100% ADDITIONAL SAMPLING REPORT - NAS MEMPHIS (NORTHSIDE STORM DRAIN)

Prepared for
Southern Divsion
Naval Facilities Engineering Command
Contract N62467-87-C-0254, Amendment #17

Prepared by
Environmental & Safety Designs, Inc.
August 9, 1988

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1.0 INTRODUCTION

Environmental and Safety Designs (EnSafe) was contracted by Southern Division Naval Facilities Engineering Command to investigate certain uncontrolled hazardous waste disposal sites located at Naval Air Station (NAS) Memphis. The investigation was designed to identify possible contamination at the following Navy locations:

Site 1.) Soils adjacent to a 60" RCP (4' sections) storm sewer from its outfall and continuing upstream a distance of 660 linear feet. The site received approximately 17,000 gallons/day of cyanide electroplating waste daily from the fifties to the seventies.

Site 2.) An outside storage yard which stored lead acid batteries and gasoline, and;

Site 3.) An area adjacent to an existing storm sewer manhole located immediately west of 7th Avenue and south of Casablanca street, near the former electroplating shop. The location of these sites is shown on Figure 1.

2.0 SAMPLING RATIONALE

The sampling target for Site 1 was to sample soils surrounding the storm sewer at all defective joints. An internal inspection of the sewer was performed by Industrial Clean-up Inc. (ICI) and all suspect joints were marked and recorded (Table 1). Photo-

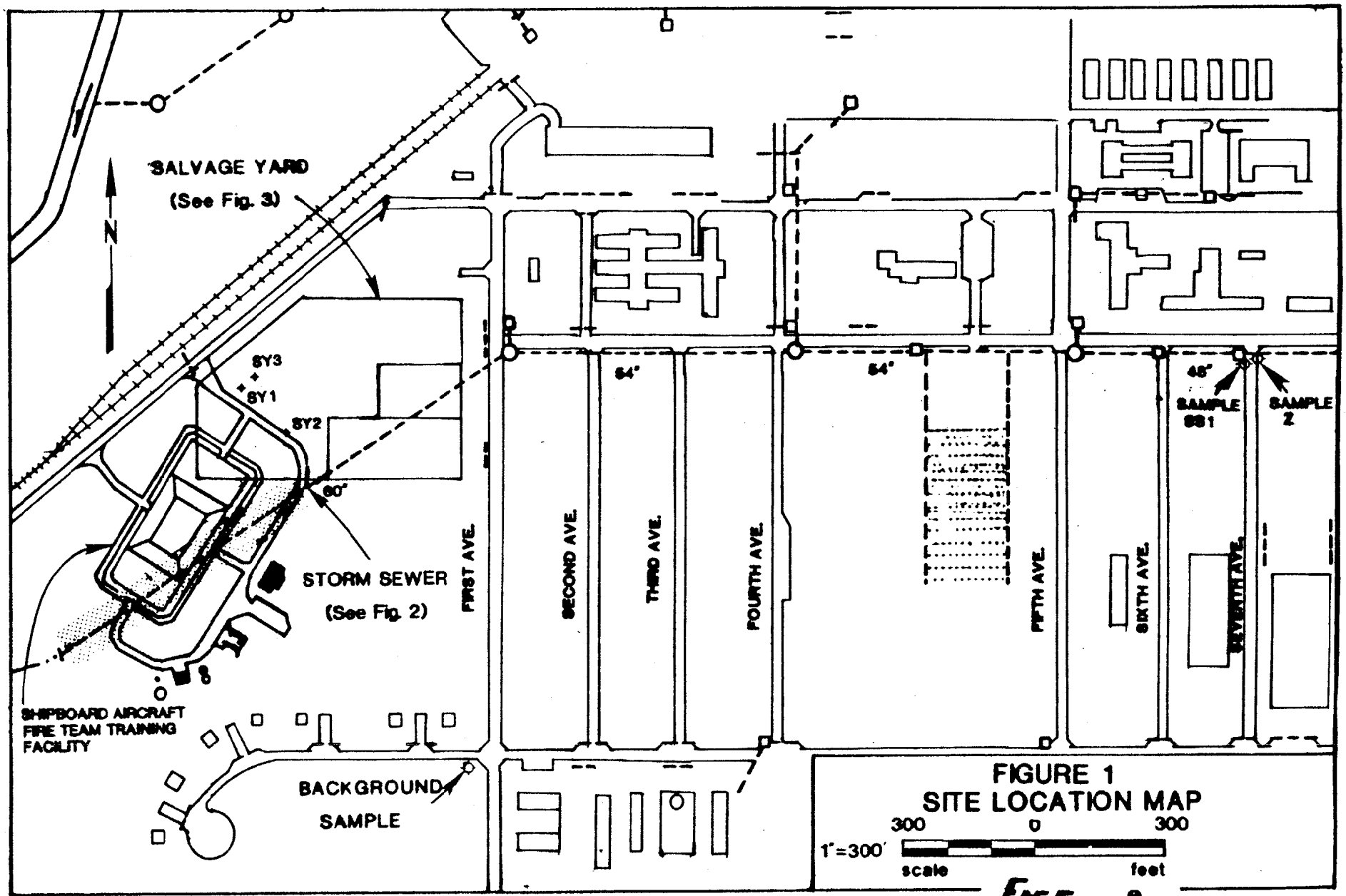

SALVAGE YARD
(See Fig. 3)
N
SY3
SY1
SY2
60'
STORM SEWER
(See Fig. 2)
SHIPBOARD AIRCRAFT
FIRE TEAM TRAINING
FACILITY
BACKGROUND
SAMPLE
FIRST AVE.
SECOND AVE.
THIRD AVE.
FOURTH AVE.
FIFTH AVE.
SIXTH AVE.
SEVENTH AVE.
54'
54'
45'
SAMPLE
SB1
SAMPLE
2
FIGURE 1
SITE LOCATION MAP
300
0
300
1"=300'
scale
feet
EnSafe

TABLE 1
SAMPLE DESIGNATION
AND JOINT LOCATIONS

SUSPECT JOINT NUMBER	FEET FROM OUTFALL	SAMPLE DESIGNATION
2	8	A
3	12	B
9	36	C
13	52	D
18	72	E
20	80	F
25	100	G
32	128	H
40	160	I
45	180	J
53	212	K
61	244	L
70	280	M
77	308	N
85	340	O
89	356	P
95	380	Q
110	440	R
125	500	S
132	528	T
140	560	U
145	580	V
148	592	W
158	632	X
164	656	Y

graphs of the joints are located in Appendix A. All joint locations were then transposed to the ground surface measuring from the outfall. Sampling was performed by drilling to depths of 0-1 feet, 1-3 feet, and 3-5 feet below the pipe's invert. Two additional borings were taken at the entrance and exit of the storm sewer at the same depth interval as the defective joints. One final sample was taken from the sediment that had collected within the system. All of the 0-1 foot samples were analyzed for EP Toxicity Metals (EPA Method SW-846) and Total Cyanide.

Site 2, the salvage yard, was visually inspected and monitored using a hNu photoionization detector. The visual inspection of the property indicated widespread discoloration of surface soils on the site. Consequently, three composite samples were collected from areas that showed staining or discoloration on the surface. An organic vapor background concentration of 0.1 ppm was established using the hNu and at sampling location SY1 there was a slight deflection to 0.3 ppm. Sample locations SY2 and SY3 were determined by staining only. Composite samples were collected at each of these locations from depths of 0-1 feet, 1-3 feet, and 3-5 feet below the surface. Samples collected from the 0-1, and 1-3 foot level were analyzed for total petroleum hydrocarbons and total lead.

The sampling target for Site 3 was the joint nearest the storm sewer manhole as shown on the attached location map (Figure 1). A composite sample was taken from a boring at depths of 0-1 foot,

1-3 feet, and 3-5 feet below the pipe's invert. The storm sewer samples (from the 0-1 feet below the invert) were also analyzed for EP Toxicity Metals and Total Cyanide.

Two additional samples were collected for "background" (BKG and BKGD2). The background samples were analyzed for EP Toxicity Metals, Total Cyanide, Total Petroleum Hydrocarbons, and Total Lead for reference criteria for all samples. The samples collected for BKG were analyzed at the 7-8, 8-10, and 10-12 foot intervals. BKGD2 samples were collected at the 0-1, 1-3, and 3-5 foot intervals; however, only the 1-3 foot sample was analyzed for the aforementioned parameters.

2.1 Sampling Procedure

The drilling operations for the sampling plan were conducted in an orderly and systematic manner in order to optimize the location of each boring. Soil samples were taken through the annulus of a hollow stem auger by driving a twenty-four inch split-spoon sampler. Upon withdrawal of the sampler the a composite sample was collected and placed in a labeled one quart wide mouth jar, covered with an aluminum foil seal, and capped.

To prevent cross contamination the split spoon sampler was decontaminated between samples. Decontamination followed a three step process: 1) wash in a dilute HCl solution 2) rinse in clean tap

water 3) rinse in distilled water. Also all personnel handling the sampler wore latex surgical gloves which were discarded between each sample. To prevent cross-contamination, all equipment: spatulas, sample jars, etc., as well as work gloves worn by workers were also decontaminated between samples.

2.2 Custody Procedures

To assure the samples were maintained in a safe and reliable manner, a strict chain of custody procedure was followed. This was implemented in the field and carried throughout the analytical process. All parties handling the samples signed the chain-of-custody form which becomes a part of the permanent record.

3.0 ANALYTICAL PROCEDURES

Soil samples were extracted by EPA Method 1310, Extraction Procedure (EP) Toxicity Method. Samples were then analyzed by direct aspiration atomic absorption techniques, except arsenic and selenium which were analyzed by gaseous hydride methods, and mercury which was analyzed by cold vapor atomic absorption.

Quality control included the analysis of one duplicate and "analytical spikes" at reporting concentrations. Triplicate spikes were performed to provide quality control data both on precision and accuracy of the analysis. The table below summarizes the quality control data obtained.

Table 2
Quality Control Data

Metal	Spike Conc. (mg/l)	Recovery 1 %	Recovery 2 %	Recovery 3 %
AS	1.00	104	108	101
SE	1.00	104	108	94
BA	0.10	99	99	98
CD	0.40	95	95	90
CR	0.10	93	93	94
PB	1.00	109	94	94
AG	1.00	88	90	92
HG	0.20	95	85	100
CN	0.80	92	112	-

Total Lead analyses were conducted by EPA Method 3050, Acid Digestion of Soils, and then analyzed by direct aspiration atomic absorption. Total cyanide was analyzed by EPA Method 9010.

