2/597

CLOSURE ACTIVITIES
ASSOCIATED WITH
SK & F SURFACE IMPOUNDMENT AREA
PONCE CENTER FOR ENVIRONMENTAL CONTROL
CECOS INTERNATIONAL, INC.
PONCE, PUERTO RICO

Prepared for

CECOS INTERNATIONAL
2321 Kenmore Avenue
Buffalo, New York 14207

Prepared by

RECRA RESEARCH, INC.
4248 Ridge Lea Road
Amherst, New York 14226

May 1984

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
2.0	FIELD ACTIVITIES	5
2.1	Overview	5
2.2	Treatment and Disposal of SK & F Sludge Material	6
2.3	Drilling Procedures	8
2.4	Sampling Methods	8
3.0	ANALYTICAL RESULTS	10
3.1	Sample Preparation	10
3.2	Analytical Data	10
4.0	SUMMARY	16

APPENDIX A Waste Characterization Profile
APPENDIX B Analytical Results
APPENDIX C Field Reports
- Memorandum to Fernando Rodriquez, P.E.
- Caribbean Soil Testing Report

APPENDIX D Chain of Custody Records

LIST OF FIGURES

Figure 1 Site Location Map
Figure 2 Location of Lagoon Quadrants
Figure 3 Boring Locations Map
Figure 4 Transportation Route

LIST OF TABLES

Table 1 Analytical Parameters
Table 2 SK & F Impoundments Soil Composites
Table 3 Summary of SK & F Sample Composite Analysis

1.0 INTRODUCTION

On June 15, 1983, Recra Research, Inc. submitted on behalf of CECOS International, Inc., a Partial Closure Plan for the Surface Impoundment Area at the Ponce Municipal Dump (see Figure 1) to Region II of the United States Environmental Protection Agency. Since the submittal of this plan, the name "Ponce Municipal Dump" has been changed to "Ponce Center for Environmental Control." The latter designation for the site will be used except when referencing the title of the closure plan. The submitted plan included the following operation activities and remedial action to be implemented:

- Removal and proper disposal of impoundment sludge material. Prior to disposal, the sludge material was to be solidified with kiln dust as a solidification reagent.
- Removal and proper disposal of surface impoundment liner material.
- Physical and chemical characterization of the underlying fill and/or municipal solid waste and adjacent residual material.
- Determine the degree and extent of contamination of underlying materials, if any, and
- Initiate partial closure and post-closure plans.

The waste sludge contained in the impoundment at the Ponce Center for Environmental Control generated by SK & F Laboratories was analyzed and found to contain several hazardous compounds/constituents. The major constituents of concern in the sludge include:

- heavy metals (barium, chromium, copper, iron, nickel, silver, and zinc)
- halogenated organics
- soluble organic carbon
- sulfide
- cyanide

Appendix A contains a complete Waste Characterization Profile prepared by Recra Research, Inc., on November 19, 1981. Since several hazardous constituents were found to be contained in the waste sludge, the partial closure plan was developed and implemented to remediate the SK & F impoundments and to determine the environmental impact, if any, past disposal practices had on the underlying material.

In order to comply with the submitted partial closure plan, field and laboratory programs were developed. The field program entailed the removal, solidification, transportation, and proper disposal of the sludge waste, liner material and underlying sand layer. The field program also involved sampling of the soil material underlying the impoundments. At the request of CECOS International, Inc., Fernando Rodriquez, P.E. and Associates (FLRA) implemented the sampling activities on September 15, 1983. Soil sampling was conducted by the Caribbean Soil Testing Co., Inc., under the supervision of Fernando Rodriquez, P.E. and Associates. All collected soil samples were shipped to Recra Research laboratory in Tonawanda, New York.

Base Map Modified From: Law Engineering Testing Company - Marietta, Georgia, Job. No. GS3223

RECRA RESEARCH INC.
BUFFALO, NEW YORK

Scale:		
	By	Date
Dwn.	KMO	
Ckd.		
Ap'vd.		
Rev.		

