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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
EDISON, NEW JERSEY 08837

REMOVAL ACTION BRANCH

ADMINISTRATIVE RECORD FILE

KING OF PRUSSIA

WINSLOW TOWNSHIP, NEW JERSEY

Prepared by:
U.S. EPA Technical Assistance Team
Roy F. Weston, Inc.
Major Programs Division
Edison, New Jersey

Prepared for:
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U.S. EPA Region II
Removal Action Branch
Edison, New Jersey

June 1991



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
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The administrative record file will be maintained at the local repository until further notice. Questions regarding the maintenance of the record file should be directed to the EPA Regional Office.

The Agency welcomes comments at any time on documents contained in the administrative record file. Please send any such comments to Mr. Eugene Dominach, On-Scene Coordinator, Removal Action Branch, USEPA Region II, Woodbridge Avenue, Edison, NJ 08837. The Agency may hold formal public comment periods at certain stages of the response process. The public is urged to use these formal review periods to submit their comments.

For further information on the administrative record file, contact Eugene Dominach at (908) 321-6666.

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KING OF PRUSSIA
ADMINISTRATIVE RECORD FILE
DRAFT INDEX OF DOCUMENTS

Document #: KOP 1.1001 - 1.1006
Title: Preliminary Assessment Report/Sampling Plan
Category: Site Identification
Author: EPA TAT
Recipient: Eugene Dominach, OSC
Date: May 18, 1988

Document #: KOP 1.2001 - 1.2004
Title: October 9, 1979 Site Investigation
Category: Site Identification
Author: Kevin Burger, EPA
Recipient: Richard D. Spear, Chief Surveillance and
Monitoring Branch
Date: January 29, 1980

Document #: KOP 2.1001 - 2.1015
Title: Sampling Plan for Soils--X-Ray Fluorescence-Carboy
Disposal Area
Category: Removal Response
Author: EPA TAT
Recipient: Eugene Dominach, OSC
Date: March 8, 1989

Document #: KOP 2.1016 - 2.1021
Title: Sample Results from X-Ray Fluorescence
Category: Removal Response
Author: EPA ERT
Recipient: Eugene Dominach, OSC
Date: April 26, 1989

Document #: KOP 2.1022 - 2.1050
Title: Sampling Plan for Contaminated Soil and Acid
Category: Removal Response
Author: EPA TAT
Recipient: Eugene Dominach, OSC
Date: October 10, 1989

Document #: KOP 2.1051 - 2.1064
Title: Sampling and Operations Plan for King of Prussia
Category: Removal Response
Author: EPA TAT
Recipient: Eugene Dominach, OSC
Date: November 26, 1990

Document #: KOP 2.1065 - 2.1071
Title: Final Field Screening for King of Prussia Site
Category: Removal Response
Author: Darvene A. Adams, Chief, Superfund Support Section
Recipient: John Witkowski, Superfund Project Manager
Date: June 12, 1989

Document #: KOP 2.1072 - 2.1084
Title: Draft Work Plan--Sampling and Excavation
Category: Removal Response--Carboy Removal
Author: Westinghouse Haztech, Inc.
Recipient: EPA
Date: June 16, 1989

Document #: KOP 2.1085 - 2.1096
Title: Work Plan--Drum Excavation
Category: Removal Response
Author: Westinghouse Haztech, Inc.
Recipient: EPA
Date: November 2, 1990

Document #: KOP 2.1097 - 2.1123
Title: King of Prussia Work Plan
Category: Removal Response--Tankers Removal
Author: Westinghouse Environmental and Geotechnical Services, Inc.
Recipient: EPA
Date: March 14, 1991

Document #: KOP 2.2001 - 2.2021
Title: Technical Memorandum--Magnetometer Survey
Category: Removal Response
Author: Westinghouse Environmental and Geotechnical Services, Inc.
Recipient: EPA
Date: September 12, 1990

Document #: KOP 2.2022 - 2.2024
Title: Memorandum--Magnetometer Survey
Category: Removal Response
Author: EPA TAT
Recipient: Roy F. Weston, REAC
Date: October 19, 1990

Document #: KOP 2.3001 - 2.3002
Title: Chain-of-Custody Record for Samples Collected
November 27, 1990
Category: Removal Response
Author: EPA TAT
Recipient: Laboratory
Date: November 27, 1990

Document #: KOP 2.3003 - 2.3006
Title: Chain-of-Custody Record for Samples Collected
December 4, 1990
Category: Removal Response
Author: EPA TAT
Recipient: Laboratory
Date: December 4, 1990

Document #: KOP 2.3007 - 2.3009
Title: Chain-of-Custody Record for Samples Collected
December 5, 1990
Category: Removal Response
Author: EPA TAT
Recipient: Laboratory
Date: December 5, 1990

Document #: KOP 2.3010 - 2.3011
Title: Chain-of-Custody Record for Samples Collected
December 5, 1990
Category: Removal Response
Author: EPA TAT
Recipient: Laboratory
Date: December 5, 1990

Document #: KOP 2.3012 - 2.3012
Title: Chain-of-Custody Record for Samples Collected
May 17, 1991
Category: Removal Response
Author: EPA TAT
Recipient: Laboratory
Date: May 17, 1991

Document #: KOP 2.4001 - 2.4006
Title: Organics and Metals Results, King of Prussia Disposal Site
Category: Removal Response
Author: Francis T. Brezenski, Chief Technical Support Branch
Recipient: Fred Rubel, Chief, Emergency Response and Hazardous Materials Inspection Branch
Date: January 8, 1980

Document #: KOP 2.4007 - 2.4038
Title: Sample Results of Acid Waste of February 20, 1990
Category: Removal Response
Author: EPA TAT
Recipient: Eugene Dominach, OSC
Date: July 10, 1990

Document #: KOP 2.4039 - 2.4040
Title: Preliminary Data
Category: Removal Response
Author: Bonner Analytical Testing Company
Recipient: Roy F. Weston
Date: March 11, 1991

Document #: KOP 2.4041 - 2.4045
Title: Other Analytes Work Table
Category: Removal Response
Author: TAT
Recipient: E. Dominach, OSC
Date: March 29, 1991

Document #: KOP 2.4046 - 2.4048
Title: Other Analytes Work Table
Category: Removal Response
Author: TAT PM J. Manfreda
Recipient: TAT
Date: March 29, 1991

Document #: KOP 2.4049 - 2.4050
Title: Other Analytes Work Table
Category: Removal Response
Author: TAT PM J. Manfreda
Recipient: TAT
Date: March 29, 1991

Document #: KOP 2.4051 - 2.4054
Title: General Chemistry Results--Preliminary Data RCRA
Characteristic Analyses
Category: Removal Response
Author: Environmental Industrial Research Associates, Inc.
Recipient: TAT
Date: Samples December 5, 1991

Document #: KOP 2.5001 - 2.5007
Title: King of Prussia Corporate Site, Winslow, NJ - Trip
Report
Category: Removal Response--Geophysical Study/Buried Drum
Area
Author: Mark Ellis, REAC Task Leader
Recipient: George Prince, EPA Work Assignment Manager
Date: November 2, 1990

Document #: KOP 2.6001 - 2.6013
Title: Preliminary Assessment and CERCLA/SARA Removals
Funding Request--Action Memorandum
Category: Removal Response--Carboy & Soil Removal Phase I
Author: Eugene Dominach, OSC
Recipient: William Muszynski, P.E., Acting Regional
Administrator
Date: May 11, 1989

Document #: KOP 2.6014 - 2.6041
Title: Request for a Ceiling Increase, a Change in Scope
and a Twelve Month Exemption--Action Memorandum
Phase II
Category: Removal Response--Buried Drums
Author: Eugene Dominach, OSC
Recipient: Constantine Sidamon-Eristoff, Regional
Administrator
Date: July 16, 1990

Document #: KOP 2.6042 - 2.6061
Title: Request for a Removal Action, Ceiling Increase, a
Change in Scope and a Twelve Month Exemption--
Action Memorandum Phase III
Category: Removal Response--Tanker Removal
Author: Eugene Dominach, OSC
Recipient: Constantine Sidamon-Eristoff, Regional
Administrator
Date: January 24, 1991

Document #: KOP 3.1001 - 3.1181
Title: Revised Final Remedial Investigation Report
Category: Remedial Investigation
Author: Environmental Resource Management, Inc.
Recipient: The King of Prussia Technical Corporation Site
Committee
Date: July 14, 1989

Document #: KOP 4.1001 - 4.1013
Title: Agreement and Consent Order
Category: Enforcement
Author: Christopher J. Daggett, Regional Administrator
Recipient: LNP Corp., Cabot Corporation, Ruetgers-Nease
Chemical Company, Inc., Johnson Matthey Inc., and
Carpenter Technology Corporation
Date: April 17, 1985

Document #: KOP 5.1001 - 5.1014
Title: Health Assessment
Category: Health Assessments
Author: Division of Science and Research, New Jersey
Department of Environmental Protection
Recipient: Agency for Toxic Substances and Disease Registry
Date: October 3, 1988

Document #: KOP 6.1001 - 6.1016
Title: Community Relations Plan
Category: Public Participation
Author: EPA TAT
Recipient: Eugene Dominach, OSC
Date: April 5, 1989

Document #: KOP 6.2001 - 6.2002
Title: FACTS
Category: Public Participation
Author: United States Environmental Protection Agency
Recipient: N/A
Date: June 1988

Document #: KOP 6.2003 - 6.2008
Title: King of Prussia Technical Corporation Disposal
Site--Superfund Update
Category: Public Participation
Author: N/A
Recipient: N/A
Date: September 1989

Document #: KOP 6.2009 - 6.2026
Title: Proposed Remedial Action--Superfund Update
Category: Public Participation
Author: N/A
Recipient: N/A
Date: July 1990

Document #: KOP 7.1001 - 7.1001
Title: EPA Regional Guidance Documents
Category: Technical Sources and Guidance Documents
Author: EPA
Recipient: N/A
Date: N/A



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TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE REMOVAL AND PREVENTION
EPA CONTRACT 68-01-7367

TAT-02-F-04641

MEMORANDUM

TO: Eugene Dominach and John Witkowski
Response and Prevention Branch, U.S. EPA

FROM: Don Graham, TAT PM *DS*
Isabelle Allgood, TAT QC *IA*

SUBJECT: Preliminary Assessment Report/Sampling Plan
King of Prussia Landfill
Winslow Township, Camden County, New Jersey

DATE: May 18, 1988

In accordance with TDD #8805-02, TAT performed the preliminary assessment of the King of Prussia landfill located on Piney Hollow Road in Winslow Township, Camden County, New Jersey. The assessment was performed on May 11, 1988, and included TAT members Carrie Mehalic, Isabelle Allgood and Don Graham. This report details TAT's preliminary findings and recommends a sampling plan which will determine whether the contamination that remains warrants an immediate removal action by EPA's Response and Prevention Branch in Region II.

BACKGROUND

The King of Prussia landfill is an abandoned chemical waste disposal site located along Piney Hollow Road in Winslow Township, New Jersey (Figure 1). The site is a relatively flat area of approximately 10 acres in size and is located within an undeveloped forest area. Prior site investigations and analyses have shown that there are varying degrees of contamination in both the soil and groundwater.

Roy F. Weston, Inc.

SPILL PREVENTION & EMERGENCY RESPONSE DIVISION

In Association with ICF Technology, Inc., C.C. Johnson & Malhotra, P.C., Resource Applications, Inc.,
Geo/Resource Consultants, Inc., and Environmental Toxicology International, Inc.

SITE ASSESSMENT

At 0930 hours on May 11, 1988, TAT personnel arrived on-site and met with EPA representatives Eugene Dominach and John Witkowski. The weather was partly cloudy, humid and temperatures were around 65-70 degrees fahrenheit.

At 1030 hours, TAT performed an initial site entry using Level B personal protection. Air monitoring using the Organic Vapor Analyzer (OVA), Combustible Gas Indicator (CGI) and Oxygen Detector and the Thyac II Radiation Detector (RAD) revealed no readings above background or indicated any oxygen deficiencies.

At 1115 hours, TAT performed a second site entry to make detailed observations throughout the site and to photodocument specific areas of interest. While conducting this assessment hydrogen cyanide (HCN) and hydrogen sulfide (H₂S) monotox units were used but no readings above background were detected. Draeger tubes specific for phenols and vinyl chloride, both suspected contaminants, were used in the area of stressed vegetation and at Lagoon #3.

The following determinations have been made:

1. Areas of stressed vegetation are located on the south perimeter of the site. These areas lie directly between the lagoon area and the nearest waterway (The Great Egg Harbor River). Sampling of the monitoring wells, conducted during 1981 in the area of the stressed vegetation, revealed gross contamination of the groundwater.
2. There are several areas throughout the site where the soil is discolored. The colors vary from white to purple and are present at the surface to an undetermined depth.
3. Of the original six (6) lagoons located on the site, four (4) have been filled with soil to ground level. The two remaining lagoons contain no liquid or sludge, but discoloration of sediment is evident and the liners are grossly deteriorated.
4. Various containers were found on-site including a single full drum of unknown material located in Lagoon #2, two deteriorated tank trailers located approximately 200 feet from Piney Hollow Road, and three partially exposed rusted drums. The exposed drums are located approximately 150 feet from an access road which enters from the west perimeter of the site.
5. There is unrestricted access to the site from all boundaries. This is evidenced by illegal trash dumping and tire tracks seen throughout the site and in the open lagoons.

Upon TAT and EPA's departure of the site at 1215 hours, TAT visited the Winslow Township Municipal Building as requested by EPA. While at the municipal building TAT first questioned the police about alleged reports of chemical exposure to adolescents whom often ride off road vehicles at the King of Prussia site. The police were not able to confirm or deny any such allegations.

TAT then visited the tax assessor's office to obtain ownership information on the King of Prussia site as well as any of the surrounding properties. TAT spoke to the township's supervisor for the Department of Public Works, Ed McGlinchey, the township's current liason for any proceedings regarding the King of Prussia site. Mr. McGlinchey informed TAT that the responsible parties' contractor, Environmental Resources Management of Exton, Pennsylvania, will be mobilizing at the site within the next few weeks to begin the Remedial Investigation and Feasibility Study (RI/FS).

Prior to TAT's departure, Mr. McGlinchey provided TAT with a copy of the letter sent by the RI/FS contractor detailing the intended scope of work. TAT subsequently submitted the letter to the EPA OSCs (Dominach and Witkowski) for appropriate coordination between the involved EPA branches.

SAMPLING PLAN

A. Objective and Scope

The objective of this sampling program is to obtain analytical data which will be utilized to determine whether the threat of contamination warrants an immediate removal action. This will be accomplished by collecting and testing various samples on-site.

Samples will be collected from several different locations on the King of Prussia landfill property. Samples will serve as verification of the results of the samples collected on-site by other branches of EPA prior to the Response and Prevention Branch's involvement.

B. Data Usage

Data obtained from the sampling program will be used in conjunction with previous analytical results to establish the threat posed by the constituents present at the site.

C. Sampling

Samples will be collected from the following points:

- 1) Stressed vegetation Area #1 and Area #2 (purple soil) - composite
- 2) Drum pile near fire road exiting rear of site
- 3) Sediment at bottom of Lagoon #2 and #3 - composite

- 4) Dark purple soil along site's northern boundary
- 5) Proposed support zone - composite
- 6) Background sample - other side of Piney Hollow Road
(See Figure #2 for approximate sampling locations).

All samples will be collected by personnel in Level C personal protection and in accordance with the existing site safety plan.

The soil samples will be collected from the surface to a depth of three (3) inches. The purpose of designating a 3" depth is to determine the potential exposure to the targeted population of individuals such as hunters and recreation vehicle users. If it is found that sufficient contamination does exist in the first 3" of soil, appropriate action will be taken by the Response and Prevention Branch in the form of a fence, clay cap or both. If, however, the soil is not contaminated to a degree that a threat of exposure exists, the Response and Prevention Branch will take no further action at this site.

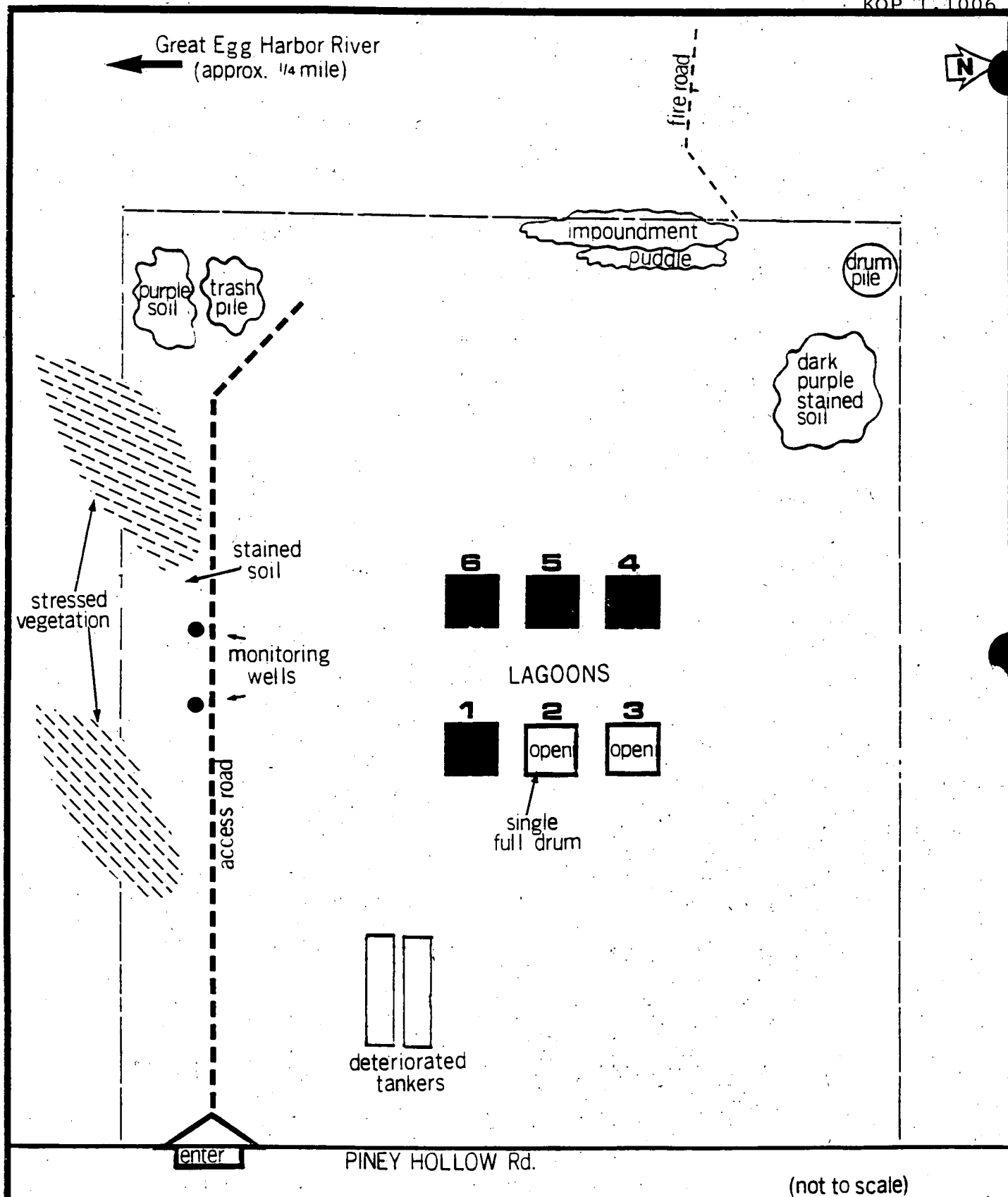


EPA PM

FIGURE 1

TAT PM

LOCATION MAP


WESTON
ENGINEERS & CONSULTANTS

 SPILL PREVENTION &
 EMERGENCY RESPONSE DIVISION

EPA PM

DOMINACH
**K.O.P. LANDFILL
 SITE MAP**

 In Association with ICF Technology Inc., C.C. Johnson & Associates,
 Inc., Resource Applications, Inc., Geo/Resource Consultants, Inc.,
 and Environmental Toxicology International, Inc.

TAT PM

GRAHAM**FIGURE 2**

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: January 29, 1980

SUBJECT: King of Prussia Hazardous Waste Site

FROM: Kevin Burger *Kevin Burger*
Environmental Scientist

TO: Richard D. Spear, Chief
Surveillance & Monitoring Branch

← File

On October 9, 1979 an investigation was conducted at the King of Prussia Hazardous Waste Site, Winslow Township, New Jersey. Participating in this investigation were Ken Gigliello and Kevin Burger of this office.

The King of Prussia site, located on Piney Hollow Road in the southern corner of Winslow Township was operated as a liquid chemical waste facility sometime prior to 1975 by Evor-Phillips Leasing Company. Sometime after it was abandoned in 1975 it is believed that illicit dumping of chemical materials continued. The entire site covers an area of approximately 7 acres. There are six lagoons on site. Four lagoons (Nos. 1, 4, 5, and 6) (see Figure I) still contain various unknown chemicals and sludges. Lagoons 4, 5, and 6 measure approximately 100' L x 80' W x 15' D. Lagoons 1, 2, and 3 measure approximately 70' L x 50' W x 15' D. There are also three defined areas where chemical powders of some sort are buried (2" to 18" thick) and one area where we have confirmed the presence of an unknown quantity of buried drums (see Figure I). A large area of dead trees in the south-southeastern boundary of the property indicates the presence of ground-water contamination, the extent of which remains unknown.

The site is situated directly above the Cohansey Aquifer in a predominantly sandy, highly permeable soil area. Ground water movement is in a southeasterly direction towards the Great Egg Harbor River which is approximately 350 to 400 yards away.

During the October 9 investigation, samples were collected at various locations as listed below and analyzed for extractable and purgeable organics as well as metals. The results are contained in Table I and identified in Figure I.

A) Drinking Water Well
Fish and Game Office
Williamstown, N.J.
Water

Sample No. 56731

B) Monitoring Well KP 1
Water

Sample No. 56732

C) Monitoring Well KP 4 Water	Sample No. 56733
D) Lagoon #4 Sludge Composite (5 locations)	Sample No. 56734
E) Purple-Buried Material Soil Sample	Sample No. 56735
F) Runoff from Property (Drainage Ditch) Water	Sample No. 56736

There were some additional compounds found in Sample Nos. 56733 and 56734 which were not quantitated as follows:

Sample No. 56733	Sample No. 56734
Petroleum Oil	Petroleum Oil
Phosphoric Acid Tributyl Ester	9,10-Anthracenedione
Benzaldehyde	Benzene 1,1-Sulfonyl Bis-2-Methyl
Cyclohexanone	Chloromethyl Phenanthrene
	Methyl Phenanthrene
	Benzene 1,1-Sulfonyl Bis-
	Tetrachlorobenzene
	Benzene 1,1-Ethenylidenbis
	Diphenylmethanone
	C ₆ -Substituted Naptalene
	Bromoxylene

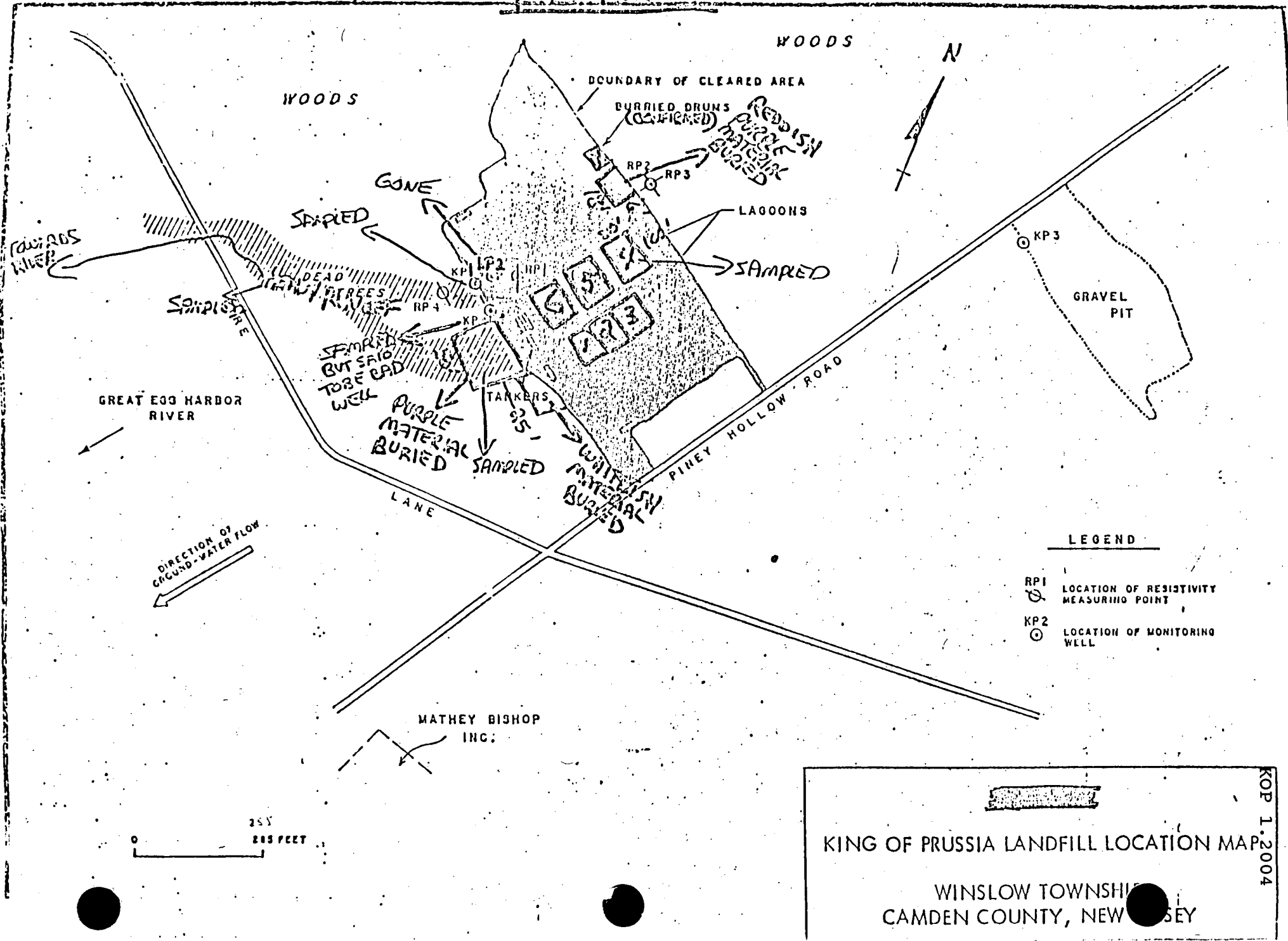
Attachments (2)

KING OF PRUSSIA HAZARDOUS WASTE SITE
SAMPLING RESULTS OCTOBER 9, 1979

		SAMPLE NUMBERS						KING OF PRUSSIA HAZARDOUS WASTE SITE	
		SAMPLING RESULTS						OCTOBER 9, 1979	
PARAMETER		W212 5673	W212 5673	W212 5673	W212 5673	W212 5673	W212 5673		
1,2-DICHLOROETHYLENE				4.0	5.2				
1,1,2,2-TETRACHLOROETHYLENE		234	0.03	4.5	0.35	0.02			
ETHYLENE CHLORIDE			0.09	23.0					
METHYLENE CHLORIDE			1.1	3.1	1.7				
CHLOROBENZENE			12.0						
1,1,1,2-TETRACHLOROETHANE		0.04	0.14	18.0		0.05			
VINYL CHLORIDE		7.3	30.0						
BENZENE				0.38					
1,1,2,2-TETRACHLOROETHANE				0.29					
1,1,2,2-TETRACHLOROETHANE				2.6	0.5				
PHENOL						0.23			
MILK				3500					
SILVER				0.7					
ARSENIC		7.2	1000.0	90.0	2.3	10.0			
PERCHLORATE			2300.0	120.0	0.1	5.0			
SODIUM			400.0		0.17				
COBALT			600.0	7.9		4.0			
CHROMIUM	50	10.0	10.0	5000.0	2500.0	10.0	340.0		
COPPER	1000	20.0	75.0	3900.0	13.00	21.0	950.0		
NICKEL		110.0	30.0	3220.0	2420.0	2.1	190.0		
LEAD				600.0	84.0	1.0			
ANTIMONY	with casing			3500.0					
ZINC	10000	2400	160.0	13100	3100.0	6.7	13,000		
THALLIUM				400.0					
MERCURY				0.41	0.30	0.07	1.44		
1,2,4-TRICHLOROETHYLENE				100.0					
HEXACHLOROETHYLENE				70,000	77,000				
FLUORANTHENE				20.0					
NAPHTHYLENE				20.0					
BIS(2-ETHYLHEXYL) PHTHALATE		0.45	3.5	4.0	1,300	570.0	9.1		
DI-N-BUTYL PHTHALATE		0.26	0.49	1.5	210.0	2400	0.81		
ETHYL PHTHALATE				4.9	82.0				
THY PHTHALATE				0.35					
THY PHTHALATE				10.0					

KOP 1.2003

FIGURE 1



KING OF PRUSSIA SAMPLING PLAN

1. Project Name: King of Prussia Sampling Plan
Winslow Township, Camden County, NJ
2. Project Requested By: Eugene Dominach, On-Scene Coordinator
Response and Prevention Branch
3. Date Requested: March 8, 1989
4. Date of Project Initiation: March 1, 1989
5. Project Officer: Atul Rajani, TAT II
6. Quality Assurance Officer: Anibal Diaz TAT II
7. Project Description:

- a. Objective and Scope:

The purpose of this project is the collection of soil samples for analysis of target compound list (TCL) metals in soils. The soil samples collected for (TCL) metals will be screened using a field X-Ray Fluorescence (XRF) unit manufactured by KEVEX and analyzed using a CLP lab. By utilizing the XRF unit in conjunction with a limited number of CLP fixed lab analyses, a determination can be made as to whether or not the contaminant levels warrant an immediate removal action by the RAB. The advantages of using the XRF unit are real time analysis, multielement analytical capacity, minimal sample quantity preparation and no cost to the project ceiling.

- B. Data Usage:

Data obtained from this sampling program will be used in conjunction with previous analytical results to accomplish the following:

- i. Identify the extent of soil contamination in and around the carboy area in order to establish the possible removal of carboys and contaminated soil.
- ii. Determine the direction of contaminant migration and evaluate the possibility of a correlation between the lagoons, carboys and stressed vegetation.
- iii. Compare the results with the data obtained by the Responsible Party.
- iv. Confirm reliability of results obtained by the KEVEX unit.

C. Sampling:

Samples will be collected from a 30,000 square foot grid encompassing the carboy area, portions of lagoons #1 and #6, and the areas of stressed vegetation (See Figure 1). The main grid will then be divided into 12 equal grids of 50' x 50' each. Three columnar samples will be collected from each grid to a depth of 3 feet. One composite sample, consisting of two jars, will be made from the three column samples taken from each of the grids. One jar will be analyzed by fixed lab analyses, while the second jar will be retained for comparative analyses on the KEVEX unit. Similarly, three more biased soil samples will be collected surrounding the lagoons. In addition, five more samples will be taken for Quality Assurance/Quality Control which will include: a field blank, a duplicate, a matrix spike and two rinsate blanks.

D. Parameter Tables:

<u>Parameter</u>	<u>Number of Samples</u>	<u>Sample Matrix</u>	<u>Analytical Method Reference</u>	<u>Sample Preservation</u>	<u>Holding Time</u>
Heavy Metals	18	Soil	Prep 3050* Analysis 7,000's	None	6 mos.
Heavy Metlas	2	Water	Prep 3010* Analysis 200's	HNO3 to pH<2	6 mos.
Heavy Metals	As needed	Soil	KEVEX Inst.***	None	6 mos.

* SW - 846

** MCAWW

*** See Appendix A

8.0 Project Fiscal Information

Sampling equipment and manpower will be provided by the Technical Assistance Team (TAT). Analysis of samples for heavy metals will be arranged by TAT and performed by CLP. Heavy metals analysis using the KEVEX will be provided by the Field Investigative Team (FIT).

9.0 Project Organizations and Responsibility:

Eugene Dominach	On-Scene Coordinator
Atul Rajani	Project Manager
Anibal Diaz	Laboratory QA/QC Analysis
Don Graham	Overall QA/QC Officer

10.0 Sampling Procedure

The utilization of any of the sampling devices described below will yield samples considered representative for the purpose of this project. The soil samples will be collected on site from 15 locations using two hand augers to a 3 foot depth. The diameter of the hand auger is 3 1/4". Figure 2 shows the components and material of construction of the auger. From each grid, three columnar soil samples will be composited to obtain one representative sample. The sample will then be split into two jars, one for CLP lab and the other for analysis on the KEVEX unit. The hand auger will be rinsed with soap and water after every sampling. To ensure no cross contamination, the final rinsate for each hand auger will be collected and sent to the CLP lab to verify the integrity of the samples. All soil samples will be collected in 8 oz glass containers that have been specially cleaned following CLP protocol. Once it is confirmed that the KEVEX is providing reliable data, those locations showing results above the instrument detection limit (IDL) (refer to Table 1), will be resampled to establish the degree and extent of contamination. An aliquot of each columnar sample location will be taken at one, two, and three feet to represent that part of the sampling grid. During this phase of sampling, a few samples from the site may be analyzed for organic parameters.