4.0 RESULTS

4.1 Site 1

Twenty eight soil samples were collected from the area corresponding with the storm sewer. Twenty-six samples collected along the course of the storm pipe are identified with an alphabetical designation from A to Y, one sample at the outfall was designated AA, and one composite sediment sample from within the drain pipe itself was labeled as "sediment". (Figure 2 shows each sample location.) One additional sample was collected from the approximate entrance area to the storm sewer location and was designated as sample "Z" (Figure 1). As mentioned in Section 2.0 each composite sample from the 0-1 foot depth below the invert

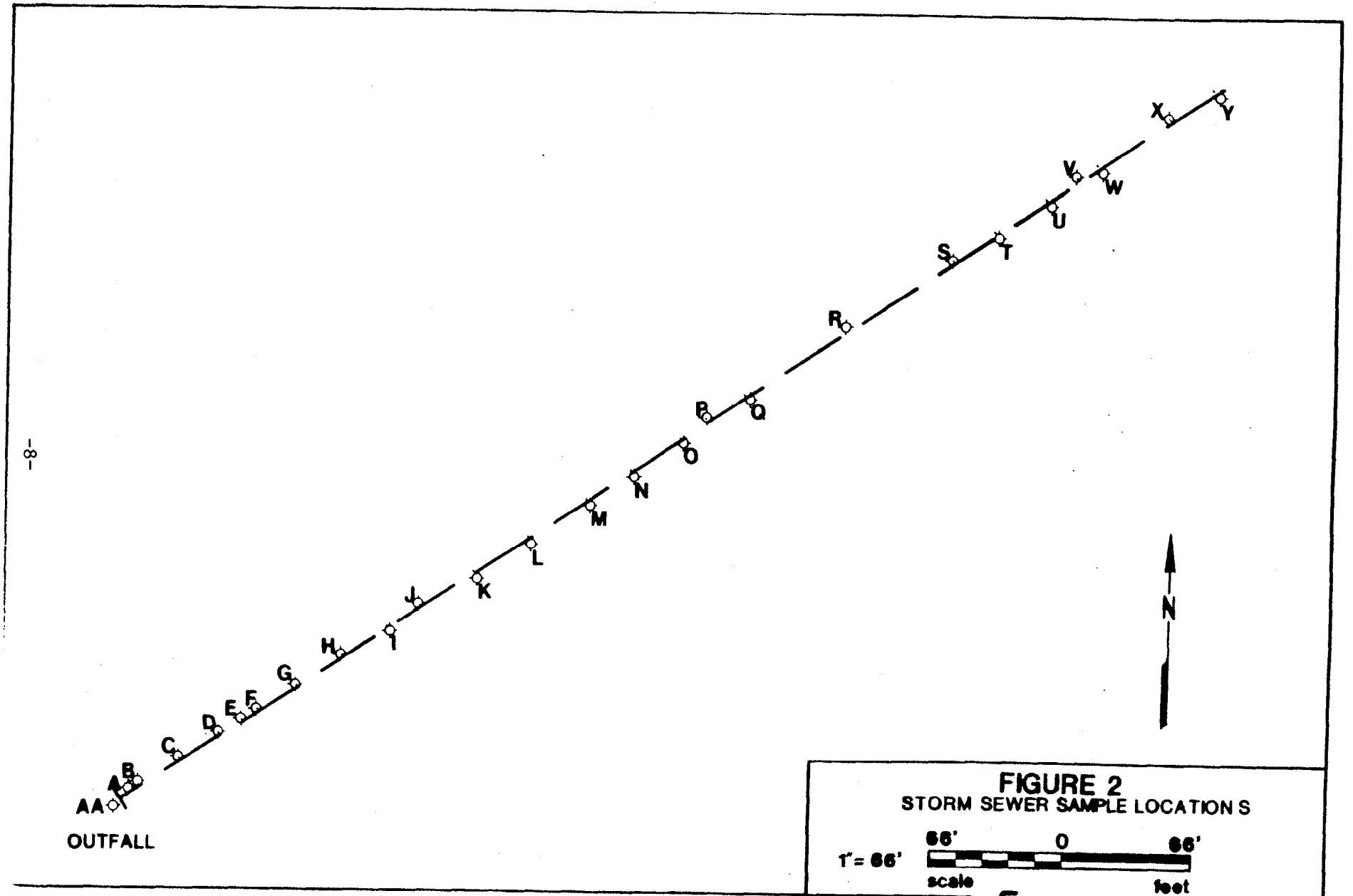


FIGURE 2
STORM SEWER SAMPLE LOCATION S

ENSAFE

was analyzed for EP Toxicity Metals and Cyanide and results are found in Table 3. All the Site 1 samples showed no detectable levels of contamination above normal background for metals and/or cyanide. The complete laboratory results are included in Appendix B.

4.2 Site 2

Three samples were collected from the salvage yard and were designated SY1, SY2, and SY3. Each composite sample at the 0-1 foot interval was analyzed for total petroleum hydrocarbons and lead. Laboratory results (Table 4) indicate the presence of high levels of hydrocarbons when referenced to the background sample. Laboratory results for composite samples collected at the 1-3 foot interval were below detectable limits. Complete laboratory results are also included in Appendix B. Sample locations are shown in Figure 3.

Table 4
Data Summary for Salvage Yard
And Related Background Tests

Sample Number		Total Petroleum Hydrocarbons (ppm)	Total Lead
SY1	0-1'	1100	70.3
SY2	0-1'	1850	15.7
SY3	0-1'	839	17.9
SY1	1-3'	<1	7.49
SY2	1-3'	<1	6.79
SY3	1-3'	<1	10.0
BKG2	1-3'	389	12.3
BKG	7-8'	<1	4.65
BKG	8-10'	9	5.20
BKG	10-12'	<1	4.80

TABLE 3
ANALYTICAL RESULTS OF NAS MEMPHIS
STORM DRAIN INVESTIGATION

SAMPLE NUMBER	EP TOXICITY AS	BA	CD	CR	PB	HG	SE	AG	TOTAL CYANIDE
	mg/l								
A1 5-6'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
B1 5-6'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
C1 6-7'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
C1 6-7'Dup	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
D1 6-7'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
E1 6-7'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
F1 6-7'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
G1 6-7'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
H1 6-7'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
I1 6-7'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
J1 6-7'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
K1 6-7'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
L1 6-7'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
M1 6-7'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
N1 6-7'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
O1 7-8'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
P1 7-8'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
Q1 7-8'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
R1 7-8'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
S1 7-8'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
T1 7-8'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
U1 7-8'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
V1 7-8'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
W1 7-8'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
X1 7-8'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
Y1 7-8'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
Z1 0-1'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
AA 0-1'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
Sediment	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
SS1 7-8'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
BKG 7-8'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
BKG 8-10'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1
BKG 10-12'	<1.0	<1.0	<0.5	<1.0	<1.0	<0.2	<0.5	<1.0	<0.1

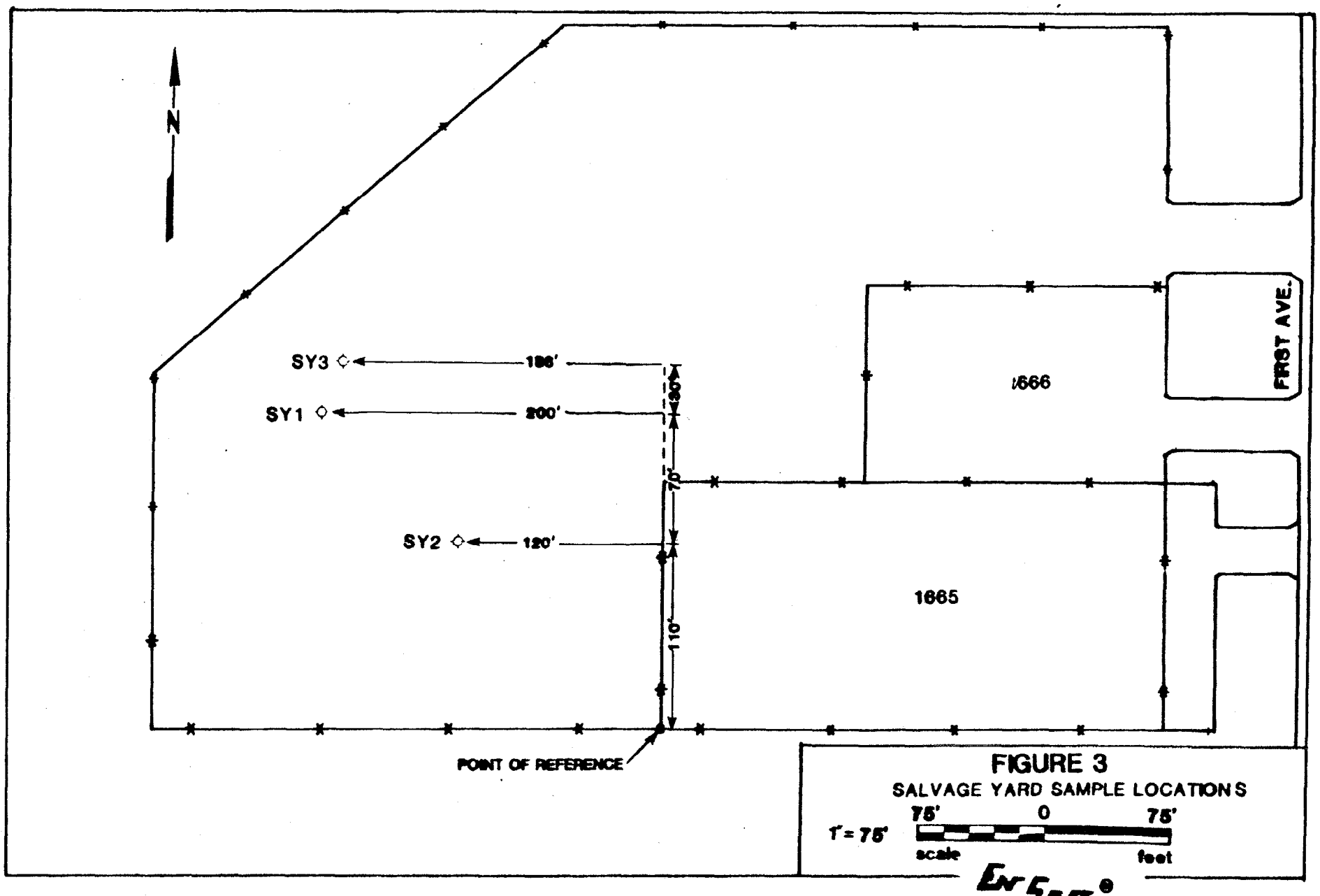


FIGURE 3

SALVAGE YARD SAMPLE LOCATIONS

4.3 Site 3

The final sample collected was adjacent to the storm sewer manhole located west of 7th Avenue and south of Casablanca. The sample, SS1, was collected by drilling to a depth of 0-1 feet, 1-3 feet, and 3-5 feet below the pipe's invert. Analytical results of the uppermost sample show no significant levels of contamination. Data for this sample is shown in Table 3 and complete laboratory results are included in Appendix B. Sample location is shown in Figure 1.