PONCE WASTE FACILITY

SITE LOCATION MAP

Project No. 4C002153

B

Figure 1

BRUNING 44-131 61160-1

The laboratory program involved compositing the soil samples by depth interval and analyzing those composites for the parameter listed in Table 1. The parameters selected for the program were based on the constituents of concern detected in the preliminary SK & F sludge Waste Characterization Profile.

The following sections will present a more detailed discussion concerning the activities involved in the partial closure of the SK & F surface impoundments.

TABLE 1

ANALYTICAL PARAMETERS

LEACHABLE SULFIDE

TOTAL CYANIDE

LEACHABLE ORGANIC CARBON

TOTAL CHROMIUM

TOTAL BARIUM

TOTAL COPPER

TOTAL LEAD

TOTAL NICKEL

TOTAL SILVER

TOTAL ZINC

TOTAL IRON

HALOGENATED ORGANIC SCAN (ECD)

DRY WEIGHT (103°C)

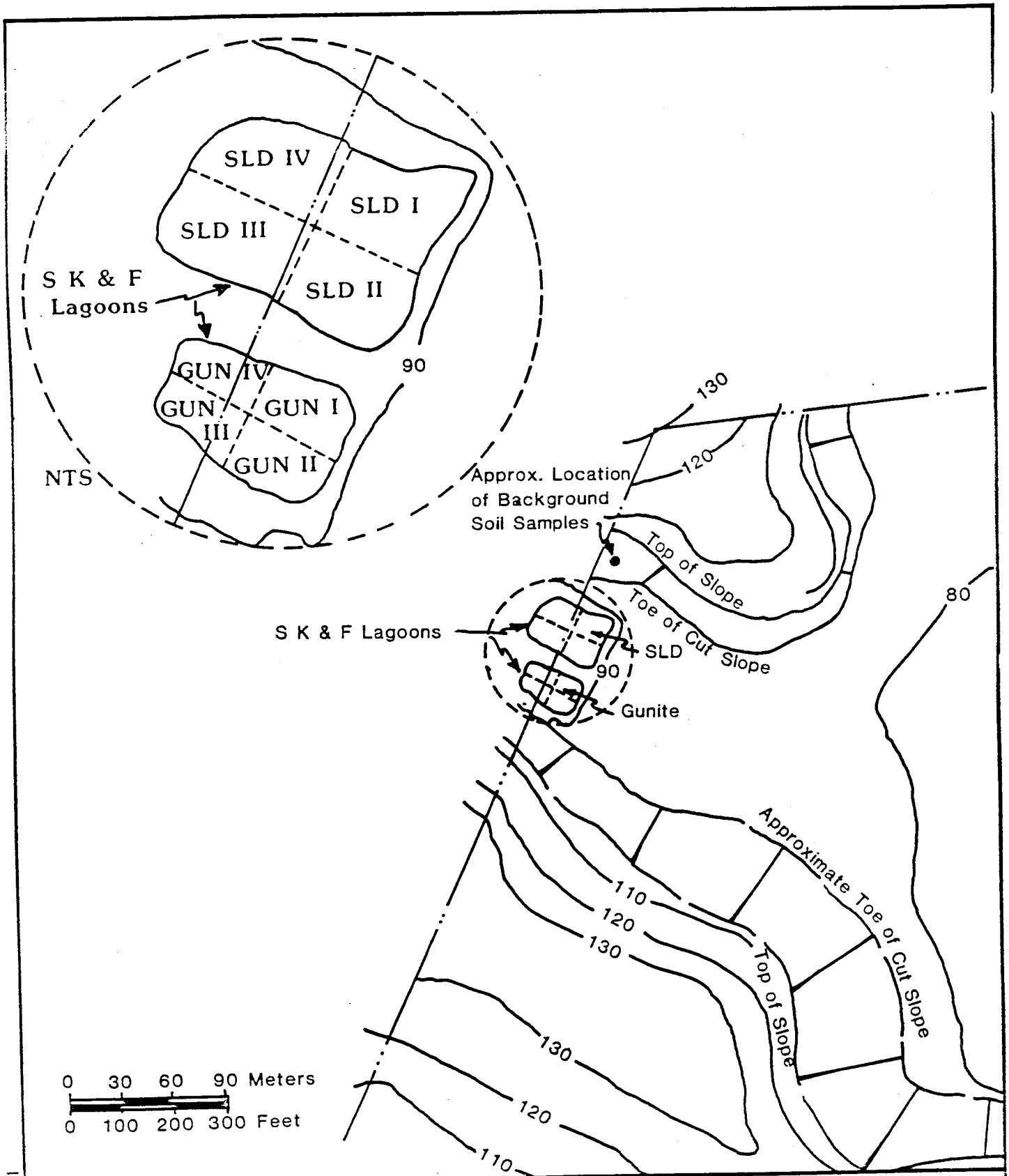
NOTE: Only those parameters which are found at levels above the detection limit will be reported in the body of this report. Analytical results are presented in Appendix B.

