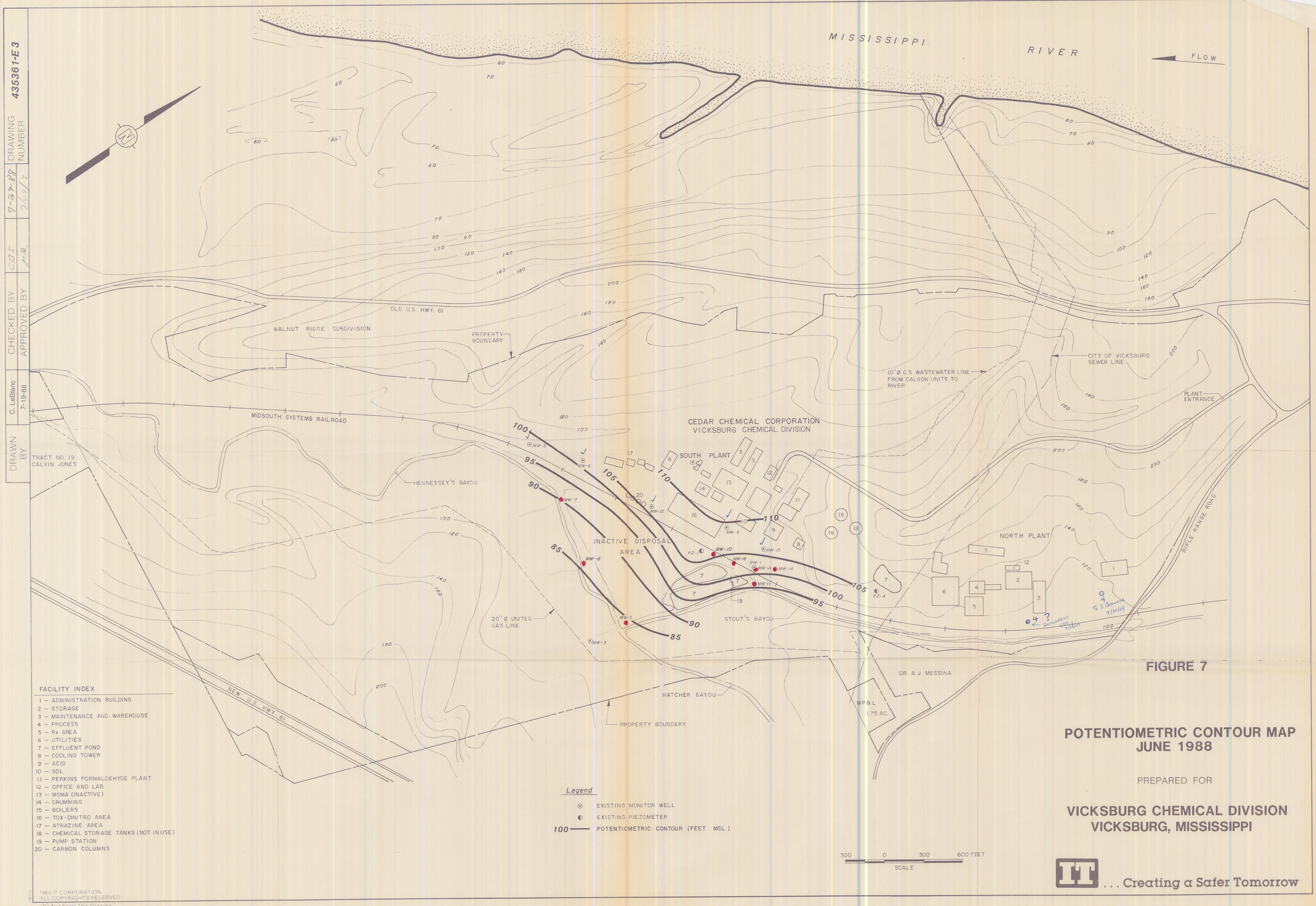


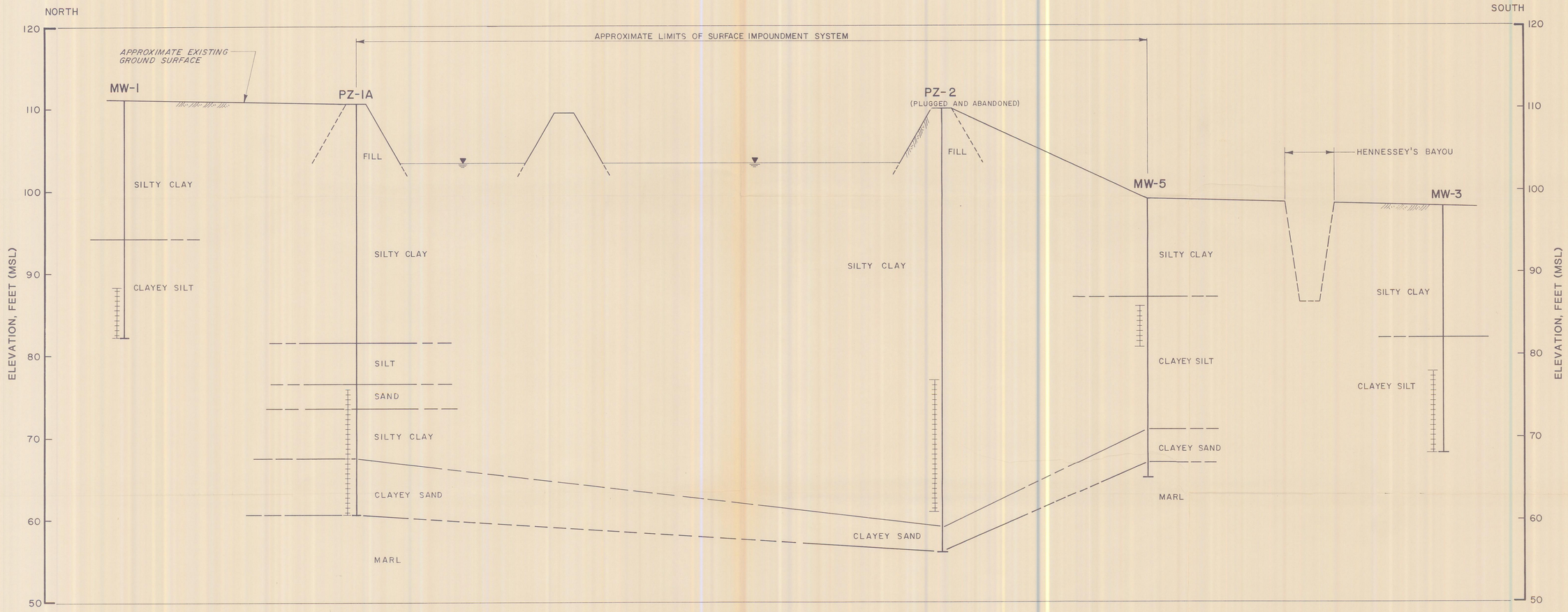
FIGURE 7

POTENTIOMETRIC CONTOUR MAP
JUNE 1988

PREPARED FOR

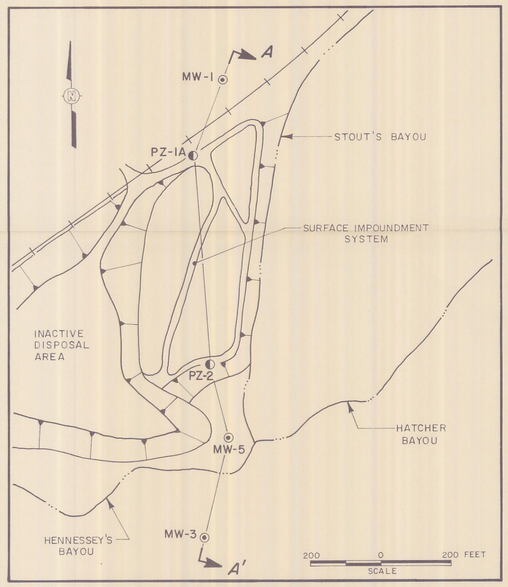
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