5.0 CONCLUSIONS

The investigation at the three sites at NAS Memphis indicate that only the former salvage yard (site 2) shows positive contaminant levels in the surficial samples. Laboratory results substantiate the presence of hydrocarbons in only the 0-1 foot sampling interval. Visual inspection of the property indicates the contamination to be continuous throughout the area.

The positive values obtained for total petroleum hydrocarbons and total lead are probably indicative of oil and/or gasoline contamination. The State of Tennessee policy for disposal of gasoline and petroleum contaminated soils is attached as Appendix C. Based on the levels of contamination encountered at the salvage yard and in accordance with the guidelines set forth by the Tennessee Department of Health and Environment Policy on Cleanup Levels for Gasoline and Other Petroleum Hydrocarbons, EnSafe recommends that all excavated soils from the 0-1 foot

level within the salvage yard be handled in accordance with Tennessee Policy. Personal communications between EnSafe and Chuck Head, Tennessee Division of Superfund, support the aforementioned recommendation.

The site location map (Figure 1) shows the aircraft training facility superimposed on the area of the storm sewer and the salvage yard. Excavation of soil (maximum depth of 1 foot) from the project area would necessitate the removal of approximately 2000 cubic yards of soil.

The Tennessee policy on disposal of petroleum contaminated soils allows the generator three options.

1) All soils in excess of 500 ppm total petroleum hydrocarbons can be disposed off site, but only as hazardous waste.

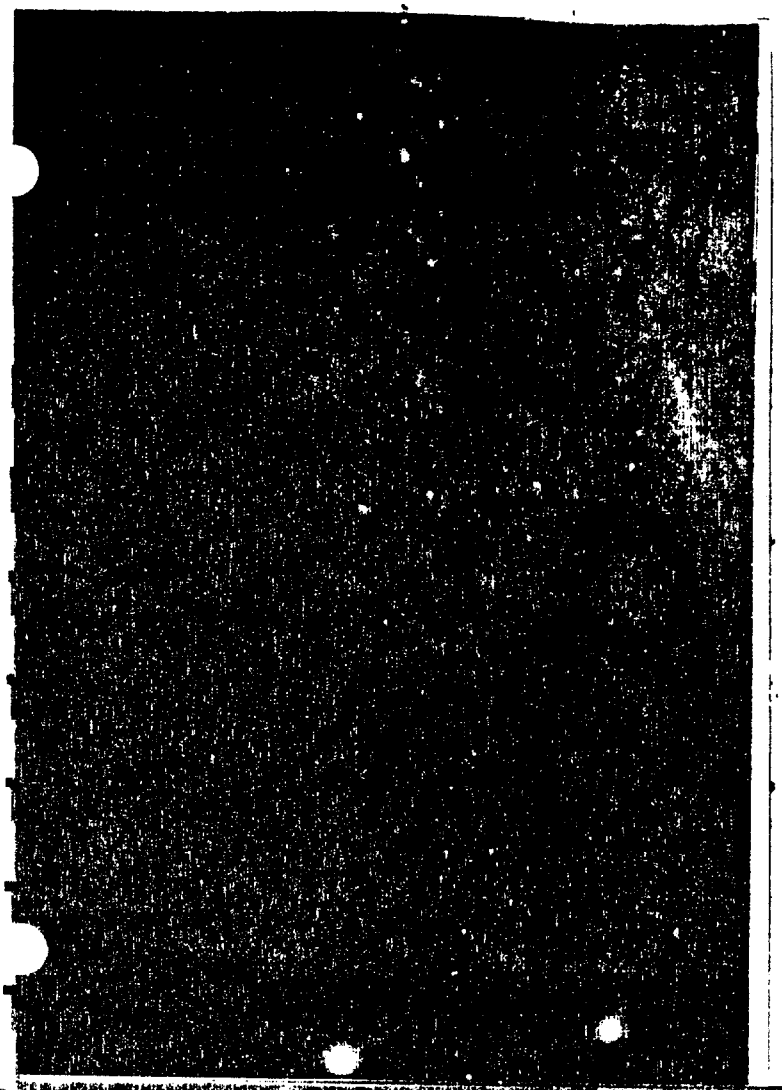
2) The soils may be burned on or off site in accordance with Tennessee Air Quality regulations; or

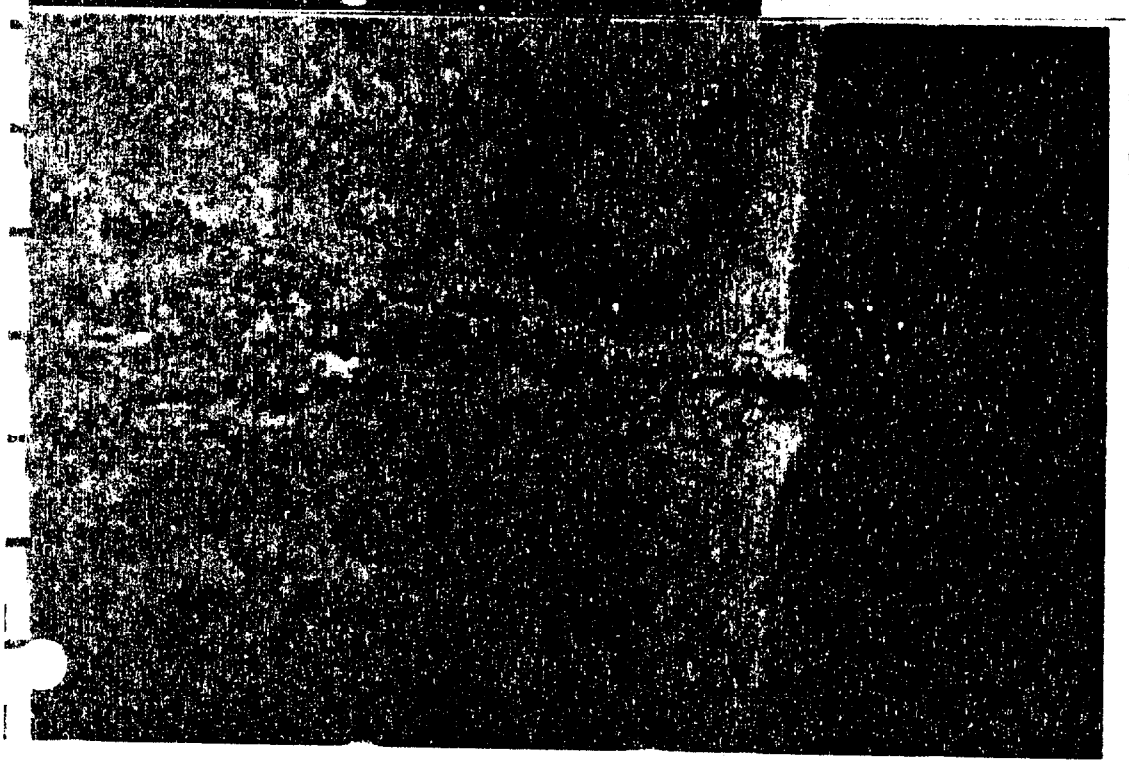
3) The soils may be 'treated' on site in accordance with a plan developed and coordinated with the Tennessee Department of Health and Environment.

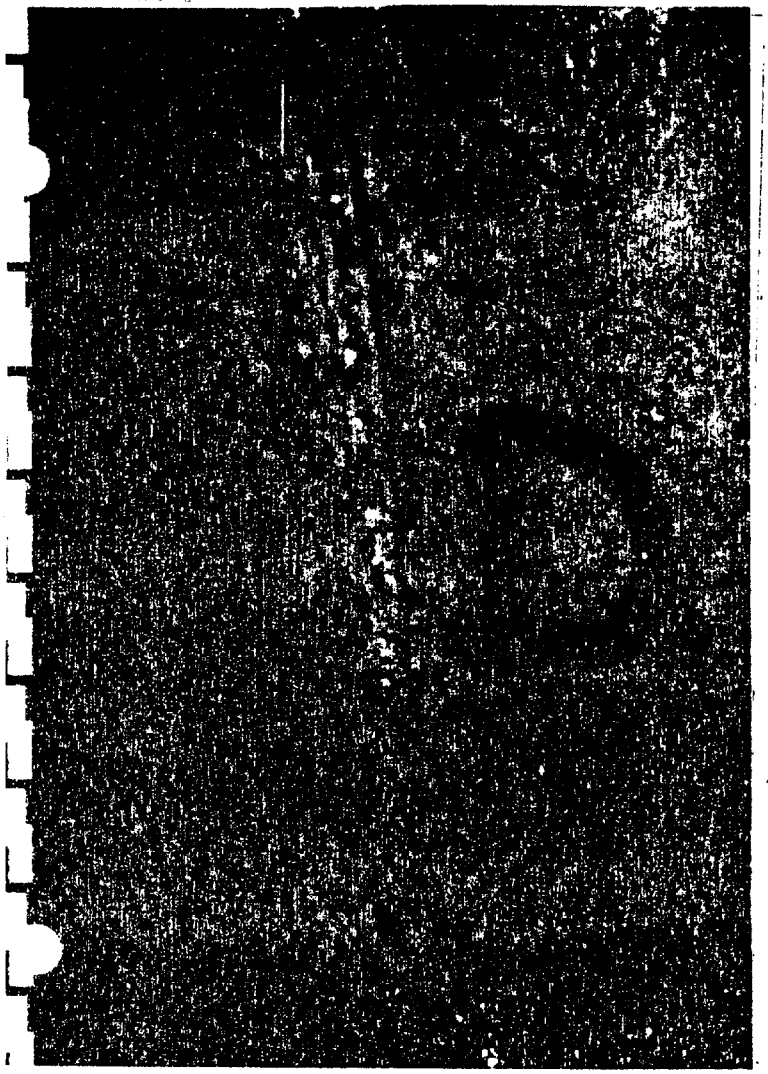
Due to the exorbitant cost of removal of the soils as hazardous waste, EnSafe recommends working in conjunction with the Tennessee Department of Health and Environment for onsite remediation.