2.0 FIELD ACTIVITIES

2.1 OVERVIEW

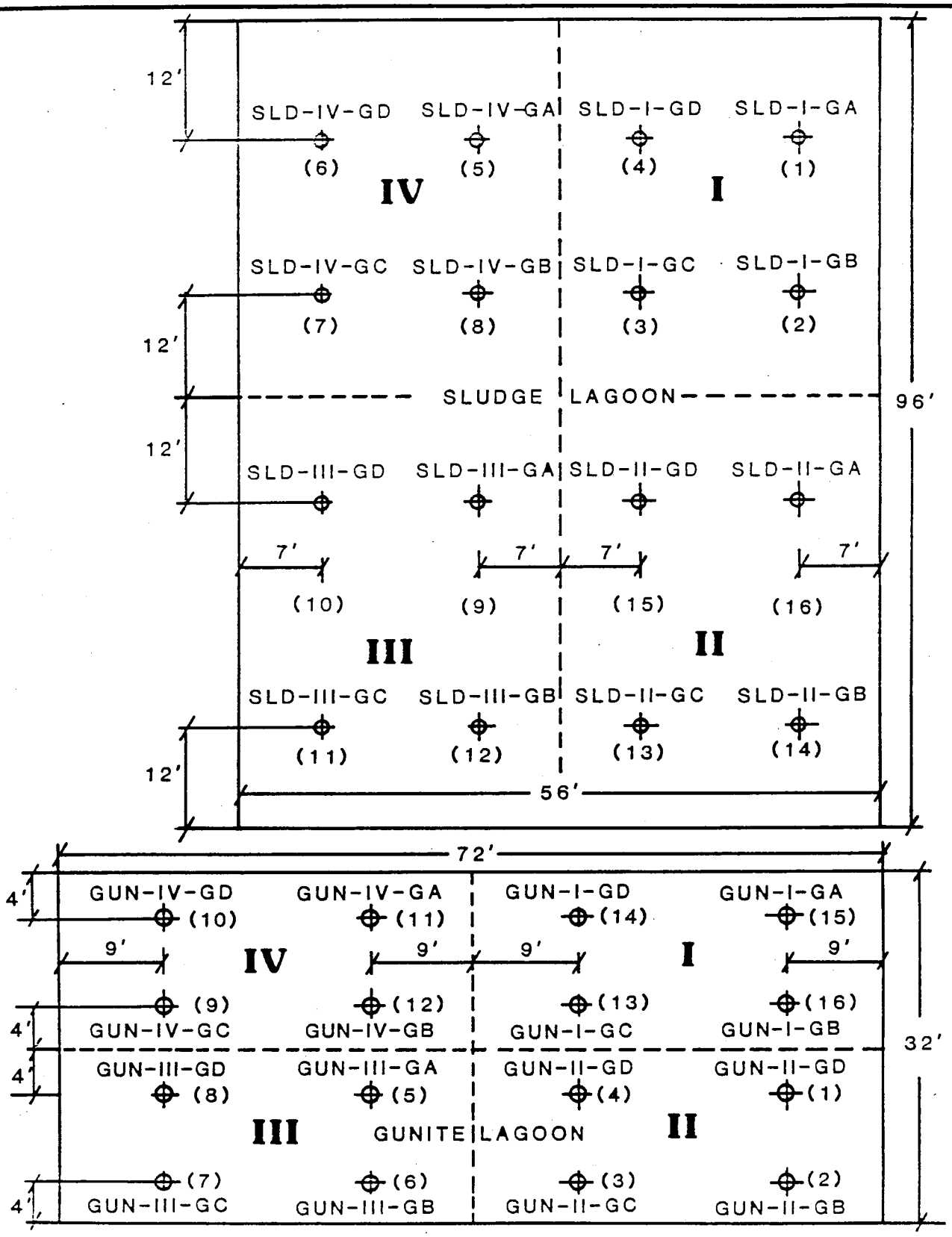
Prior to initiating field sampling activities, the material within the SK & F lagoons was stabilized and solidified with kiln dust. This solidified waste material, the underlying liner, and sand layer were then excavated and transported for subsequent disposal at BFI's Calcasieu Waste Facility in Louisiana. Disposal of the SK & F waste material at the Calcasieu Facility occurred from June 16, 1983, through August 4, 1983.