TABLE 1 - IDL FOR METALS

<u>Element</u>	<u>IDL, ppb</u>
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	5
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanadium	50
Zinc	20

11.0 Sample Custody Procedures:

EPA Chain-of-Custody will be maintained throughout the sampling program as per TAT Standard Operating Procedures (SOP) on sample handling, sample container contract specifications and EPA Laboratories SOP. The Chain-of-Custody form to be used lists the following information:

- i. Sample number
- ii. Number of sample containers
- iii. Description of samples including specific location of sample collection.
- iv. Identity of person collecting the sample.
- v. Date and time of sample collection.
- vi. Date and time of custody transfer to laboratory (if sample was collected by a person other than laboratory personnel).
- vii. Identity of person accepting custody (if the sample was collected by a person other than the laboratory personnel).
- viii. Identity of laboratory performing the analysis.

12.0 Documentation, Data Reduction and Reporting:

Documentation: Field data will be entered into a bound notebook. Field notebooks, Chain-of-Custody forms, and laboratory analysis reports will be filed and stored per the TAT Document Control System.

13.0 Quality Assurance and Data Reporting:

Contracted Laboratory Quality Assurance:

QA/QC to be furnished by the contracted laboratory in performance of the analysis will consist, at a minimum of the following measures to ensure accurate data.

1. One field blank will be shipped unopened to the laboratory. This blank is to be analyzed in order to ensure that no contamination has occurred.
2. Every 20th sample will be collected in duplicate and analyzed to determine analytical precision and accuracy.

3. A matrix spike sample will be analyzed to evaluate analytical accuracy.
4. A rinsate blank will be analyzed to verify sampling integrity.

14.0 Data Validation:

All steps of data generation and handling will be evaluated by the On-Scene Coordinator, the Project Officer, and the Quality Assurance Officer for compliance with EPA Region II SOP for validating hazardous waste site data.

15.0 System Audit:

The QA/QC Officer or a designated representative will observe the sampling operations and review subsequent analytical data to assure that the QA/QC project plan has been adhered to.

16.0 Corrective Action:

All provisions in the field and laboratory will be taken to ensure that any problems that may develop will be dealt with as quickly as possible to ensure the continuity of the sampling program. Any deviations from this sampling plan will be noted in the final report.

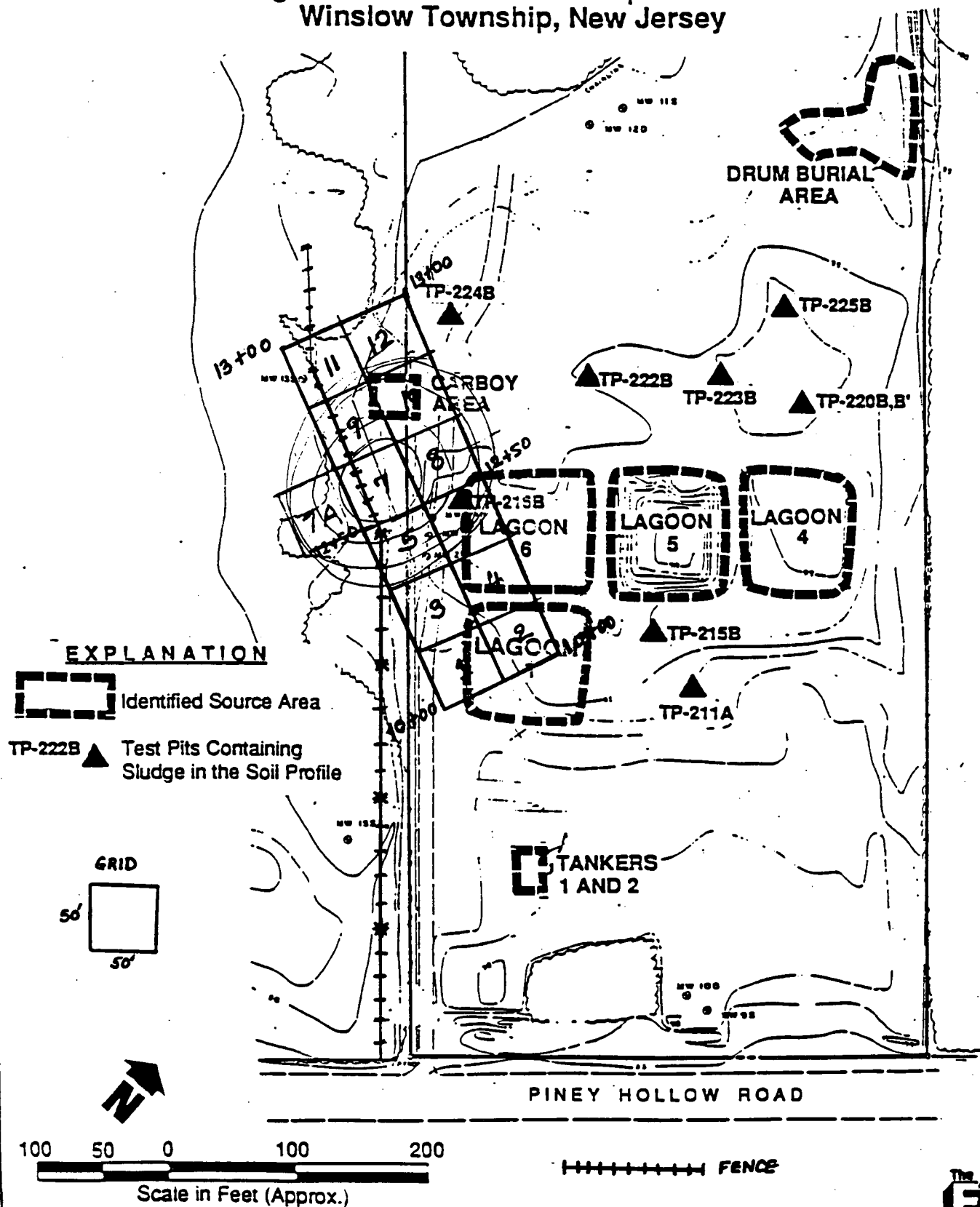
17.0 Reports:

Draft reports will be issued 14 days after receipt of laboratory results. Final reports will be issued 7 days after the return of the draft report by the EPA's Project Manager.

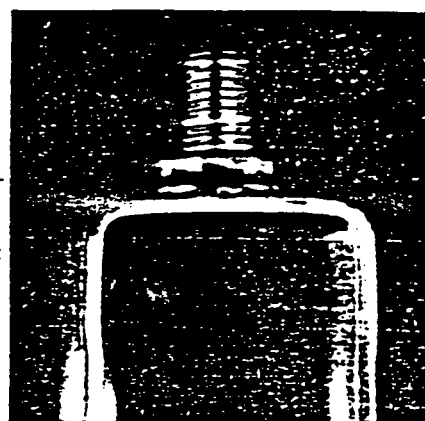
Figure 1

Identified Source Areas

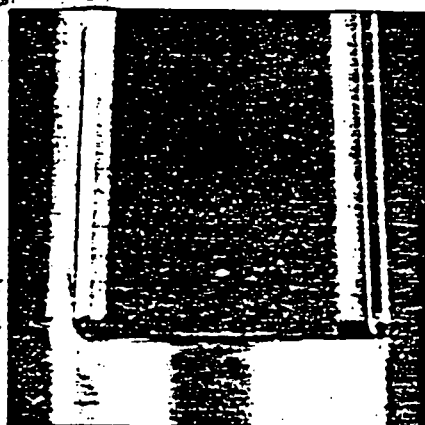
King of Prussia Technical Corporation Site Winslow Township, New Jersey



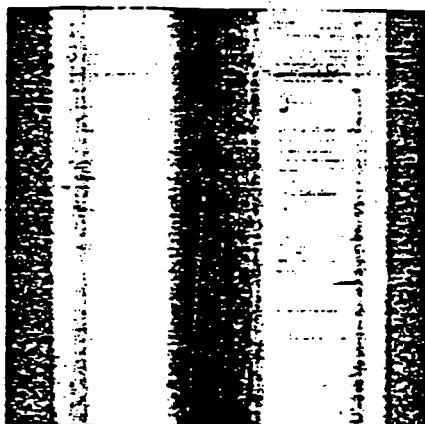
APPENDIX A
INFORMATION ON KEVEX INSTRUMENT



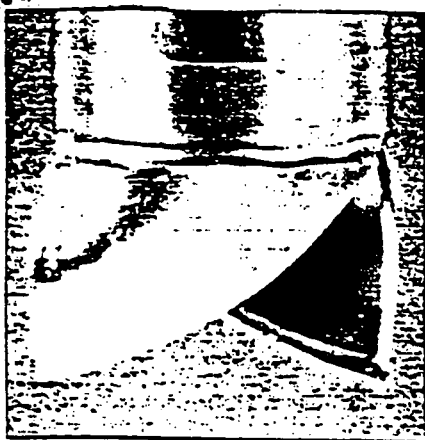
$\frac{1}{2}$ " NC
threaded pin
coupling



Extra strong
bail of
carbon steel,
 $\frac{3}{16}$ " thick
and $1\frac{1}{4}$ " wide



Hard drawn
stainless
steel cylinder,
smooth sur-
face, will not
rust



Forged high-
carbon alloy
steel bits
with stellite hard
surfaced
edges, shar-
pened to a
fine cutting
edge

Cross handles and extensions are
available in two materials and fit all
extendable equipment.



$\frac{3}{4}$ " thinwall
lightweight
conduit

4130 aircraft
quality,
chrome
molybdenum
seamless
tubing

FIGURE 2. HAND AUGER

Applications of X-Ray Fluorescence Spectroscopy for Site Screening

KOP 2.1009

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Ecology and Environment, Inc.
Denver, Colorado

ABSTRACT

Recent field investigations have demonstrated the successful use of x-ray fluorescence spectroscopy (XRF) screening analysis for metal contamination at various hazardous waste sites.

Using minimal sample preparation and field sampling methods, the results were comparable to laboratory results using conventional methods such as atomic absorption (AA) and inductively coupled plasma (ICP). Multi-elemental analysis was performed on soil samples with particular interest in lead, arsenic, chromium, copper, and zinc levels. Detection limits achieved for some elements were 10 ppm. The XRF results were used in mapping and contouring the extent of contamination of a hazardous waste site containing inorganic contamination.

The lower detection limits and quick turn-around times proved the feasibility of using the XRF in screening hazardous waste sites and environmental monitoring.

INTRODUCTION

The Ecology and Environment, Inc. (E&E, Inc.) Field Investigation Team was tasked by the U.S. EPA to initiate a field analytical screening program to assist in site investigations and listing or expanded site investigations. Field screening should enhance the pre-remedial program by assisting the U.S. EPA in completing the site inspection inventory in a timely manner, by decreasing the number of "non-detected" samples, by supporting the revised Hazardous Ranking System, and by accelerating remedial investigation and feasibility studies. The increased sampling capability increases the chances of detecting an observed release without compromising data quality since rapid turn-around allows CLP confirmation. Part of this program was to develop a screening analysis for metal-contaminated solids such as soils and sediments including mine tailings and mining waste materials in U.S. EPA Region VIII. E&E, Inc. determined the best instrument for these types of analysis would be an x-ray fluorescence spectrophotometer. Previous successful operations with the XRF indicated the XRF's usefulness in screening analysis of metal contaminated solids on potential hazardous waste sites.^{1,2,3,4} However, lower detection limits were difficult to achieve:

The rapid turn-around times available on a wide variety of elements and minimal sample preparation made the XRF almost ideal for screening analysis. As previously stated, one major drawback associated with the XRF was the relatively high detection limits. However, with the Tracor 6000 XRF, E&E, Inc. is able to achieve detection limits of approximately 10 ppm consistently and confidently without liquid nitrogen cooling of the XRF detector as needed for other conventional low level XRF analysis. This advantage greatly increases the mobility of the instrument. These detection limits are more than adequate for most metal-contaminated sites.

The purpose of this paper is to summarize E&E, Inc.'s experience with low level XRF analysis and AA/ICP analysis from the CLP on collocated samples. An example of how the XRF screening analysis is used to characterize a hazardous waste site with grid sampling and contour mapping is presented.

INSTRUMENT CALIBRATION

Elemental identification and quantification are obtained using the "Fundamental Parameters" personal computer software in conjunction with the Tracor Spectrace 6000 energy dispersive x-ray fluorescence analyzer.

When metal atoms present in a soil sample (metals are actually present as metal complexes) are irradiated with a beam of x-rays, electrons in the atom's lower lying energy levels are excited to higher energy levels. The vacancies left in the inner electron orbitals make the atom unstable. Relaxation to the stable ground state occurs, resulting in the emission of x-rays characteristic of the excited elements. Thus, by examining the energies of the x-rays emitted by the irradiated soil sample, identification of metals present in the sample is possible. Comparing the intensities of the x-rays emitted from a given unknown sample to those emitted from reference standards with known analyte concentrations allows quantification of the metals present in the sample.

During sample analysis, a spectrum is acquired. Different instrumental parameters and excitation conditions are used to analyze for different metals. Generally, metals are segregated for analysis into groups which emit x-rays within a specified energy range. Currently 14 different elements are being analyzed using three separate excitation conditions. A sample spectrum for the mid atomic number elements potassium, calcium, and chromium is presented in Figure 1. Figure 2 is a sample spectrum for the high atomic number elements: manganese, iron, copper, zinc, arsenic, and lead. And a sample spectrum for the elements silver, cadmium, tin and antimony is presented in Figure 3.

As previously stated, a peak's position along the spectral energy axis (horizontal axis) is indicative of the element from which it arose, and therefore is the primary basis of elemental identification. Each metal will exhibit several peaks in the spectrum, since a separate peak will be observed for each allowed electron orbital energy transition. For example, peak A in Figure 2 is lead's L-alpha line. It arises when electrons initially excited to a lead atom's M shell return to the lead atom's L shell giving off x-rays which have an energy of 10.5 KeV. Peak B is lead's L-beta line. When electrons in the lead atom energetically relax from the N shell to the L shell, x-rays at 12.6 KeV are emitted.

Prior to running a series of samples, the instrument is calibrated

Finally, the program calculates values termed alpha coefficients which quantitatively describe matrix absorption, or enhancement effects on the analyte intensity. The alphas are calculated using the hypothetical standards established by the "Fundamental Parameters" program. The program first generates a list of standards with concentrations values grouped around the average concentrations of the actual standards. For each of the hypothetical standards, the program calculates the relative intensities that would be measured for each element in the standard. Alpha coefficients are then calculated from these hypothetical standards. The standards data are stored on a disk and the instrument does not have to be standardized prior to each run, only reference calibrated with the pure copper standard.

When running an unknown, the program first recalculates pure element count rates by sorting the standards to which one is closest to the unknown based on the intensities of the unknowns and standards.

Analysis of unknowns proceeds by an iterative computation. An estimate of the composition of the unknown is made by comparison of the measured intensities to the pure element count rate values. The estimated concentrations are then used along with the alpha coefficients to make a new estimate of the composition. The process is repeated again with the program using the last calculated composition values along with the alpha coefficients and pure elemental count rates to calculate a new composition. If the difference between the last calculated concentration and the concentration determined from the new iteration is less than 1% relative, the program assumes convergence and the analysis procedure ends.

SAMPLE PREPARATION

Soil and sediment samples are collected with the usual protocol, although not as large a sample is required as with the acid digestion in AA/ICP analysis. The most homogeneous sample possible is recommended.

No great differences have appeared between grab or composite sampling provided the samples are well mixed. Grab samples have shown a slight statistical advantage in comparing with AA/ICP results which probably reflect sample homogeneity.

Analysis of particulates collected on dust filters is now being tested. No sample preparation is involved with air filters, however accuracy of the results depends greatly on sampling procedures and accurate measurement of sample amount.

Sample preparation for XRF screening analysis was designed to be kept simple. Accuracy of XRF results is described in detail by Wheeler.³ The sample preparation is minimal to ensure rapid turnaround and to provide adequate analytical quality. The minimum sample preparation includes air or mild oven drying of the solid sample and mixing in a mortar and pestle to homogenize the sample as much as possible. No sieving is necessary unless the sample contains particles larger than 10 mesh. After mixing, the sample is placed as a loose powder in a sample cup and sealed with mylar. The sample is irradiated through the mylar by the instrument and analyzed. Using this procedure, a sample can be prepared and analyzed in approximately 30 min.

The sensitivity of the XRF is proportional to the fineness of the sample and smoothness of the analytical surface. Procedures not employed by E&E, Inc., but which improve analytical sensitivity, include grinding the sample and pressing a pellet or fluxing the sample. Both methods have been deemed inappropriate for site screening analysis. These procedures, however, are still obviously quicker and less hazardous than the acid digestion AA/ICP methods.

QUALITY ASSURANCE AND QUALITY CONTROL

QA/QC for XRF screening analysis includes duplicate samples, standards checks, and splits with other laboratories. Sample duplicates are run at a 10 to 20% frequency with the sample split before sample preparation. This procedure indicates the precision of an analysis and sampling procedure as well as the homogeneity of the sample matrix. An indication of the precision of the Tracor 6000 XRF alone was made by analyzing a standard as an unknown 10 times and calculating the standard deviation Table 1.

Table 1
Standard Deviation of Ten NBS Standard Sample Runs

ELEMENT	RUN 1 (PPM)	RUN 2 (PPM)	RUN 3 (PPM)	RUN 4 (PPM)	RUN 5 (PPM)	RUN 6 (PPM)
E	18520	18090	17220	18150	18400	18000
CA	52220	51630	50500	51790	50550	50870
CR	370	370	360	360	370	360
NI	700	680	660	800	830	760
FE	25780	26040	25810	25800	25540	25350
CU	550	630	560	550	570	540
ZN	4370	4340	4400	4340	4350	4260
AS	0	0	0	0	0	0
PB	6070	6050	6020	6050	6060	5920
AG	10	10	0	10	0	10
CD	80	80	70	80	70	70
SN	170	170	170	170	170	160
SB	40	40	30	40	40	40

ELEMENT	RUN 7 (PPM)	RUN 8 (PPM)	RUN 9 (PPM)	RUN 10 (PPM)	AVERAGE (PPM)	STANDARD DEVIATION
E	18330	18800	17350	17190	17715	157.3
CA	51320	50770	50100	51250	51100	612.6
CR	360	340	370	360	362	8.7
NI	610	740	740	810	713	67.1
FE	25500	25360	25590	25800	25663	217.2
CU	550	550	550	550	562	25.2
ZN	4270	4290	4310	4310	4324	42.0
AS	0	0	0	0	0	0.0
PB	5940	6010	5960	5940	6002	54.0
AG	10	0	0	0	5	3.0
CD	80	70	70	80	75	5.0
SN	170	170	170	170	169	3.0
SB	40	40	30	40	38	4.0

Standards used to calibrate the Tracor 6000 XRF were obtained from the National Bureau of Standards (NBS) and the Canadian Department of Energy, Mines and Resources (CDEM). These standards are run at a 10 to 20% frequency during a site analysis to determine continuing calibration of the instrument. The NBS- and CDEM-certified standard results were compared to results obtained from analyzing these standards as unknowns on the XRF Table 2.

Table 2
Comparison of XRF Results to NBS and Canadian Standards

SAMPLE	ELEMENT	CONCENTRATION UNKNOWN	TRUE	RELATIVE PERCENT DIFFERENCE (RPD)
NBS 1648 SOIL STANDARD	E	9833	10500	6.56
	CA	51817	NA	NA
	CR	367	403	4.05
	NI	700	868	20.51
	FE	26213	30100	13.00
	CU	570	600	5.26
	ZN	4420	4760	7.41
	AS	ND	115	NA
	PB	6073	6550	7.56
	AG	ND	6	NA
	CD	81	75	10.10
SO-3 CANADIAN SOIL STANDARD	E	9910	11600	25.13
	CA	140010	146300	4.39
	CR	40	26	42.42
	NI	280	520	60.00
	FE	12790	15100	16.57
	CU	20	17	16.22
	ZN	50	52	3.92
	AS	ND	NA	NA
	PB	30	14	72.73
	AG	ND	NA	NA
	CD	ND	NA	NA
CCO-1A CANADIAN SOIL STANDARD	E	ND	NA	NA
	CA	2350	2500	6.19
	CR	60	NA	NA
	NI	430	NA	NA
	FE	27270	304700	11.06
	CU	226670	267800	16.44
	ZN	25220	28600	12.36
	AS	ND	53	NA
	PB	3120	3640	15.38
	AG	120	145	10.87
	CD	240	96	85.71
	SN	110	NA	NA
	SB	10	NA	NA

ND = NOT DETECTED
NA = NOT ANALYZED
RPD = $(X-Y)/(X+Y)/2 \times 100$, where
X = TRUE; and Y = UNKNOWN

The Tracor 6000 results compared favorably to the certified standard results, especially for lead. To date, in samples containing high lead concentrations, arsenic percentages lower than approximately 12% of the lead concentrations could not be detected Table 3. In addition,

potassium and manganese values were observed to be increasingly with increasing calcium and iron concentrations, respectively.

Table 3
Arsenic Detection Limits for Increasing Lead Concentrations

SAMPLE	ELEMENT	CONCENTRATION (PPM) UNKNOWN	TRUE	RELATIVE PERCENT DIFFERENCE (RPD)
PD-1 CANADIAN SOIL STANDARD	K	1780	NA	NA
	CA	4060	NA	NA
	CR	190	NA	NA
	MN	7050	NA	NA
	FE	205710	NA	NA
	CU	106570	NA	NA
	SN	523810	NA	NA
	AS	7030	7700	9.10
	PB	24840	27500	10.16
	AG	130	NA	NA
	CD	2040	NA	NA
	SH	500	NA	NA
	SB	123	NA	NA
CPB-1 CANADIAN SOIL STANDARD	K	ND	NA	NA
	CA	8000	NA	NA
	CR	110	NA	NA
	MN	400	390	2.53
	FE	90370	84300	15.40
	CU	2720	2540	6.84
	SN	49600	44200	1.25
	AS	ND	560	NA
	PB	669910	647400	3.42
	AG	400	626	8.27
	CD	800	143	139.34
	SH	190	190	0.00
	SB	3000	3000	5.41
SO-1 CANADIAN SOIL STANDARD	K	26460	26000	0.52
	CA	17640	18000	2.02
	CR	170	160	6.06
	MN	910	890	2.22
	FE	52100	60000	13.24
	CU	60	61	26.95
	SN	130	146	11.59
	AS	ND	NA	NA
	PB	20	21	4.00
	AG	ND	NA	NA
	CD	ND	NA	NA
	SH	20	NA	NA
	SB	ND	NA	NA

ND = NOT DETECTED
NA = NOT ANALYZED
RPD = $(X-Y)/((X+Y)/2) \times 100$, where
X = TRUE ; and Y = UNKNOWN

COMPARISON OF XRF RESULTS TO CONTRACT LABORATORY PROGRAM DATA

As in any comparison, the more similar the sample and the procedure are for multiple analysis, the closer the comparison will become. In dealing with soils and solid environmental samples the homogeneity of the matrix is questionable and therefore a true duplicate or split is difficult to achieve. Also, the differences in the methodologies of the XRF and CLP AA/ICP analyses lend to the differences observed in the comparison results.

A comparison between XRF and CLP results for a specific site is reported in Table 4.

Flags for the CLP data were not available at the time this manuscript was prepared. In most cases, XRF values were consistently high in comparison to CLP results for this site. Similar comparisons at other sites have yielded different results due to variations in soil matrices and CLP laboratories. In most XRF/CLP comparisons of data, chromium tends to be consistently higher in the XRF results by approximately a factor of two. No apparent reason is known for this phenomenon, but some theories suggest loss of chromium in the acid digestion process through a change in the oxidation number or enhancement properties in the soil matrix when XRF analysis is performed. Nevertheless, XRF results compared favorably with CLP results in many cases and certainly justify the XRF as a site screening tool.

APPLICATIONS OF RESULTS

Interpretation of XRF results have been used most successfully in more fully characterizing the extent and magnitude of contaminants on a site, characterizing contaminants migrating off-site, confirming and supporting health assessment studies, and aiding in remedial action by confirming extent of cleanup. XRF results also have been used for field screening purposes which have aided in preliminary evaluations and on-site decision making. The quick turn-around times and low

Table 4
Comparison of XRF Results to CLP Results 2.1011

SAMPLE	ELEMENT	CONCENTRATION (PPM) UNKNOWN	TRUE	RELATIVE PERCENT DIFFERENCE (RPD)
SC-1A CANADIAN SOIL STANDARD	K	ND	NA	NA
	CA	390	NA	NA
	CR	50	NA	NA
	MN	40	100	22.22
	FE	113380	109000	3.94
	CU	6780	6290	7.50
	SN	337800	346500	2.78
	AS	ND	NA	NA
	PB	22000	22400	1.80
	AG	1610	1720	6.61
	CD	3940	NA	NA
	SH	6020	6100	1.32
	SB	80	NA	NA
UR-1 CANADIAN SOIL STANDARD	K	ND	200	NA
	CA	16260	16700	2.67
	CR	3100	3100	0.00
	MN	900	1200	28.57
	FE	119140	134000	11.74
	CU	3770	4300	13.14
	SN	100	100	0.00
	AS	ND	NA	NA
	PB	20	NA	NA
	AG	ND	NA	NA
	CD	10	NA	NA
	SH	20	NA	NA
	SB	ND	NA	NA

ND = NOT DETECTED
NA = NOT ANALYZED
RPD = $(X-Y)/((X+Y)/2) \times 100$, where
X = TRUE ; and Y = UNKNOWN

detection limits achieved by the XRF unit make this instrument ideal for these and many more applications.

Sampling points and grid layouts have also been used extensively to interpret XRF results. Grid layouts are based on the size of the site, detail of investigation, turn-around time required, and economics such as extent of sampling and man-hours available. Results of a grid examination of a site using XRF analysis are presented in Figures 4 and 5. The figures presented show contamination zones and relative amounts of lead and zinc present on a hazardous waste site.

The intensity of the employed sampling characterized the waste present on-site and in the immediate areas and was used to evaluate on-site pathways. Forty-one soil samples were collected for XRF analysis, while 18 of these samples were submitted for CLP analysis. These figures clearly show the areas of high concentrations of contaminants.

CONCLUSIONS

XRF screening analysis of low level metal contamination is proving to be valuable in the investigations of hazardous waste sites. XRF screening analyses have very effectively: established contamination boundaries using contouring maps; visualized contaminated zones and the extent of contamination on-site; and characterized migration pathways. It has also aided in preliminary evaluations and on-site decision-making.

The cost savings compared to usual inorganic analytical services is estimated to be \$80/sample per sample after instrument payoff. The turn-around times with XRF analysis are conducive to field screening. The small amount of sample necessary and minimal sample preparations diminish health and safety problems and reduce the amount of sample to dispose. The non-destructive analytical technique allows multiple analysis and archiving of samples.

With advancing technology, x-ray fluorescence spectrometers are becoming more mobile and portable while achieving lower detection limits. Thus field screening analyses are possible. Finally, the results obtained from XRF screening analyses show good correlations with other types of inorganic analyses and basic trends and comparisons can be confidently made.

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1. Raab, G. A., "Evaluation of a Prototype Field Portable X-Ray Fluorescence System for Hazardous Waste Screen", EPA Research & Development, Aug.

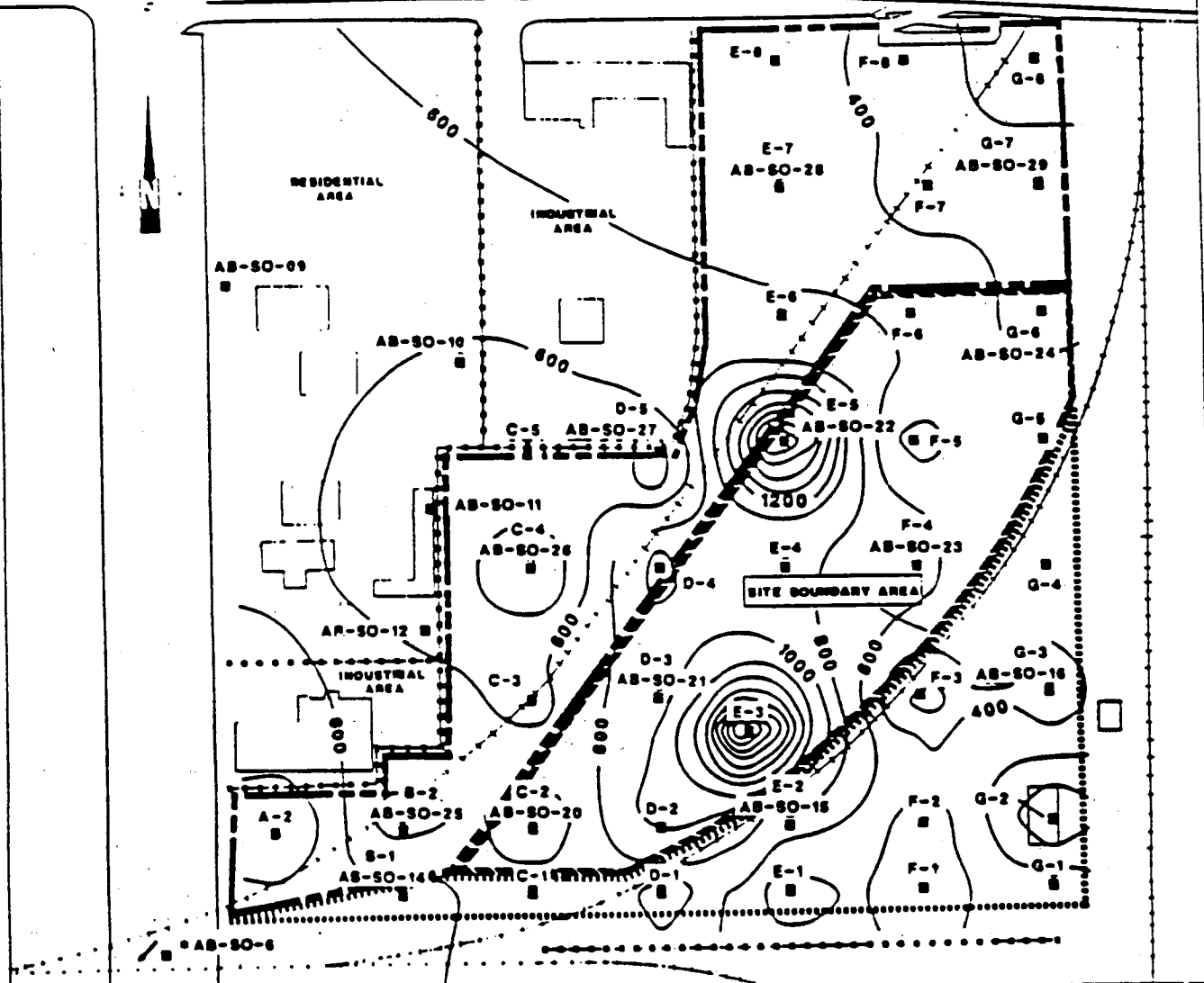
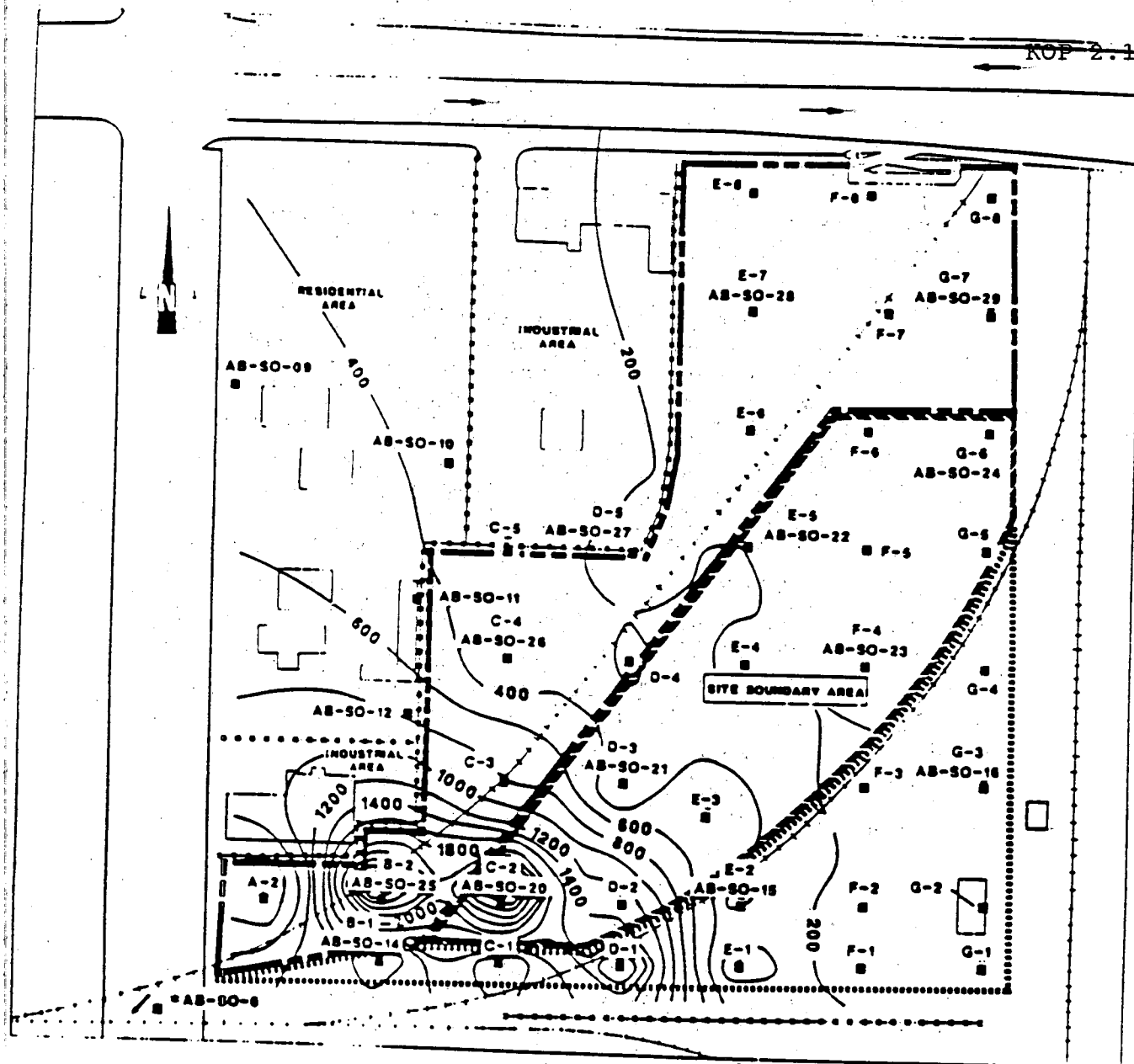


Figure 4
Lead IDS Contour Map

- 1987.
2. Furst, G. and Spittler, T., "Screening for Metals at Hazardous Waste Sites: A Rapid Cost-Effective Technique Using X-Ray Fluorescence", *Proc. Management of Uncontrolled Hazardous Waste Sites 6th National Conference*, HMCRI, Silver Spring, MD, pp. 93-96, Nov. 1985.
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4. Piorek, S. and Rhodes, J. R., "Hazardous Waste Screening Using a Portable X-Ray Analyzer", *R&E Report #528*, March 1987.
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LEGEND

Site boundary area

0 50 100

See map for
Zinc IDS Contour Map

Figure 5
Zinc IDS Contour Map

METHOD FM-2: X-RAY FLUORESCENCE (XRF) IN LABORATORY FOR HEAVY METALS

SUMMARY: Rapid screening of most metals (46) in soil and water in field laboratory to minimum of 20 mg/kg in soil. Conventional methods have better sensitivity and precision. Simultaneous detection (of the 18 elements analyzed for) is one of the greatest advantages of the system.