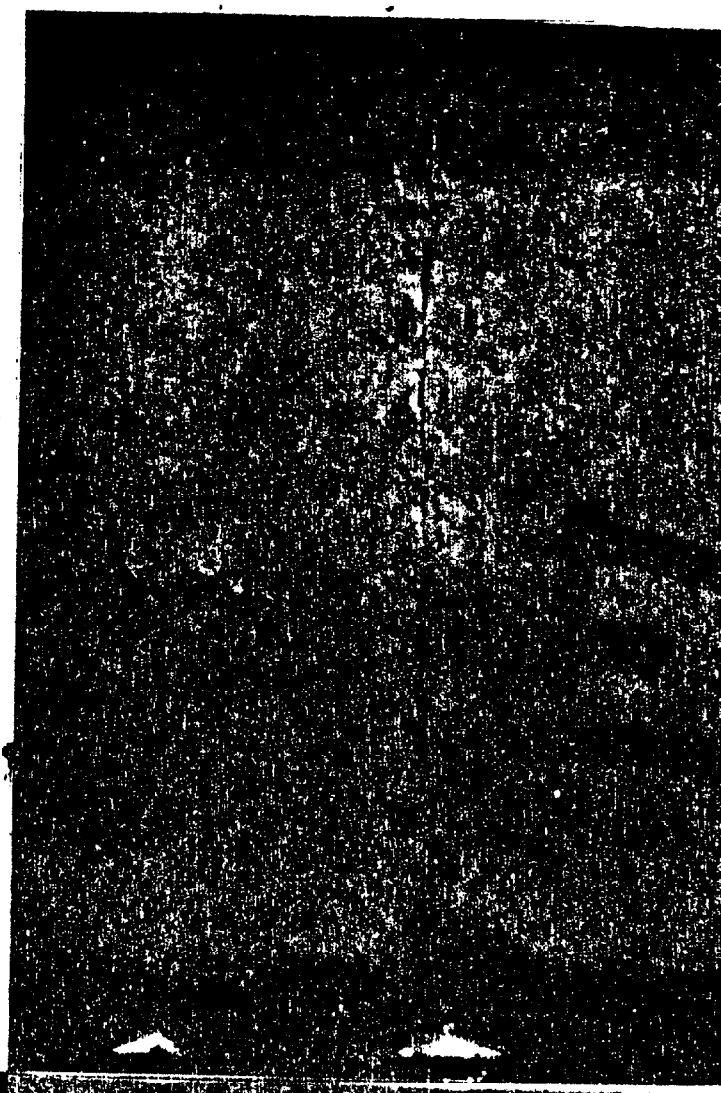
APPENDIX A

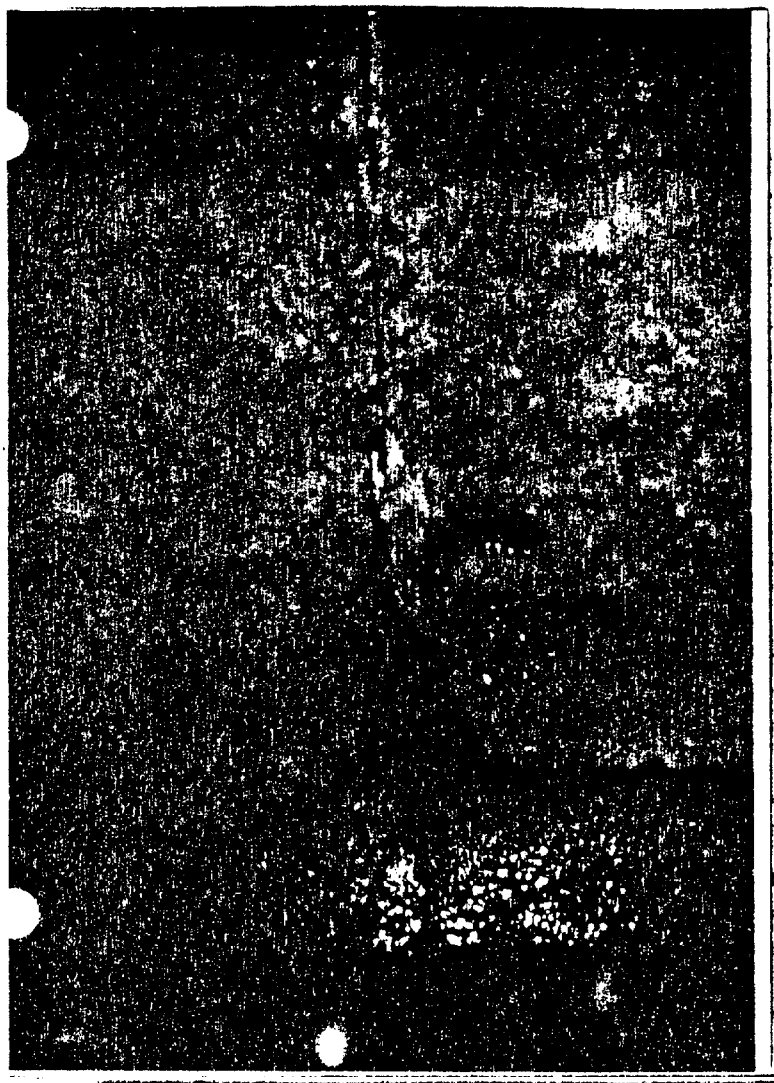
PHOTOGRAPHS OF STORM DRAIN JOINTS

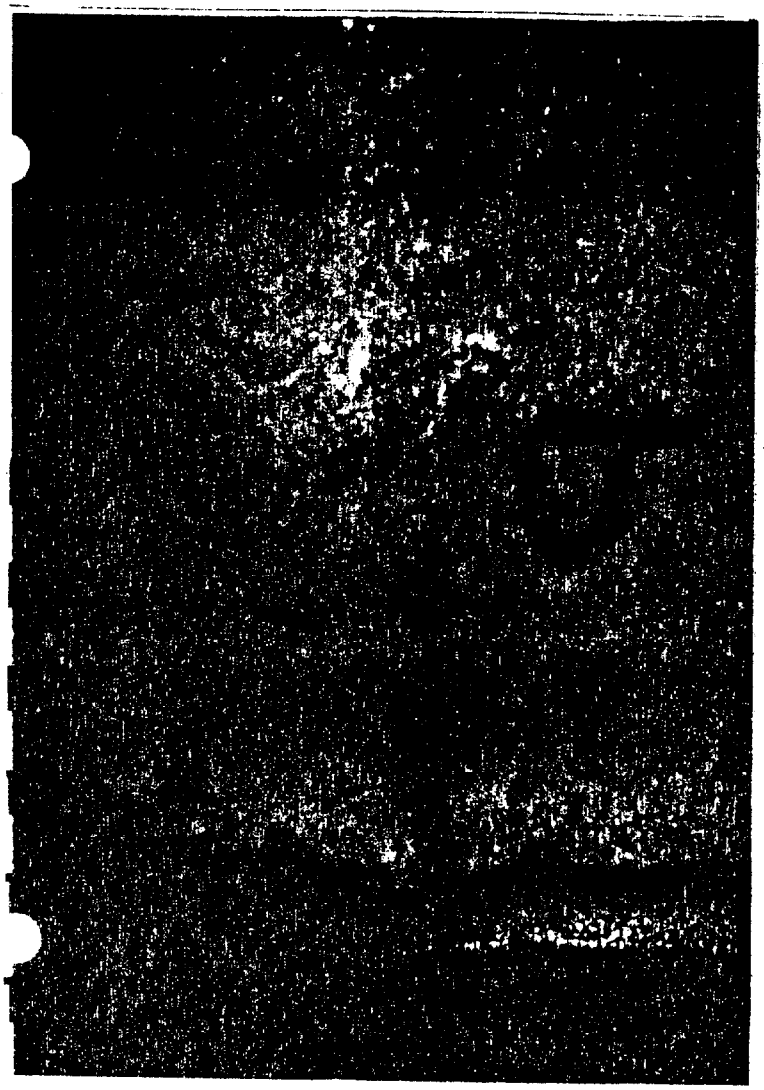


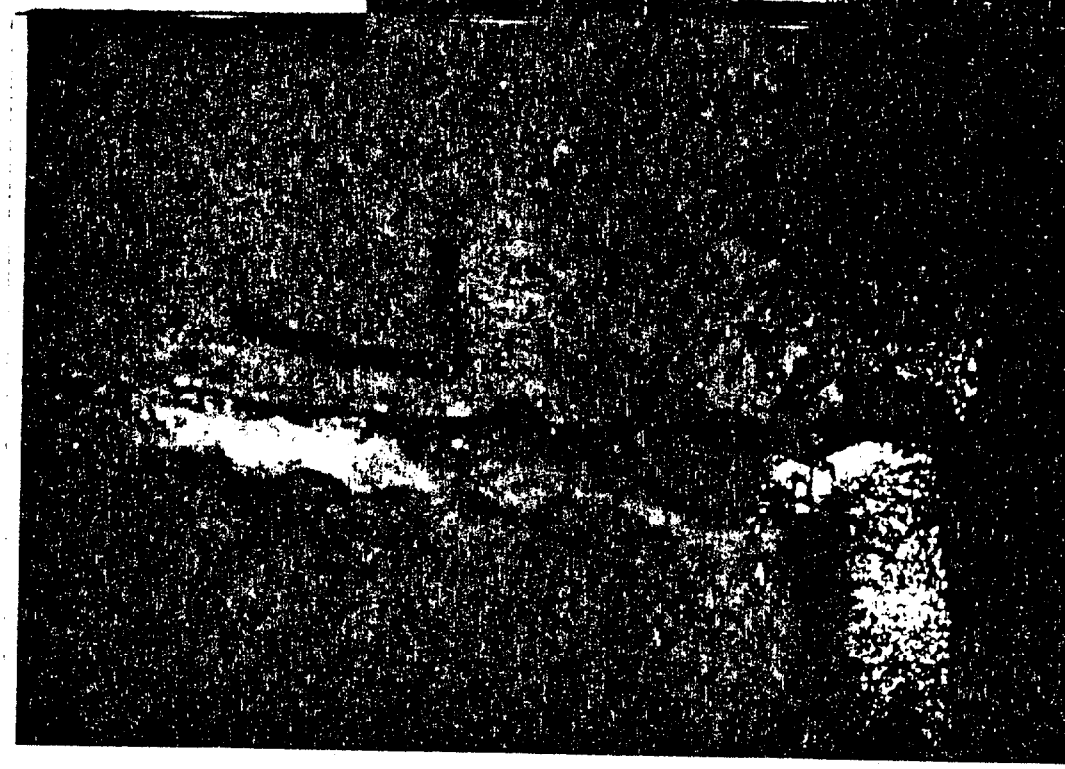


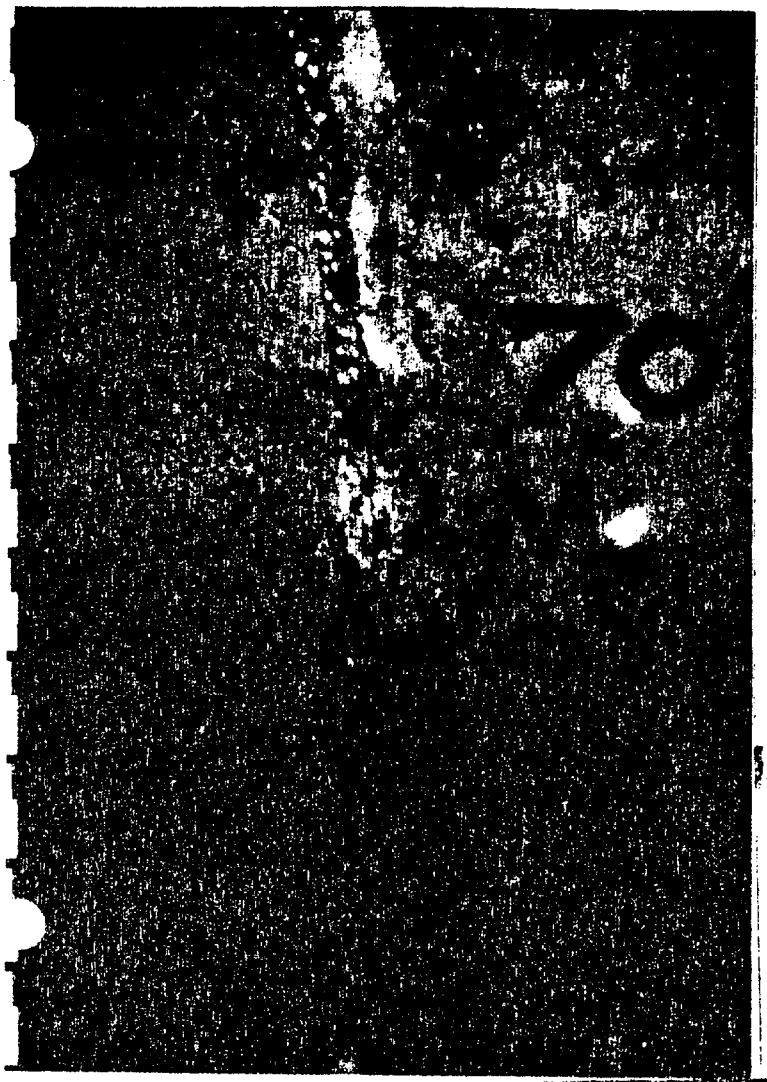


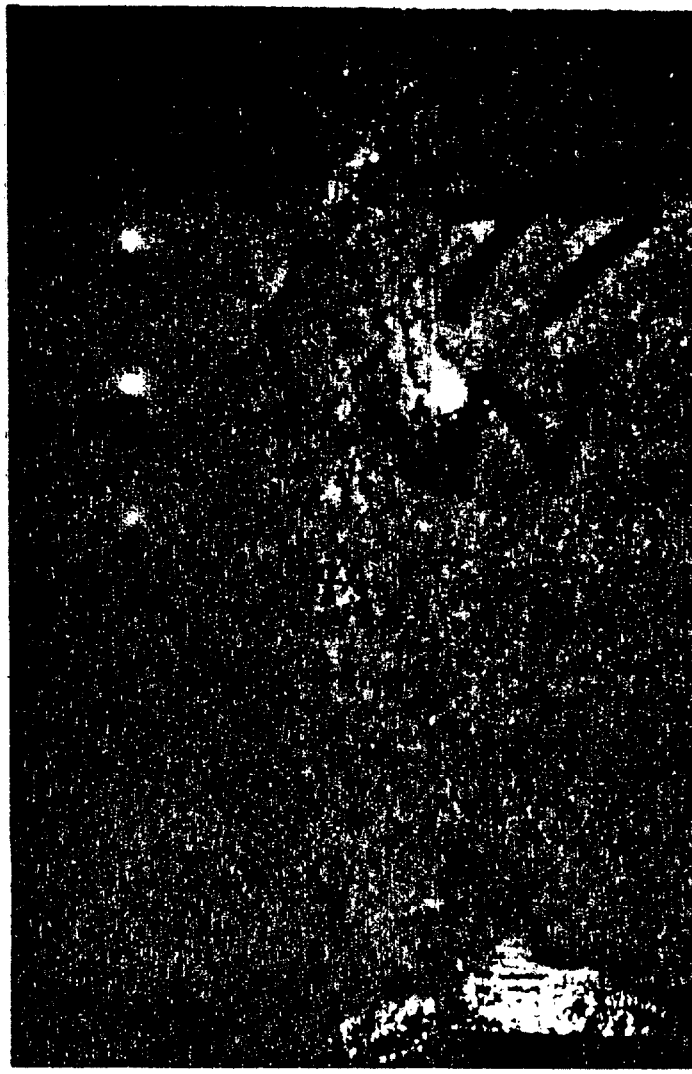


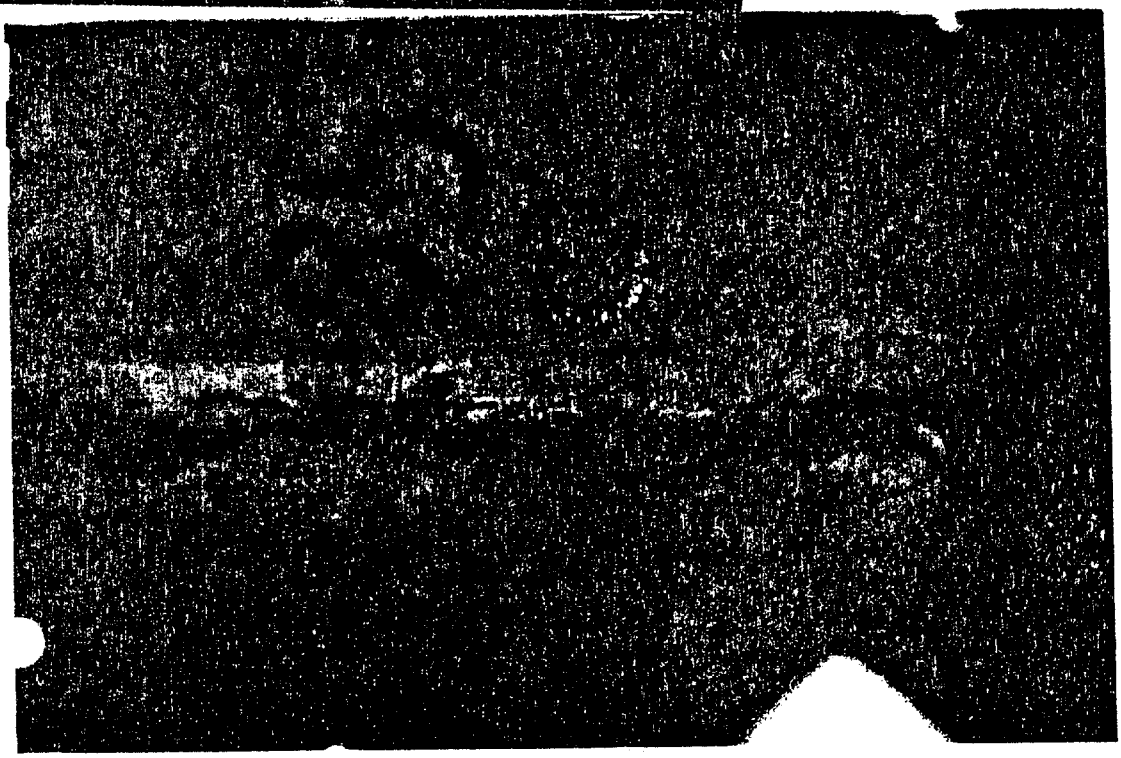


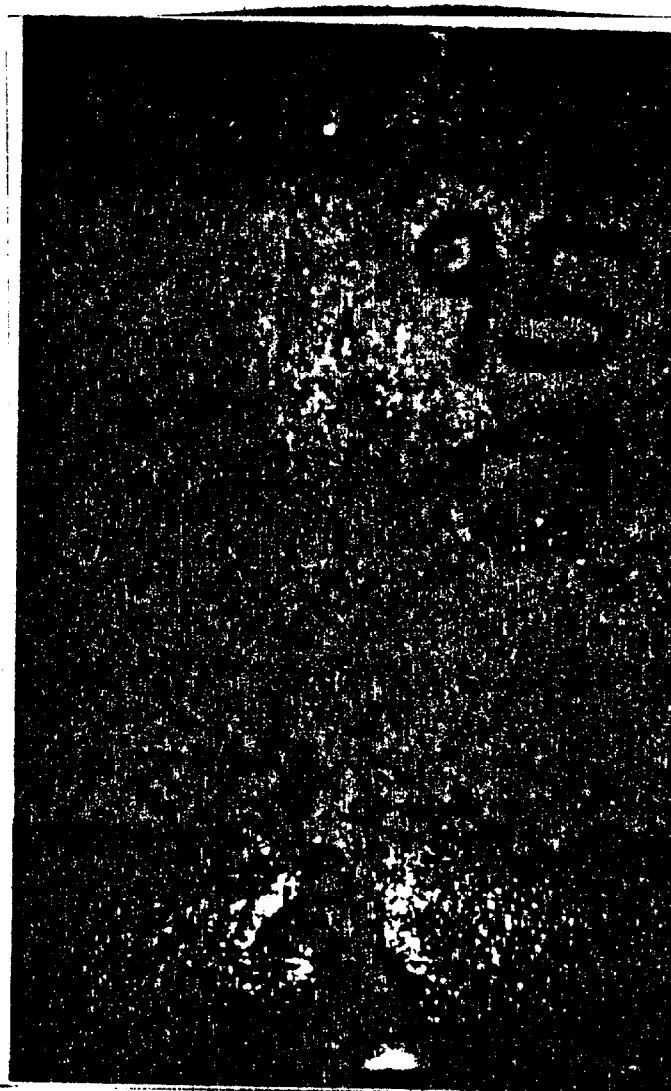


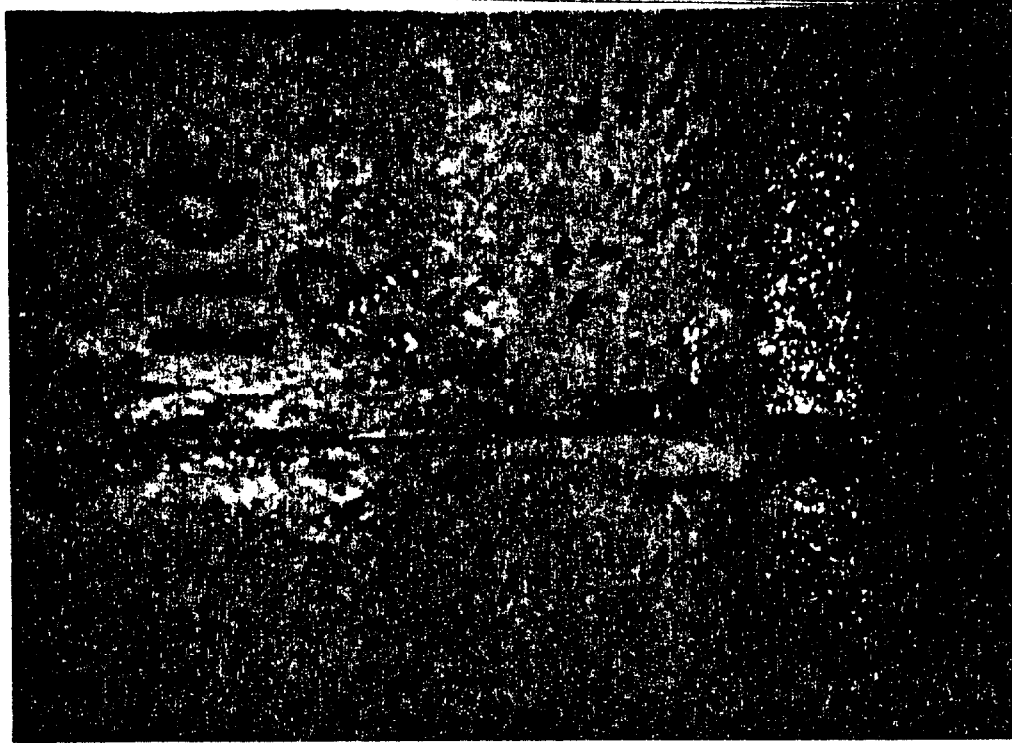


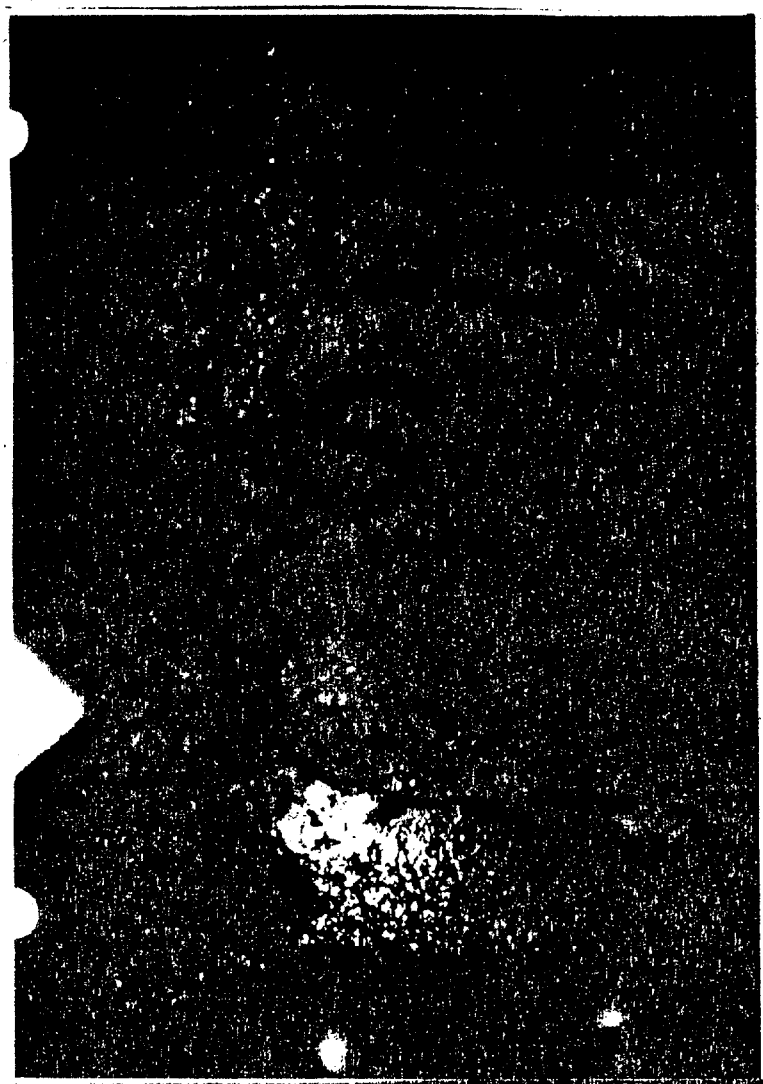


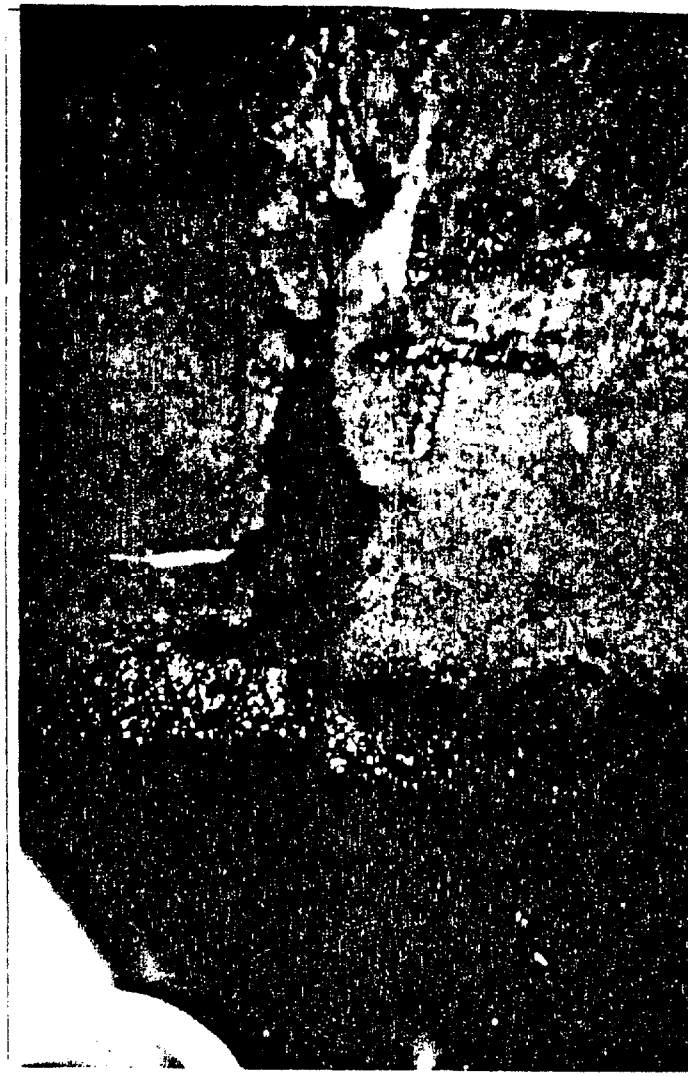


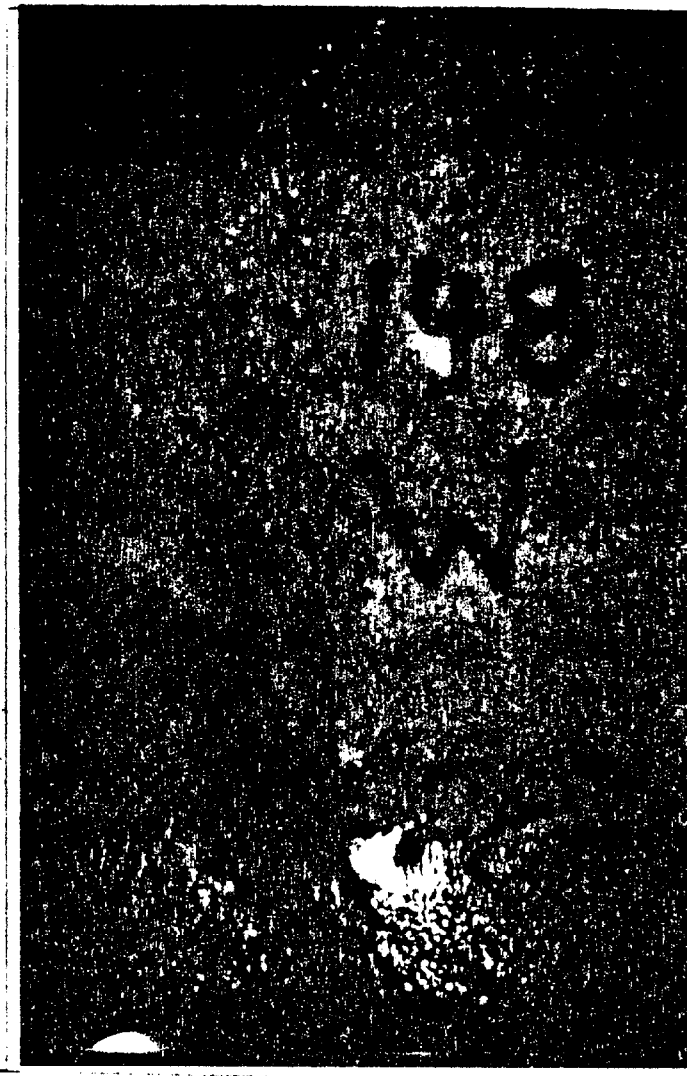












APPENDIX B

LABORATORY REPORTS

GENERAL ENGINEERING LABORATORIES