On September 15 and 16, 1983, the Caribbean Soil Testing Company, Inc., performed sixteen (16) soil borings in each of the two (2) SK & F surface impoundments. The two (2) surface impoundments sampled are identified in this report as gunite (GUN) and sludge lagoon disposal (SLD). Each impoundment was divided into four (4) quadrants (see Figure 2). In each quadrant four (4) sampling points were selected as per Partial Closure Plan specifications (submitted to the U.S. EPA on June 15, 1983). In addition, two (2) soil samples from the Ponce Formation were obtained from a cut face in the mountain side north of the SK & F lagoon area. These two (2) samples were obtained to provide background concentration for comparison. All boring locations were established by the field personnel of Fernando L. Rodriquez, P.E. & Associates as illustrated on Figure 3. Boring logs and discussion of field activities are presented in a memorandum to Fernando Rodriquez dated September 19, 1983, and in a field report from Caribbean soil Testing Co., Inc. (Appendix C).



RECRA RESEARCH INC. BUFFALO, NEW YORK	Scale:			PONCE WASTE FACILITY	LOCATION OF LAGOON QUADRANT
		By	Date		
	Dwn.				
	Ckd.				
	Ap'vd.				
	Rev.			Project No. 4C002153	A Figure 2

BRUNING 44-131 61160 1



RECRA RESEARCH INC. BUFFALO, NEW YORK	Scale: NTS		PONCE WASTE FACILITY	BORING LOCATIONS MAP	
		By	Date		
	Dwn.	KMO	5/84		
	Ckd.				
	Ap'vd.				
	Rev.			Project No. 4C002153	A Figure 3

Sampling protocol was in accordance with ASTM designation D-1586-67. During sampling activities, to insure the health and safety of the field personnel, Level C safety equipment was utilized. This includes: neoprene coveralls, hardhat, goggles, respirators, and rubber gloves.

Upon completion of all boring activity, the soil samples were transported to Recra Research, Inc., Environmental Laboratories, Tonawanda, New York, via Federal Express, 24-hour service.