METHOD DESCRIPTION: Uses a flux of high energy x-rays to bombard sample causing elements in sample to emit characteristic wavelengths. The instrument separates the elements' wavelengths into a spectrum. Concentration of elements present is directly proportional to energies being produced. Technique used to screen soil and water samples. Soil sample preparation includes drying sample and grinding to a fine powder. Aqueous sample preparation includes concentrating the metallic

cations by filtering through strong acid ion exchange paper. Sample pH must be below 2 to ensure that metal ions are in cationic form. When anionic forms such as arsenate, etc. are present, base ion exchange is required. Region VIII method uses portable XRF analyzer which offers less sensitivity and detects fewer metals than this method.

APPLICATION: Rapid screening in laboratory for chromium, barium, cobalt, silver, arsenic, antimony, selenium, thallium, mercury, tin, cadmium, lead, copper, nickel, zinc, manganese, iron, and vanadium.

LIMITATIONS: Does not have sensitivity or precision of atomic absorption or other conventional methods. Lithium, beryllium, aluminum, and boron not detected using this method.

INSTRUMENTATION USED: Kevex 7000 X-Ray Fluorescence Spectrometer.

PERFORMANCE SPECIFICATION

DETECTION LIMIT: Is element specific. For critical elements such as lead, it is 20 mg/kg in soil and 600 ug/l in water. For 18 elements tested, the range was from 20 to 50 mg/kg in soil and 100 to 600 ug/l in water.

SELECTIVITY: Elements may be identified by looking at various emission x-rays (i.e., K-alpha, K-beta, etc.). Spectra are stored on computer disc for later printout and direct identification of each element.

ACCURACY: Four samples analyzed for lead by CLP had values of 80, 180, 130 and 910 mg/kg. The range of values for the same samples analyzed by XRF were 100-300, 100-200, 95-120 and 800-900 mg/kg, respectively.

PRECISION/REPEATABILITY: Duplicate samples show good repeatability.

COMMENTS: XRF is non-destructive; samples can be stored for future reference after analysis.

USE

LOCATION USED: Sudbery, MA; 1985 (Non-CERCLA).

EPA SITE NUMBER (CERCLIS): Non-CERCLA

MATRIX: Soil and Water.

PREPARATION, MAINTENANCE AND CLEANUP: Soil samples (dried, 60 mesh-screened) are placed directly into sample cup; aqueous samples are ion exchanged by passing through a resin-coated filter paper. XRF spectrometer must be set up and programmed. Maintenance of the spectrometer includes checking probe for cleanliness and dryness and checking source decay. Standards are prepared using 1,000 mg/kg AA standard solutions for Ag, Ba, Mn, Ni, Sn, Zn, Se and Pb. Standards can be prepared separately or as multi-element mixtures and can be used up to 5 months.

ANALYSIS TIME: 10-30 minutes for sample preparation. Analysis time is less than 10 minutes.

CAPITAL COSTS: \$80,000.00

CALIBRATION: Standards required at concentrations of 1000, 500, 250, and 125 mg/kg for soil and 2, 1, 0.5 and 0.25 ug/l plus a blank for water samples. Run all standards at beginning of each day and run a set every fourth hour of analysis or after all samples have been analyzed, whichever is more frequent. Additional standards must be prepared and used to cover the entire working range of required analyses.

COMMENTS: Spectrum displayed on video screen and stored in computer disk. Used routinely in Region I. Sample quantity needed for analysis is 1g of soil or 40 ml for water.

PROTOCOL AVAILABLE: Yes.

SOURCE

TECHNICAL CONTACT:

Dr. Thomas Spittler

AFFILIATION:

U.S. EPA Region I Laboratory

TELEPHONE:

(617) 861-6700

PREPARED:

April 7, 1987

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04/26/89

KING OF PRUSSIA SITE

TAT SAMPLE #	FIT SAMPLE #	DEPTH	COPPER	ZINC	NICKEL
A	KOP-1	0-1.5	174.10	19.34	91.69
B	KOP-2	0-1.5	126.96	61.31	54.59
C	KOP-3	0-1.5	67.34	17.20	30.26
D	KOP-4	0-1.5	72.37	27.41	30.13
E	KOP-5	0-1.5	16.54	6.25	10.72
F	KOP-6	0-1.5	536.39	20.58	13.61
G	KOP-7	0-1.5	177.49	20.76	20.77
H	KOP-8	0-1.5	56.61	26.57	28.44
I	KOP-9	0-1.5	24.58	8.89	9.59
J	KOP-10	0-1.5	101.29	22.04	50.85
K	KOP-11	0-1.5	87.40	6.25	56.05
L	KOP-12	0-1.5	57.12	9.96	36.86
M	KOP-13	0-1.5	301.95	104.17	91.39
N	KOP-14	0-1.5	6.52	6.25	11.71
O	KOP-15	0-1.5	6.48	6.25	15.77
P	KOP-16	0-1.5	130.71	22.35	62.04
Q	KOP-17	0-1.5	53.75	9.92	7.11
R	KOP-18	0-1.5	271.48	12.6	19.37
S	KOP-19	0-1.5	~4000.0 .43 %	151.92	641.74
T	KOP-20	0-1.5	522.11	88.32	70.41
U	KOP-21	0-1.5	79.89	16.02	14.40
V	KOP-22	0-1.5	54.58	11.93	16.34
W	KOP-23	0-1.5	117.26	52.18	85.14
X	KOP-24	0-1.5	221.29	31.03	29.91
Y	KOP-25	0-1.5	36.11	26.85	39.51
Z	KOP-51	0-1.5	25.97	15.44	54.27
A1	KOP-53	0-1.5	216.10	29.09	39.92
B1	KOP-55	0-1.5	275.56	66.53	138.75
C1	KOP-57	0-1.5	258.76	34.52	57.10
D1	KOP-59	0-1.5	201.54	15.05	<10.00
E1	KOP-61	0-1.5	219.54	24.62	60.27
F1	KOP-63	0-1.5	429.00	55.69	102.53
G1	KOP-65	0-1.5	211.54	28.41	28.25
H1	KOP-67	0-1.5	223.69	32.89	38.38
I1	KOP-69	0-1.5	66.98	15.90	11.52
J2	KOP-71	0-1.5	19.26	16.32	<10.00
K1	KOP-73	0-1.5	12.52	10.14	<10.00
L1	KOP-75	0-1.5	52.93	47.74	22.07
M1	KOP-77	0-1.5	59.97	14.73	11.78
N1	KOP-79	0-1.5	14.46	13.15	<10.00
O1	KOP-81	0-1.5	48.68	22.12	46.92
P1	KOP-83	0-1.5	40.66	12.22	41.31
Q1	KOP-85	0-1.5	248.70	37.73	103.24
R1	KOP-87	0-1.5	193.60	26.84	57.70
S1	KOP-89	0-1.5	500.99	26.45	58.35
T1	KOP-91	0-1.5	52.53	15.39	61.18
U1	KOP-93	0-1.5	223.88	23.91	67.07
V1	KOP-95	0-1.5	332.03	35.18	61.25
W1	KOP-97	0-1.5	34.50	16.67	21.49

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KING OF PRUSSIA SITE

TAT SAMPLE #	FIT SAMPLE #	DEPTH	COPPER	ZINC	NICKEL
A	KOP-26	1.5-3	11.90	<10.00	<10.00
B	KOP-27	1.5-3	53.19	17.20	19.78
C	KOP-28	1.5-3	17.42	15.97	<10.00
D	KOP-29	1.5-3	<10.00	<10.00	<10.00
E	KOP-30	1.5-3	<10.00	<10.00	<10.00
F	KOP-31	1.5-3	168.87	13.12	<10.00
G	KOP-32	1.5-3	97.43	15.33	14.98
H	KOP-33	1.5-3	11.91	36.91	10.63
I	KOP-34	1.5-3	17.86	<10.00	13.83
J	KOP-35	1.5-3	12.77	<10.00	<10.00
K	KOP-36	1.5-3	<10.00	<10.00	10.36
L	KOP-37	1.5-3	<10.00	<10.00	11.64
M	KOP-38	1.5-3	305.71	49.93	85.42
N	KOP-39	1.5-3	196.62	18.86	27.42
O	KOP-40	1.5-3	~3500.0 .35 %	774.04	509.35
P	KOP-41	1.5-3	~2000.0 .20 %	117.08	492.34
Q	KOP-42	1.5-3	64.74	12.32	22.77
R	KOP-43	1.5-3	101.97	14.19	14.97
S	KOP-44	1.5-3	104.30	21.75	18.75
T	KOP-45	1.5-3	~3900.0 .39 %	269.30	613.78
U	KOP-46	1.5-3	57.42	12.44	17.16
V	KOP-47	1.5-3	36.65	10.95	15.22
W	KOP-48	1.5-3	29.78	20.80	12.91
X	KOP-49	1.5-3	26.84	<10.00	13.13
Y	KOP-50	1.5-3	16.62	11.98	33.85
Z	KOP-52	1.5-3	16.17	12.76	13.51
A1	KOP-54	1.5-3	45.35	14.92	<10.00
B1	KOP-56	1.5-3	93.33	19.38	30.34
C1	KOP-58	1.5-3	60.77	20.19	26.59
D1	KOP-60	1.5-3	47.37	<10.00	<10.00
E1	KOP-62	1.5-3	67.63	12.14	30.07
F1	KOP-64	1.5-3	157.24	36.83	27.28
G1	KOP-66	1.5-3	248.56	19.13	21.88
H1	KOP-68	1.5-3	37.56	12.33	<10.00
I1	KOP-70	1.5-3	14.48	<10.00	<10.00
J1	KOP-72	1.5-3	<10.00	<10.00	<10.00
K1	KOP-74	1.5-3	18.07	<10.00	63.84
L1	KOP-76	1.5-3	37.05	13.67	11.11
M1	KOP-78	1.5-3	76.61	<10.00	<10.00
N1	KOP-80	1.5-3	11.80	<10.00	<10.00
O1	KOP-82	1.5-3	31.07	<10.00	46.37
P1	KOP-84	1.5-3	35.05	14.45	42.83
Q1	KOP-86	1.5-3	55.17	10.52	64.03
R1	KOP-88	1.5-3	252.60	22.42	152.61
S1	KOP-90	1.5-3	441.51	13.80	41.73
T1	KOP-92	1.5-3	795.01	72.55	148.29
U1	KOP-94	1.5-3	130.99	16.69	29.53
V1	KOP-96	1.5-3	34.69	<10.00	24.72

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KING OF PRUSSIA SITE

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KING-OF-PRUSSIA
FIT ANALYTICAL RESULTS VS CLP ANALYTICAL RESULTS

SAMPLE #	COPPER			ZINC			NICKEL		
	FIT	CLP	% CHANGE	FIT	CLP	% CHANGE	FIT	CLP	% CHANGE
KOP-01	174.1	178.0	2.2	19.3	41.5	114.6	91.7	78.2	-14.7
KOP-02	127.0	89.8	-29.3	61.3	19.4	-68.4	54.6	30.3	-44.5
KOP-05	16.5	90.8	450.3	<10.0	7.9		10.7	6.9	-35.5
KOP-06	536.4	452.0	-15.7	20.6	22.3	8.3	13.6	14.0	2.9
KOP-10	101.3	79.7	-21.3	22.0	17.6	-20.0	50.6	31.9	-37.0
KOP-15	<10.0	13.2		<10.0	6.2				
KOP-19	4300.0	4200.0	-2.3	152.0	146.0	-3.9	641.7	708.0	10.3
KOP-20	522.1	909.0	74.1	88.3	109.0	23.4	70.4	127.0	80.4
KOP-25	36.1	72.1	99.7	26.9	25.6	-4.8	39.5	48.9	23.8
KOP-30	<10.0	19.9		<10.0	5.5		<10.0	5.8	
KOP-31	168.9	176.0	4.2	13.1	12.1	-7.6	<10.0	8.5	
KOP-35	12.8	27.0	110.9	<10.0	6.6		<10.0	8.1	
KOP-38	305.7	217.0	-29.0	49.9	30.0	-39.9	85.4	62.5	-26.8
KOP-40	3500.0	31200.0	791.4	774.0	12500.0	1515.0	509.4	9630.0	1790.5
KOP-41	2000.0	2030.0	1.5	117.1	161.0	37.6	492.3	669.0	36.0
KOP-45	3900.0	149.0	-96.2	269.3	25.7	-90.5	613.8	25.6	-95.8
KOP-50	16.6	199.0	1098.8	12.0	83.3	594.2	34.0	77.3	127.4
KOP-53	216.1	185.0	-14.4	29.1	25.0	-14.1	40.0	36.6	-8.5
KOP-54	45.4	45.4	0.0	14.9	7.9	-99.4	<10.0	7.8	
KOP-55	276.6	394.0	42.2	66.5	55.7	-16.2	138.8	132.0	-4.9
KOP-56	93.3	111.0	19.0	19.4	9.0	-53.6	30.3	25.5	-15.8
KOP-60	47.4	52.1	9.9	<10.0	15.4		<10.0	5.6	
KOP-63	429.0	384.0	-10.5	55.7	61.9	11.1	102.5	104.0	1.5
KOP-65	211.5	221.0	4.5	28.4	31.8	12.0	28.3	37.9	33.9
KOP-75	52.9	30.5	-42.3	47.7	7.9	-83.3	22.1	5.7	-74.2
KOP-80	11.8	19.2	62.7	<10.0	10.6		<10.0	5.7	
KOP-85	250.4	445.0	77.7	40.4	54.6	35.1	72.5	103.0	42.1
KOP-90	385.2	410.0	6.4	11.4	11.4	0.9	<10.0	6.4	
KOP-95	410.6	202.0	-50.8	32.2	35.7	10.9	43.0	39.6	-7.9
KOP-100	80.8	73.0	-9.3	11.7	8.5	-27.4	19.5	9.5	-51.3
KOP-105	78.5	107.0	36.3	19.1	42.2	120.9	23.1	26.2	13.4
KOP-110	<10.0	14.1		<10.0	8.9		<10.0	9.4	
KOP-115	601.3	806.0	34.0	59.0	73.6	24.7	75.0	107.0	42.7
KOP-120	347.6	272.0	-21.7	15.3	7.5	-51.0	<10.0	9.7	
KOP-124	86.0	53.9	-37.3	<10.0	10.4		<10.0	8.1	
KOP-125	356.6	566.0	58.7	84.9	132.0	55.5	129.6	193.0	48.9
KOP-129	97.5	129.0	35.4	19.1	41.2	115.7	<10.0	14.3	

SAMPLING QA/QC PLAN

King of Prussia Removal

Prepared by
Roy F. Weston, Inc.

EPA Project No.: 2-8909-01
Contractor Work Order No.: 2504
EPA Contract No.: 2962-21-02-2504

APPROVALS

Roy F. Weston, Inc.

Julian Hill
Julian Hill
Task Leader

10/10/89
Date:

Anibal Diaz
Anibal Diaz
Project Manager

10/5/89
Date

EPA

Eugene Dominach Date:
On-Scene Coordinator

1.0 BACKGROUND

The suspected contamination is a result of:
an abandoned liquid waste treatment facility.

The following information is known about the site:
The site is located in the city of Winslow Township in the County of Camden, in the State of New Jersey. See attached map, Figure 1.1. The nearest residents are located within a quarter mile of the site, in an easterly direction. The site was a liquid waste treatment facility on 10 acres of property which had been operating for a number of years and is now abandoned since 1975.

The types of material(s) handled by this facility were/are:

☐ radioactives
☒ acids
☒ unknown
☒ organic solvents
☒ bases
☒ petroleum
☒ inorganics
☐ (specify other)

The volume(s) of contaminated materials to be addressed are: 350 cubic yards of soil and 150 gallons of Hydrochloric Acid.

The contaminants of concern are:

Chemical	Range
Metals	100ppm to 20,000 ppm
HCL	1% to 25%

The basis of this information/data may be found in:
the site associated polreps and the action memo.

2.0 OBJECTIVES

The objective of this sampling event is to determine:

- ☐ the presence of contamination
- ☒ the extent of contamination
- ☒ the magnitude of contamination
- ☐ the impact of contamination
- ☐ the effectiveness of new sampling methods or instrumentation
- ☐ (specify other)

For the purpose of:

- ☐ site characterization
- ☒ monitoring data
- ☐ engineering design
- ☐ risk assessment
- ☒ enforcement action
- ☒ disposal
- ☐ field personnel health & safety
- ☐ bioassessment
- ☐ compatibility
- ☒ (specify other)
- ☐ residual contamination assessment

The data will be evaluated against:

- ☐ an existing data base (specify)
- ☒ federal/state action levels (NJDEP/RCRA)
- ☐ permit levels (specify)
- ☐ (specify other)

3.0 QUALITY ASSURANCE OBJECTIVES

As identified in Sections 1.0 and 2.0, the objective of this sampling event applies to the following parameters:

Parameters	Matrix	INTENDED USE OF DATA	QA
VOA	liq/soil	disposal	2
BNA	liquid	disposal	2
PEST	liquid	disposal	2
PCB	liquid	disposal	2
METALS	liquid	disposal	2
CN	liquid	disposal	2
HCL	liquid	disposal	1
CORROSIVITY	liq/soil	disposal	1
IGNITABILITY	liq/soil	disposal	1
REACTIVITY	liq/soil	disposal	1
EP TOXICITY	soil	disposal	1

Verification of preliminary screening results will be achieved by:

- Definitive quantitation - On at least 10% of the samples collected, analyte quantitation will be verified by alternate method or repeat of preliminary procedure; and a determination of precision, accuracy, and confidence limits will be made on at least 1% of the samples collected using the verification method.

Methods to be employed during this event include:

- X spot tests
- X indicator tubes
- X paper strip tests
- X chemical reactions producing colors, gases, or precipitates
- X electronic meters (e.g. pH, conduct)
- X electronic detectors
 - ___ photoionization
 - ___ electron capture
 - ___ flame ionization
 - ___ flame photometric
 - ___ electron capture
 - ___ infrared
 - ___ gas chromatography
 - ___ mass spectroscopy (single ion monitoring)
 - ___ GC/MS
 - X atomic adsorption
 - X ICP
 - X X-ray fluorescence
- X other
 - Ion Chromatography

Methods for confirmed identification on organics include:

- GC/photoionization
- GC/electron capture
- GC/flame ionization
- GC/flame photometric
- infrared
- gas chromatography
- mass spectroscopy
- GC/MS
- [other]

Methods for definitive quantitation and determination of confidence limits will include matrix spike duplicates.

Results will be representative, comparable, and complete. This QA Objective, defined by this criteria as QA-2, is further defined by requirements in Section 6.0.

4.0 APPROACH AND SAMPLING METHODOLOGIES

4.1 Media/Matrix

This event involves the assessment of the following media/matrix:

- ☒ soil/sediment
- ☐ groundwater
- ☐ surface water
- ☐ air
- ☒ waste material
- ☐ soil gas
- ☐ specify other

4.2 Sampling Equipment

The following equipment will be utilized to obtain samples from the respective media/matrix:

Matrix/Media	Sampling Equipment	Fabrication	Dedicated
liquid waste	scoop	plastic	no
soil	auger/trowel	stainless steel	no

4.2.1 Sampling Equipment Decontamination

The following decontamination procedure will be employed prior and subsequent to sampling each soil location in the following sequence:

- ☐ 1 physical removal
- ☐ non-phosphate detergent wash [specify:
- ☐ 2 potable water rinse
- ☐ distilled/deionized water rinse
- ☐ 3 10% nitric acid rinse
- ☐ solvent rinse [specify:
- ☐ solvent rinse [specify:
- ☐ 5 air dry
- ☐ 4 distilled water rinse
- ☐ organic free water rinse

4.3 Sampling Design

The sampling design is depicted on the attached Sample Location Map (Figure 4-1) and is based on the following rationale:

A composite of all the Hydrochloric Acid waste will be obtained by mixing equal volumes from each drum in 16 ounce bottles. These samples will be collected using a plastic scoop.

The soil samples will be obtained from three distinct sources; an acid tainted-neutralized soil pile, a metals contaminated soil pile and the excavation area. An auger will be used to collect a composite from the piles. Aliquots from a grid on the piles will be mixed in a stainless steel bowl using trowels and submitted for analysis. The trowels will be used for obtaining samples from the excavation area and for any other subsurface samples.

All of the samples will be mixed thoroughly and then split to allow for all the necessary analyses. One of the liquid waste samples will be Hazcatted, a second sent to a lab for disposal analysis and another stored as a retain sample. Similarly, every soil sample from the excavation area will be screened using an XRF and six to ten of them will be submitted to CLP for metals analysis (confirmation of XRF, determination of levels of contamination and evaluation of residual contamination). The soil from the waste piles will be split for XRF, CLP, disposal analysis and a fourth aliquot retained for future evaluation.

The sampling equipment will be decontaminated following the procedure specified above and the final distilled water rinse collected and sent to the lab involved in metals analysis for determination of sample integrity.

4.4 Standard Operating Procedures

4.4.1 Sample Documentation

All sample documents must be completed legibly, in ink. Any corrections or revisions must be made by lining through the incorrect entry and by initialing the error.

1. Field Log Book

The Field Log Book is essentially a descriptive notebook detailing site activities and observations so that an accurate account of field procedures can be reconstructed in the writer's absence. All entries should be dated and signed by the individuals making the entries, and should include (at a minimum) the following:

1. Site name and project number.
2. Name(s) of personnel on-site.
3. Dates and times of all entries (military time preferred).
4. Descriptions of all site activities, including site entry and exit times.
5. Noteworthy events and discussions.
6. Weather conditions.
7. Site observations.
8. Identification and description of samples and locations.
9. Subcontractor information and names of on-site personnel.
10. Date and time of sample collections, along with chain-of-custody information.
11. Record of photographs.
12. Site sketches.

2. Sample Labels

Sample labels must clearly identify the particular sample, and should include the following:

1. Site number.
2. Time sample was taken.
3. Sample preservation.
4. Initial of sampler(s).

Optional, but pertinent, information:

1. Analysis requested.
2. Sample location.

Sample labels must be securely affixed to the sample container. Tie-on labels can be used if properly secured.

3. Chain of Custody Record

A Chain of Custody record must be maintained from the time the sample is taken to its final deposition. Every transfer of custody must be noted and signed for, and a copy of this record kept by each individual who has signed. When samples (or groups of samples) are not under direct control of the individual responsible for them, they must be stored in a locked container sealed with a Chain of Custody seal.

The Chain of Custody record should include (at minimum) the following:

1. Sample identification number.
2. Sample information.
3. Sample location.
4. Sample date.
5. Name(s) and signature(s) of sampler(s).
6. Signature(s) of any individual(s) with control over samples.

4. Chain of Custody Seals

Chain of Custody Seals demonstrate that a sample container has not been tampered with, or opened.

The individual in possession of the sample(s) must sign and date the seal, affixing it in such a manner that the container cannot be opened without breaking the seal. The name of this individual, along with a description of the sample packaging, must be noted in the Field Logbook.

5. Corrective Action

Corrective actions are those taken in response to nonconformance reports, audit findings, or surveillance findings. The quality assurance representative is responsible for reviewing audit reports and nonconformance reports to determine the significant or repetitious conditions adverse to quality, or failure to implement or adhere to required quality assurance practices. When such problems are identified, the responsible manager must investigate the causes of the problems and define and implement the necessary actions to correct the problems. Documentation that supports major corrective actions must be maintained in the project files.

4.4.2 Sampling

Drum Sampling

Prior to sampling, drums must be inventoried, staged, and opened. Inventory entails recording visual qualities of each drum and any characteristics pertinent to the contents' classification. Staging involves the organization, and sometimes consolidation of drums which have similar wastes or characteristics. Opening of closed drums can be performed manually or remotely. Remote drum opening is recommended for worker safety.

The method used for sampling the drums involves the use of a plastic scoop. This method is quick, simple and inexpensive. The scoop is inserted into the drum to obtain a grab sample from the subsurface of the liquid. The waste is allowed to equilibrate in the scoop, which is then emptied into three sample containers. The process is repeated for the other two drums.

Soil Sampling

The collection of samples from near-surface soil will be accomplished with trowels. Surface debris will be removed to the required depth with this equipment in order to collect a representative sample. This method can be used in most soil types but is limited to sampling near surface areas. The use of a flat, pointed mason trowel to cut a block of the desired soil can be helpful when undisturbed profiles are required.

Sampling at depth will be accomplished with an auger. This system consists of an auger, a series of extensions, and a "T" handle. The auger is used to bore a hole to desired sampling depth. The core is then withdrawn and the sample collected.

Subsurface soil sample collection will follow excavation activities. Samples are collected from the pit using a trowel scoop.

The stainless steel sampling devices should be cleaned, before sampling and between samples, following the decontamination procedure described elsewhere in Section 4.0.

Waste Pile Sampling

Stainless steel shovels, spoons, or scoops will be used to clear away surface material before samples are collected. For samples at depth, a decontaminated auger will be required.

All samples collected, except those for volatile organic analysis, will be placed into a plastic or stainless steel pail and mixed thoroughly before transfer to appropriate sample container.

4.4.3 Sample Handling and Shipment

Each of the sample bottles will be sealed and labeled according to the following protocol. Caps will be secured with custody seals. Bottle labels will contain all required information including sample number, time and date of collection, analysis requested, and preservative used. Sealed bottles will be placed in large metal or plastic coolers, and padded with an absorbent material such as vermiculite.

All sample documents will be affixed to the underside of each cooler lid. The lid will be sealed and affixed on at least two sides with EPA custody seals so that any sign of tampering is easily visible.

4.5 Schedule of Activities

Table 1: Proposed Schedule of Work

Activity	(Time Period)							
	9/11	9/18	9/22	10/5	10/31	11/17	12/1	12/30
1. Laboratory Procurement	→							
2. Sample Staging		→						
3. XRF Screening		→						
4. Sampling		→						
5. Disposal Analysis			→					
6. CLP Analysis			→	→				
7. Data Review					→			
8. Draft Report						→		
9. Final Report							→	

5.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The EPA On-Scene Coordinator, Eugene G. Dominach, will provide overall direction to Roy F. Weston, Inc. staff concerning project sampling needs, objectives, and schedule.

The Roy F. Weston, Inc. Task Leader, Julian Hill, is the primary point of contact with the EPA On-Scene Coordinator. The Task Leader is responsible for the implementation of the Sampling QA/QC Plan, project team organization, and supervision of all project tasks, including reporting and deliverables.

The Roy F. Weston, Inc. Site QC Coordinator, Anibal Diaz, is responsible for ensuring field adherence to the Sampling QA/QC Plan and recording any deviations. The Site QC Coordinator is also the primary project team contact with the lab. The following field sampling personnel will work on this project.

Personnel	Responsibility
Anibal Diaz	Supervise and coordinate the analytical services and disposal, prepare OSC report, hazcat samples, provide QC for XRF and assist with preparation of POLREPS.
Julian Hill	Assist OSC with removal action; Keep entry/exit log, monitor ERCS contractor, check 1900-55's, collect necessary samples, provide SIMS reports and maintain file.
Haztech	Obtain disposal samples and analysis for disposal.

The Roy F. Weston, Inc. Task Leader, Julian Hill, Health and Safety Officer, Bill Kowalski, and Project Manager, Anibal Diaz, are responsible for auditing and guiding the project, reviewing the final deliverables and proposing corrective action, if necessary, for nonconformity to the Sampling QA/QC Plan or Health and Safety Plan.

The following laboratories will be providing the following analyses:

Lab Name/Location	Lab Type	Parameters
Rocky Mountain Laboratory Arvada, Colorado	CLP	metals
AnalytiKem Cherry Hill, New Jersey	commercial	disposal
Shaefer & Associates Bozeman, Montana	commercial	XRF/metals

Haztech will handle all matters pertaining to the disposal sampling and analysis (Appendix A).

6.0 QUALITY ASSURANCE REQUIREMENTS

The following requirements apply to the respective QA Objectives and parameters identified in section 3.0:

The following QA/QC protocols will be addressed:

- sample documentation
- chain of custody documentation (optional for field analysis)
- sample holding time documentation
- collection and evaluation of blanks and sample replicates (Refer to Tables 2 and 3)
- instrument calibration documentation
- PE samples, if appropriate
- detection limit will be determined, unless inappropriate
- definitive identification: confirmed identification of analytes by a second GC column or mass spectra for 10% of the samples collected (organics only) and provide gas chromatograms and/or mass spectra.
- definitive quantitation: verify preliminary quantitative results by reanalyzing 10% of the samples collected and make a determination of precision, accuracy, and confidence limits by preparing and analyzing matrix spike duplicates on 1% of the samples collected. If the preliminary method is a field screening procedure, an alternate, EPA approved method will be used to verify the quantitative results.

Numbers of samples to be collected for this project are entered onto Table 2 (Field Sampling Summary) and Table 3 (QA/QC Analysis and Objectives Summary) to facilitate ready identification of analytical parameters desired, type, volume and number of containers needed, preservation requirements, number of samples required and associated number, and type of QA/QC control samples required based on this QA level.

All project deliverables will receive an internal peer QC review prior to release, as per guidelines established in the (EPA Regional or Branch or Contractor) Quality Assurance Program Plan.