Environmental Engineering and Analytical Services

Molly F. Greene
President

George C. Greene, P.E., Ph.D.
Vice President
SC Registration No. 9103

Laboratory Certifications:
FL E87150/88/2
NC 233
SC 84009
VA 00013
NACIP Approved

CERTIFICATE OF ANALYSIS

Client: ENVIRONMENTAL & SAFETY DESIGNS, INC
P.O. BOX 341315
MEMPHIS , TN 38184
Contact: MR. J. SPEAKMAN, PhD, PE

Date: 06/17/88

Released by: A.M. Crane
ALLAN M. CRANE

cc/fc: ENSA/ENSA1

Page No.: 1

Parameter	Sample ID / Collected by	A1 5-6' 06/07/88	B1 5-6' 06/06/88	C1 6-7' 06/06/88	C1 6-7' DUPLICATE 06//06/88
	Lab ID	88060460	88060461	88060462	88060463
	Sample Type	15	15	15	15
	Date Received	06/09/88	06/09/88	06/09/88	06/09/88
	Collected by	ENSA	ENSA	ENSA	ENSA
CYANIDE, TOTAL		<0.1 ppm	<0.1 ppm	<0.1 ppm	<0.1 ppm
ARSENIC		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
BARIUM		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
CADMIUM		<0.50 ppm	<0.50 ppm	<0.50 ppm	<0.50 ppm
CHROMIUM		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
LEAD		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
MERCURY		<0.20 ppm	<0.20 ppm	<0.20 ppm	<0.20 ppm
SELENIUM		<0.50 ppm	<0.50 ppm	<0.50 ppm	<0.50 ppm
SILVER		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
DIGESTION FOR MERCURY ANALYSIS		YES	YES	YES	YES
EP TOX EXTRACTION-SOLID		YES	YES	YES	YES