DRAWN BY	C. Le BLANC 7/25/88	CHECKED BY	CPT 7-29-88	DRAWING NUMBER	435361-E2
		APPROVED BY			



CROSS-SECTION A-A'

0 50 100 FEET
HORIZONTAL SCALE
VERTICAL SCALE AS SHOWN



LOCATION MAP

LEGEND

SCREENED INTERVAL

FIGURE 6

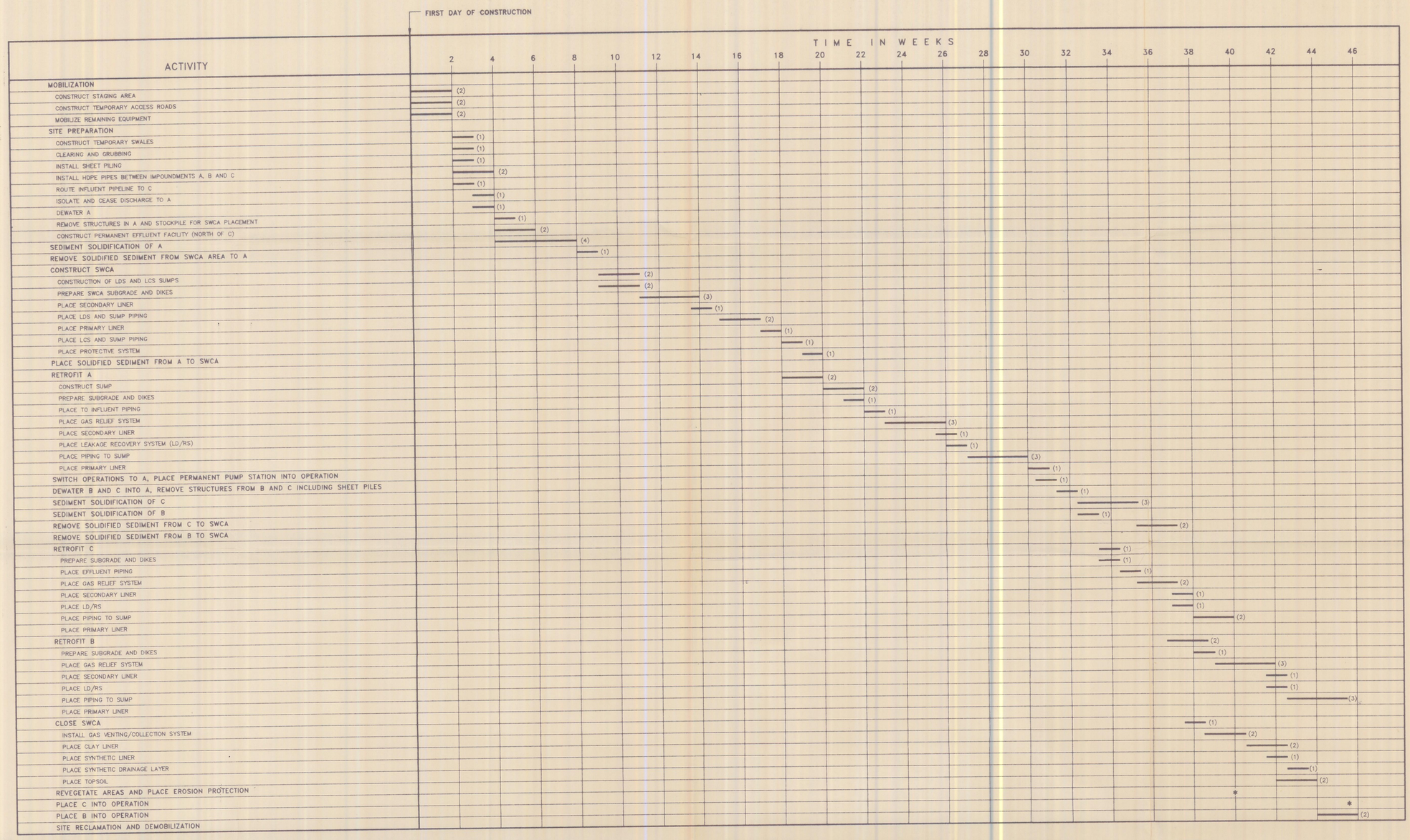
GEOLOGIC CROSS-SECTION A-A'