2.2 TREATMENT AND DISPOSAL OF SK & F SLUDGE MATERIAL

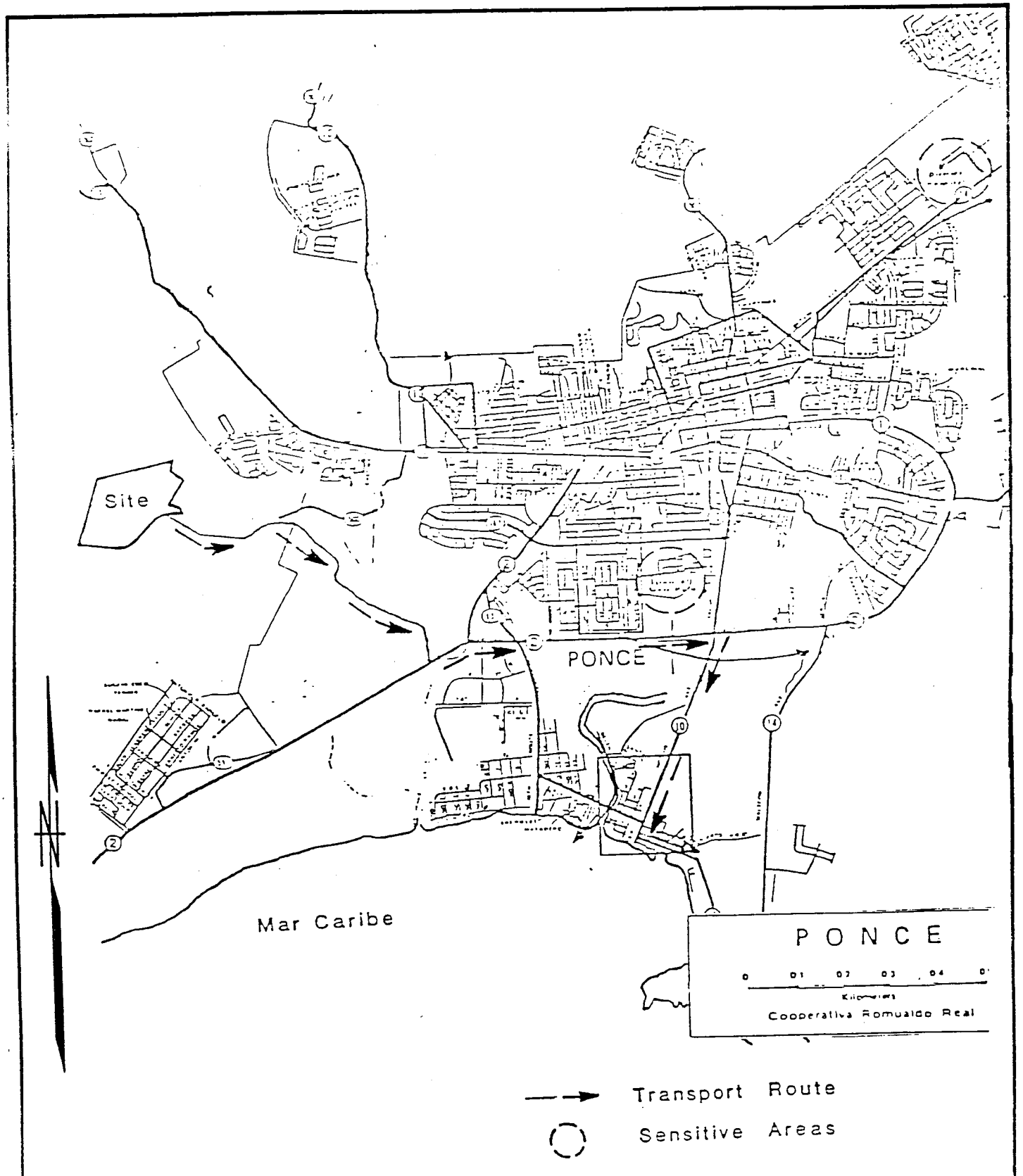
The SK & F sludge material was physically stabilized and solidified using cement kiln dust as a solidification reagent. The alkaline nature of the cement kiln dust will render the potentially mobile heavy metal constituents of the SK & F sludge immobile by reacting to form relatively insoluble metallic hydroxides/carbonates and attentuate the potential for the liberation of toxic gases such as hydrogen sulfide and hydrogen cyanide which may result if exposed to acidic conditions. In addition, the kiln dust is a pozzolonic material; meaning it will react in the presence of water, which is supplied by the waste, with siliceous and alumino siliceous compounds in the kiln dust to yield a solidified product.