Table 2: Field Sampling Summary

Parameter	Container	Preservative	Holding Time	Site Samples*	Rinsate Blank
PCB	8 oz glass	none	7days	3	0
Metals	8 oz glass	none+	6 months#	13	3
pH	8 oz glass	none	none	3	0
Reactivity	incl w/pH	none	14 day	3	0
TPHC	incl w/pH	none	7 days	3	0
EP Tox metals	incl w/pH	none	7 days	3	0
Acid Conc.	incl w/pH	none	n/a	1	0

* All sample shipment of 3 samples includes 2 soil and 1 liquid

Mercury has a holding time of 28 days

+ metals include 3 rinsate blanks preserved with HNO₃ to pH<2

Table 3: QA/QC Analysis and Objectives

Parameter	Matrix	Preparation Method	Analytical Method	Spikes	Detection Level	QA
PCB	S/L	3500	8080	0	<0.5ppm	1
Metals	S/L	3040	7000	2	CLP*	2
pH	S/L	N/A	9045	0	0.2	1
Reactivity	S/L	N/A	SW-846	0	N/A	1
TPHC	S/L	N/A	418.1M	0	<1ppm	1
EP Tox metals	S/L	N/A	1310	0	EP Tox*	1
Acid Conc.	L	N/A	305.1+	0	1%	1

* See Appendix B for specific levels

7.0 DELIVERABLES

The Roy F. Weston, Inc. Task Leader, Julian Hill, will maintain contact with the EPA On-Scene Coordinator, Eugene G. Dominach, to keep him informed about the technical and financial progress of this project. This communication will commence with the issuance of the work assignment and project scoping meeting. Activities under this project will be reported in status or trip reports and other deliverables (e.g., analytical reports, final reports) described herein. Activities will also be summarized in appropriate format for inclusion in monthly and annual reports.

The following deliverables will be provided under this project:

- Site Log-book
- Polreps
- Hazcat data
- XRF data
- CLP Metals Analysis
- OSC Report

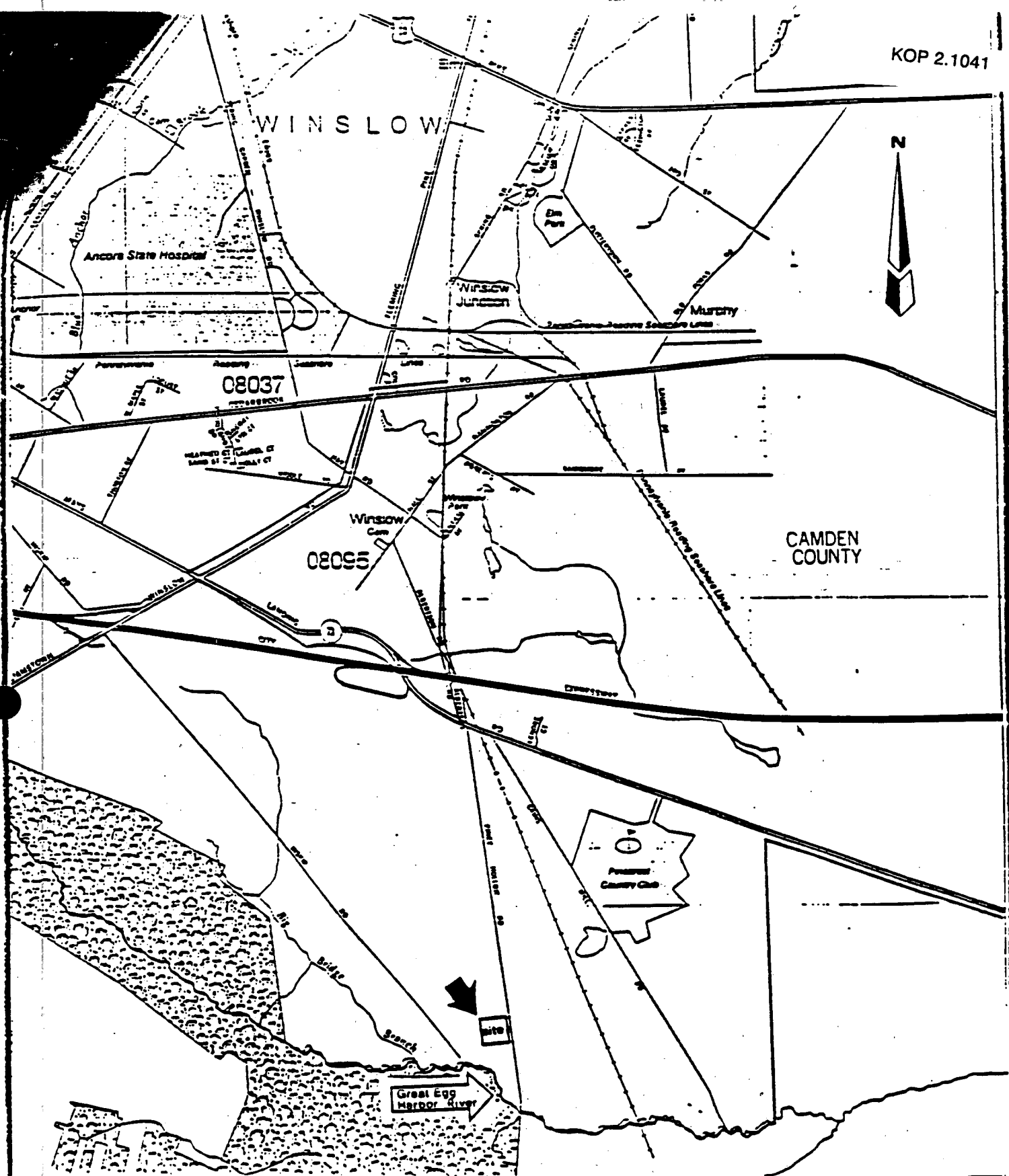
8.0 DATA VALIDATION

Data generated under this QA/QC Sampling Plan will be evaluated accordingly with appropriate criteria contained in the Removal Program Data Validation Procedures which accompany OSWER Directive #9360.4-1.

Specific data review activities for QA-2 should be performed by the following approach:

1. Of the samples collected in the field, 10% will be confirmed for identification, precision, accuracy, and error determination.
2. The results of 10% of the samples in the analytical data packages should be evaluated for holding times, blank contamination, spike (surrogate/matrix) recovery, and detection capability.
3. The holding times, blank contamination, and detection capability will be reviewed for the remaining samples.

King of Prussia Removal
Figure 1-1 Site Location Map


WESTERN

 SPILL PREVENTION &
EMERGENCY RESPONSE DIVISION

EPA PM

DOMINACH
FIGURE 1

 In Association with ICF Technology Inc., C.C. Johnson & Associates,
Inc., Resource Applications, Inc., Geo/Resource Consultants, Inc.,
and Environmental Toxicology International, Inc.

TAT PM

GRAHAM
LOCATION MAP



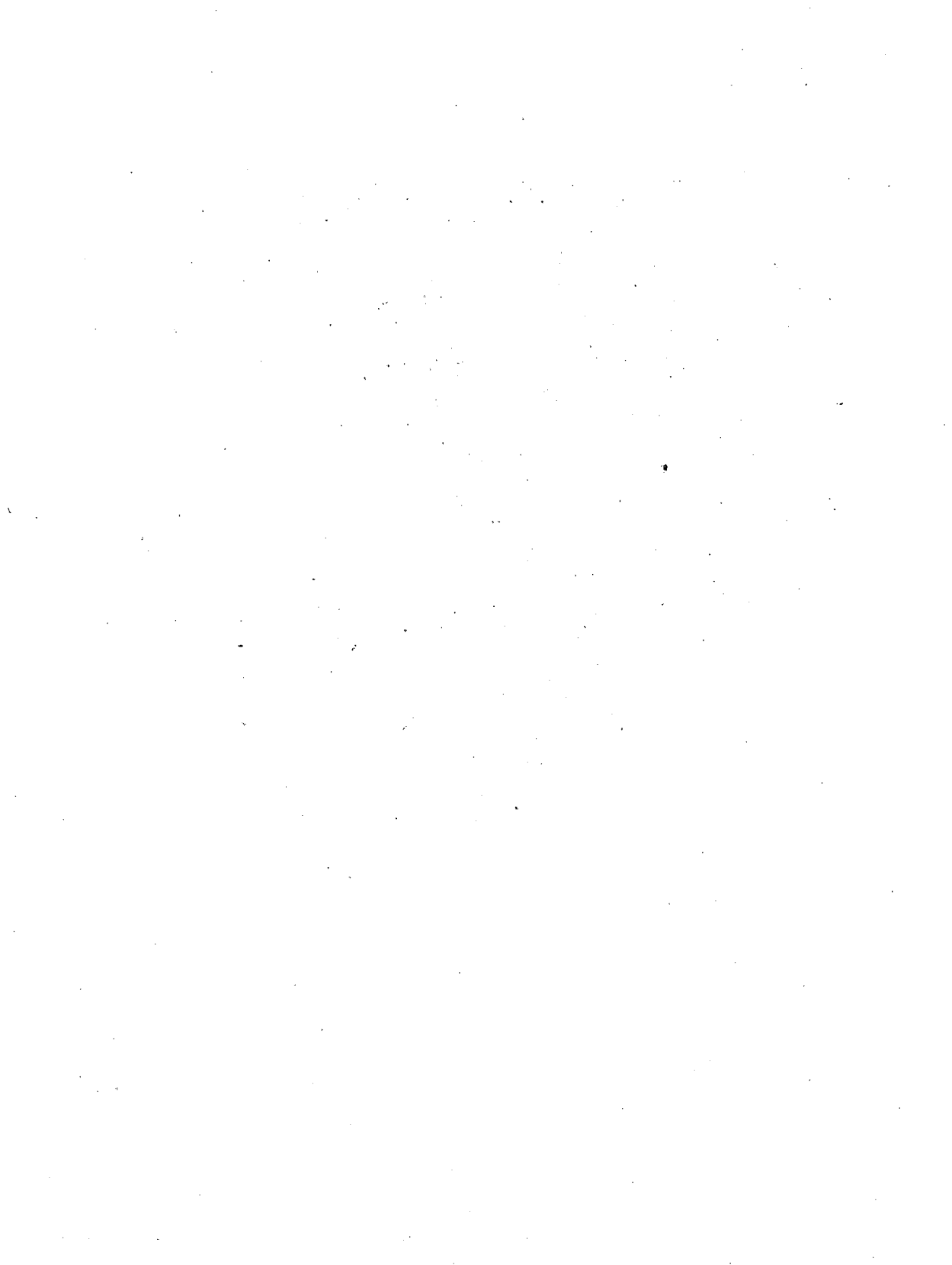
DOMINACH

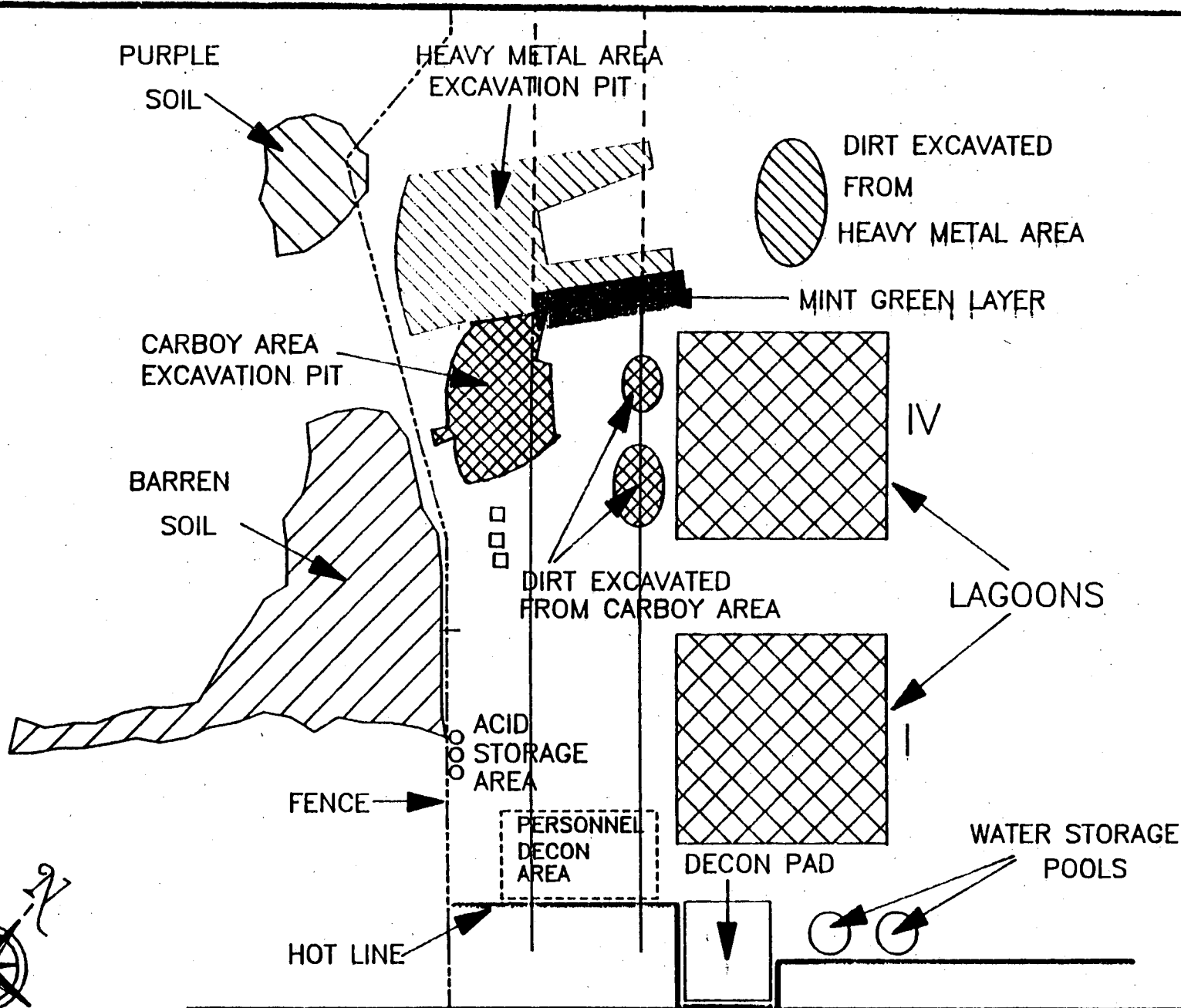
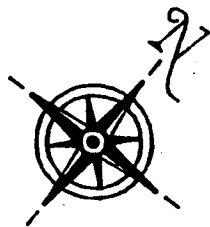
FIGURE 1

GRAHAM

LOCATION MAP

King of Prussia Removal
Figure 4-1 Sample Location Map





SPILL PREVENTION &
EMERGENCY RESPONSE DIVISION

In Association with KCF Technology Inc., C.C. Johnson & Associates, Inc., Resource Applications, Inc., Geo-Resource Consultants, Inc., and Environmental Toxicology International, Inc.

EPA PM
E. Dominach

TAT PM
J. Hill

King of Prussia Site

Site Map 09/22/89

APPENDIX A: Disposal Sampling and Analysis
(Proposed by Haztech)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
DELIVERY ORDER NO.: 0016-02-003
WINSLOW TOWNSHIP, NEW JERSEY

WESTINGHOUSE HAZTECH
PROJECT NO.: 2340-89-4047

SAMPLING PLAN FOR CHARACTERIZATION
OF STOCK PILED SOILS FOR DISPOSAL

PREPARATION

- o Sampling equipment will be cleaned by the sampling technician prior to mobilization to the site.
- o The cleaned sampling equipment (ss hand auger) will be wrapped in aluminum foil and remain sealed until arrival at the project site.

SAMPLING EQUIPMENT DECONTAMINATION PROCEDURES

All sampling equipment (i.e., augers, scoops and trowels) will be constructed of inert materials and decontaminated prior to use in the field. The sampling equipment will be decontaminated between samples and all augers will be steam cleaned prior to use at a new sampling location. All sampling devices will be cleaned and prepared for field using the following procedures:

1. non-phosphate detergent and tap water wash;
2. tap water rinse;
3. distilled/deionized water rinse;
4. total air dry or nitrogen blow out and
5. distilled/deionized water rinse.

SOIL SAMPLING PROCEDURES

All sampling will be accomplished in accordance with the NJDEP Field Sampling Procedures Manual, February, 1988.

1. The laboratory "shuttle" will be opened and sample bottles will be inspected to make sure that all of the required bottles are presented and properly labeled.
2. Collection of soil samples in shallow borings will be performed using a clean, standard SS Hand Auger. When retrieved, the sampler will be opened, and the soil will be placed into the 8 oz. jars using a scoop or trowel. To the extent possible, soil which has come in contact with the walls or the sampler will be discarded.
3. Sampling Method (waste profiles) - Using a ss hand auger one sample collected per 100 yards of material. Divide the pile into a grid and collect samples at the nodes, obtaining a core of 1-2 feet in length at each node.
4. For each sampling event, samples will be handled with a new pair of disposable plastic surgical gloves.

SOIL SAMPLING PROCEDURES / CONTINUED

5. Each sample bottle will be labeled with the following information:
 - a. owner/client;
 - b. sample number or designation;
 - c. date;
 - d. time;
 - e. type of laboratory analysis (i.e. PCE, etc.); and
 - f. name of person collecting sample.
6. Each core sample taken will be removed and the core sample material will be removed from the hand auger, using a plastic disposable scoop, into a stainless steel 2 1/2 gallon pail. When all of the core samples have been composited from the soil pile and put into the stainless steel pile and mixed, 4-8 oz. samples will be obtained from the composite.
7. The Chain-Of-Custody forms from the analytical laboratory will be completed and signed.
8. The shuttle will be sealed and stored.
9. A field blank will be collected in accordance with procedures described above.
10. The shuttles will be transported to the laboratory within 24 hours after the samples are collected. The laboratory will be notified by the response manager in a timely manner of the impending arrival of the samples. The laboratory will be prepared to receive the samples and perform preliminary extractions or analyses within the EPA-recommended holding times.

DISPOSAL ANALYSIS

The following analytical analysis parameters will be conducted by the laboratory chosen to perform the analyses:

PH
Reactivity
PHT's
PCB's

EP TOX Metals

APPENDIX B: Detection Levels Specified

Table 1. Elements Determined by Inductively Coupled
Plasma Emission or Atomic Absorption Spectroscopy

Element	Contract Required Detection Level (1,2) (ug/L)
Aluminum	200
Antimony	60
• Arsenic	10
Barium	200
Beryllium	5
• Cadmium	5
Calcium	5000
• Chromium	10
Cobalt	50
• Copper	25
• Iron	100
• Lead	5
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanadium	50
Zinc	20

Table II-2
Toxicity Characteristic Leachate Procedure List

	HAZ WASTE NO	CONTAMINANT	TCLP (MG/L)		HAZ WASTE NO	CONTAMINANT	TCLP (MG/L)
VOLATILES	D018	Acetonitrile	5.0	BASE- NEUTRALS	D020	EIS (2-Chloroethyl) Ether	0.05
	D019	Benzene	0.07		D029	1, 2-Dichlorobenzene	4.3
	D021	Carbon Disulfide	14.4		D030	1, 4-Dichlorobenzene	10.8
	D022	Carbon Tetrachloride	0.07		D033	2, 4-Dinitrotoluene	0.1
	D024	Chlorobenzene	1.4		D035	Hexachlorobenzene	0.1
	D025	Chloroform	0.07		D036	Hexachlorobutadiene	0.7
	D031	1, 2-Dichloroethane	0.40		D037	Hexachloroethane	4.3
	D032	1, 1-Dichloroethylene	0.1		D041	Nitrobenzene	0.1
	D038	Isobutanol	25.0		D044	Pyridine	5.0
	D039	Methylene Chloride	3.6	ACID EXTRACT	D026	O-Cresol	10.0
	D040	Methyl Ethyl Ketone	7.2		D027	M-Cresol	10.0
	D045	1, 1, 1, 2-Tetrachloroethane	10.0		D028	P-Cresol	10.0
	D046	1, 1, 2, 3-Tetrachloroethane	1.3		D042	Pentachlorophenol	3.6
	D047	Tetrachloroethylene	0.1		D043	Phenol	14.4
	D049	Toluene	14.4		D048	2, 3, 4, 6-Tetrachlorophenol	1.5
	D050	1, 1, 1-Trichloroethane	25.0		D053	2, 4, 5-Trichlorophenol	5.8
	D051	1, 1, 2-Trichloroethane	1.2		D054	2, 4, 6-Trichlorophenol	0.3
	D052	Trichloroethylene	0.07				
	D055	Vinyl Chloride	0.05				

	HAZ WASTE NO	CONTAMINANT	TCLP (MG/L)	EP TOX (MG/L)
METALS	D004	Arsenic	5.0	5.0
	D005	Barium	100.0	100.0
	D006	Cadmium	1.0	1.0
	D007	Chromium	5.0	5.0
	D008	Lead	5.0	5.0
	D009	Mercury	0.2	0.2
	D010	Selenium	1.0	1.0
	D011	Silver	5.0	5.0
PESTICIDES	D012	Endrin	0.003	0.02
	D013	Lindane	0.06	0.4
	D014	Metoxychlor	1.1	10.0
	D015	Toxaphene	0.07	0.5
	D016	2, 4-D	1.4	10.0
	D017	2, 4, 5-TP	0.14	1.0
	D023	Chlordane	0.03	
	D034	Heptachlor (And Hydroxide)	0.001	

TAT-02-F-06144

**Sampling and Operations Plan for King of Prussia
Winslow, Camden County, New Jersey
Site Assessment**

Prepared for:

**Eugene Dominach
Removal Action Branch
U.S. EPA Region II
Edison, New Jersey 08837**

Prepared by:

**Rohan Tadas
Region II Technical Assistance Team
Roy F. Weston, Inc.
Edison, New Jersey 08837**

Removal Action Branch
U.S. EPA Region II
Edison, NJ 08837

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LIST OF APPENDICIES

<u>Appendix</u>	<u>Description</u>
A	Site Location Map

1. PROJECT NAME: King of Prussia
Winslow
Camden County, New Jersey
2. PROJECT REQUESTED BY: Eugene Dominach
Removal Action Branch
3. DATE REQUESTED: November 19, 1990
4. DATE OF PROJECT INITIATION: November 26, 1990
5. PROJECT ORGANIZATION AND RESPONSIBILITY:

The following is a list of key project personnel and their corresponding responsibilities:

Eugene Dominach, USEPA	Project Director
James Manfreda, TAT II	Overall Project Coordination Sampling QC
Rohan Tadas, TAT II	Sampling Operations
Anibal Diaz, TAT II	Laboratory Coordination & QC

6. PROJECT DESCRIPTION:

A. Site Description

The King of Prussia Technical Corporation (KOP) site is listed as a superfund site by the United States Environmental Protection Agency (USEPA) due to the contamination of soil, groundwater, and local surface waters, attributable to the hundreds of drums and polyethylene containers dumped (or buried) there. The facility is located on approximately 10 acres of land in Winslow Township, New Jersey. Originally, the property served as a hazardous waste disposal and treatment facility. The site now contains several hundred buried drums of potentially hazardous substances, two rusting and deteriorated tankers containing approximately 10 cubic yards of solid hazardous waste, and six lagoons.

Previous sampling has shown high levels of TCL metals in the soils.

An EPA Removal Action is presently ongoing at the site.

B. Laboratories

All samples will be submitted via the Contract Laboratory Program (CLP) as Routing Analytical Services (RAS) or Special Analytical Services (SAS) funded by the RCRA program. An EPA QA/QC Level 2 is required for this project.

C. Objectives and Scope

The objective of this project is to provide data pertaining to the nature and quantity of possible contamination from the drums, carboys, and soil located in the northern section of the site.

The scope of this project entails collecting samples from several locations. The following groups of samples will be taken:

1. A sample will be taken from each removed drum and/or container
2. The samples will be segregated by waste stream classification
3. Samples will be hazcatted for compatibility. The compatible samples will then be composited, as liquids, sludges, and solids, in lots of ten drums each in both organic and inorganic matrices
4. Two soil samples will be taken from the stained surficial soil in the drum removal area
5. All drums with identification will be sampled and analyzed separately
6. Wipe samples will be taken from removed drums/containers which are empty
7. One composite sample from the four drums of soil which are aboveground in the lagoons
8. Two samples from the tankers will be taken
9. A composite sample from each percent of the various composited soil, sludge, and solids, samples will be taken for TCLP analyses

All composited samples will be analyzed for disposal characteristics. Disposal method for the various wastestreams will be done by field testing.

Organic wastestreams will be analyzed for incineration characteristics. Inorganic wastestreams will be analyzed for TCL/TAL; wastewater characteristics for liquids; TCLP for soils, sludges, and solids.

D. Data Usage

This data will provide information as to the type of contaminants that may have been released into the soil at the site. The contaminants are important, since the groundwater in this area is close to the surface and there is documentation of groundwater contamination.

E. Parameter Table1. Drum Samples

<u>Parameter</u>	<u>Matrix</u>	<u>Analytical Method No.</u>	<u>Prep.</u>	<u>Holding Time</u>	<u>Volume</u>
Volatiles	solids/sludge	8240	None	10 days	8 oz.
Extractables	solids/sludge	8250	None	10 days	8 oz.
PCB/pesticides	solids/sludge	8080	None	10 days	8 oz.
TCLP	solids/sludge	1300	None	6 months	16 oz.

2. Soil Samples

<u>Parameter</u>	<u>Matrix</u>	<u>Analytical Method No.</u>	<u>Sample Prep.</u>	<u>Holding Time</u>	<u>Volume</u>
Volatiles	soil	8240	None	10 days	8 oz.
Extractables	soil	8250	None	10 days	8 oz.
PCB/pesticides	soil	8080	None	10 days	8 oz.
TCLP	soil	1300	None	6 months	16 oz.

3. Liquid Samples

<u>Parameter</u>	<u>Matrix</u>	<u>Analytical Method No.</u>	<u>Sample Prep.</u>	<u>Holding Time</u>	<u>Volume</u>
Volatiles	liquid	8240	None	10 days	8 oz.
Extractables	liquid	8250	None	10 days	8 oz.
PCB/pesticides	liquid	8080	None	10 days	8 oz.
Total metals	liquid	7000	None	6 months	8 oz.

4. Aqueous Samples

<u>Parameter</u>	<u>Matrix</u>	<u>Analytical Method No.</u>	<u>Sample Prep.</u>	<u>Holding Time</u>	<u>Volume</u>
Volatiles	aqueous	624	Cool to 4°C HCL to Ph<2	10 days	2 x 40 ml.
Extractables	aqueous	625	Cool to 4°C	5 days	4 x 1 liter amber
PCB/pesticides	aqueous	608	Cool to 4°C	5 days	4 x 1 liter amber
Total metals	aqueous	200	Cool to 4°C HNO ₃ to Ph<2	6 months	1 liter poly

5. Sludge Samples

<u>Parameter</u>	<u>Matrix</u>	<u>Analytical Method No.</u>	<u>Sample Prep.</u>	<u>Holding Time</u>	<u>Volume</u>
Volatiles	solids/sludge	8240	None	10 days	8 oz.
Extractable	solids/sludge	8250	None	10 days	8 oz.
PCB/pesticides	solids/sludge	8080	None	10 days	8 oz.
TCLP	solids/sludge	1300	None	6 months	16 oz.

6. Wipe Samples

<u>Parameter</u>	<u>Matrix</u>	<u>Analytical Method No.</u>	<u>Analysis</u>	<u>Sample Prep.</u>	<u>Holding Time</u>	<u>Volume</u>
TCL	wipe	3540	CLP-SOW	None	10 days	6 wipes
TAL	wipe	320	CLP-SOW	None	6 months	6 wipes

NOTE: Soil and aqueous--Low concentration
Solids and liquids--High concentration

7. SAMPLING PROCEDURES:A. Soil

A dedicated stainless steel trowel or scoop will be used to collect three samples from the contaminated soil pile. All rocks and other debris will be removed prior to collection. The soil will be homogenized in a stainless steel bowl prior to being transferred to a final collection bottle.

B. Sludge

All sludges will be collected in 8 oz. jars. Stainless steel trowels will be used in the collection process. All sludges from drums will be collected in a composite manner, after field compatibility checking is completed.

C. Wipe

Wipe samples will be taken from the empty drum area. Three sampling points will be chosen for analysis. Each wipe will use hexane as a solvent. A blank will be taken and will be provided for analysis.

D. Liquid

All liquids will be sampled using either a drum thief or COLIWASA. Each sample will be placed in 8 oz. glass jars. A blind duplicate and a blank will also be provided for analysis.

E. Solids

Solid samples will be taken using a stainless steel or plastic scoop or trowel and placed in an 8 oz. jar. Each composite will be homogenized in a stainless steel bowl, after field compatibility checking is completed.

8. SAMPLE CONTAINERS:

All sample containers will be I-Chem laboratory precleaned glassware, as specified by the USEPA Sample Management Office Contract Lab Program. Refer to Section II of the Disposal Manual for requirements.

9. SAMPLE COLLECTION:

For sample collection, quantities, and preservation guidelines, see Section II of the Disposal Manual.

10. EQUIPMENT AND CONTAINER PREPARATION:

All equipment, augers, mixing bowls, dip samples, and shovels will be properly rinsed before the sampling event as discussed below. After sampling is completed the equipment will be decontaminated on-site as specified below:

- 1) Wash and scrub with low phosphate detergent
- 2) Deionized water rinse
- 3) Rinse with 10% HNO₃, ultrapure
- 4) Deionized water rinse
- 5) An acetone or methanol rinse followed by hexane rinse (solvents must be pesticide grade or better)
- 6) Deionized water rinse
- 7) Air dry
- 8) Wrap in aluminum foil, shiny side out, for transport

If metals samples are not being collected, the 10% nitric acid (HNO₃) rinse may be omitted, and, conversely, if organics samples are not being taken, the solvent rinse may be omitted.

When it is necessary to use carbon steel sampling equipment the nitric acid rinse may be diluted to 1% to reduce the possibility of metal leaching from the piece of equipment itself.

11. SAMPLE LABEL:

Each sample will be accurately and completely identified. All labels will be moisture resistant and able to withstand field conditions. Sample containers will be labeled prior to sample collection. The information on each label will include the following, but is not limited to:

- i. Date of collection
- ii. Site name
- iii. Sample identify/location
- iv. Analysis requested

12. SAMPLE CUSTODY PROCEDURES:

EPA Chain-of-Custody will be filled out and maintained throughout the entire site activities as per TAT Standard Operating Procedures (SOP) on sample handling, Sample Container Contract specifications, and EPA Laboratories SOP. The Chain-of-Custody form to be used lists the following information:

- i. Project name;
- ii. Sample number;
- iii. Number of sample containers;
- iv. Description of samples including specific location of sample collection;
- v. Identity of person collecting the sample;
- vi. Date and time of sample collection;
- vii. Date and time of custody transfer to laboratory (if the sample was collected by a person other than laboratory personnel);
- viii. Identity of person accepting custody (if the sample was collected by a person other than the laboratory personnel);
- ix. Identity of laboratory performing the analysis.

13. DOCUMENTATION, DATA REDUCTIONS, AND REPORTING:

Field data will be entered into a bound notebook. Field notebooks, field data sheets, Chain-of-Custody forms, and laboratory analysis reports will be filed and stored per the TAT Document Control System.

14. QUALITY ASSURANCE AND DATA REPORTING:

QA/QC to be furnished by the contracted laboratory in performance of the analysis will (at a minimum) consist of the following measures to ensure accurate data:

1. One field rinsate blank for each type of equipment per day will be shipped to the laboratory. These blanks are to be prepared prior to the sampling events on each day and analyzed in order to ensure that no contamination has occurred during sampling.
2. One trip blank for the water will be provided daily to ensure the integrity of the samples.

3. A blind duplicate for each matrix will be submitted for every 20 samples to check the analytical precision. Results will be documented and submitted in the written report.
4. Matrix spike and matrix spike duplicate analysis will also be performed on one sample for every 20 samples of each matrix. Triple volume will be collected.
5. The contracted laboratory will also furnish the following deliverables as warranted:
 - a) GC/MS tuning and calibration standards;
 - b) Copies of all spectral data obtained during performance of analysis. Copies should be signed by the analyst and checked by the Laboratory Manager;
 - c) Data System Printout (quantitation report or legible facsimile (GC/MS));
 - d) Manual work sheets;
 - e) Identification and explanation of any analytical modifications used that differ from USEPA protocol.

All results are to be completed and a written report submitted by the lab to the TAT QC officer within twenty-one (21) days of the Validated Time of Sample Receipt (VTSR).

15. DATA VALIDATION:

All steps of data generation and handling will be evaluated by the Project Officer and the Quality Assurance Officer for compliance with the specified requirements. ESD-MMB will perform data validation using current protocol.

16. SYSTEM AUDIT:

The Quality Control Officer will observe the sampling operations and subsequent analytical data to assure that the QA/QC project plan has been followed.

17. CORRECTIVE ACTION:

All provisions will be taken in the field and laboratory to ensure that any problems that may develop will be dealt with as quickly as possible. This will be done to ensure the continuity of the sampling program. Any deviations from this sampling plan will be noted in the final report.