PREPARED FOR

VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

IT . . . Creating a Safer Tomorrow

1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
"Do Not Scale This Drawing"



NOTES: (2) = DURATION OF EVENT IN WEEKS
* = EVENT LESS THAN ONE DAY

FIGURE 5

CONSTRUCTION SCHEDULE

PREPARED FOR

VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

IT . . . Creating a Safer Tomorrow

DRAWING NUMBER 435361-E13

CHECKED BY CBS

APPROVED BY

DRAWN BY T.BURNS 7/29/88

1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
Do Not Scale This Drawing

DRAWN BY	C.Bentz 7-28-88	CHECKED BY	C.B.J. 7-29-88	DRAWING NUMBER	435361-M3
		APPROVED BY	W.G.R. 7/29/88		

NOTE: FOR FINAL GRADING CROSS-SECTION E-E', SEE FIGURE 9

REFERENCE: BASE TOPOGRAPHIC MAP PROVIDED BY MAP TECH, INC. JACKSON, MISSISSIPPI, DATE OF AERIAL PHOTOGRAPHY, APRIL 1988.

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
"Do Not Scale This Drawing"

FIGURE 4

PLAN VIEW

FINAL GRADING CLOSURE

PREPARED FOR

VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

IT ... Creating a Safer Tomorrow

DRAWN BY	C.Bentz 7-28-88	CHECKED BY	C.B.T. 7-29-88	DRAWING NUMBER	435361-M2
		APPROVED BY	H.K.R. 7-29-88		

NOTE: FOR INITIAL GRADING CROSS-SECTIONS A-A', B-B', C-C' AND D-D', SEE FIGURE 8.

REFERENCE: BASE TOPOGRAPHIC MAP PROVIDED BY MAP TECH, INC. JACKSON, MISSISSIPPI, DATE OF AERIAL PHOTOGRAPHY, APRIL 1988.

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
"Do Not Scale This Drawing"

FIGURE 3

PLAN VIEW, INITIAL GRADING AND CONSTRUCTION PRIOR TO RETROFIT

PREPARED FOR

VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

IT ... Creating a Safer Tomorrow

DRAWN BY	T. Burns 7/27/88	CHECKED BY	CDT	DRAWING NUMBER	435361-M1
		APPROVED BY			

REFERENCE: BASE TOPOGRAPHIC MAP PROVIDED BY MAP TECH, INC. JACKSON, MISSISSIPPI, DATE OF AERIAL PHOTOGRAPHY, APRIL 1988.

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
"Do Not Scale This Drawing"