2040 Savage Road • Charleston, SC 29414 / P.O. Box 30712 • Charleston, SC 29417
Phone (803) 556-8171 • FAX (803) 766-1178

GENERAL ENGINEERING LABORATORIES

Environmental Engineering and Analytical Services

Molly F. Greene
President

George C. Greene, P.E., Ph.D.
Vice President
SC Registration No. 9103

Laboratory Certifications:

FL	E87156/87291
NC	233
SC	10120
VA	00013
NACIP	Approved

JUN 20 1988

CERTIFICATE OF ANALYSIS

Client: ENVIRONMENTAL & SAFETY DESIGNS, INC
P.O. BOX 341315
MEMPHIS , TN 38184

Date: 06/16/88

Contact: MR. J. SPEAKMAN, PhD, PE

Released by: ALLAN M. CRANE

cc/fc: ENSA/ENSA1

Page No.: 1

Parameter	Sample ID / Collected by	F1 6-7' 06/03/88	G1 6-7' 06/03/88	H1 6-7' 06/02/88	I1 6-7' 06/02/88
	Lab ID	88060410	88060411	88060412	88060413
	Sample Type	15	15	15	15
	Date Received	06/09/88	06/09/88	06/09/88	06/09/88
	Collected by	ENSA	ENSA	ENSA	ENSA
CYANIDE, TOTAL		<0.1 ppm	<0.1 ppm	<0.1 ppm	<0.1 ppm
ARSENIC		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
BARIUM		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
CADMIUM		<0.50 ppm	<0.50 ppm	<0.50 ppm	<0.50 ppm
CHROMIUM		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
LEAD		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
MERCURY		<0.20 ppm	<0.20 ppm	<0.20 ppm	<0.20 ppm
SELENIUM		<0.50 ppm	<0.50 ppm	<0.50 ppm	<0.50 ppm
SILVER		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
DIGESTION FOR MERCURY ANALYSIS		YES	YES	YES	YES
EP TOX EXTRACTION-SOLID		YES	YES	YES	YES

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SC Registration No. 9103

Laboratory Certifications:

FL	E87156/87294
NC	233
SC	10120
VA	00151
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CERTIFICATE OF ANALYSIS

Client: ENVIRONMENTAL & SAFETY DESIGNS, INC
P.O. BOX 341315
MEMPHIS , TN 38184

Date: 06/16/88

Contact: MR. J. SPEAKMAN, PhD, PE

Released by: ALLAN M. CRANE

cc/fc: ENSA/ENSA1

Parameter					
	Sample ID :	J1 7-8' 06/02/88	K1 7-8' 06/02/88	L1 7-8' 06/02/88	M1 7-8' 06/02/88
	Lab ID :	88060414	88060415	88060416	88060417
	Sample Type :	15	15	15	15
	Date Received:	06/09/88	06/09/88	06/09/88	06/09/88
	Collected by :	ENSA	ENSA	ENSA	ENSA
CYANIDE, TOTAL		<0.1 ppm	<0.1 ppm	<0.1 ppm	<0.1 ppm
ARSENIC		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
BARIUM		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
CADMIUM		<0.50 ppm	<0.50 ppm	<0.50 ppm	<0.50 ppm
CHROMIUM		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
LEAD		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
MERCURY		<0.20 ppm	<0.20 ppm	<0.20 ppm	<0.20 ppm
SELENIUM		<0.50 ppm	<0.50 ppm	<0.50 ppm	<0.50 ppm
SILVER		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
DIGESTION FOR MERCURY ANALYSIS		YES	YES	YES	YES
EP TOX EXTRACTION-SOLID		YES	YES	YES	YES

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Contact: MR. J. SPEAKMAN, PhD, PE

Released by: A.M. Crane
ALLAN M. CRANE

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Page No.: 1

Parameter	Sample ID / Collected by	N1 7-8'	O1 7-8'	P1 7-8'	Q1 7-8'
	Sample ID :	N1 7-8'	O1 7-8'	P1 7-8'	Q1 7-8'
		06/02/88	06/02/88	06/02/88	06/02/88
	Lab ID :	88060418	88060419	88060420	88060421
	Sample Type :	15	15	15	15
	Date Received:	06/09/88	06/09/88	06/09/88	06/09/88
	Collected by :	ENSA	ENSA	ENSA	ENSA
CYANIDE, TOTAL		<0.1 ppm	<0.1 ppm	<0.1 ppm	<0.1 ppm
ARSENIC		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
BARIUM		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
CADMIUM		<0.50 ppm	<0.50 ppm	<0.50 ppm	<0.50 ppm
CHROMIUM		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
LEAD		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
MERCURY		<0.20 ppm	<0.20 ppm	<0.20 ppm	<0.20 ppm
SELENIUM		<0.50 ppm	<0.50 ppm	<0.50 ppm	<0.50 ppm
SILVER		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
DIGESTION FOR MERCURY ANALYSIS		YES	YES	YES	YES
EP TOX EXTRACTION-SOLID		YES	YES	YES	YES

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Parameter	Sample ID :	R1 7-8' 06/01/88	S1 7-8' 06/01/88	T1 7-8' 06/01/88	U1 7-8' 06/01/88
	Lab ID :	88060422	88060423	88060424	88060425
	Sample Type :	15	15	15	15
	Date Received:	06/09/88	06/09/88	06/09/88	06/09/88
	Collected by :	ENSA	ENSA	ENSA	ENSA
CYANIDE, TOTAL		<0.1 ppm	<0.1 ppm	<0.1 ppm	<0.1 ppm
ARSENIC		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
BARIUM		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
CADMIUM		<0.50 ppm	<0.50 ppm	<0.50 ppm	<0.50 ppm
CHROMIUM		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
LEAD		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
MERCURY		<0.20 ppm	<0.20 ppm	<0.20 ppm	<0.20 ppm
SELENIUM		<0.50 ppm	<0.50 ppm	<0.50 ppm	<0.50 ppm
SILVER		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
DIGESTION FOR MERCURY ANALYSIS		YES	YES	YES	YES
EP TOX EXTRACTION-SOLID		YES	YES	YES	YES

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SC	[illegible]
VA	[illegible]
NACIP	[illegible]

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cc/fc: ENSA/ENSA1

Parameter	Sample ID : Collected by :	V1 7-8' 06/01/88 ENSA	W1 7-8' 06/01/88 ENSA	X1 7-8' 06/01/88 ENSA	Y1 7-8' 06/01/88 ENSA
	Lab ID :	88060426	88060427	88060428	88060429
	Sample Type :	15	15	15	15
	Date Received:	06/09/88	06/09/88	06/09/88	06/09/88
CYANIDE, TOTAL		<0.1 ppm	<0.1 ppm	<0.1 ppm	<0.1 ppm
ARSENIC		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
BARIUM		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
CADMIUM		<0.50 ppm	<0.50 ppm	<0.50 ppm	<0.50 ppm
CHROMIUM		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
LEAD		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
MERCURY		<0.20 ppm	<0.20 ppm	<0.20 ppm	<0.20 ppm
SELENIUM		<0.50 ppm	<0.50 ppm	<0.50 ppm	<0.50 ppm
SILVER		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
DIGESTION FOR MERCURY ANALYSIS		YES	YES	YES	YES
EP TOX EXTRACTION-SOLID		YES	YES	YES	YES

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NC 233
SC 84001
VA 00151
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ALLAN M. CRANE

cc/fc: ENSA/ENSA1

Parameter	Sample ID / Collected by	D1 6-7'	E1 6-7'	Z1 0-1'	AA 0-1'
	Sample ID :	D1 6-7'	E1 6-7'	Z1 0-1'	AA 0-1'
		06/03/88	06/03/88	06/07/88	06/07/88
	Lab ID :	88060464	88060465	88060466	88060467
	Sample Type :	15	15	15	15
	Date Received:	06/09/88	06/09/88	06/09/88	06/09/88
	Collected by :	ENSA	ENSA	ENSA	ENSA
CYANIDE, TOTAL		<0.1 ppm	<0.1 ppm	<0.1 ppm	<0.1 ppm
ARSENIC		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
BARIUM		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
CADMIUM		<0.50 ppm	<0.50 ppm	<0.50 ppm	<0.50 ppm
CHROMIUM		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
LEAD		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
MERCURY		<0.20 ppm	<0.20 ppm	<0.20 ppm	<0.20 ppm
SELENIUM		<0.50 ppm	<0.50 ppm	<0.50 ppm	<0.50 ppm
SILVER		<1.00 ppm	<1.00 ppm	<1.00 ppm	<1.00 ppm
DIGESTION FOR MERCURY ANALYSIS		YES	YES	YES	YES
EP TOX EXTRACTION-SOLID		YES	YES	YES	YES

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Date: 06/17/88

Released by: ALLAN M. CRANE

cc/fc: ENSA/ENSA1

Page No.: 1

Parameter	Sample ID :	STORM PIPE SEDIMENT 06/07/88	SS1 7-8' 06/07//88
	Lab ID :	88060468	88060469
	Sample Type :	15	15
	Date Received:	06/09/88	06/09/88
	Collected by :	ENSA	ENSA
CYANIDE, TOTAL		<0.1 ppm	<0.1 ppm
ARSENIC		<1.00 ppm	<1.00 ppm
BARIUM		<1.00 ppm	<1.00 ppm
CADMIUM		<0.50 ppm	<0.50 ppm
CHROMIUM		<1.00 ppm	<1.00 ppm
LEAD		<1.00 ppm	<1.00 ppm
MERCURY		<0.20 ppm	<0.20 ppm
SELENIUM		<0.50 ppm	<0.50 ppm
SILVER		<1.00 ppm	<1.00 ppm
DIGESTION FOR MERCURY ANALYSIS		YES	YES
EP TOX EXTRACTION-SOLID		YES	YES

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NC	[illegible]
SC	[illegible]
VA	[illegible]
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Date: 06/17/88

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ALLAN M. CRANE

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Page No.: 1

Parameter		BKG 7-8'	BKG 8-10'	BKG 10-12'
	Sample ID :	BKG 7-8' 06/07/88	BKG 8-10' 06/07/88	BKG 10-12' 06/07/88
	Lab ID :	88060473	88060474	88060475
	Sample Type :	15	15	15
	Date Received:	06/09/88	06/09/88	06/09/88
	Collected by :	ENSA	ENSA	ENSA
CYANIDE, TOTAL		<0.1 ppm	<0.1 ppm	<0.1 ppm
TOTAL HYDROCARBONS		<1 ppm	9 ppm	<1 ppm
LEAD		4.65 ppm	5.20 ppm	4.80 ppm
ACID DIGESTION		YES	YES	YES
ARSENIC		<1.00 ppm	<1.00 ppm	<1.00 ppm
BARIUM		<1.00 ppm	<1.00 ppm	<1.00 ppm
CADMIUM		<0.50 ppm	<0.50 ppm	<0.50 ppm
CHROMIUM		<1.00 ppm	<1.00 ppm	<1.00 ppm
LEAD		<1.00 ppm	<1.00 ppm	<1.00 ppm
MERCURY		<0.20 ppm	<0.20 ppm	<0.20 ppm
SELENIUM		<0.50 ppm	<0.50 ppm	<0.50 ppm
SILVER		<1.00 ppm	<1.00 ppm	<1.00 ppm
DIGESTION FOR MERCURY ANALYSIS		YES	YES	YES
EP TOX EXTRACTION-SOLID		YES	YES	YES