18. REPORTS:

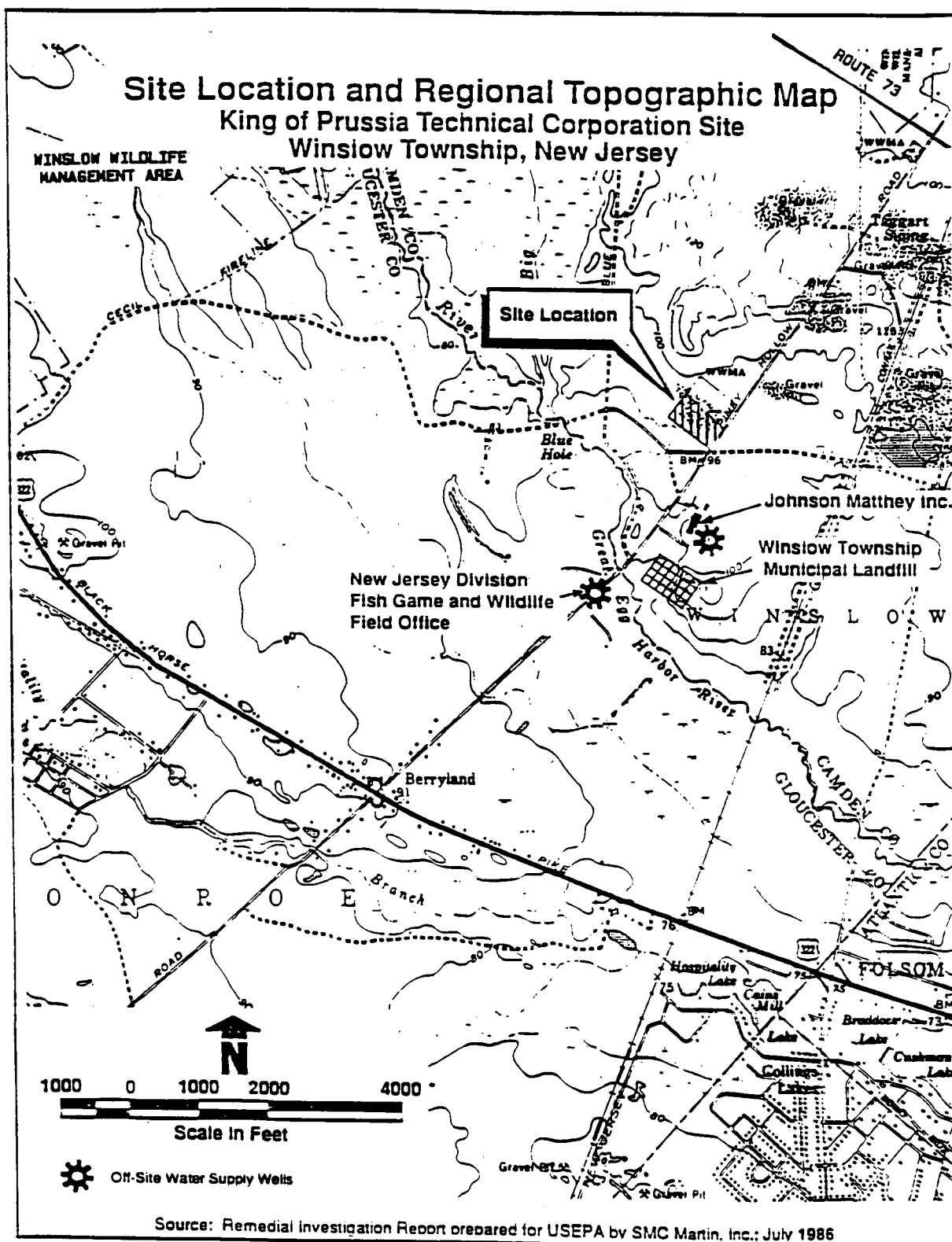
Laboratory results and all requested QA/QC information will be submitted to EPA upon completion of sample analyses. Sampling reports will be issued after receipt of laboratory results.

19. PROJECT FISCAL INFORMATION:

Sampling equipment and manpower shall be provided by the Technical Assistance Team (TAT) in coordination with the USEPA.

APPENDIX A

SITE LOCATION MAP



WESTON Roy F. Weston, Inc.
MAJOR PROGRAMS DIVISION

In Association with ICF Technology Inc., C.C. Johnson & Malhotra, P.C., Resource Applications, Inc. and R.E. Sarriera Associates

EPA PM
E. Dominach

TAT PM
J. Manfreda

King Of Prussia
Winslow, New Jersey

Site Location Map
Figure A

DATE:

JUN 12 1989

SUBJECT: Transmittal of Final Field Screening Data for King of Prussia Site

FROM: Darvene A. Adams, Chief *Darvene Adams*
Superfund Support Section, SMB, ESDTO: John Witkowski, Superfund Project Manager
Removal Action Branch, ERRD

Attached are the final results of field screening analyses conducted by NUS/FIT at the King of Prussia site (in Winslow Township) using the Kevex X-ray Fluorescence (XRF) unit. Please keep in mind that FIT's XRF capability is intended to be used only as an analytical screening tool, and that these results should not be expected to stand up as evidence in enforcement proceedings without adequate substantiating data of CLP quality.

Please note in NUS' cover letter to the data tables (attached) that two groups of samples (KOP-61 through -80, and KOP-122 through -130) required reanalysis, so that these final results may differ from the preliminary results submitted to the TAT Project Manager at the time of sampling.

If you should have any questions regarding the attached data, please contact me or Amy Brochu, of my staff.

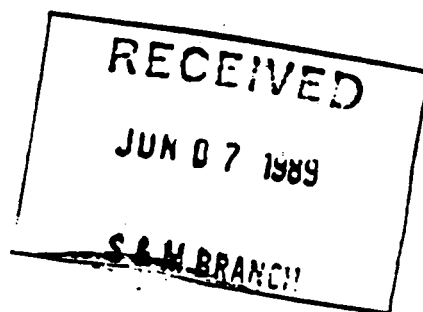
Attachments

cc: R. Spear - SMB
R. Naman - NUS/FIT
~~E. Dominach~~ - ERRD
A. Rajani - Weston/TAT



1090 KING GEORGES POST ROAD
SUITE 1103
EDISON, NEW JERSEY 08837
201-225-6160

KOP 2.1066



C-584-06-89-16

June 6, 1989

Ms. Amy Brochu
U.S. Environmental Protection Agency
Region 2
Edison, New Jersey 08817

Dear Ms. Brochu:

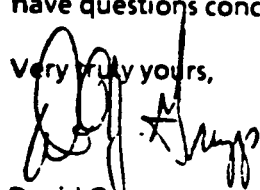
On-site screening analysis of soil samples using Energy Dispersive X-ray Fluorescence (EDXRF) was conducted by NUS Corporation Region 2 FIT, in support of the EPA Region 2 Technical Assistance Team (TAT), at the King of Prussia site in Winslow Township, Camden County, New Jersey. This was authorized under Technical Directive Document No. 02-8904-44.

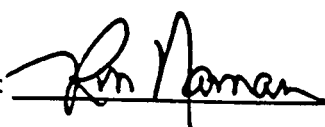
A total of 130 soil samples were collected by TAT and analyzed on-site by FIT on 4/26/89 through 5/2/89. TAT used the analytical results to determine the extent of contamination in the carboy area of the site in an attempt to estimate the amount of soil to be excavated for removal and disposal purposes. Samples were analyzed for copper, zinc, and nickel as indicator metals of contamination. All samples were prepared and analyzed following the NUS Corporation Region 2 Final Draft Standard Operating Procedures for Metals Analysis Using X-ray Fluorescence. Preliminary analytical results were given to the TAT project manager on a daily basis. Table 1 provides the final analytical results for the King of Prussia site. Two groups of samples, KOP-61 through KOP-80 and KOP-122 through KOP-130, required reanalysis because original QA/QC sample results associated with these samples were outside specified control limits, therefore final analytical results for these groups of samples may be different than the preliminary results given to the TAT Project Manager.

In addition to the XRF samples, TAT submitted 37 of the samples collected for TCL metals analysis via the CLP. These samples are listed on Table 2.

Enclosed are the final XRF analytical results for the King of Prussia site for transmittal to John Witkowski ERRD-RP, Eugene Dominach ERRD-RP, and Atul Rajani - TAT Project Manager. If they have questions concerning this data they should initiate contact through you.

Very truly yours,


David Grupp

Reviewed and Approved: 

DG/ci

TABLE 1
XRF ANALYTICAL RESULTS
KING OF PRUSSIA SITE
WINSLOW TOWNSHIP, CAMDEN, NEW JERSEY

<u>SAMPLE ID NO.</u>	<u>COPPER</u>	<u>CONCENTRATION (mg/kg)</u>	
		<u>ZINC</u>	<u>NICKEL</u>
KOP-1	174.10	19.34 E	91.69 E
KOP-2	126.96	61.31 E	54.59 E
KOP-3	67.34	17.20 E	30.26 E
KOP-4	72.37	27.41 E	30.13 E
KOP-5	16.54	< 10 E	10.72 E
KOP-6	536.39	20.58 E	13.61 E
KOP-7	177.49	20.76 E	20.77 E
KOP-8	56.61	26.57 E	28.44 E
KOP-9	24.58	< 10 E	< 10 E
KOP-10	101.29	22.04 E	50.85 E
KOP-11	87.40	< 10 E	56.05 E
KOP-12	57.12	< 10 E	36.86 E
KOP-13	301.95	104.17 E	91.39 E
KOP-14	< 10	< 10 E	11.71 E
KOP-15	< 10	< 10 E	15.77 E
KOP-16	130.71	22.35 E	62.04 E
KOP-17	53.75	< 10 E	< 10 E
KOP-18	271.48	12.60 E	19.37 E
KOP-19	0.43% Wt.(4300)	151.92 E	641.74 E
KOP-20	522.11	88.32 E	70.41 E
KOP-21	79.89	16.02	14.40
KOP-22	54.58	11.93	16.34
KOP-23	117.26	52.18	85.14
KOP-24	221.29	31.03	29.91
KOP-25	36.11	26.85	39.51

E - Estimated value

TABLE 1 (continued)

<u>SAMPLE ID NO.</u>	<u>COPPER</u>	<u>CONCENTRATION mg/kg</u>	
		<u>ZINC</u>	<u>NICKEL</u>
KOP-26	11.90	<10	<10
KOP-27	53.19	17.20	19.78
KOP-28	17.42	15.97	<10
KOP-29	<10	<10	<10
KOP-30	<10	<10	<10
KOP-31	168.87	13.12	<10
KOP-32	97.43	15.33	14.98
KOP-33	11.91	35.41	10.63
KOP-34	17.86	<10	13.83
KOP-35	12.77	<10	<10
KOP-36	<10	<10	10.96
KOP-37	<10	<10	11.64
KOP-38	305.71	49.93	85.42
KOP-39	196.62	18.86	27.42
KOP-40	0.35% Wt. (3500)	774.04	509.35
KOP-41	0.20% Wt.(2000)	117.08	492.34
KOP-42	64.74	12.32	22.77
KOP-43	101.97	14.19	14.97
KOP-44	104.30	21.75	18.75
KOP-45	0.39% Wt. (3900)	269.30	613.78
KOP-46	57.42	12.44	17.16
KOP-47	36.65	10.95	15.22
KOP-48	29.78	20.80	12.91
KOP-49	26.84	<10	13.13
KOP-50	16.62	11.98	33.85
KOP-51	25.97	15.44	54.27
KOP-52	16.17	12.76	13.51
KOP-53	216.10	29.08	39.92
KOP-54	45.35	14.92	<10
KOP-55	276.56	66.53	138.75

TABLE 1 (continued)

<u>SAMPLE ID NO.</u>	<u>COPPER</u>	<u>CONCENTRATION mg/kg</u>	
		<u>ZINC</u>	<u>NICKEL</u>
KOP-56	93.33	19.38	30.34
KOP-57	258.76	34.52	57.10
KOP-58	60.77	20.19	26.59
KOP-59	201.54	15.05	10.02
KOP-60	47.37	<10	<10
KOP-61	219.59 E	24.62 E	60.27
KOP-62	67.63 E	12.14 E	30.07
KOP-63	429.00 E	55.69 E	102.53
KOP-64	157.24 E	36.83 E	27.28
KOP-65	211.54 E	28.41 E	28.25
KOP-66	248.56 E	19.13 E	21.88
KOP-67	223.69 E	32.89 E	38.38
KOP-68	37.56 E	12.33 E	<10
KOP-69	66.98 E	15.90 E	11.52
KOP-70	14.48 E	<10 E	<10
KOP-71	19.26 E	16.32 E	<10
KOP-72	<10 E	<10 E	<10
KOP-73	12.52 E	10.14 E	<10
KOP-74	18.07 E	<10 E	63.84
KOP-75	52.93 E	47.74 E	22.07
KOP-76	37.05 E	13.67 E	11.11
KOP-77	59.97 E	14.73 E	11.78
KOP-78	76.61 E	<10 E	<10
KOP-79	14.46 E	13.15 E	<10
KOP-80	11.80 E	<10 E	<10
KOP-81	29.18 E	24.46	11.01
KOP-82	10.62 E	10.66	<10
KOP-83	<10 E	<10	<10

E - Estimated value.

TABLE 1 (continued)

KOP 2.1070

<u>SAMPLE ID NO.</u>	<u>COPPER</u>	<u>CONCENTRATION mg/kg</u>	
		<u>ZINC</u>	<u>NICKEL</u>
KOP-84	< 10 E	< 10	< 10
KOP-85	250.42 E	40.41	72.47
KOP-86	13.30 E	< 10	< 10
KOP-87	234.80 E	36.30	39.26
KOP-88	293.04 E	19.87	137.98
KOP-89	440.35 E	19.05	< 10
KOP-90	385.25 E	11.39	< 10
KOP-91	28.45 E	< 10	24.66
KOP-92	828.75 E	78.34	122.50
KOP-93	189.13 E	16.83	38.34
KOP-94	31.10 E	< 10	20.02
KOP-95	410.57 E	32.18	42.96
KOP-96	135.85 E	11.45	14.84
KOP-97	30.75 E	15.32	< 10
KOP-98	21.54 E	< 10	< 10
KOP-99	30.20 E	< 10	< 10
KOP-100	80.82 E	11.86	19.48
KOP-101	< 10	< 10	11.31
KOP-102	253.32	20.72	147.07
KOP-103	< 10	< 10	14.08
KOP-104	12.36	15.71	< 10
KOP-105	78.49	19.06	23.09
KOP-106	< 10	< 10	< 10
KOP-107	458.56	87.26	130.72
KOP-108	31.37	< 10	25.41
KOP-109	85.71	< 10	< 10
KOP-110	< 10	< 10	< 10
KOP-111	132.81	36.40	28.46
KOP-112	105.98	15.44	29.78

E - Estimated value.

<u>SAMPLE ID NO.</u>	CONCENTRATION mg/kg		
	<u>COPPER</u>	<u>ZINC</u>	<u>NICKEL</u>
KOP-113	241.16	33.18	53.65
KOP-114	96.41	24.57	14.36
KOP-115	601.25	59.18	75.16
KOP-116	0.16% Wt. (1600)	20.99	33.99
KOP-117	797.76	26.27	12.45
KOP-118	24.84	<10	<10
KOP-119	587.81	15.72	<10
KOP-120	347.62	15.39	<10
KOP-121	27.69	12.50	<10
KOP-122	65.78 E	11.66 E	<10 E
KOP-123	76.45 E	<10 E	<10 E
KOP-124	86.18 E	<10 E	<10 E
KOP-125	356.57 E	84.94 E	129.64 E
KOP-126	71.97 E	27.25 E	31.81 E
KOP-127	41.01 E	17.38 E	17.95 E
KOP-128	18.57 E	10.46 E	<10 E
KOP-129	97.46 E	19.10 E	<10 E
KOP-130	84.70 E	20.59 E	<10 E

<u>SAMPLE ID NO.</u>	CONCENTRATION mg/kg		
	<u>COPPER</u>	<u>ZINC</u>	<u>NICKEL</u>
Blank-1	12.40	12.40	<10
Blank-2	10.90	10.46	<10
Blank-3	10.39	<10	<10
Blank-4	<10 E	<10	<10
Blank-5	<10 E	<10	<10

E - Estimated value.

DRAFT WORK PLAN

**SAMPLING AND EXCAVATION
REGIONAL E.R.C.S. PROJECT
WINSLOW TOWNSHIP, NEW JERSEY
D.O. NO.: 0016-02-003**

**WESTINGHOUSE HAZTECH, INC.
PROJECT NO.: 2340-89-4047**

REVISION I



INDEX

SECTION I

SECTION II

SECTION III

SECTION IV

SECTION V

SECTION VI

SAMPLING AND ANALYSIS

**MOBILIZATION AND SITE PREP
DECONTAMINATION & CONSTRUCTION**

EXCAVATION AND BACKFILL

TRANSPORTATION AND DISPOSAL

**EQUIPMENT DECONTAMINATION AND
DEMOBILIZATION**

COST AND SCHEDULE



SECTION I
Sampling and Analysis

Sampling

Three soil samples will be taken in the designated area, using a hand auger to a depth of 1.5 feet each. These three samples will be composited into four 8 oz. samples to be sent to Analyti Chem in Cherry Hill, New Jersey for analysis.

Analysis - (Contaminated Soil)

The sample will be analyzed using land fill disposal acceptance, analysis will include RCRA Metals.

Analysis - (Backfill)

Based on competitive supplier selection a backfill material supplier will be selected. A sample of the backfill material will be collected and sent to Analyti Chem for E.P. TOX analysis.

Analysis - (Wash Water)

Water samples will be collected from each batch of waste wash-water collected from the decontamination pad and analyzed prior to discharging or off-site disposal.



SECTION II
Decontamination Pad Construction

Pad Construction (Subcontractor)

- o 20' x 35' with sump under drain collection and pumping system.
(Drawing 1A - 1B).

Collection System (Equipment)

- o 1 - 6.5 KW Generator
- o 1 - 6,000 gallon clean water holding pool
- o 2 - 110 Volt 2 inch submersible pump
- o 1 - 3,000 P.S.I. pressure washer
- o 1 - 6,000 gallon gray water holding pool
- o 100' - 2" discharge hose

Process

One 2-inch submersible pump in the clean water supply pool will pump water to the 3,000 psi power washer. The power washer will be used to decontaminate equipment and dump trailer trucks. A second 2-inch submersible pump will pump the waste wash water from the decon pad collection system to the second 6,000 gallon holding pool. A 6.5 KW Generator will be used to supply 110 volt power to both of the 2-inch submersible pumps.

SECTION III**Mobilization / Site Prep.****Mobilization**

Prior to mobilization of the excavation crew to the site, the office trailer will be set up and the decontamination pad construction would have been completed. Also, by the time we are ready to mobilize to the site, transportation and disposal approvals will be in place.

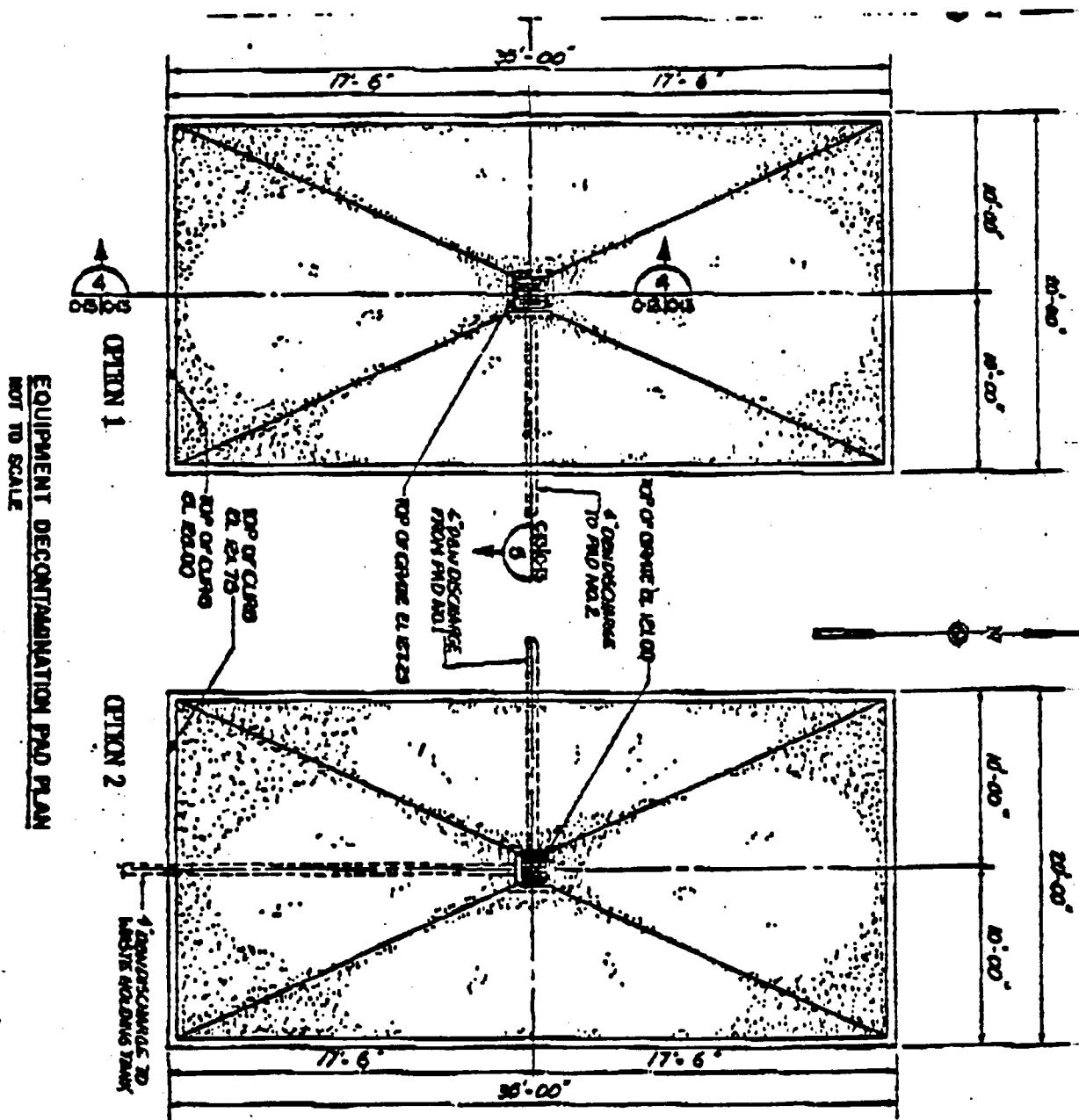
Office Trailer Equipment:

- 1 - Fax Machine
 - 1 - Copier
 - 1 - Water Cooler
 - 1 - Lap Top Computer (R.C.M.S.)
 - 1 - Cellular Phone
- Misc. Office Supplies and Furniture

Site Prep

As part of site preparation existing electrical service will be connected to the office trailer, a cellular mobile phone will be provided for on site for communications, At the O.S.C's request.

The decontamination pad collection and process equipment system will be set up and temporary generator power will be connected as well.



SECTION III

Excavation and Backfill

Excavation and Backfill

The excavation area is estimated to be approximately 350 c.y. Based on preliminary site assessment by E.P.A. and T.A.T. Using a CAT 215-Excavator the area will be excavated to a depth of 1.5 feet as indicated by the preliminary information.

The contaminated soil will be loaded into the bucket of a track loader and transported and loaded onto 20 yard dump trailers for off-site disposal. Prior to starting of any excavation, a erosion control fencing system will be installed around the excavation area. Based on the information available at this time, post excavation conformation sampling will not be required. During the excavation removal operation, should surface or rain water enter the excavation, that by passes the erosion control fencing system, it will have to be removed and transported to the waste water holding pool using a vacuum truck.

Backfill

When the excavation has been completed, post excavation sampling and analysis if required has also been completed, backfilling of the excavation will be accomplished in the following manner:

- o Placement of the backfill material will be accomplished using the CAT 215 excavator. Backfill will be dumped adjacent to the excavation and spread using the CAT 215.
- o When the backfill material has been spread out, it will be compacted in 18" lifts using walk behind plate compactors.

The reason for the compaction of the backfill material is to minimize erosion from surface run off from rain fall.

SECTION IV
Transportation and Disposal

Based on laboratory results, disposal of contaminated soil from the site will be arranged for in accordance with all Local, State and Federal regulations.

Transportation of contaminated soil will be arranged for on a competitive subcontractor basis as outlined by contract requirements.

All transportation and disposal arranged for by Westinghouse/Haztech are subject to approval by the project O.S.C.



SECTION V**Equipment Decontamination / Demobilization**

All equipment and dump trailers will be decontaminated before leaving the site or be demobilized.

Gross contamination will be removed prior to equipment being power washed on the decontamination pad and demobilized.

When all equipment has be decontaminated and the decon pad and sump has been cleaned, all water collection and process equipment except for the contaminated wash water pool will be demobilized.



SECTION VI
Cost and Scheduling

1. Sampling and Analysis		
a.	Sampling - Personnel, Equipment, Supplies	\$ 573.00
b.	Analysis - Contaminated Soil Area	2,500.00
c.	Analysis - Backfill Material	5,000.00
d.	Analysis - Wash Water	2,000.00ea
2. Mobilization and Site Prep.		
a.	Mobilization - Personnel, Equipment, Subcontractors	2,200.00
b.	Site Prep - Electrician, Set-up	1,500.00
c.	Decontamination Pad Construction	14,000.00
d.	Process Equipment	4,500.00
3. Excavation and Backfill		
a.	Personnel and Equipment	18,000.00
b.	Backfill 350 c.y. x 20.00/c.y.	7,000.00
4. Transportation and Disposal		
a.	Transportation / per ton x 350 tons	
b.	Disposal / per ton x 350 tons \$ 380.00/ton	133,000.00
5. Equipment Decontamination & Demobilization		
a.	Decontamination 1,200/day x 5 days	6,000.00
b.	Demobilization	2,200.00
Estimated Total		\$198,473.00

Personnel

- 1 - Response Manager
- 1 - Admin. Tech.
- 2 - Equipment Operators
- 1 - Technician (Decon Pad)
- 1 - Clean-up Technician (Excavation Spotter)

Equipment

- 1 - Fuel Truck
- 1 - Van
- 1 - 215 Track Excavator
- 1 - Track Loader
- 1 - 6.5 KW Generator
- 2 - 6,000 Gallon Holding Pools
- 2 - 2 Inch Submersible Pumps
- 1 - 3,000 psi Washer

Level C Protection (As Needed)
Level B Protection (As Needed)

Subcontractors

Electrician
Masonry Contractor
Transportation
Disposal
Analytical Services

附註事項:

LOOKUP YOUR :

REF. NO. 1

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Abstract

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THE UNIVERSITY OF CHICAGO PRESS

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KOP 2.1084

**King of Prussia Drum Excavation
Work Plan
Winslow Township, New Jersey**

Submitted to:

**United States Environmental Protection Agency
Region II, Removal Action Branch
Edison , New Jersey**

Submitted by:

Westinghouse Environmental and Geotechnical Services, Inc.

**Turnpike Business Center, Suite 549
Cedar Lane
Florence, New Jersey 08518**

November 2, 1990



Westinghouse Environmental
and Geotechnical Services, Inc.

Springhouse Corporate Center II
323 Norristown Road, Suite 200
Ambler, Pennsylvania 19002
(215) 542-9100
Fax (215) 542-9105

November 2, 1990

Mr. Gene Dominach
United States Environmental Protection Agency
Region II - Emergency & Remedial Response Division
Woodbridge Avenue
Edison, New Jersey 08837

RE: Work Plan
King of Prussia Drum Excavation
Piney Hallow Road
Winslow, New Jersey 08095
D.O. # 0016-02-003
Westinghouse Project Number: 2340-89-4047

Dear Mr. Dominach:

Westinghouse Environmental and Geotechnical Services, Inc. (Westinghouse) appreciates the opportunity to present this revised work plan regarding the referenced project. The scope of work is based upon your August 23, 1990 Amendment of Solicitation/Modification of Contract and our September 6, 1990 magnetometer survey.

If you have any questions regarding the proposed scope of work, please do not hesitate to contact us.

Very truly yours,

WESTINGHOUSE ENVIRONMENTAL AND GEOTECHNICAL SERVICES, INC.

Sam Durbano (B7)

Sam Durbano
Department Manager,
Remediation Services

Bob Dease (B7)

Bob Dease
Response Manager,
Remediation Services

b8-d3
enclosure

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- 1.0 Introduction
 - Facility/Operations
 - Site Description
 - Magnetometer Survey
- 2.0 Mobilization/Site Preparation
 - Mobilization
 - Operational Layout
 - Environmental Controls
- 3.0 Drum Excavation/Site Specific Air Monitoring Equipment/Requirements
- 4.0 Drum Staging/Drum Sampling
- 5.0 Transportation and Disposal
- 6.0 Health and Safety Plan Modifications
- 7.0 Site Map

1.0 Introduction

Facility/Operations/Site Description

The King of Prussia Landfill is an abandoned hazardous waste management facility located along Piney Hollow Road, Winslow Township, Camden County, New Jersey. The property is bounded on three sides by a State Wildlife Management Area and the fourth borders Piney Hollow Road. Along the southern perimeter of the site is in intermittent wetland which feeds directly into the Great Egg Harbor River. The site is in a rural/remote area and the nearest residence is less than a quarter mile from the site. Several gravel operations, a chemical manufacturer, an asphalt plant and the municipal landfill are all within a quarter mile of the site.

Magnetometer Survey

On September 6, 1990, Westinghouse conducted a magnetometer survey at the King of Prussia Landfill. The survey was conducted in an attempt to delineate a suspected buried drum field. The surveyed area was approximately 42,000 square feet and was located in the northeastern section of the site immediately north of the abandoned lagoons 5 and 6. The magnetometer survey indicates that buried ferro-magnetic material (drums) exists at two locations in the northeastern section of the site.

2.0 Mobilization/Site Preparation

Mobilization

Westinghouse will mobilize all the necessary equipment and manpower to the jobsite, at the On-Scene Coordinator's (OSC) discretion. The site preparation will include; staging of the office and decontamination facilities, telephone line and electric hook-up. Shrubs and brush, if necessary will be removed from the excavation and drum staging areas which will be located south of the excavation area.

Operational Layout

Contamination reduction zone (CRZ) and clean zones will be established using air monitoring data and available information on waste locations (Figure 1). Site activities will be governed by these zones. Drum staging will be conducted in the exclusion zone; personal decontamination will be carried out in the CRZ zone; and administrative and emergency medical care will be given in the clean zone.

Each area will be designed to provide adequate room to maneuver equipment and to provide for emergency evacuation. On-site evaluation will be used to determine the minimum safe distance between different staging operating area. Within each of these areas, provisions will be used to determine the minimum safe distance between different operating areas. Within each of these areas, provisions will be made to segregate reactive, corrosive, flammable, and incompatible wastes. Any waste identified as explosive or radioactive will be staged or stored in an isolated area until off-site disposal is arranged. Also, on each operating area, necessary measures will be taken to minimize environmental release, prevent incompatible waste reactions, and contain contaminants which are released.

Environmental Controls

Operating areas for staging drum wastes and contaminated soils will be graded to prevent puddling, lined with polyethylene and a geotextile fabric berm, or diked. The equipment decontamination area will be a hard surface area that will retain wash water by perimeter curbing, which will drain into a built in sump to collect the wastewater. The wastewater will be collected with a vacuum skid unit and then pumped into 55 gallon drums for transportation and disposal.

In addition to the above mentioned preventive measures, a number of additional measures will be taken to mitigate and minimize release. These will include:

- o If a drum is critically over-pressurized, it will be isolated with a barricade until the pressure can be relieved remotely. Slow venting using a bung-wrench and a plastic cover over the drum may work for less critical situation; however, this will only be attempted by experienced personnel and extreme caution will be exercised.
- o Any drum that is leaking, badly corroded or deformed will be overpacked or will have its contents transferred to a new or reconditioned drum.
- o If gas cylinders are encountered, they will be picked up with a sling and moved promptly with a backhoe to an area where the temperature can be controlled, particularly if they are subject to temperature extremes or direct sunlight. Gas cylinders will not be rolled, dragged or slid, even for short distances. Care will be taken not to drop the cylinders or allow them to violently strike another cylinder or drum.
- o As contaminated soils are excavated from the disposal area, they will be transferred to temporary storage area that has been diked or bermed and lined with polyethylene and geotextile. Pools of liquid waste that accumulates from rain water will be collected with the vacuum skid unit and transferred into 55 gallon drums or pool or tank for transportation and disposal. Any spillage from a drum being excavated will be collected immediately and placed into a new or reconditioned drum, with a shovel or a drum pump.