The SK & F sludge material was solidified within the confines of the surface impoundments. Solidification involved mixing the in-situ sludge material with a 2:1 by weight ratio of kiln dust to waste sludge. Thorough mixing was accomplished using earth-moving equipment such as backhoes. The solidified waste material was allowed to cure for 24 hours within the impoundments.

After the prescribed curing time, the solidified waste material, surface impoundment liner material, and underlying sand layer were excavated and transported via sealed and properly placarded cargo vans/trailers to the Ponce docks for ocean transport. The transportation route is illustrated in Figure 4. Disposal of the solidified SK & F sludge material occurred from June 16, 1983, through August 3, 1983; during this time period, approximately 91 loads of material were received at BFI's Calcasieu Waste Facility in Louisiana.

2.3 DRILLING PROCEDURE

The sixteen (16) soil borings performed in each of the SK & F surface impoundments were accomplished utilizing a motorized cathead hoist. Borings were advanced with driven 2-1/2" I.D. flush joint steel casing. The cuttings are removed by forcing pressurized water through the rods which operate inside the casing. Attached to the bottom-most rod section is a chisel-shaped bit; the bit coupled with a raising and lowering action loosens the soils allowing the cuttings to come to the surface. Borings were terminated at six (6) feet below ground surface with the exception of Boring SLD-3 which was terminated at ten (10) feet at the request of Mr. R. Good, CECOS International, Inc.



RECRA RESEARCH INC. BUFFALO, NEW YORK	Scale:		PONCE WASTE FACILITY		Transport Route
		By	Date		
	Dwn.				
	Ckd.				
	Ap'vd.				
	Rev.		Project No. 4C002153	A	Figure 4

BRUNING 44-131 61160 1

2.4 SAMPLING METHOD

Soil samples were continuously obtained until termination of the test boring at each cited location within the GUN and SLD surface impoundments. The samples were collected using a 1-3/8" I.D. split spoon sampler in accordance with ASTM designation 1586-67. A Standard Penetration Test was performed during sample retrieval; thus, allowing the "N" value to be obtained. The value may be related to the consistency and cohesiveness of soils and the relative density of granular soils. This value is obtained by recording the number of blows required to drive a sample spoon eighteen (18) inches into the ground with a 140 lb. hammer falling thirty (30) inches.

Each sample collected was placed in an appropriately cleaned and teflon sealed glass jar, then into a plastic bag for shipment. At this point, a chain of custody document was initiated and maintained until receipt at Recra's Environmental Laboratory in Tonawanda, New York.

The chain of custody records are presented as Appendix D. As previously mentioned, the samples were shipped via Federal Express, 24-hour service.

3.0 ANALYTICAL RESULTS

3.1 SAMPLE PREPARATION

As described in Section 2.3, continuous sampling was conducted at each boring location identified in Figure 3. Preparation for analysis involved compositing equal weights of each one (1) foot interval aliquots from the individual sampling points within a quadrant. Table 2 presents the sample composite information. The composited samples from the upper- and lower-most depth interval for each quadrant were analyzed for the analytical parameters specified in Table 1. In addition, the two (2) soil samples of the Ponce Formation which were secured outside the impoundment area, were analyzed individually to provide background data.

The analytical parameters listed in Table 1 were performed in accordance with EPA methods provided in the following reference texts:

- Methods for Chemical Analysis of Water and Wastes, United States Environmental Protection Agency.
- Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, U.S. EPA, SW846, 2nd Edition, 1982.

3.2 ANALYTICAL DATA

Table 3 presents an analytical data summary of the composite and background samples collected on September 15 and 16, 1983, from the SK & F surface impoundment and adjacent hillside cut face. The analytical results for the impoundment composites when compared to the results of the background samples, CM-AM-1 and CM-AM-2, do not appear anomalous

for the analyzed parameters except for cyanide and sulfide concentrations. Sulfide concentrations for the collected samples were not, in all cases, anomalous with background values. Those nine (9) composites, which varied, had a concentration range from 136.0 - 610.0 ug/g dry as compared to 125.0 - 134.0 ug/g dry for the background samples. The concentration of cyanide ranges from 0.81-8.44 ug/g dry as compared to <0.5 ug/g dry for the background samples.