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NC	248
SC	10120
VA	00151
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Date: 06/17/88

Contact: MR. J. SPEAKMAN, PhD, PE

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ALLAN M. CRANE

cc/fc: ENSA/ENSA3

Parameter				
	Sample ID :	SY1 0-1' 06/07/88	SY2 0-1' 06/07/88	SY3 0-1' 06/07/88
	Lab ID :	88060470	88060471	88060472
	Sample Type :	15	15	15
	Date Received:	06/09/88	06/09/88	06/09/88
	Collected by :	ENSA	ENSA	ENSA
TOTAL HYDROCARBONS		1100 ppm	1850 ppm	839 ppm
LEAD		70.3 ppm	15.7 ppm	17.9 ppm
ACID DIGESTION		YES	YES	YES

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Date: 06/13/88

Contact: MR. J. SPEAKMAN, PhD, PE

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cc/fc: ENSA/ENSA1

Parameter	Sample ID	NI 7-8' DUPLICATE	NI 7-8' TRIPLICATE
	Lab ID	88060514	88060515
	Sample Type	15	15
	Date Received	06/10/88	06/10/88
	Collected by	ENSA	ENSA
ARSENIC		<1.00 ppm	<1.00 ppm
BARIUM		<1.00 ppm	<1.00 ppm
CADMIUM		<0.50 ppm	<0.50 ppm
CHROMIUM		<1.00 ppm	<1.00 ppm
LEAD		<1.00 ppm	<1.00 ppm
MERCURY		<0.20 ppm	<0.20 ppm
SELENIUM		<0.50 ppm	<0.50 ppm
SILVER		<1.00 ppm	<1.00 ppm
DIGESTION FOR MERCURY ANALYSIS		YES	YES
EP TOX EXTRACTION-SOLID		YES	YES

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Date: 07/29/88

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cc/fc: ENSA/ENSAJ

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Parameter	Sample ID : BKGD2 1-3' 07/21/88 NAS Lab ID : 88071073 Sample Type : 15 Date Received: 07/22/88 Collected by : ENSA
TOTAL HYDROCARBONS	389 ppm
LEAD	12.3 ppm
ACID DIGESTION	YES
LEAD	<1.00 ppm
EP TOX EXTRACTION-SOLID	YES
BENZENE	<5 ppb
ETHYLBENZENE	<10 ppb
TOLUENE	<10 ppb
XYLENE	<10 ppb
AROCLOR 1016	<1 ppm
AROCLOR 1221	<1 ppm
AROCLOR 1232	<1 ppm
AROCLOR 1242	<1 ppm
AROCLOR 1248	<1 ppm
AROCLOR 1254	<1 ppm
AROCLOR 1260	<1 ppm
AROCLOR 1262	<1 ppm
SAMPLE PREP - PCB'S	YES

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Date: 08/09/88

Released by: for ALLAN M. CRANE

cc/fc: ENSA/ENSAJ

Parameter	Sample ID	SY1 1-3'	SY2 1-3'	SY3 1-3'
	Lab ID	88070677	88070678	88070679
	Sample Type	15	15	15
	Date Received	07/18/88	07/18/88	07/18/88
	Collected by	ENSA	ENSA	ENSA
TOTAL HYDROCARBONS		<1 ppm	<1 ppm	<1 ppm
LEAD		7.49 ppm	6.79 ppm	10.0 ppm
ACID DIGESTION		YES	YES	YES
LEAD		<1.00 ppm	<1.00 ppm	<1.00 ppm
EP TOX EXTRACTION-SOLID		YES	YES	YES
BENZENE		<5 ppb	<5 ppb	<5 ppb
ETHYLBENZENE		<10 ppb	<10 ppb	<10 ppb
TOLUENE		<10 ppb	<10 ppb	<10 ppb
XYLENE		<10 ppb	<10 ppb	<10 ppb
AROCLOR 1016		<1 ppm	<1 ppm	<1 ppm
AROCLOR 1221		<1 ppm	<1 ppm	<1 ppm
AROCLOR 1232		<1 ppm	<1 ppm	<1 ppm
AROCLOR 1242		<1 ppm	<1 ppm	<1 ppm
AROCLOR 1248		<1 ppm	<1 ppm	<1 ppm
AROCLOR 1254		<1 ppm	<1 ppm	<1 ppm
AROCLOR 1260		<1 ppm	<1 ppm	<1 ppm
AROCLOR 1262		<1 ppm	<1 ppm	<1 ppm
SAMPLE PREP - PCB'S		YES	YES	YES

APPENDIX C

TENNESSEE POLICY ON CLEANUP LEVELS FOR GASOLINE AND OTHER PETROLEUM HYDROCARBONS

FILE
TENNESSEE

RECEIVED
JAN - 4 1988

Policy No. UST 001-1

Tennessee Department of Health and Environment

Division of Ground Water Protection

Policy on Cleanup Levels for Gasoline

and Other Petroleum Hydrocarbons

Ground Water

March 18, 1987

I. Policy

A. Gasoline Contamination -

All ground water contaminated by gasoline must be treated until the benzene level is 5 parts per billion (ppb) or less. The Department's criteria for ground water in Rule 1200-4-6-.05 do not allow any concentrations of chemical constituents or other pollutants that would impair the usefulness of the water. In the November 13, 1985 Federal Register, EPA proposed a Recommended Maximum Contaminant Level (RMCL) of 5 ppb for community water supplies. It is the Division's position that benzene levels in excess of 5 ppb in ground water impairs its use as drinking water. By definition, such a condition is pollution.

Although the Division may determine in a specific circumstance that cleanup to this level is technologically impossible, that does not change the legal liabilities to the state or other parties incurred by the party responsible for the pollution. The Department does not have legal authority to approve a cleanup that does not reach the 5 ppb level.

All gasoline contaminated soil and fill material that exceeds a total of 10 parts per million (ppm) benzene, toluene, and xylene ("BTX") must be removed from the site or treated in place until the BTX value is below 10 ppm. If the BTX level is between 10 ppm and 100 ppm then the material may be handled in any of the four methods below:

1. Taken to a solid waste landfill for disposal provided that the Division of Solid Waste Management issues a Special Waste Approval Letter and the material is accepted by the landfill;

2. Taken to an asphalt recycler for reuse in the manufacture of asphalt;

3. Spread on a relatively impermeable material and aerated until the BTX level is below 10 ppm with approval of the Division of Air Pollution Control (or local Air Pollution Authority); or

4. Treatment of the soil in place (biodegradation, infiltration gallery, etc.) until the BTX value is less than 10 ppm. If this method is chosen then soil and ground water samples must be submitted on a regular schedule approved by the Division to monitor progress.

If the soil and/or fill material exceeds 100 ppm BTX there are three options in handling the material.

1. The material may be handled as a hazardous substance and disposed as such;

2. The material may be taken to an asphalt recycler providing it does not cause the recycler to exceed his air pollution stack limits;

3. The material may be treated in place until the BTX concentration is less than 10 ppm. (Treatment subject to Division approval.) Soil and ground water samples must be submitted on a regular schedule approved by the Division to monitor progress.

In rare instances, the Division may accept a proposal from the responsible party to leave soil with BTX levels exceeding 10 ppm in place. A proposal may be submitted only if all other methods of removing the contamination have been exhausted. This proposal for gasoline contaminated soil must follow the guidelines established by EPA as directed in the Federal Register (269.94(b) Criteria) and the December 1, 1986 ACL Guidance Document (or most recent EPA document). Any proposal must convince the Division concentrations of BTX greater than 10 ppm in the soil will not substantially alter the quality of the environment now or ever and that BTX in the contaminated soil will never migrate and contaminate groundwater.

B. Other Petroleum Hydrocarbons

All ground water contaminated with other petroleum hydrocarbons (such as diesel fuel, kerosene, jet fuel, aviation fuel, motor oil, etc.) must be treated until the hydrocarbon level (as total hydrocarbon) is less than 100 ppb or no noticeable taste and/or odor problems exist. If ground water is contaminated with benzene from hydrocarbons, it is subject to the 5 ppb benzene cleanup level for gasoline, the 100 ppb hydrocarbon cleanup level, or the removal of the taste and/or odor problem, whichever is

If the soil and/or fill materials exceed 500 ppm total hydrocarbon, there are three options in handling the material:

1. The material may be handled as a hazardous waste and disposed as such;

2. The material may be taken to an asphalt recycler providing it does not cause the recycler to exceed his air pollution stack limits; or

3. The material may be treated in place until the diesel fuel concentration is less than 100 ppm (Treatment subject to Division approval). If this method is chosen, then soil and ground water samples must be submitted on a regular schedule approved by the Division to monitor progress.

A proposal to leave hydrocarbon contamination in soil at levels greater than 100 ppm may be submitted to the Division. However, it will be subject to the same conditions as proposals for gasoline contaminated soil.

II. Purpose

The purpose of this policy is to institute contamination cleanup levels for petroleum that will protect ground water and the environment. The Tennessee Water Quality Control Act prohibits the pollution of the waters of the state or placement of any substance into a situation such that it might pollute the waters of the state. This policy sets contamination cleanup levels that will protect Tennessee's ground water resource for future use and prevent future ground water problems through cleanup of contaminated soil. Failure to cleanup contaminated ground water and soil will be considered a violation of

the Tennessee Water Quality Control Act and subject to the appropriate enforcement action.

III. Procedure

Once pollution has been documented the Division will require the responsible party (usually the tank owner) to complete an environmental assessment. The environmental assessment must determine the areal and vertical extent of contamination in the soil and ground water through soil borings and/or installation of ground water monitoring wells or other techniques approved by the Division. Once the extent of contamination has been determined by the responsible party, a proposal for corrective action must be submitted for review and approval by the Division prior to implementation except as approved by the Division in an emergency situation.

The policy is effective immediately, it shall not be modified or recinded except in writing under signature of this office.

Date: July 10, 1987

By: Terry R. Cothron

Director, Division of Ground Water Protection

Date: July 10, 1987

By: D. Eleanor Lemm

Administrator, Office of Water Management

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