3.0 Drum Excavation/Site Specific Air Monitoring Equipment/Requirements

The excavation of the buried drums will be accomplished by using a combination of conventional excavation, lifting and loading equipment such as backhoes, front-end loaders and bobcats, but with special equipment modifications or accessories adapted to hazardous waste site applications. Equipment used in the excavation and staging of drums must be suitable for digging, lifting, loading and manipulating drums. Safe handling practices will include the determination of the drum integrity prior to drum excavation. This may be accomplished through visual inspection of the drum surface for corrosion, leaks, swelling or missing bungs.

Where certain highly hazardous or toxic materials are suspected, additional precautions may be required. These precautions include:

- o Immediate overpacking and isolation of radioactive materials.
- o Minimal contact, prompt isolation, and preferably remote handling of explosive or shock-sensitive materials. If an explosive situation is expected or identified, Westinghouse will contact an explosive expert before relocating the situation.
- o Cautions handling of gas cylinders to avoid dragging or striking them.
- o Where drums are found to be leaking or structurally unsound, the drums should be overpacked or the contents transferred to new container promptly in order to avoid spills or release that could jeopardize worker safety.

Field personnel will rely on continuous air monitoring equipment (e.g. oxygen meters, combustible gas indicators, gas/vapor/vapor analyzers) to provide and indication of unsafe conditions on the immediate vicinity of drums. The site specific air monitoring equipment/requirements is detailed on the Health & Safety Plan.

4.0 Drum Staging/Drum Sampling

The next activity involves opening and sampling the drums. This generally requires that all drums be sampled in order to determine potential treatment and disposal options. The procedures used for staging and opening depend upon the number of drums onsite, their relative hazard, and the space available for performing these activities. It is recommended that drums be staged according to their physical contents (i.e., liquids, solids, gas cylinders, lab packs) since procedures for opening and sampling these containers are unique. Preferably, the drum staging and opening areas should be physically separated to minimize the risk of a chain reaction in the event of fire or explosion during drum opening. The drum opening area will be diked and lined.

There is a variety of tools available for opening drums. Nonsparking wrenches and manually operated deheaders can be used only for drums with good integrity and where the contents are not suspected of being explosive. The majority of the drums will be opened remotely by spiking the drum with a brass/beryllium punch attached to the arm of the backhoe. Further protection will be provided during drum opening by conducting the operation from behind a plexiglass shield. In, general, remote drum opening is recommended where drum integrity is poor or the wastes are highly toxic.

The drums will be placed in double rows within each compatibility group segregating the liquids from the solids. During the staging/moving process overpacks, a drum pump, and absorbent material will be kept readily at hand in the event of a leaking drum.

After the drums are staged an inventory will be taken to determine the location and quantities of each container. A number, unique to each container, will be assigned and a preliminary container log will be completed. At this time the logs will provide visible specifics about each container, such as; container type and size, condition of container, label and markings on container and location on site. Additional information will be added to these logs during the sampling phase.

Before sampling begins, any leaking or questionable drums will have been overpacked into a secondary container. Any drums that are bulging or have crystallized material around the bungs or are deemed to be explosive, shock sensitive, air or water reactive will require special handling. Any drum that requires special handling will be moved to the remote sampling area.

Liquid samples will be collected in 8 ounce jars and labelled with the drum number and project number. Bulk solids will be collected in the same manner. Basic compatibility analysis will be conducted on each sample either via onsite hazcating or offsite laboratory analysis. Additional information will be denoted on the container log. After all samples have been taken and the compatibility analysis is complete, the drums will be segregated according to hazard class.

Within each hazard class a 32 ounce composite sample will be taken to minimize the amount of samples sent for disposal analysis. Any unknowns or questionable materials will be sent individually for analytical and grouped at a later date if possible. The composite sample being sent for analytical will represent no more than 25 drums.

Sampling will be performed using one or more of the following: glass sample thief, plastic or stainless steel trowels and scoops. The sample bottle utilized will be provided by Westinghouse or the analytical lab.

During the sampling process air monitoring will be conducted to check for flammable vapors, volatile organics and halogens. Sampling will be conducted in a safe and orderly fashion, according to Westinghouse policy and State and Federal regulations.

A chain-of-custody (COC) will be completed and will accompany the samples at all times. The COC will contain all the sample numbers in the shipment group and will bear the name of the last person responsible for them. The samples will be sent federal express or hand delivered by a Westinghouse employee, depending on the location of a preapproved laboratory.

The samples will be double bagged and cushioned in a plastic cooler with vermiculite. Westinghouse will request a turnaround time of three to seven days.

The requested analytical parameters will include, but not be limited to, the following; E.P. TOX metals, herbicides, pesticides, PCB, total petroleum hydrocarbons, reactivity for hydrogen sulfide and cyanide, flammability, corrosivity and chlorine.

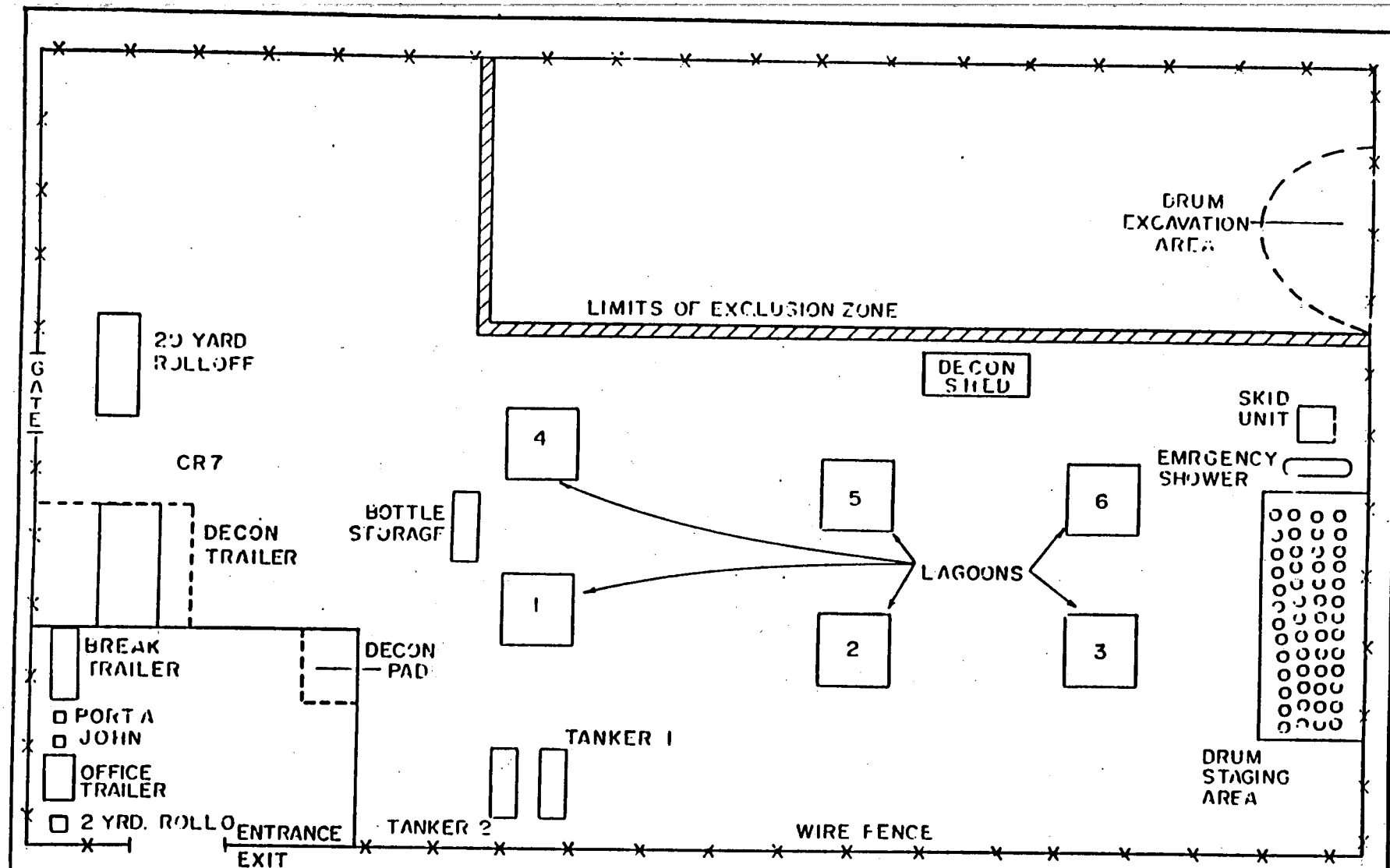
5.0 Transportation and Disposal

Westinghouse will properly package the waste shipments leaving the site in accordance with federal, state and local regulations. Westinghouse will also assist in the labeling, loading and manifesting of a waste transported for disposal. Westinghouse will coordinate with the transporter to ensure compliance with all federal, state and local ordinances on the transportation of hazardous waste. Westinghouse will also inspect the transporters permits to ensure they are current and in order. A visible inspection of the truck and a video log will also be implemented for safety and liability reasons. All information will be noted in the daily log and any variations from the standard operating procedure will be brought to the attention of the OSC.

6.0 Health and Safety Plan Modifications

The June 19, 1989 and the revised Site Safety Plan for the King of Prussia Landfill Site, Winslow Township, Camden County, New Jersey are attached and has been modified to accommodate the current scope of work.

7.0 Site Map



DATE: 10/30/90	KING OF PRUSSIA SITE MAP WINSLOW TOWNSHIP N.J.	DRAWN BY: F. E. L.
SCALE: NOT TO SCALE		FIGURE: 1



Westinghouse
Environmental &
Geotechnical
Services

**King of Prussia Tankers Removal
Work Plan
Winslow Township, New Jersey**

Submitted to:

**United States Environmental Protection Agency
Region II, Removal Action Branch
Edison, New Jersey**

Submitted by:

**Westinghouse Environmental and Geotechnical Services, Inc.
Turnpike Business Center, Suite 549
Cedar Lane
Florence, New Jersey**



Westinghouse Environmental
and Geotechnical Services, Inc.

Springhouse Corporate Center II
323 Norristown Road, Suite 200
Ambler, Pennsylvania 19002
(215) 542-9100
Fax (215) 542-9105

March 14, 1991

Mr. Gene Dominack
United States Environmental
Protection Agency
Region II - Emergency and
Remedial Response Division
Woodbridge Avenue
Edison, NJ 08837

RE: King of Prussia
Work Plan, Tanker Removal
Piney Hallow Road
Winslow Township, New Jersey 08095
D.O. # 0016-02-003
MOD. # 007
Westinghouse Project Number 2340-89-4047

Dear Mr. Dominack:

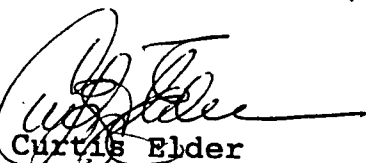
Westinghouse Environmental and Geotechnical Services, Inc. (Westinghouse) appreciates the opportunity to present this updated work plan regarding the referenced project. The scope of work is based upon your February 14, 1991 amendment of Solicitation/Modification of Contract, and our February 27, 1991 on-site meeting and discussion.

If you have any questions regarding the proposed scope of work, please do not hesitate to contact us.

Very truly yours,

WESTINGHOUSE ENVIRONMENTAL AND GEOTECHNICAL SERVICES, INC.


Bobby Dease
Response Manager


Curtis Elder
Manager, Project Management
Department

BD/CE/vlh

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1.0 Introduction

Facility/Operations/Site Description

The King of Prussia Landfill is an abandoned hazardous waste management facility located along Piney Hollow Road, Winslow Township, Camden County, New Jersey. The property is bounded on three sides by a State Wildlife Management Area and the fourth borders Piney Hollow Road. Along the southern perimeter of the site is an intermittent wetland which feeds directly into the Great Egg Harbor River. The site is in a rural/remote area and the nearest residence is less than a quarter mile from the site. Several gravel operations, a chemical manufacturer, an asphalt plant and the municipal landfill are all within a one-quarter mile radius of the site.

2.0 Mobilization

Site Preparation/Operational Layout

Westinghouse will mobilize all the necessary equipment and manpower to the job site, at the on-scene coordinator's (OSC) discretion.

Initial site preparation has been completed with office trailer, electric power, and telephone service. Additional items required on-site are (2) two porta-Johns, (1) one two-yard roll-off and (1) one eight foot by twenty-four foot decontamination trailer with electricity connected.

General preparation for the tankers removal operation will require the entire tanker area be marked off with caution tape, which will also serve as the boundary for the exclusion zone (EZ). Entrance and exit points will be established along with the contamination reduction zone (CRZ) and the clean zone.

Additional preparation in the EZ will be the placing of geotech fabric underneath and around both tankers prior to any work activity. Also, approximately two to three inches of clean soil will be spread on top of the geotech to prevent sparks from contacting the geotech fabric during the cutting operation.

Two 20-pound fire extinguishers will be located inside the EZ, one inside the CRZ and one outside the clean zone. A large first aid kit, portable eye wash, and a stretcher board are other equipment items to be located within the clean zone.

3.0 Tanker Removal Procedures

Tanker removal will be accomplished through a four-step procedure.

- Step 1 Gain access into the tankers by cutting the top half of each unit off, utilizing acetylene/oxygen torch set.
- Step 2 Each tanker will be manually scraped using hand tools and waste material shoveled into 55-gallon poly-lined drums prior to transferring the tank to the decon area. Visqueen will be laid to capture any spillage.
- Step 3 Both tankers will continue to be cut into smaller sections and moved via the backhoe onto the decontamination pad.
- Step 4 If necessary final cleaning will take place prior to wet down. High pressure spray washing will then be performed..

4.0 Transportation and Disposal

Westinghouse will provide transportation to remove all metal tank debris off-site. Disposal will be at a local metal facility.

5.0 Health and Safety Plan Modifications

The June 19, 1989 and the revised Site Safety Plan for the King of Prussia Landfill Site, Winslow Township, Camden County, New Jersey are attached, and have been modified to accommodate the current scope of work.

6.0 Site Map

Please see attached Site Map.

WESTINGHOUSE HAZTECH SITE-SPECIFIC HEALTH AND SAFETY PLAN

***** The Health and Safety Plan must be reviewed with ALL employees before work begins. Have employees SIGN site plan after it is reviewed.

Project Name: KING OF PRUSSIA Project Number: 2340-89-4047

Site Address: PINEY Hollow Rd Winslow Twp NJ Site Phone: 609-567-2927

Lines of Authority

Project Mgr/Operations Mgr: _____ Phone # _____

Supervisor: B.M. Bakky Dease Off Site Phone # 609-499-0098

Site Health & Safety Coordinator: _____ Alternate: _____

Foreman: LARRY McCall Alternate: _____

Other Personnel:	Functions:	Other Personnel:	Functions:
1. <u>STEVE DAVIS</u>	<u>AD. TECH</u>	7. _____	_____
2. <u>MARK WALDO</u>	<u>TECH</u>	8. _____	_____
3. <u>JAMES EDWARDS</u>	<u>TECH</u>	9. _____	_____
4. _____	_____	10. _____	_____
5. _____	_____	11. _____	_____
6. _____	_____	12. _____	_____

Subcontractor's Company Name: *	Functions:	Contact Person:	Phone Number:
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____

*Give subcontractors a copy of this plan because by law, they must be told about hazards on the job.

Regulatory agencies involved: EPA ☒ Other _____
 Job \$: Lump sum _____ T&M _____ not to exceed _____ unit rate ☒
 Other _____

Plans prepared by: Bobby DEASE Date: 3-14-91
 Position/Title: RESPONSE MANAGER

Plans reviewed by: _____ Date: _____
 Position/Title: _____

Amendments prepared by: _____ Date: _____
 Position/Title: _____

July 8, 1988

Activities to be Performed

1. Spill clean up ☐ Remedial Cleanup ☒ Asbestos ☐ Sampling only ☐
1st Reconnaissance ☐ Other CLEAN OUT, AND DISPOSE TWO TANKERS OFF SITE
2. Soil: excavation ☐ sampling ☐ drilling ☐ other ☐
3. Drum: excavation ☐ sampling ☐ staging ☐ bulking ☐
of Drums ☐ other ☐
4. Well: installation ☐ sampling ☐
5. Building: Decontamination ☐ Demolition ☐
6. Tank: air monitoring ☒ sampling ☐ cleaning ☒ repair ☐
removal ☐ leak containment ☐ demolition/cut up ☒ other ☐
7. Water Treatment: ☐
8. Liquid Treatment: ☐
9. Trenching ☐
10. Other: A SEMI SOLID MATERIAL IN BOTH TANKERS, WILL BE SCRAPED AND PICKED LOOSE THEN SHOVEL INTO 55 GAL POLY LINED DRUMS

Existing Features

Tanks ☒ tank size 5' X 24' # of drums ☐ containers ☐
 buildings ☐ dikes ☐ power lines ☐ sumps ☐ bodies of water ☐
 dips in the land ☐ buried lines ☐ telephone lines ☐ lagoons ☒
 well installations ☒ neighboring homes, businesses ☐ pits ☐
 unusual hazards ☐
 approximate size of site 10 + ACRES
 expected duration of cleanup 5 DAYS

Physical Hazards

Check the hazards which apply to the site:

Heat ☐ Cold ☒ Radiation ☐ Small entry/exit ☐ Confined space ☐
 Electrical equipment/sparks ☒ Scaffolds ☐ Trenching ☐ Earthquake ☐
 Oxygen deficiency ☐ High winds ☐ Slippery ground ☒ Ice ☐
 Snake bites ☐ Turbulent weather ☐ Heavy equipment noise ☐ Falls ☒
 See General Health and Safety Plan for detailed confined space information.

Medical Surveillance

All HAZTECH field employees are enrolled in the medical monitoring program which includes a minimum of a baseline, annual, and exit physical. For more information see the Medical Monitoring Program. If you are not sure if additional medical tests should be performed, contact OMA or the IHS. If Level C or B and adjusted temps are 82.5°-85° or hotter, oral temperatures must be taken every 60 minutes or more often. [Temp(adj) = ambient temp + (13 x % sunshine)] See general plan for more details.

Will taking oral temperatures and monitoring be necessary? yes ☐ no ☐
 If yes, order thermometers. Will steel cool vests be needed? yes ☐ no ☐
 If no, write in expected temperature maximum

Contaminants

Please fill out 1 sheet for each significant contaminant using page 4. Use the following references:

Sittig's Handbook of Toxic & Hazardous Chemicals & Carcinogens, NIOSH's Pocket Guide to Chemical Hazards, and ACGIH's TLV's Threshold Limit Values 1987-88, Condensed Chemical Dictionary, and Hazardous Chemicals Data Book.
 If MSDS is available, attach.

NA = not applicable DNA = data not available

*OSHA REQUIREMENT

Site Map

Please label the following on the map:

1. prevailing wind direction
2. work areas and hot zone
3. decontamination zone
4. clean zone
5. office and/or support
6. location of eye wash
7. location of emergency shower
8. 1st aid area
9. rest areas
10. 2 or more escape routes
11. offsite meeting place
(for emergency)
12. offsite landmarks
13. well installations
14. problem containment areas*
15. topography* (rivers, cliffs, etc.)
16. roads/air accessibility*
17. pathways for hazardous
dispersions*

SUBSTANCE:

Physical state: solid ☐ sludge ☐ liq. in container ☐ free liq. ☐ vapor ☐on soil ☐ residue ☐ other ☐
Fire: combust ☐ flam ☐ pyrophoric ☐ shock sensit ☐ explos ☐
DNA ☐Incompatibles: strong oxidizers (Cl, O-O's, etc) ☐ water ☐ air ☐
strong acids ☐ strong bases ☐ active metals ☐ heavy metals ☐
other ☐Exposure limits: '87 TLV ☐ ppm or ☐ mg/m3 "SKIN" yes ☐ no ☐
PEL ☐ ppm or ☐ mg/m3 IDLH ☐ ppm ☐ mg/m3Radioactives: yes ☐ no ☐ expected ☐Warning Properties: corrosive: yes ☐ no ☐Respiratory irritant: yes ☐ no ☐ skin irritant: yes ☐ no ☐odor characteristics ☐ odor threshold ☐Skin absorber: yes ☐ no ☐

SIGNS AND SYMPTOMS:

☐ Abdominal pain	☐ Diarrhea	☐ Nausea
☐ Anorexia	☐ Dizziness	☐ Nervousness
☐ BAD JUDGMENT	☐ Drowsiness	☐ Nose irritation
☐ Blindness	☐ Excess eye discharge	☐ Numbness
☐ Breathing problems	☐ Eye burns on contact	☐ Pulmonary edema
☐ Chest pain	☐ Eye irritation	☐ Skin burns on contact
☐ Chloracne	☐ Fatigue	☐ Skin discoloration
☐ CMS depression	☐ Fever	☐ Skin edema
☐ Collapse	☐ Headache	☐ Skin irritation
☐ Coma	☐ Heart palpitations	☐ Skin thickening
☐ Confusion	☐ Irritability	☐ Throat irritation
☐ Convulsions	☐ Jaundice	☐ Tremors
☐ Coughing	☐ Lacrimation (tears)	☐ Vision disturbances
☐ Dark urine	☐ M&M irritation	☐ Vomiting
☐ Death	☐ Motor Incoordination	☐ Weakness
☐ Dermatitis	☐ Nail discoloration	

Other Signs/Symptoms: _____

Long Term Effects:

Suspect carcin ☐ human carcin ☐ teratogen ☐ mutagen ☐ sensitizer ☐ NA ☐
damage to: CNS ☐ liver ☐ kidney ☐ skin ☐ resp ☐ blood formers ☐FIRST AID: flush eyes w/water ☐ flush skin w/water ☐ wash skin ☐
get to clean air ☐ give oxygen ☐ if not breathing, art. respir. ☐
Other ☐

OPTIONAL INFORMATION:

vapor density (air=1): heavier than air ☐ lighter than air ☐
vapor pressure ☐ soluble: water ☐ other ☐
appearance ☐
reaction w/incompatibles ☐

SUBSTANCE:

Physical state: solid ☒ sludge ☐ liq. in container ☒ free liq. ☐ vapor ☐
 on soil ☒ residue ☐ other ☐
 Pure: combust ☐ flam ☐ pyrophoric ☐ shock sensit ☐ explos ☐
 DNA ☒

Incompatibles: strong oxidizers (Cl, O-O's, etc) ☐ water ☐ air ☐
 strong acids ☐ strong bases ☐ active metals ☐ heavy metals ☐
 other ☐

Exposure limits: '87 TLV ☐ ppm or ☐ mg/m3 "SKIN" yes ☐ no ☐
 REL ☐ ppm or ☐ mg/m3 IDLH ☐ ppm ☐ mg/m3

Radioactives: yes ☐ no ☒ expected ☐

Warning Properties: corrosive: yes ☐ no ☒

Respiratory irritant: yes ☒ no ☐ skin irritant: yes ☐ no ☒

odor characteristics MILD to NONE odor threshold ☒

Skin absorber: yes ☐ no ☒

SIGNS AND SYMPTOMS:

☐ Abdominal pain	☐ Diarrhea	☐ Nausea
☐ Anorexia	☐ Dizziness	☐ Nervousness
☐ BAD JUDGMENT	☐ Drowsiness	☐ Nose irritation
☐ Blindness	☐ Excess eye discharge	☐ Numbness
☐ Breathing problems	☐ Eye burns on contact	☐ Pulmonary edema
☐ Chest pain	☐ Eye irritation	☐ Skin burns on contact
☐ Chloracne	☐ Fatigue	☐ Skin discoloration
☐ CNS depression	☐ Fever	☐ Skin edema
☐ Collapse	☐ Headache	☐ Skin irritation
☐ Coma	☐ Heart palpitations	☐ Skin thickening
☐ Confusion	☐ Irritability	☐ Throat irritation
☐ Convulsions	☐ Jaundice	☐ Tremors
☐ Coughing	☐ Lacrimation (tears)	☐ Vision disturbances
☐ Dark urine	☐ M&M irritation	☐ Vomiting
☐ Death	☐ Motor Incoordination	☐ Weakness
☐ Dermatitis	☐ Nail discoloration	

KOP 2.1082

Other Signs/Symptoms: _____

Long Term Effects:

suspect carcin ☐ human carcin ☐ teratogen ☐ mutagen ☐ sensitizer ☐ NA
 damage to: CNS ☐ liver ☐ kidney ☐ skin ☐ resp ☐ blood formers ☐

* FIRST AID: flush eyes w/water ☒ flush skin w/water ☐ wash skin ☐
 get to clean air ☐ give oxygen ☐ if not breathing, art. respir. ☐
 other ☐

OPTIONAL INFORMATION:

density (air=1): heavier than air ☐ lighter than air ☐
 vapor pressure ☐ soluble: water ☐ other ☐
 appearance ☐
 reaction w/incompatibles ☐

SUBSTANCE:

Physical state: solid ___ sludge ___ liq. in container ___ free liq. ___ vapor ___
 on soil ___ residue ___ other ___
 re: combust ___ flam ___ pyrophoric ___ shock sensit ___ explos ___
 DNA ___

Incompatibles: strong oxidizers (Cl, O-O's, etc) ___ water ___ air ___
 strong acids ___ strong bases ___ active metals ___ heavy metals ___
 other ___

Exposure limits: '87 TLV ___ ppm or ___ mg/m3 "SKIN" yes ___ no ___
 PEL ___ ppm or ___ mg/m3 IDLH ___ ppm ___ mg/m3

Radioactives: yes ___ no ___ expected ___

Warning Properties: corrosive: yes ___ no ___
 Respiratory irritant: yes ___ no ___ skin irritant: yes ___ no ___
 odor characteristics ___ odor threshold ___

Skin absorber: yes ___ no ___

SIGNS AND SYMPTOMS:

Abdominal pain	Diarrhea	Nausea
Anorexia	Dizziness	Nervousness
BAD JUDGMENT	Drowsiness	Nose irritation
Blindness	Excess eye discharge	Numbness
Breathing problems	Eye burns on contact	Pulmonary edema
Chest pain	Eye irritation	Skin burns on contact
Chloracne	Fatigue	Skin discoloration
CNS depression	Fever	Skin edema
Collapse	Headache	Skin irritation
Coma	Heart palpitations	Skin thickening
Confusion	Irritability	Throat irritation
Convulsions	Jaundice	Tremors
Coughing	Lacrimation (tears)	Vision disturbances
Dark urine	M&M irritation	Vomiting
Death	Motor Incoordination	Weakness
Dermatitis	Nail discoloration	

Other Signs/Symptoms: _____

Long Term Effects:

Aspect carcin ___ human carcin ___ teratogen ___ mutagen ___ sensitizer ___ NA
 Damage to: CNS ___ liver ___ kidney ___ skin ___ resp ___ blood formers ___

FIRST AID: flush eyes w/water ___ flush skin w/water ___ wash skin ___
 get to clean air ___ give oxygen ___ if not breathing, art. respir. ___
 other _____

ADDITIONAL INFORMATION:

vapor density (air=1): heavier than air ___ lighter than air ___
 vapor pressure ___ soluble: water ___ other ___
 appearance _____
 reaction w/incompatibles _____

Contamination

Wooden tools used on skin absorbing contaminants should be discarded.
 Remember to bag sensitive instruments before use. See the General Health and Safety Plan for possible decon layouts and list of skin absorbers.

Solution(s) to be used: detergent & water ☒ Zep _____ Other: _____
 Methanol _____ Isopropanol _____ Hexane _____ Radiac _____
 Ivory (for oil) _____ Penatone (for PCBs) _____ Kerosene _____
 Aquinox (good for pumps) _____ Diluted HTH _____

Heavy Equipment:

Decon Plan: Waterlaser ☒ Diesel _____ Steam Cleaners _____
 Other: _____

Special Training or Review of Training

According to OSHA's 1910.120, the following items as they apply to the project must be discussed before work begins:

- + Emergency procedures, evacuation routes, prevailing wind direction, signals, location of eye wash, 1st aid equipment
- + Medical assistance (location, maps, phone numbers)
- + The buddy system and its responsibilities
- + Safe work practices for this particular job
- + Symptoms and signs associated with the contaminants
- + Other properties of the contaminants (carcinogenic, flammable, etc.)
- + Confined space (hazards, safe work practices, the buddy system, etc.)
- + Decontamination (solutions, layout, etc.)
- + Appropriate PPE

Please check if these topics are also relevant and consequently need review:

Heat stress _____ Cold stress ☒ Odor thresholds ☒ Confined space _____
 Unusual hazards _____ Handling shock sensitives _____ Drum Handling _____
 Other: REVIEW HOT CUTTING PROCEDURES, PROPER SAFETY EQUIPMENT

Air Monitoring

Air Monitoring Equipment Needed:

Gas ☒ O₂ meter ☒ Explosimeter ☒
 Sample pump ensemble: Dupont or Gillian pumps _____ Media _____ Tubing _____
 Passive dosimeters for organic vapors _____ Geiger counter _____
 Detector tubes (useful for inorganics) types _____
 Confined space: CO _____ H₂S _____

Other: _____

*Remember CONTINUOUS monitoring is necessary for confined spaces.

*** Be sure to calibrate and to attach log with air monitoring data. Send this information to H&S in Atlanta. Periodically contact H&S with results. If initial reconnaissance data is available, please attach results. If another company has air monitoring data, obtain a copy and attach to plan.

AIR MONITORING SCHEME - WRITE IN RESULTS!

Confined Space (CS)

Work Area/Hot Zone

Explosimeter

b4 entry/continually
within CS

Explosimeter

b4 work/continually/1/3 hr/1 hr/4 hr/daily/new act

O₂

b4 entry/continually
within CS

O₂

b4 work/continually/1/3 hr/1 hr/4 hr/daily/new act

HNu

b4 entry/continually/
other _____

HNu

b4 work/continually/1/3 hr/1 hr/4 hr/daily/new act

Detector Tubes

CO: b4 entry/1 hr/4 hr/
other _____

Detector tubes

Tube type: _____

H₂S: b4 entry/1 hr/4 hr/
other _____

b4 work/1/4 hr/1/2 hr/1 hr/4 hr/daily/
other: _____

Other tube type: _____

b4 entry/1 hr/4 hr/
other time _____

Sample Pumps

Worn by person closest to contamination sources.
Sample for which contaminant? _____

Other: _____

daily/T&R/weekly/new act/other _____

b4 entry/1 hr/4 hr/
other time _____

Vacuum Canisters or Grab Bag

b4 work/weekly/new act/once during work/other _____

Sample Pumps

daily/T&R/weekly/new act
other _____

Geiger Counter

b4 work/new act/daily/opening drums/other _____

Vacuum Canisters or Grab Bag

b4 entry/wkly/new act/
once during work/
other _____

Comments:

Geiger counter

b4 work/new activity/NA

T & R = Tuesdays & Thursdays

Please remember the protection factor for full face cartridge respirator is 10,000; for SAR is 2,000; for SCBA is 10,000.

Multiply the protection factor x the TLV = maximum amount of contaminant in ppm allowed for that respirator. Exception: Switch to SARs or SCBAs when levels are IDLH or when O_2 is 19.5% or less, or if working in confined space.

For example: full face cartridge respirator X TLV Acetic Acid

50

X 10ppm $\leq$ 500 ppm Acetic Acid
with that respirator.
(IDLH = 1000 ppm)

Hard hats must be worn for all excavation activities.

For when hazards are unknown, Level B protection is required.

In Level C, 2 hoods must be worn, on under respirator straps and one over the straps.

EPA Criteria for PPE; Total Organics; FOR UNKNOWNNS:

Level C 0-5ppm total organics above background

Level B 5-500 ppm total organics above background

Level A 500-1000 ppm total organics above background

Indicate the protection level expected to begin the job and what the criteria will be for a change in protection level.

Personal Protective Equipment

Concentration of Contaminant

Level C 0 ppm to 5 ppm or activities PREVIOUS INSTRUMENT READING INDICATED 0.0PPM
Full face resp. cartridge A0 R 53 HE, MSA GMC-H
Protective clothing: Tyvek 1 Other: _____
Hood: 2 Tyvek 1 2 Other: _____
Inside glove: Sample 1 Other: _____
Outside glove: PVC _____ Other: COTTON
Footwear: Tingley (neoprene) ☒ steel toe ☒ other _____
Face Shield: ☒ Hard hat: ☒
Other: _____

Level B _____ ppm to _____ ppm or activities _____
SCBA _____ SAR _____
Protective clothing: Tyvek _____ Chemrel _____ acid suit (PVC) _____
Other: _____
Hood: Tyvek _____ Acid Suit _____ Other: _____
Inside glove: Sample _____ Other: _____
Outside glove: PVC _____ Other: _____
Footwear: Tingley(neoprene) _____ steel toe _____ other _____
Face Shield: _____ Hard hat: _____
Other: _____

Level A _____ ppm to _____ ppm or activities _____
SCBA _____
Encapsulating Suit _____
Plus what items _____
Other: _____

Non-flammable suits _____

[illegible]

LEVEL OF PROTECTION

RISK ANALYSIS:

(Probability Of)

Hot Zone CLEANING OUT
AND CUTTING TANKERS

A B (C) D Other

Fire

No

Heat
Stress

NO

Illness/
Illness

No

Bac
Inj

Ni

A B C D Other

A B C D Other

A B C D Other

A B C D Other

A B C D Other

A B C D Other

A B C D Other

A B C D Other

A B C D Other

A B C D Other

A B C D Other

A B C D Other

Decon Zone High pressure
Washing TANKER SECTIONS

A B C D Other

No

140

No

2

A B C D Other

A B C D Other

A B C D Other

Communication Procedures

CLEAR

Radio/Horn Blast/Siren/Other: HOT ZONE is the emergency signal to indicate that all personnel should leave the Exclusion Zone.