TABLE 2

SK & F IMPOUNDMENTS
SOIL COMPOSITES

Composite 1	Gun I - 1-2 ft.
Composite 2	Gun I - 5-6 ft.
Composite 3	Gun II - 1-2 ft.
Composite 4	Gun II - 5-6 ft.
Composite 5	Gun III - 1-2 ft.
Composite 6	Gun III - 5-6 ft.
Composite 7	Gun IV - 1-2 ft.
Composite 8	Gun IV - 5-6 ft.
Composite 9	SLD I - 1-2 ft.
Composite 10	SLD I - 5-6 ft.
Composite 11	SLD II - 1-2 ft.
Composite 12	SLD II - 5-6 ft.
Composite 13	SLD III - 1-2 ft.
Composite 14	SLD III - 5-6 ft.
Composite 15	SLD IV - 1-2 ft.
Composite 16	SLD IV - 5-6 ft.
CM-AM-1	Background Sample
CM-AM-2	Background Sample

NOTE: All composites samples were prepared as equal weight aliquots and mixed thoroughly before analysis.

Background Samples obtained from cut face in mountain side (Ponce Formation) north of the SK & F lagoon area.

TABLE 3
SUMMARY OF SK & F SAMPLE COMPOSITE ANALYSIS

PARAMETER	UNIT OF MEASURE	SAMPLE IDENTIFICATION PARAMETER				
		Comp-1	Comp-2	Comp-3	Comp-4	Comp-5
pH with water	STANDARD UNIT	9.75	8.12	7.87	7.85	7.79
Leachable TOC	mg/l	30	63	26	74	28
Sulfide	ug/g Dry	127.5	13.1	371.1	194.7	85
T-Cyanide	ug/g Dry	5.89	7.58	3.37	2.47	4.62
T-Chromium	ug/g Dry	29	41	26	30	31
T-Copper	ug/g Dry	28	30	18	23	18
T-Lead	ug/g Dry	7.7	110	39	19	1.8
T-Nickel	ug/g Dry	16	26	22	21	22
T-Silver	ug/g Dry	0.73	<0.4	<0.4	<0.4	<0.4
T-Zinc	ug/g Dry	65	84	77	180	47
T-Iron	ug/g Dry	18,600	64,400	15,700	18,600	17,700
Halogenated Organic Scan (ECD)	ug/g Dry as Chlorine; Lindane Std.	<0.01	0.24	<0.01	0.07	0.09
Dry Weight	%	70	61	83	76	80

TABLE 3
(continued)
SUMMARY OF SK & F SAMPLE COMPOSITE ANALYSIS

PARAMETER	UNIT OF MEASURE	SAMPLE IDENTIFICATION PARAMETER							
		Comp-6	Comp-7	Comp-8	Comp-9	Comp-10	Comp-11	Comp-12	Comp-13
pH w/water	STANDARD UNIT	8.08	8.48	>12.00	12.02	10.68	8.42	9.37	9.07
Leachable TOC	mg/l	45	44	100	96	27	33	132	31
Sulfide	ug/g Dry	136.7	220.0	406.5	194.7	101.2	96.6	610.0	<22.2
T-Cyanide	ug/g Dry	6.64	0.78	0.81	1.22	0.48	1.06	2.03	3.47
T-Chromium	ug/g Dry	30	29	40	55	19	29	20	18
T-Copper	ug/g Dry	24	18	66	46	5.9	11	9.2	6.4
T-Lead	ug/g Dry	1.7	1.8	25	8.3	1.2	1.9	1.1	0.77
T-Nickel	ug/g Dry	36	24	34	20	5.1	11	16	4.1
T-Silver	ug/g Dry	>0.03	<0.3	<0.4	<0.4	<0.2	<0.2	<0.3	<0.2
T-Zinc	ug/g Dry	76	63	180	94	3.7	36	14	6.0
T-Iron	ug/g Dry	21,100	12,600	98,400	7,800	8,700	8,900	10,000	4,800
Halogenated Organic Scan (ECD)	ug/g Dry as Chlorine; Lindane Std.	0.13	0.02	0.11	1.4		0.07		0.17
Dry Weight	%	79	80	62	76	83	87	80	90