FIGURE 2

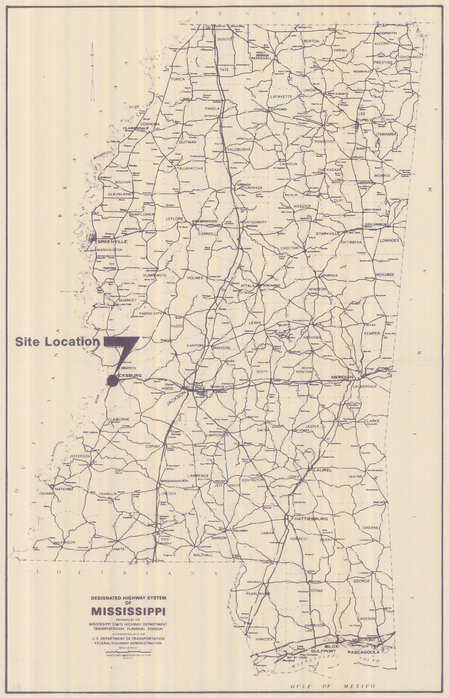
PLAN VIEW, EXISTING CONDITIONS

PREPARED FOR

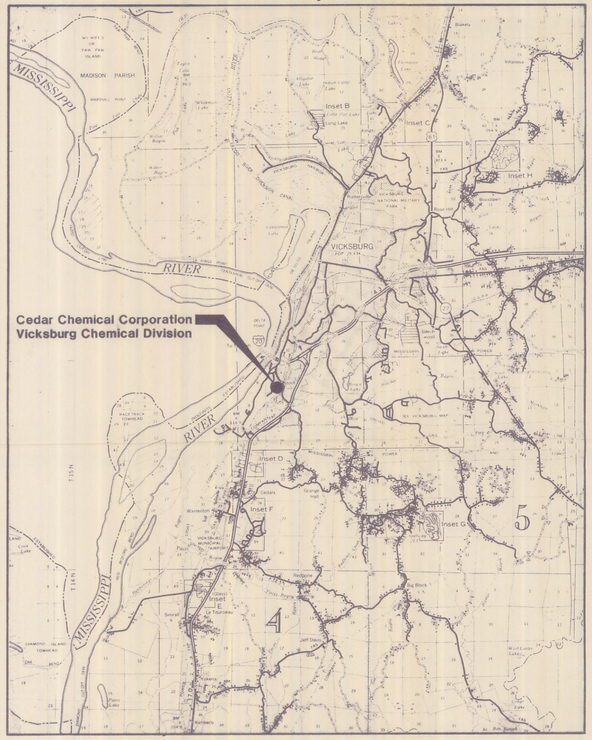
VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

IT ... Creating a Safer Tomorrow

DRAWING NUMBER	435361-E12
DRAWN BY	
CHECKED BY	C. LeBlanc 7/21/88
APPROVED BY	



LOCATION MAP



PROJECT LOCATION MAP

DRAWING NUMBER	FIGURE NUMBER	TITLE
435361-E12	T	TITLE SHEET
435361-E1	1	SITE FACILITIES MAP
435361-M1	2	PLAN VIEW, EXISTING CONDITIONS
435361-M2	3	PLAN VIEW, INITIAL GRADING AND CONSTRUCTION
435361-M3	4	PLAN VIEW, FINAL GRADING CLOSURE
435361-E13	5	CONSTRUCTION SCHEDULE
435361-E2	6	GEOLOGIC CROSS-SECTION A-A'
435361-E3	7	POTENTIOMETRIC CONTOUR MAP
435361-E4	8	CROSS-SECTIONS, INITIAL GRADING
435361-E5	9	CROSS-SECTIONS, FINAL GRADING CLOSURE
435361-E6	10	DETAIL SHEET 1 OF 6
435361-E7	11	DETAIL SHEET 2 OF 6
435361-E8	12	DETAIL SHEET 3 OF 6
435361-E9	13	DETAIL SHEET 4 OF 6
435361-E10	14	DETAIL SHEET 5 OF 6
435361-E11	15	DETAIL SHEET 6 OF 6

CEDAR CHEMICAL CORPORATION

VICKSBURG CHEMICAL DIVISION

CLOSURE/RETROFIT SURFACE IMPOUNDMENT SYSTEM

VICKSBURG, MISSISSIPPI

FIGURE T

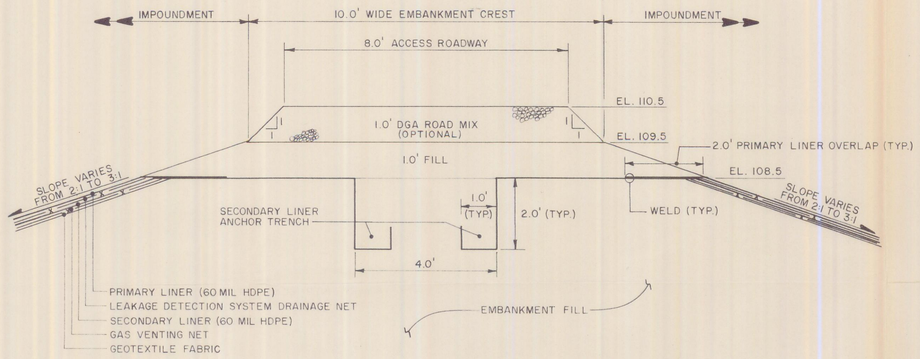
TITLE SHEET

Approved By: Mark L. Morgan
Mark L. Morgan, P.E.
Mississippi Registration No. 9998
August, 1988