Hand Signals:

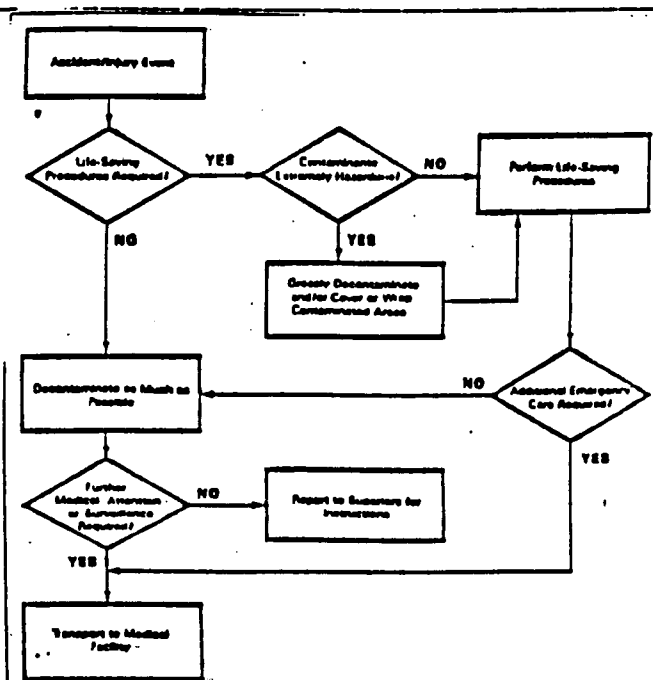
Hands on top of head = Need work assistance
 Hands around neck = Out of air, can't breathe
 Hands in U shape = In trouble or out of air
 Grip partner's wrist/
 hands around waist = Leave area immediately
 Thumbs up = Ok, I am all right, I understand Thumbs down = No, negative
 Blasts: 1 long horn blast = Evacuate 1 short blast = Attention
 2 blasts---Fire

Emergency Equipment: eyewash ☒ shower ☒ lifeline _____ harness _____ SCBA _____
 stretchers ☒ emergency oxygen ☒ first aid kit ☒ PPE for the next level _____
 protection _____ radios _____ telephones ☒ airhorns _____
 Fire Extinguishers: A,B,C (Multiple purpose) _____
 A (ordinary materials) ☒ B (flammables and grease) ☒
 C (electrical equipment) ☒ D (combustible metals e.g. Mg, Na, K) _____

Other: _____

MEDICAL EMERGENCY & HEAT STRESS
 (NEW GENERAL PRIORITIES)

1. Survey Situation.
2. Call for help & EMT's.
3. Decide: rescue in 1 level higher or SCBA.
4. Rapidly survey victim and area for clues. Look for chem releases.
5. Do chin lift to open airway; watch or feel for chest rise and fall for 5+ seconds. No breathing = brain damage in 3 minutes.
6. If no breathing, move from area; perform artificial respiration - 2 full breaths and check pulse. If no, 1 breath every 5 seconds for 1 minute. If no pulse, do CPR if qualified, or call out for CPR & continue artificial respiration.
7. If breathing, move to decon.
8. Chin lift! Keep airway open.
9. If contaminants are life-threatening, do cursory decon. If not, CUT OUT of PPE!! Look for contamination.
10. If fire burns - roll on dirt or use blanket. Stop clothing from smouldering. Use STERILE solution if no sterile sheet. Cut off clothing except areas stuck to skin. AIRLIFT.



11. Speedily FLUSH contaminated eyes or skin for 15+ minutes.
12. If shock, put nothing in mouth; calm.
13. For heat/stress and no shock, get cool water, keep cool.
14. Never use ice nor buckets of water.
15. Sponge or wrap in wet sheet for stress but not thermal burns.
16. Do chin lift, recheck breathing.
17. Do not hesitate to use airlift.

Emergency Contacts

Post at Site, in many locations. Post map in vehicles likely to be used during an emergency.

1. EMT's Phone # _____ 911 Available/Not Available in this area

2. Hospital: Phone # 609-561-3300 Travel Time 20 MIN

Name WEST JERSEY Address TOWNSEND AVE & WHITE HORSE PIKE
HOSPITAL SO. DIVISION BERLIN, NEW JERSEY

Map: SEE GENERAL SITE HEALTH AND SAFETY Written Directions:
 PLAN. SECTION 9.2

3. Fire Phone # 609-561-0696 4. Police Phone # 609-561-0696

5. Poison Center Phone # 609-768-6060

6. HAZMAT Phone # _____ Status & capabilities to aid in an emergency _____

**Medical Toxicology Consultants (813) 253-2787, (813) 253-4444
 Drs. Gaar and Hillman

HAZTECH, (404) 981-9338 - 24 hour emergency

Atlanta (404) 981-9332, (404) 593-3803, (404) 593-3464

Tampa (813) 988-5650, New Jersey (609) 298-8705

Toledo (419) 882-3306, Boston (617) 353-6492

Chemtrec (24 hrs) (800) 424-9300

Bureau of Explosives (24 hrs) (202) 293-4048

National Response Center (NRC) (800) 424-8802

**Occupational Medicine Associates (OMA) (404) 449-9014, 455-7008
 Dr. Henderson, Syfried, Prader
 After 4:30 p.m., (404) 529-9117

CONFINED SPACE ENTRY PERMIT

Page 2

AIR MONITORING/TESTING

Monitor breathing zone, high overhead, near hips/knees, and at the floor (many flammable gases are heavier or lighter than air). Test different levels; if levels are >10%, proceed with further testing, five minutes apart to be certain.

For atmospheres less than 20% of the LEL, use non-sparking tools.

If LEL is greater than 20%, or if oxygen levels are greater than 21.5% (normal=20.9), entry is FORBIDDEN until engineering controls are used to alter the atmosphere. If LEL is between 10% and 20%, altering the atmosphere is wise because conditions may change.

CONTINUOUS monitoring inside the space is critical.

OXYGEN METER

	b4 entry 1st	2nd	3rd	some values during work
overhead	_____	_____	_____	_____
breathing zone	_____	_____	_____	_____
hips/ knees	_____	_____	_____	
floor	_____	_____	_____	

EXPLOSIMETER

	b4 entry 1st	2nd	3rd	some values during work
overhead	_____	_____	_____	_____
breathing zone	_____	_____	_____	_____
hips/ knees	_____	_____	_____	
floor	_____	_____	_____	

Tests Performed By: _____

Signature

Time

Date

CONFINED SPACE ENTRY PERMIT
Page 3

STANDBY/RESCUE: (Phone No. for paramedics: _____)

Yes

No

☐☐

Will there be a standby person on the outside in constant visual or auditory communication with the person on the inside?

☐☐

Name (Person trained in CPR).

☐☐

Will the standby person be able to see and/or hear the person inside at all times?

☐☐

Has the standby person(s) been trained in rescue procedures?

☐☐

Will safety lines and harness be required to remove a person?

☐☐

Hoist needed?

☐☐

Are you familiar with emergency rescue procedures?

☐☐

Do you know who to notify and how in the event of an emergency?

☐☐

SCBA or SAR Worn?

☐☐

Rescuer in SCBA ready?

☐☐

Communication signals reviewed?

Supervisor's Authorization for Entry:

Time _____

Date _____

Employees Signatures:

RECORDABLE CASES: The OSHA 200 Log is used to record all work-related injuries and illnesses that require medical treatment or lost time from work. It is a form which must be filled out by the employer, or a designated representative, at the time of the injury or illness. It is a permanent record of the injury or illness and is used for statistical purposes.

Instructions: Fill out this form for each injury or illness that is recordable. If an employee is injured or becomes ill more than once during the year, fill out a separate form for each incident. If an employee is injured or becomes ill on more than one day, fill out a separate form for each day. If an employee is injured or becomes ill on the same day, fill out a single form. If an employee is injured or becomes ill on a day that is a holiday or a day when the business is closed, fill out a form for that day. If an employee is injured or becomes ill on a day that is a day when the business is open, but the employee is not working, fill out a form for that day. If an employee is injured or becomes ill on a day that is a day when the business is open, but the employee is not working, fill out a form for that day. If an employee is injured or becomes ill on a day that is a day when the business is open, but the employee is not working, fill out a form for that day.

Form Structure:

- Part 1: General Information**
 - 1. Date of Injury or Illness
 - 2. Location of Injury or Illness
 - 3. Name of Employee
 - 4. Job Title
 - 5. Department
 - 6. Supervisor
 - 7. Description of Injury or Illness
 - 8. Date of First Aid or Medical Treatment
 - 9. Date of Last Day of Absence
 - 10. Date of Return to Work
 - 11. Date of Last Day of Absence
 - 12. Date of Return to Work
- Part 2: Details of Injury or Illness**
 - 13. Description of Injury or Illness
 - 14. Date of First Aid or Medical Treatment
 - 15. Date of Last Day of Absence
 - 16. Date of Return to Work
 - 17. Date of Last Day of Absence
 - 18. Date of Return to Work
- Part 3: Summary**
 - 19. Total Number of Injuries or Illnesses
 - 20. Total Number of Days Lost
 - 21. Total Number of Days of Absence
 - 22. Total Number of Days of Absence
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 - 100. Total Number of Days of Absence

INJURIES

ILLNESSES

Occupational injury is any injury such as a cut, fracture, sprain, amputation, etc., which results from a work accident or from an exposure involving a single incident in the work environment.

NOTE: Conditions resulting from animal bites, such as insect or snake bites or from one-time exposure to chemicals, are considered to be injuries.

Occupational illness of an employee is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact.

7a. Occupational Skin Diseases or Disorders
Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plastic oil acids; chrome ulcers; chemical burns or inflammation; etc.

7b. Dust Diseases of the Lungs (Pneumoconiosis)

7c. Respiratory Conditions Due to Toxic Agents
Examples: Pneumonitis, pharyngitis, trinititis or acute congestion due to chemicals, dusts, fumes, or fumes (farmer's lung, etc.).

Treatment includes treatment (other than first aid) administered or by registered professional personnel under the direction of a physician. Medical treatment does NOT include first aid (first aid treatment and subsequent observation of minor burns, lacerations, and so forth, which do not require medical attention or treatment by a physician or registered professional personnel).

OSHA 200 Log

POST ONLY THIS PORTION OF THE LAST PAGE NO LATER THAN 30 DAYS AFTER THE DATE OF THE INJURY OR ILLNESS

7d. Poisoning (Systemic Effect of Toxic Materials)
Examples: Poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzene, carbon tetrachloride, or other organic solvents; poisoning by insecticides, herbicides, or other pesticides; poisoning by radioactive materials; poisoning by other chemicals such as formaldehyde, plastics, and resins; etc.

7e. Disorders Due to Physical Agents (Other than Toxic Materials)
Examples: Heatstroke, sunstroke, heat exhaustion, and other effects of environmental heat; freezing, frostbite, and effects of exposure to low temperatures; carbon monoxide, effects of ionizing radiation (X-rays, radium); effects of nonionizing radiation (ultraviolet light, microwave oven, microwave, ultrasound, etc.).

7f. Disorders Associated With Repeated Trauma
Examples: Noise-induced hearing loss; neuritis, tenosynovitis, and bursitis; Raynaud's phenomenon; and other conditions due to repeated motion, vibration, or pressure.

7g. All Other Occupational Illnesses

Supervisors & Foremen,
If you get an on-site injury or illness,
① write up an accident report
• send a copy to Sany
• keep a copy of the site trip
• send original to secretary within 2 days or call her (for workers' comp)
② write about the details on OSHA 200 Log
• 2 photos of the loss of the site
• mail the copy to Sany

JOB SAFETY & HEALTH PROTECTION

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers by promoting safe and healthful working conditions throughout the Nation. Requirements of the Act include the following:

Employers

All employers must furnish to employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm to employees. Employers must comply with occupational safety and health standards issued under the Act.

Employees

Employees must comply with all occupational safety and health standards, rules, regulations and orders issued under the Act that apply to their own actions and conduct on the job.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards, and its Compliance Safety and Health Officers conduct jobsite inspections to help ensure compliance with the Act.

Inspection

The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection.

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace.

Complaint

Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold, on request, names of employees complaining.

The Act provides that employees may not be discharged or discriminated against in any way for filing safety and health complaints or for otherwise exercising their rights under the Act.

Employees who believe they have been discriminated against may file a complaint with their nearest OSHA office within 30 days of the alleged discrimination.

Citation

If upon inspection OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each

citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

Proposed Penalty

The Act provides for mandatory penalties against employers of up to \$1,000 for each serious violation and for optional penalties of up to \$1,000 for each nonserious violation. Penalties of up to \$1,000 per day may be proposed for failure to correct violations within the proposed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to \$10,000 for each such violation.

Criminal penalties are also provided for in the Act. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of not more than \$10,000, or by imprisonment for not more than six months, or by both. Conviction of an employer after a first conviction doubles these maximum penalties.

Voluntary Activity

While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce workplace hazards voluntarily and to develop and improve safety and health programs in all workplaces and industries. OSHA's Voluntary Protection Programs recognize outstanding efforts of this nature.

Such voluntary action should initially focus on the identification and elimination of hazards that could cause death, injury, or illness to employees and supervisors. There are many public and private organizations that can provide information and assistance in this effort, if requested. Also, your local OSHA office can provide considerable help and advice on solving safety and health problems or can refer you to other sources for help such as training.

Consultation

Free consultative assistance, without citation or penalty, is available to employers, on request, through OSHA supported programs in most State departments of labor or health.

More Information

Additional information and copies of the Act, specific OSHA safety and health standards, and other applicable regulations may be obtained from your employer or from the nearest OSHA

Atlanta, Georgia
Boston, Massachusetts
Chicago, Illinois
Dallas, Texas
Denver, Colorado
Kansas City, Missouri

Telephone numbers for these offices, and additional area office locations, are listed in the telephone directory under the United States Department of Labor in the United States

Washington, D.C.
1985
OSHA 2203

Edy Park



HOT WORK PERMIT

Date: _____ Time: _____

Location: _____

Issued to: _____

Site Safety Officer: _____

Supervisor: _____

Do not cut or use other open-flame or spark producing equipment until the following precautions have been taken.

Protective Equipment used _____

(Initial Each Item)

- _____ The location where the work is to be done has been personally examined.
- _____ Any available fire protection systems are in service.
- _____ There are no flammable dusts, vapors, liquids or unpurged tanks (empty) in the area.
- _____ Explosimeter reading <10% LEL
- _____ All combustibles have been moved away from the operation, or otherwise protected with fire curtains or equivalent.
- _____ Ample portable fire extinguishing equipment has been provided.
- _____ Arrangements have been made to patrol the area for at least 1/2 hour after the work has been completed.
- _____ The phone number for the local Fire Department is _____

This form must be filled out daily whenever HOT WORK is being conducted and posted at the jobsite.

TANK CUTTING PERMIT

DATE: _____ FROM: _____ TO: _____

LOCATION: _____ PROJECT NO.: _____

WORKERS AUTHORIZED:

FIRE WATCH:

CUTTING METHOD: _____

RIGGING REQUIRED: YES _____ NO _____

TYPE OF CUT: _____

PERSONAL PROTECTIVE EQUIPMENT REQUIRED:

AREA SAFETY EQUIPMENT REQUIRED:

PRE-CUTTING ATMOSPHERIC TESTING:

	READING:	TIME:	INITIALS:
Test for O ₂ content:	_____ %O ₂	_____	_____
Test for flammability:	_____ %LEL	_____	_____
Test for toxicity:	_____ PPM	_____	_____

PERMIT AUTHORIZATION:

I certify that I have inspected the work area for safety and have reviewed all safety precautions recorded on this permit.

PERMIT AUTHORIZED BY (SIGNATURE): _____

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SECTION 14

WELDING AND CUTTING

14.A. GENERAL

14.A.01. All welding and cutting equipment and operations shall be in accordance with standards and recommended practices of the American Welding Society, Safety in Welding and Cutting, ANSI Z49.1, and the recommendations of the National Fire Protection Association (See also 21.D.)

14.A.02. Transformer-type electric welding apparatus shall comply with ANSI C33.2 and shall be installed, maintained, and operated in accordance with the National Electrical Code.

14.A.03. Gas welding and cutting equipment shall be listed by Underwriters' Laboratories, Inc. Chicago, Illinois or by Factory Mutual Laboratories, Boston, Mass.

14.A.04. All welding equipment shall be inspected daily. Defective equipment shall be removed from service, replaced, or repaired and reinspected before again being placed in service.

14.A.05. Each welding or cutting unit shall be equipped with a compatible fire extinguisher.

14.A.06. Compatible fire extinguishing equipment shall be provided in the immediate vicinity of the welding or torch operation whenever combustible material is exposed.

14.A.07. Objects to be welded, cut, or heated shall be moved to a safe location or, if they cannot be moved, all moveable fire hazards in the vicinity shall be taken to a safe place or the combustible material and construction shall be protected from the heat, sparks, and slag of welding.

14.A.08. Workers and the public shall be shielded from welding rays, flashes, sparks, molten metal, and slag.

14.A.09. Cable, hoses, and other equipment shall be kept clear of passageways, ladders, and stairways.

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supply shut off whenever work is suspended.

14.B.02. The torch and hose shall be removed from confined spaces whenever work is suspended.

14.B.03. All oxyacetylene or other fuel gas-oxygen combinations used in cutting or welding equipment shall have reverse-flow check valves between torch and regulator. Manifold systems shall have the reverse-flow valves installed at the manifold connections.

14.B.04. Boxes used for the storage of gas hose shall be ventilated.

14.B.05. Acetylene regulators shall not be adjusted to permit a discharge greater than 15 psig.

14.B.06. Connection of multiple sets of oxy-acetylene hoses to a single regulator on a single set of oxy-acetylene tanks may only be accomplished by installing a commercially available fitting approved by Compressed Gas Association (CGA) Standards and UL listed. The fitting shall be installed on the output side of the regulator and shall have a built-in shut-off valve and reverse-flow check valve on each branch.

14.C. ELECTRIC EQUIPMENT

14.C.01. Switching equipment for shutting down the welding machine shall be provided on or near the welding machine.

14.C.02. The noncurrent carrying metal parts of electrically powered welding machines shall be grounded. Grounding circuits, other than by means of the structure, shall be checked to ensure that the circuit between the ground and the equipment to be grounded has resistance low enough to permit sufficient current to flow to cause the overcurrent device to interrupt the circuit.

14.C.03. Neither terminal of the welding generator shall be bonded to the frame of the welder.

14.C.04. Pipe lines containing gases or flammable liquids or conduits carrying electrical conductors shall not be used for a ground return circuit.

14.C.05. The equipment shall be shut down when

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the leads are unattended.

14.C.06. Cables with splices or repaired insulation within 10 feet of the holder shall not be used.

14.C.07. Welding supply cables shall not be placed near power supply cables or other high tension wires.

14.C.08. Welding leads shall not be permitted to contact metal parts supporting suspended scaffolds.

14.C.09. Circuits from welding machines used for other than welding tools shall be grounded.

14.D. INERT-GAS METAL-ARC WELDING

14.D.01. Chlorinated solvents shall be kept at least 200 feet, unless shielded, from the exposed arc. Surfaces prepared with chlorinated solvents shall be dry before welding is permitted on such surfaces.

14.D.02. Persons in the area not protected from the arc by screening shall be protected by filter lenses. When two or more welders are exposed to each other's arc, filter lens goggles shall be worn under welding helmets. Hand shields to protect the welders against flashes and radiant energy shall be used when either the helmet is lifted or the shield is removed.

14.D.03. Welders and other persons who are exposed to radiation shall be protected so that the skin is covered to prevent burns and other damage by ultraviolet rays. Welding helmets and hand shields shall be free of leaks, openings, and highly reflective surfaces.

14.D.04. When inert-gas metal-arc welding is performed on stainless steel, persons will be protected against dangerous concentrations of nitrogen dioxide by local exhaust ventilation or air line respirators.

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14.A.10. All hollow spaces, cavities, or containers shall be vented to permit the escape of air or gases before preheating, cutting, or welding. Department of Transportation, Office of Pipeline Safety, 49 CFR Part 192, Minimum Federal Standards for Gas Pipelines, shall apply when welding, cutting, and heating on steel pipelines containing natural gas. Pipelines containing gases or flammable liquids or conduits containing electrical circuits shall not be used as a ground return.

14.A.11. When welding or cutting must be done in a location where combustible or flammable materials are located, inspection and written authorization by the designated authority shall be required before such operations are begun. The location shall be checked for latent fires after the work is completed.

14.A.12. Cylinders shall be kept beyond the range of sparks, hot slag, or flame.

14.A.13. Compressed gas cylinders shall be stored, handled, and used in accordance with 21.D.

14.A.14. Positive mechanical and/or personal protective measures shall be taken when welding, cutting, or heating metals of toxic significance in enclosed spaces. When beryllium is involved, provisions of 07.B.08 apply.

14.A.15. Oxygen shall not be used for ventilation, comfort cooling, blowing dust from clothing, or for cleaning the work area.

14.A.16. Before welding, cutting, or heating is commenced on any surface covered by a preservative coating whose flammability is not known, a test shall be made to determine its flammability. Preservative coatings shall be considered to be highly flammable when scrapings burn with extreme rapidity.

14.A.17. Precautions shall be taken to prevent ignition of highly flammable hardened preservative coatings. When coatings are determined to be highly flammable, they shall be stripped from the surface to be heated to prevent ignition.

14.A.18. In enclosed spaces, all surfaces covered with toxic preservatives shall be stripped of all

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toxic coatings for a distance of at least 4 inches from the area of heat application or the employees shall be protected by air line respirators.

14.A.19. In the open air, workers shall be protected against toxic preservative coatings by a respirator that meets requirements of NIOSH.

14.A.20. Preservative coatings shall be removed a sufficient distance from the area to be heated to ensure that the temperature of the unstripped metal will not be appreciably raised.

14.A.21. When the welding, cutting, or heating operation is such that normal fire prevention precautions are not sufficient, additional personnel shall be assigned to guard against fire and instructed in anticipated fire hazards and how fire fighting equipment is to be used. (See also 13.B.03).

14.A.22. Hose which has been subject to flashback, or which shows severe wear or damage, shall be tested to twice the normal pressure to which it is subject but in no case less than 300 p.s.i. Defective hose, or hose in doubtful condition, shall not be used.

14.A.23. No welding, cutting, or heating shall be done where the application of flammable paints, or the presence of other flammable compounds, or heavy dust concentration creates a hazard.

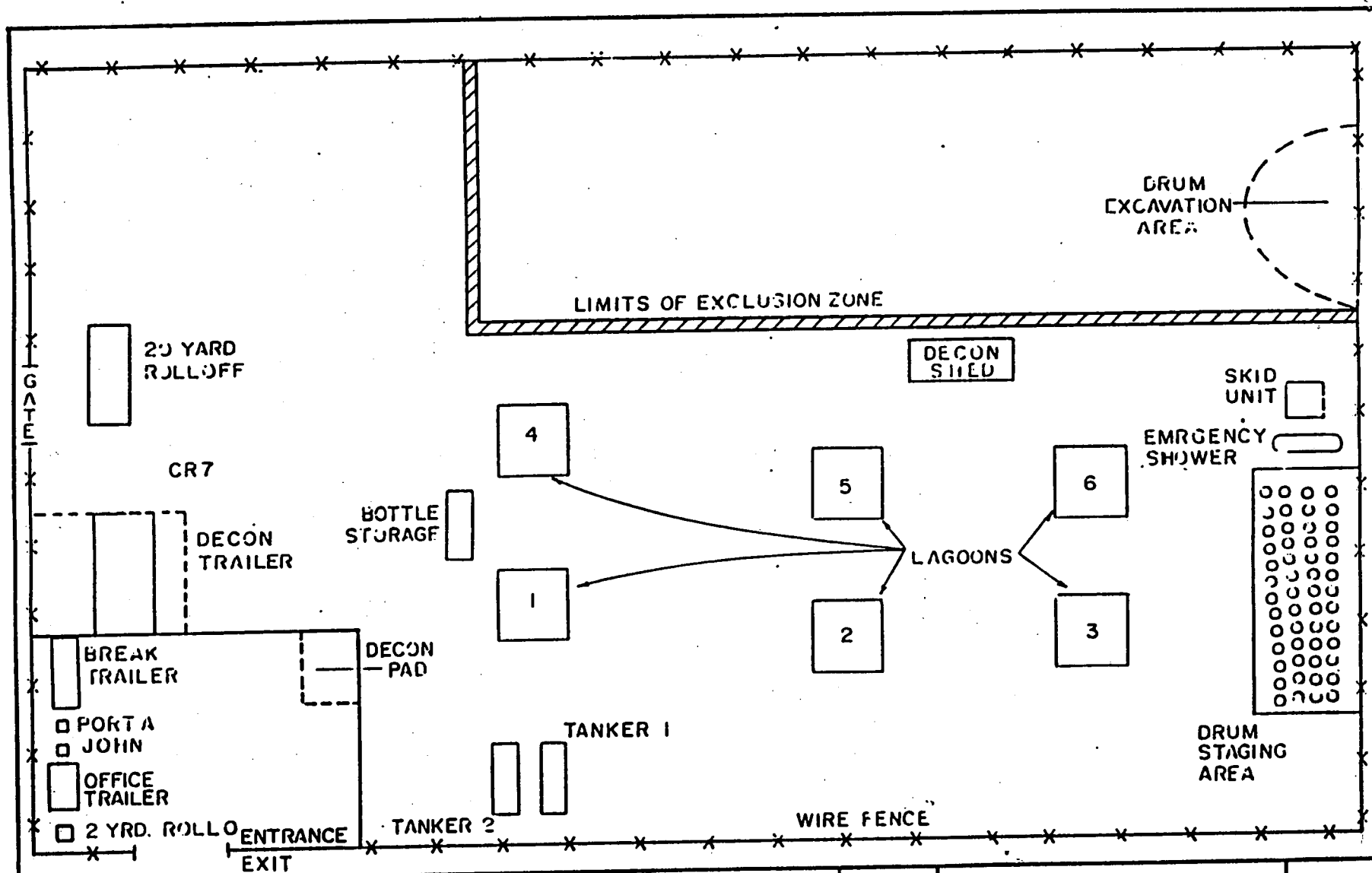
14.A.24. Noncombustible barriers shall be installed below welding or burning operations in or over a shaft or raise.

14.A.25. When welding, cutting, or heating is performed on walls, floors and ceilings, the same precautions shall be taken on the opposite side as are taken on the side on which the welding is being performed.

14.A.26. All structural welding accomplished by the contractor or subcontractor on critical items such as scaffolding, shoring, forms, ladders, piling, etc., shall be performed by certified welders using qualified welding procedures.

14.B. GAS EQUIPMENT

14.B.01. Torch valves shall be closed and gas



DATE: 10/30/90	KING OF PRUSSIA SITE MAP WINSLOW TOWNSHIP N.J.		DRAWN BY: F. E. L.
SCALE: NOT TO SCALE	 Westinghouse Environmental & Geotechnical Services		FIGURE: 1

KOP 2.1123

TECHNICAL MEMORANDUM

RE: King of Prussia Landfill
Magnetometer Survey
Westinghouse Project Number 2340-90-4047

Introduction:

On September 6, 1990, Westinghouse Environmental and Geotechnical Services, Inc. (Westinghouse) conducted a magnetometer survey at the King of Prussia Landfill.

The magnetometer survey was conducted in an attempt to delineate a suspected buried drum field. It encompassed approximately 42,000 square feet of the northeastern-most section of the site immediately north of the abandoned lagoons 4 and 5.

The site was initially gridded at 20 by 50 foot flagged intervals consisting of 13 magnetometer survey lines. Total magnetic field readings were taken at 20 by 10 foot intervals using an EG&G Geometrics Model G-856 proton precession magnetometer. The magnetometer records the intensity of the disturbance between the earth's natural magnetic field and the magnetic field generated or induced by a ferro-magnetic body, in this case suspected buried drums. The total magnetic field recorded measures the difference in the magnetized field of the inducing object and that of the ambient field.

The resulting anomaly is recorded as a magnetic low either approaching or departing the inducing object, and a magnetic high when closer to the center of the inducing body.

Findings

Magnetometer survey lines 1 through 4, located along the western extent of the magnetometer survey area, were initiated 50 feet north of the remaining survey lines and were conducted for complete coverage of the suspected burial area. The magnetic anomaly graphs of the respective survey lines reflect increasingly lower magnetic values as approaching the induced magnetic field of the northern boundary fence. This decreasing anomaly is also noted in the remaining survey lines, however, it may not be as prevalent due to signal interference generated by the mounded/bermed material located along the north boundary within the site.

Technical Memorandum
September 12, 1990
Page 2

Survey lines 5 and 6 and corresponding magnetic anomaly graphs reflect no induced magnetic field throughout their extent.

Survey lines 7 and 8 and corresponding magnetic anomaly graphs reflect minor positive anomalies from 600 to 800 gammas, respectively, generated approximately 0 to 10 feet north of position 0. However, the strength of the generated anomaly may be due in part to an existing monitoring well in the general vicinity and observed scattered surficial metal. Line 8 also shows an abrupt large positive anomaly approximately 80 feet north of position 0, however due to the noted absence of any subsequent negative response, this anomaly cannot be attributed to a buried drum.

Lines 9, 10, and 11 and corresponding magnetic anomaly graphs clearly reflect the presence of a known buried drum approximately 20 feet north of position 0. Lines 10 and 11 also show a larger broad positive anomaly ranging from 800 to 1,500 gammas located 0 to 80 feet north of position 0.

Lines 12 and 13 are located 10 feet immediately west and east, respectively, of the eastern boundary fence. The magnetic anomaly graphs for both characteristically reflect a continuous negative graph plot defining the induced magnetic field of the boundary fence. The single positive anomaly located approximately 180 feet north of position 0 along line 12 is attributed to observed surficial metallic debris.

Conclusions and Recommendations

The magnetometer survey and corresponding magnetic anomaly graphs for the King of Prussia Landfill suggest buried ferro-magnetic material exists at two locations within the site. These two areas of clearly defined magnetic anomalies, occurring 0 to 80 feet north of position 0 along lines 9, 10, and 11 and 0 to 40 feet north of position 0 along lines 7 through 9, suggest the existence of buried drums at these locales. Further delineation of the aerial extent of buried drums at this site might be accomplished by the construction of test pits near the defined magnetic anomalies and the use of Ground Penetrating Radar (GPR) to distinguish nonmetallic drums.