TABLE 3
(continued)
SUMMARY OF SK & F SAMPLE COMPOSITE ANALYSIS

PARAMETER	UNIT OF MEASURE	SAMPLE IDENTIFICATION PARAMETER				
		Comp-14	Comp-15	Comp-16	CM-AM-1	CM-AM-2
pH w/water	STANDARD UNIT	7.04	11.31	9.10	9.76	10.58
Leachable TOC	mg/l	27	207	64	11,800	10,900
Sulfide	ug/g Dry	112	180.3	306.2	125	134
T-Cyanide	ug/g Dry	3.66	8.44	3.70	<0.5	<0.5
T-Chromium	ug/g Dry	28	35	15	23.9	25.7
T-Copper	ug/g Dry	19	28	7.6	7.48	8.50
T-Lead	ug/g Dry	2.6	7.5	3.0	380	130
T-Nickel	ug/g Dry	20	24	4.5	4.27	9.23
T-Silver	ug/g Dry	<0.3	1.5	<0.2	<0.3	<0.2
T-Zinc	ug/g Dry	120	59	7.0	10.5	13.4
T-Iron	ug/g Dry	22,200	19,200	8,900	21,300	19,500
Halogenated Organic Scan (ECD)	ug/g Dry as Chlorine; Lindane Std.	0.15	1.2	0.01	0.04	0.03
Dry Weight	%	75	71	81	96	97

4.0 SUMMARY

Closure of the SK & F surface impoundments was completed on September 24, 1983. Closure activities involved the complete solidification of the SK & F waste sludge material, excavation of this material along with the impoundment liner and underlying sand layer. All excavated materials were transported to and disposed of at BFI's Calcasieu Facility in Louisiana. Closure of each impoundment unit was accomplished by grading their containment berm into the impoundment and applying one (1) foot of cover material. The cap material used was from the Ponce formation. This material was obtained from a borrow area located on the site.

As the chemical analysis reveals, concentrations of the chemical constituents of concern within the residual soils underlying the impoundments except for cyanide and sulfide do not exceed the established background data. Therefore, with the removal of the SK & F sludge material and liner, the only existing source of potential contamination to groundwater and surface water from past disposal practices at the site is in the underlying soils, which contain slightly elevated levels of cyanide and sulfide.

The potential for this existing material to contribute to surface water contamination is negated due to the capping of the area with material from the Ponce formation. Only through erosion of the cover material can the underlying material potentially contribute to surface water contamination. By maintaining the integrity of the cover material, this potential will not occur.

The potential of contamination to the underlying groundwater is also

limited due to the hydrogeologic conditions at the facility. The hydrogeologic conditions at the site are favorable in that the zone of saturation occurs hundreds of feet below the ground surface in this area. This condition eliminates the potential of groundwater intersecting this material and potentially contaminating the groundwater. Only through migration of infiltrating rainwater through this material does the potential for contamination of the underlying groundwater exist. Also, groundwater in the area is not suitable for drinking water due to very high dissolved solids content.

The climatic conditions (i.e. evapotransporation exceeds precipitation) at the site limit the amount of rainfall available to infiltrate into the subsurface. This factor, in addition to the existence of a cover cap over the area, which potentially reduces further the amount of water available to percolate through the underlying soils, and the extreme depths to groundwater limits the potential for the soils with slightly elevated concentrations of cyanide and sulfide to contribute to groundwater contamination.

By maintaining the integrity of the Caliche soil cover, the only potential source for surface and/or groundwater contamination due to past disposal practices within the SK & F impoundments is controlled. Therefore, the remedial activities undertaken during closure at the SK & F impoundments have been completed.