IT . . . Creating a Safer Tomorrow

1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
"Do Not Scale This Drawing"

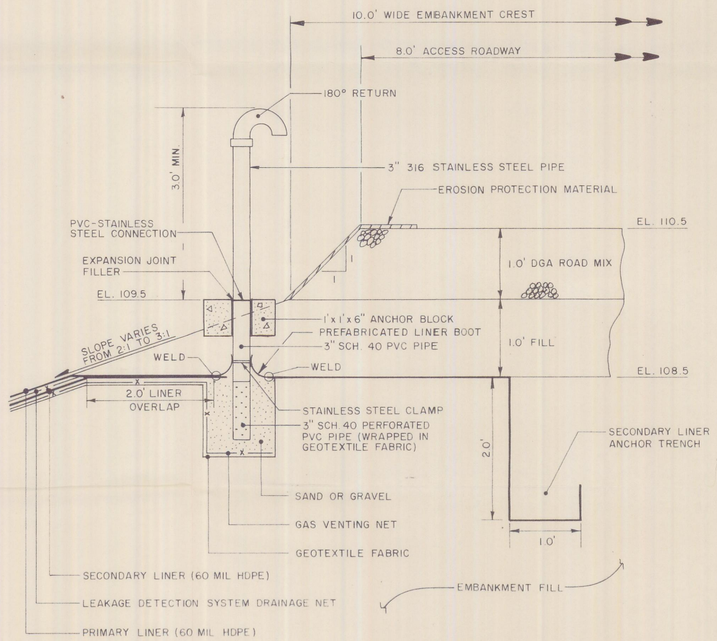
DRAWN BY	CAL 7/27/88	CHECKED BY	APPROVED BY	DRAWING NUMBER 435361-E11



TYPICAL IMPOUNDMENT ACCESS ROAD/LINER INTERFACE

0 2 4 FEET
SCALE

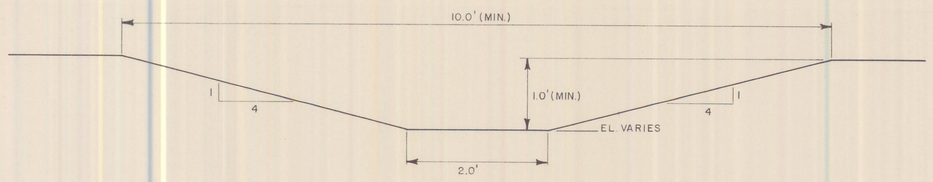
DETAIL 13



IMPOUNDMENT GAS VENTING SYSTEM

0 1 2 FEET
SCALE

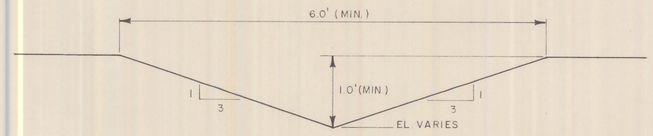
DETAIL 14



TEMPORARY DRAINAGE DITCH

0 1 2 FEET
SCALE

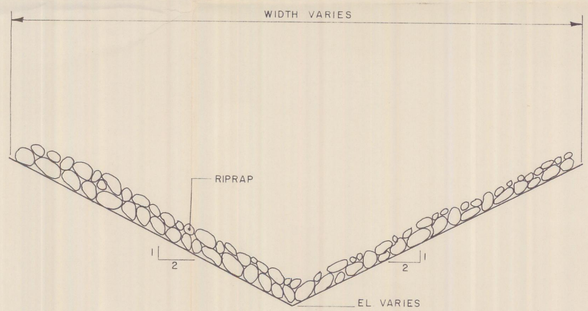
DETAIL 15



STAGING AREA DRAINAGE DITCH

0 1 2 FEET
SCALE

DETAIL 16



SWCA SYSTEM DRAINAGE DITCH

N.T.S.

DETAIL 17

FIGURE 15

DETAIL SHEET 6 OF 6

PREPARED FOR

VICKSBURG CHEMICAL DIVISION
VICKSBURG, MISSISSIPPI

IT . . . Creating a Safer Tomorrow

1987F4 © 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
"Do Not Scale This Drawing"