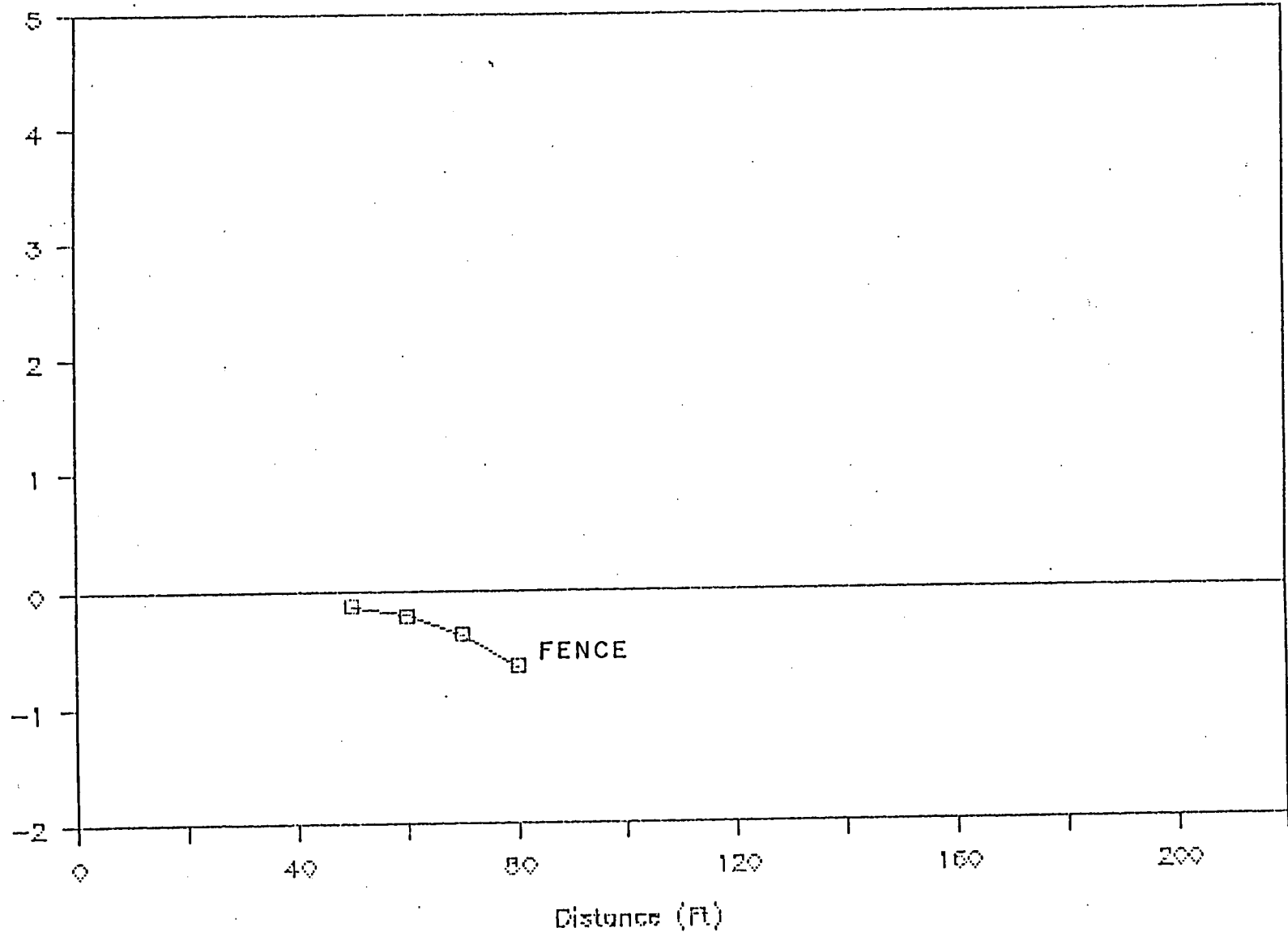
GR4/vlh

Magnetic Anomaly Graph

Line 1

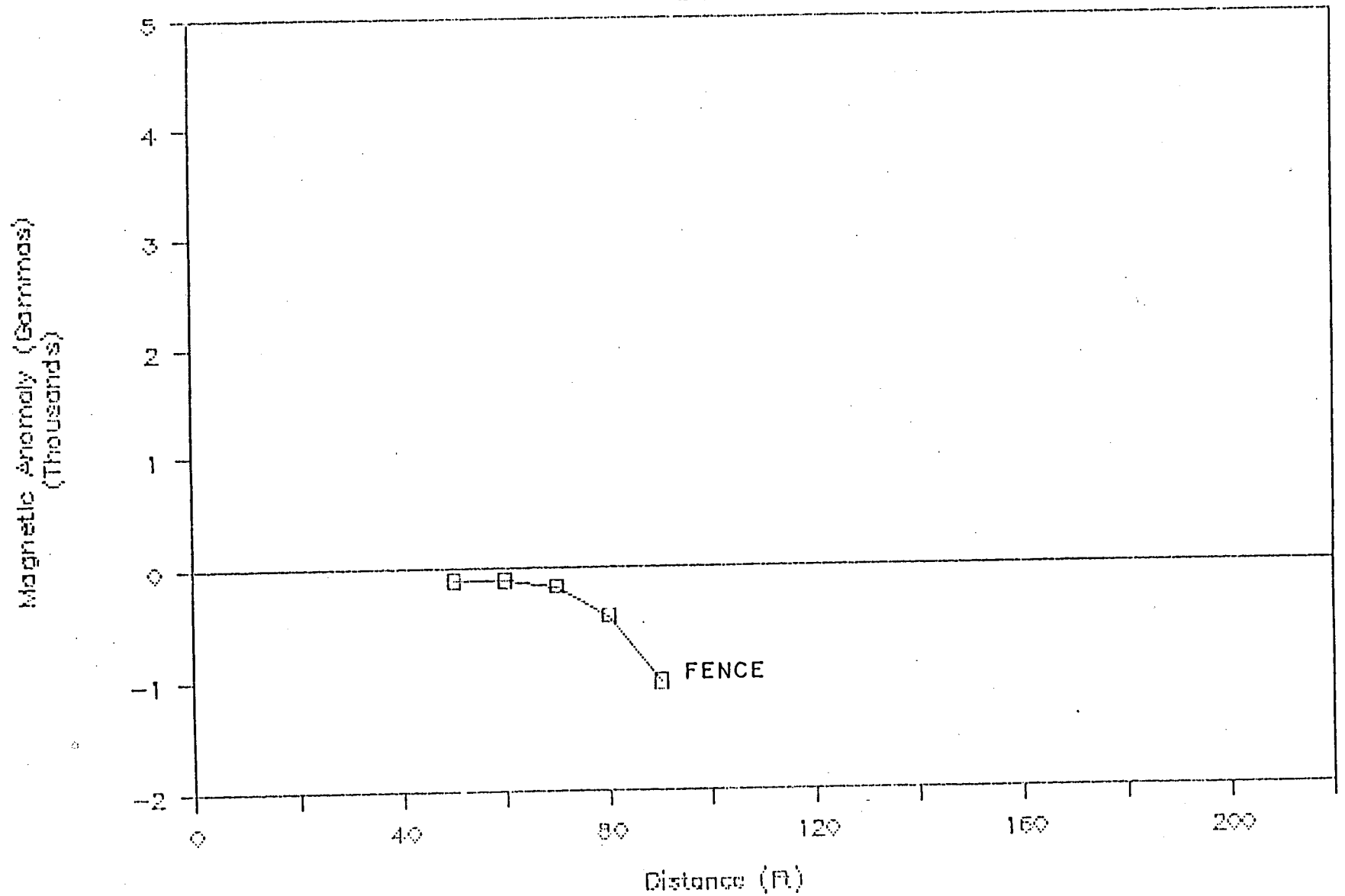


Magnetic Anomaly (Gauss)
(Thousands)



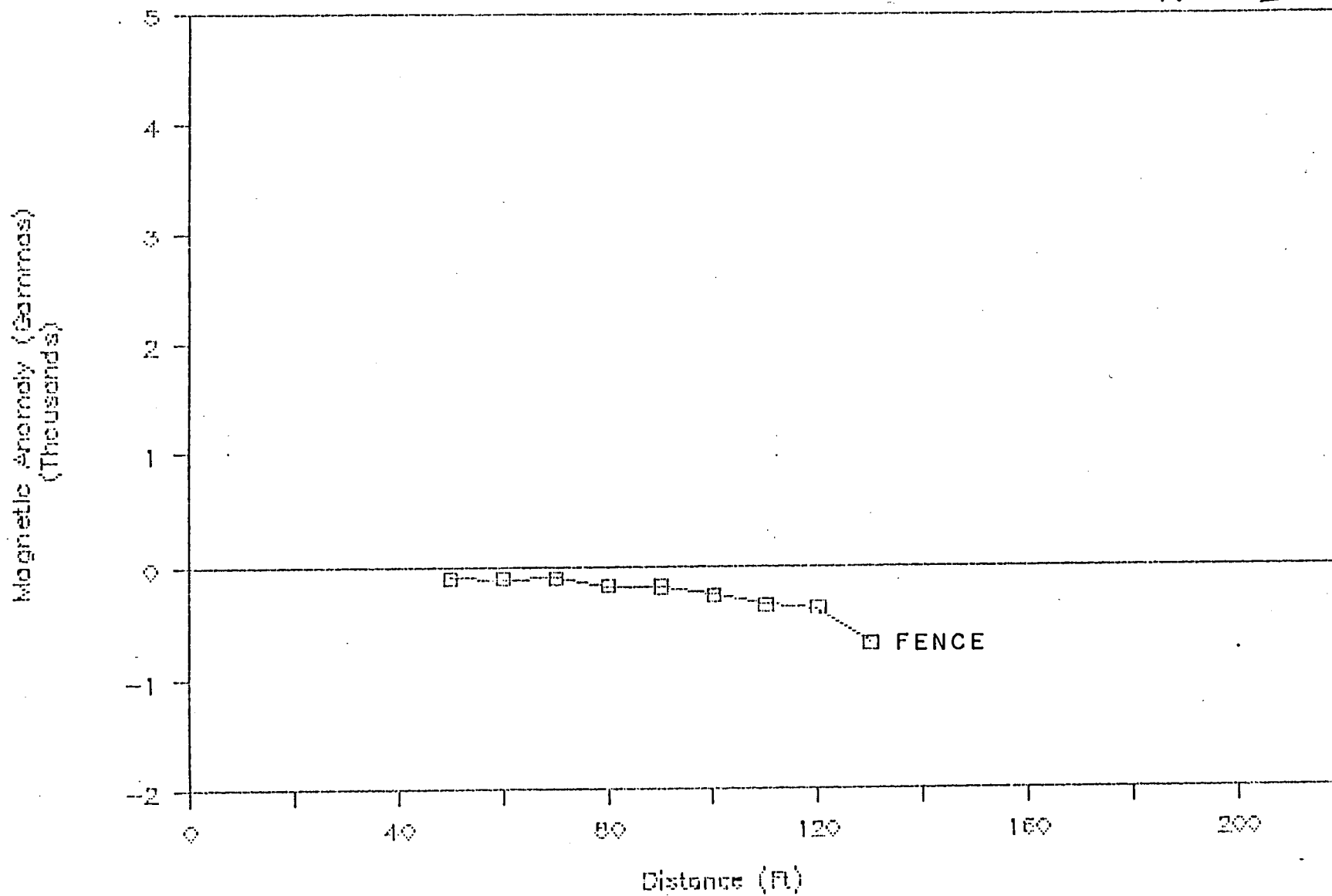
Magnetic Anomaly Graph

Line 2



Magnetic Anomaly Graph

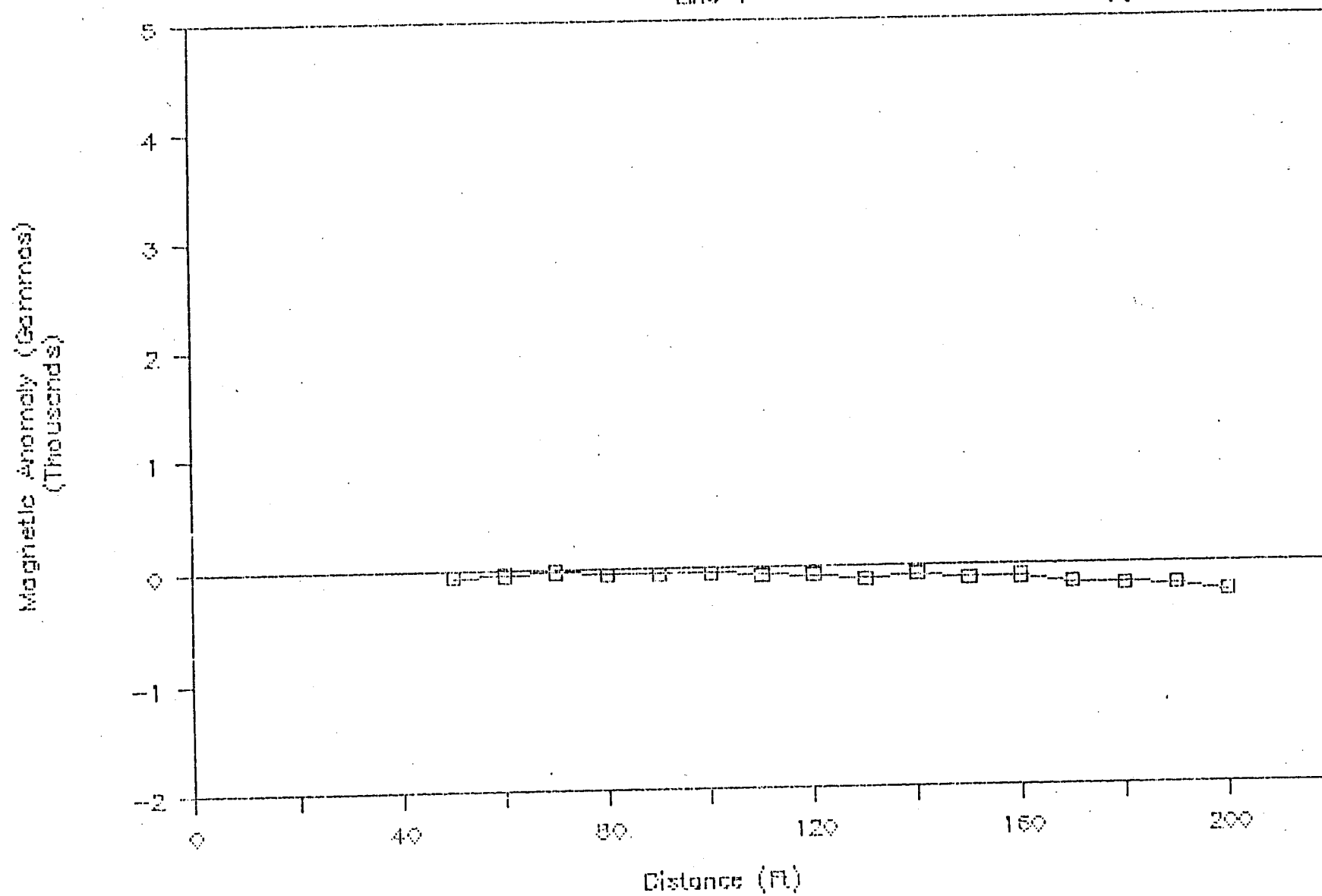
Line 3



Magnetic Anomaly Graph

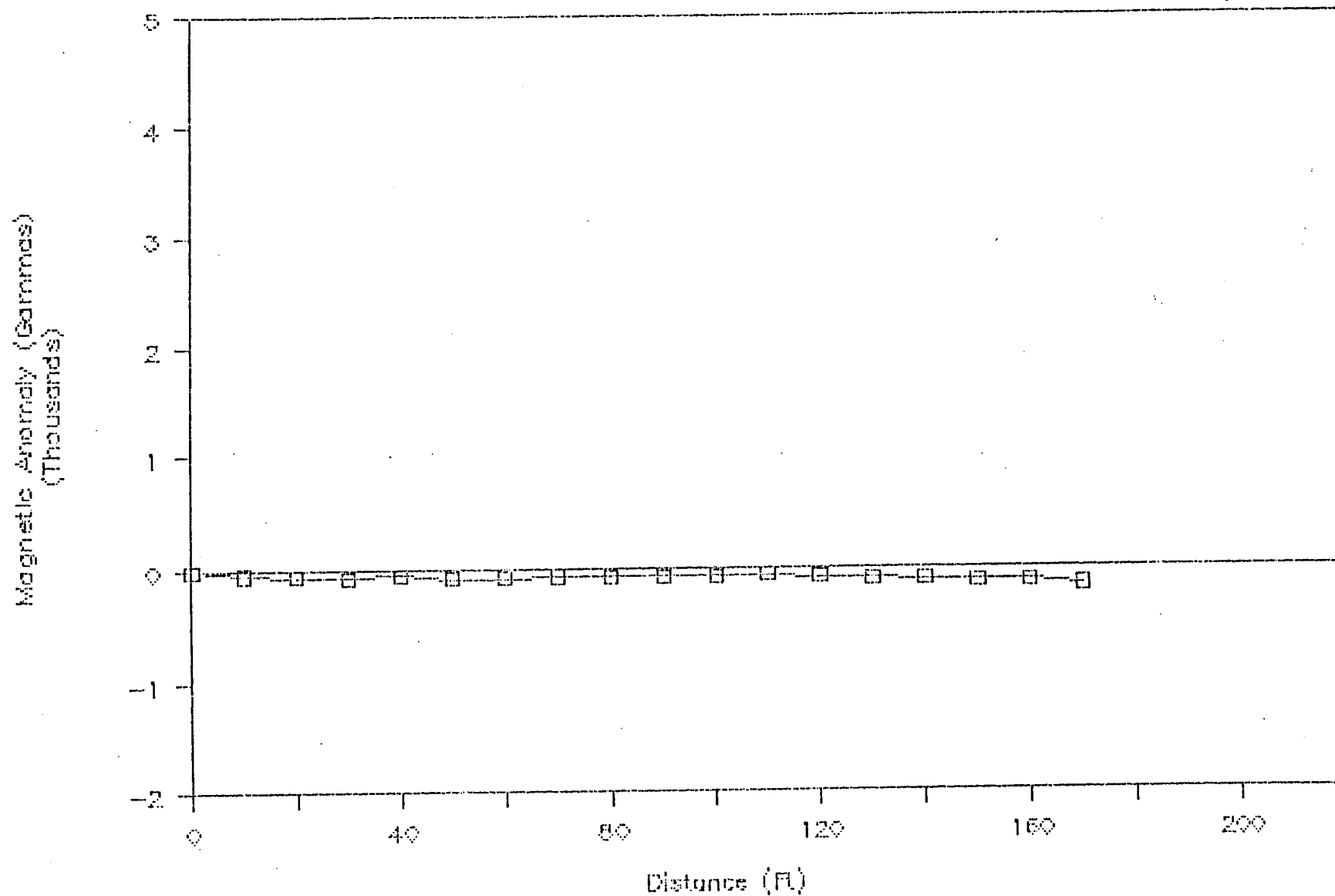
Line 4

N



Magnetic Anomaly Graph

Line 5

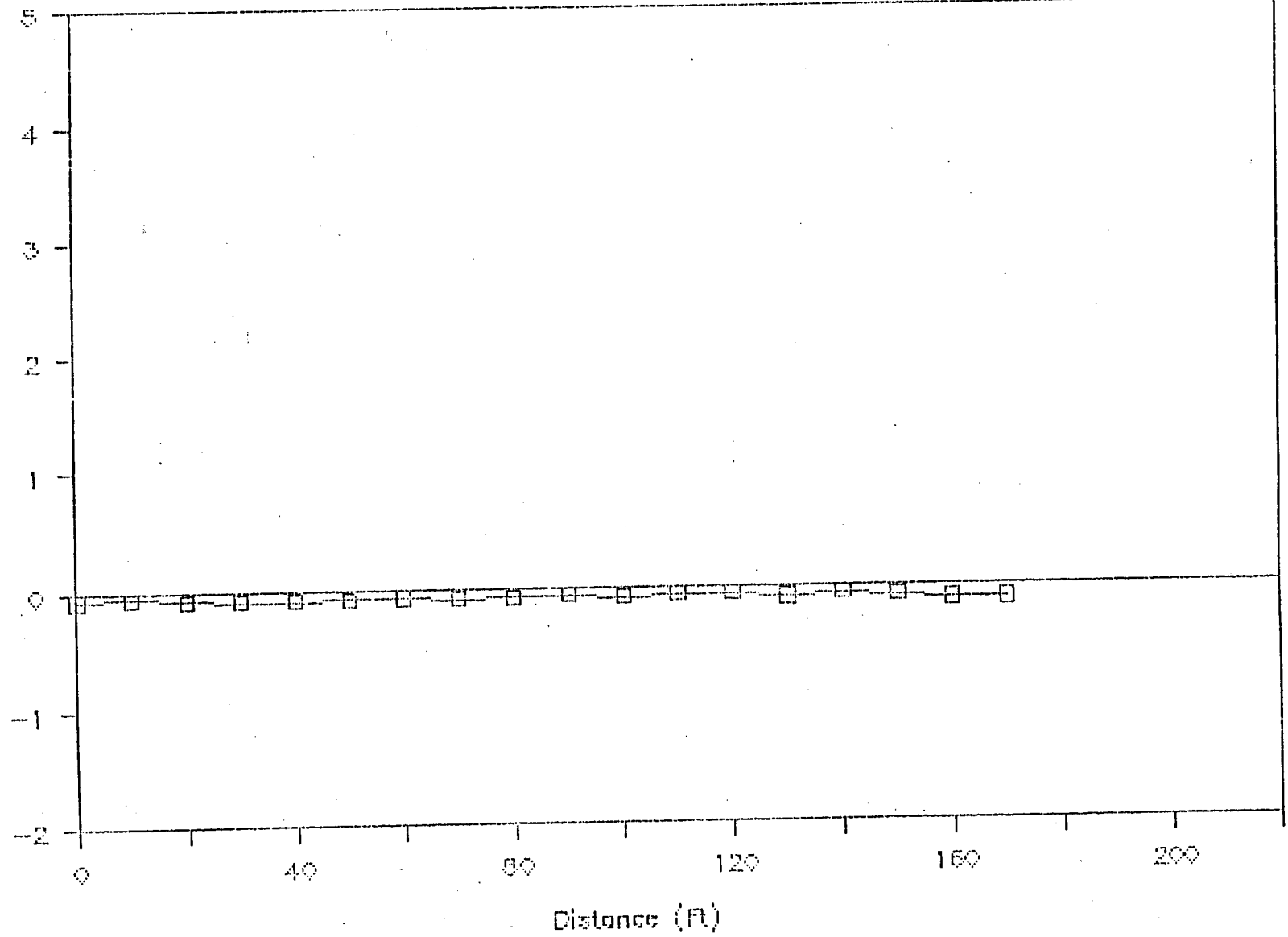


Magnetic Anomaly Graph

Line 6



Magnetic Anomaly (Gammmas)
(Thousands)

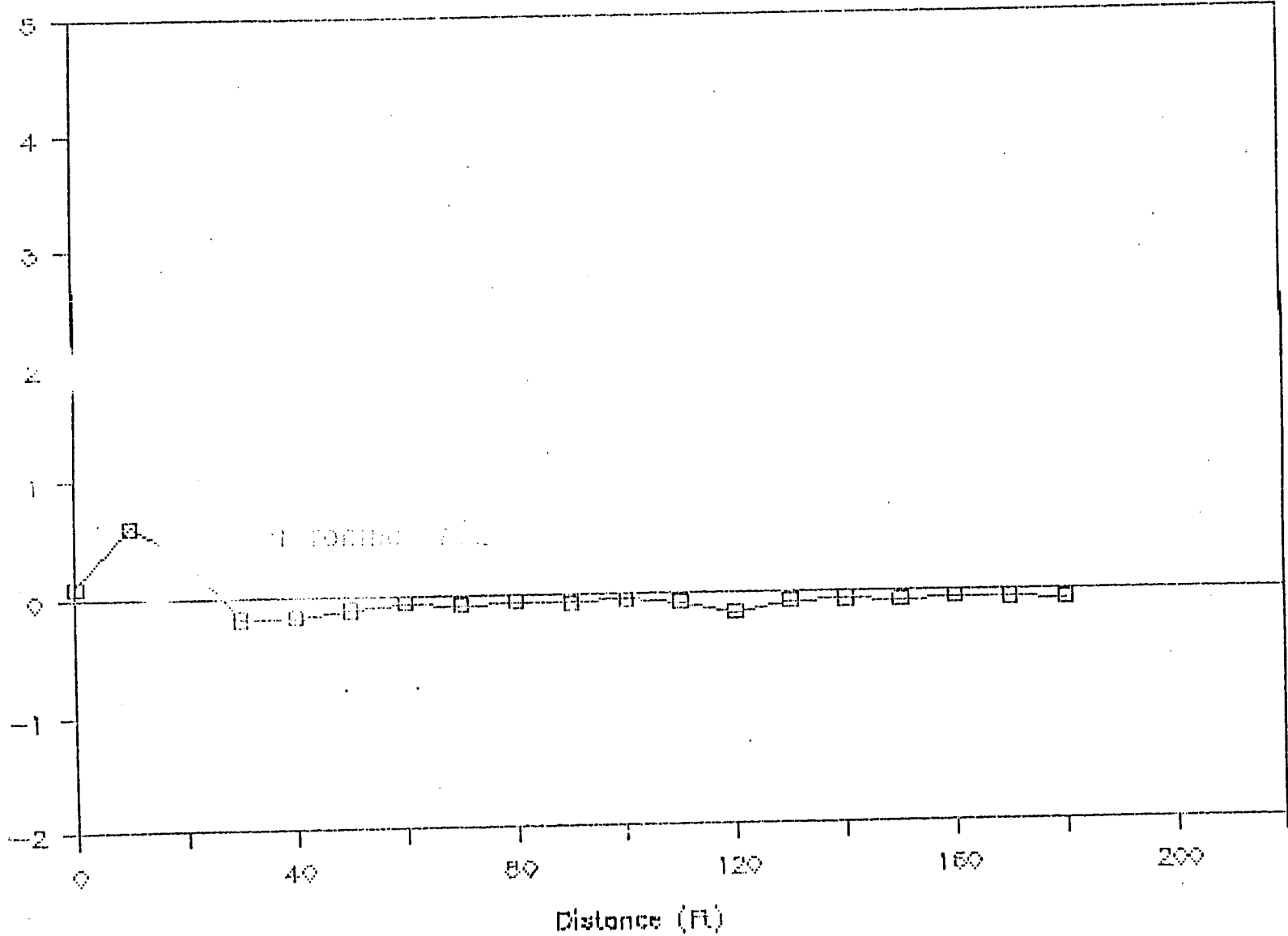


Magnetic Anomaly Graph

Line 7

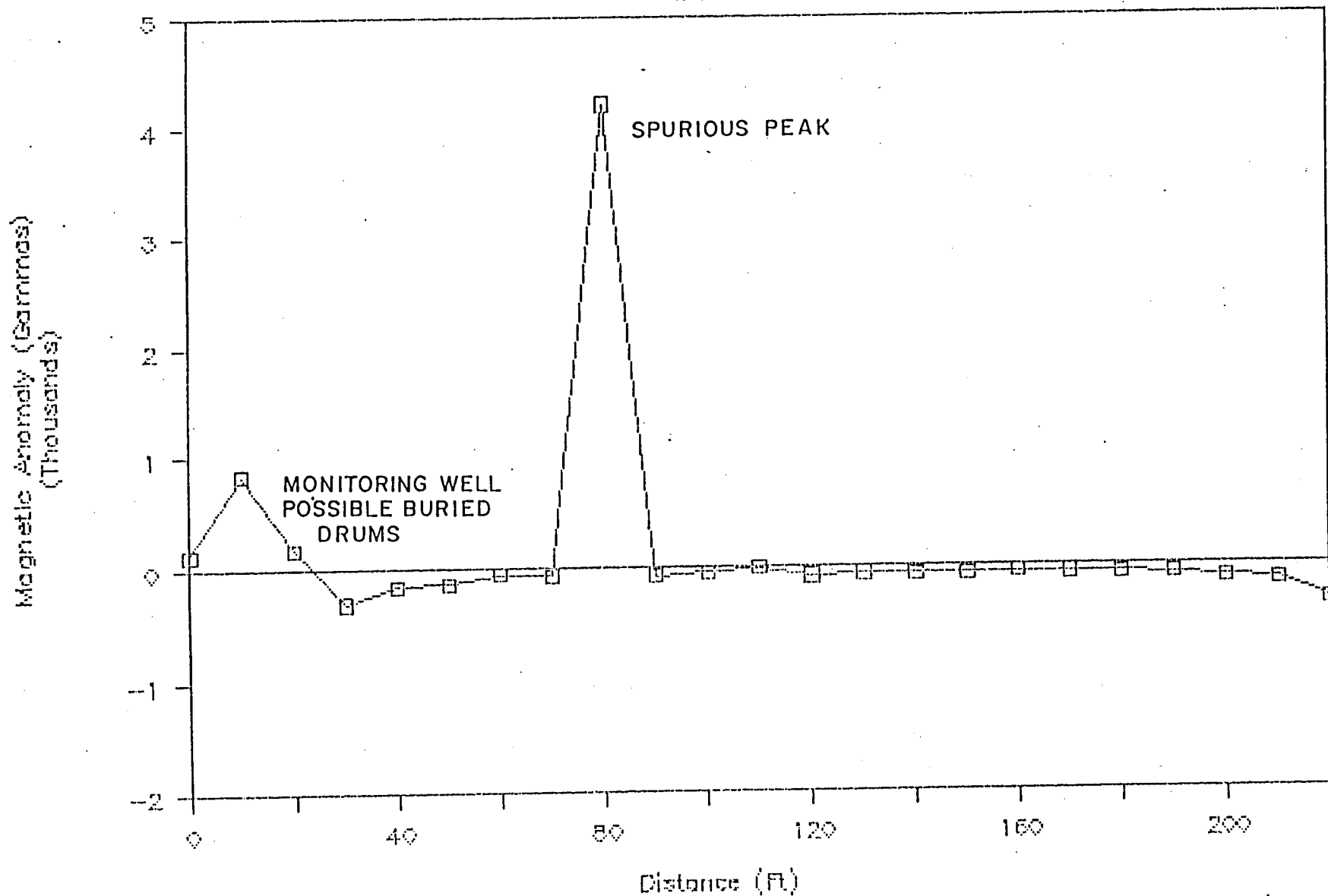


Magnetic Anomaly (Gauss)
(Thousands)



Magnetic Anomaly Graph

Line 8

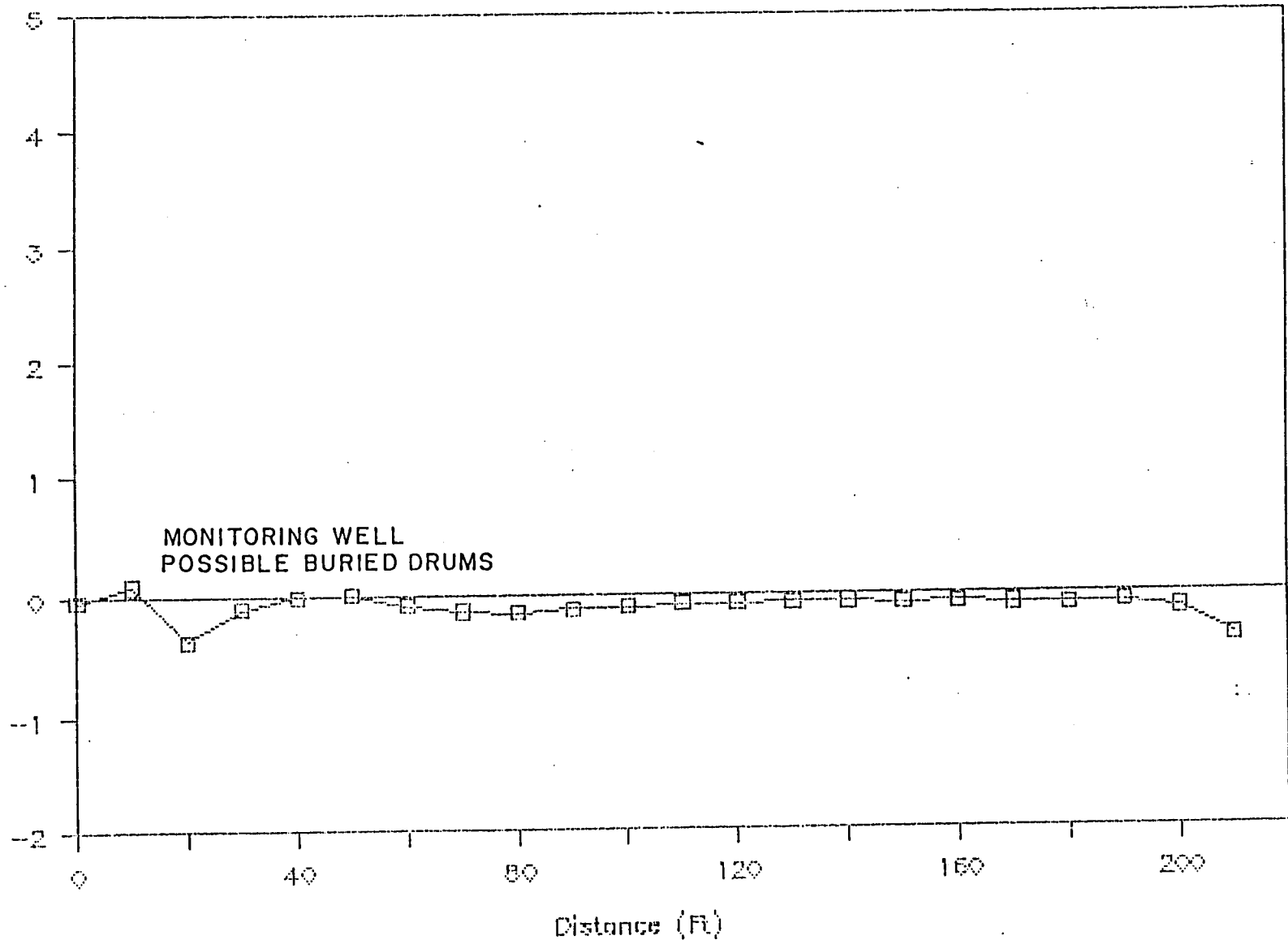


Magnetic Anomaly Graph

Line 9



Magnetic Anomaly (Gauss)
(Thousands)

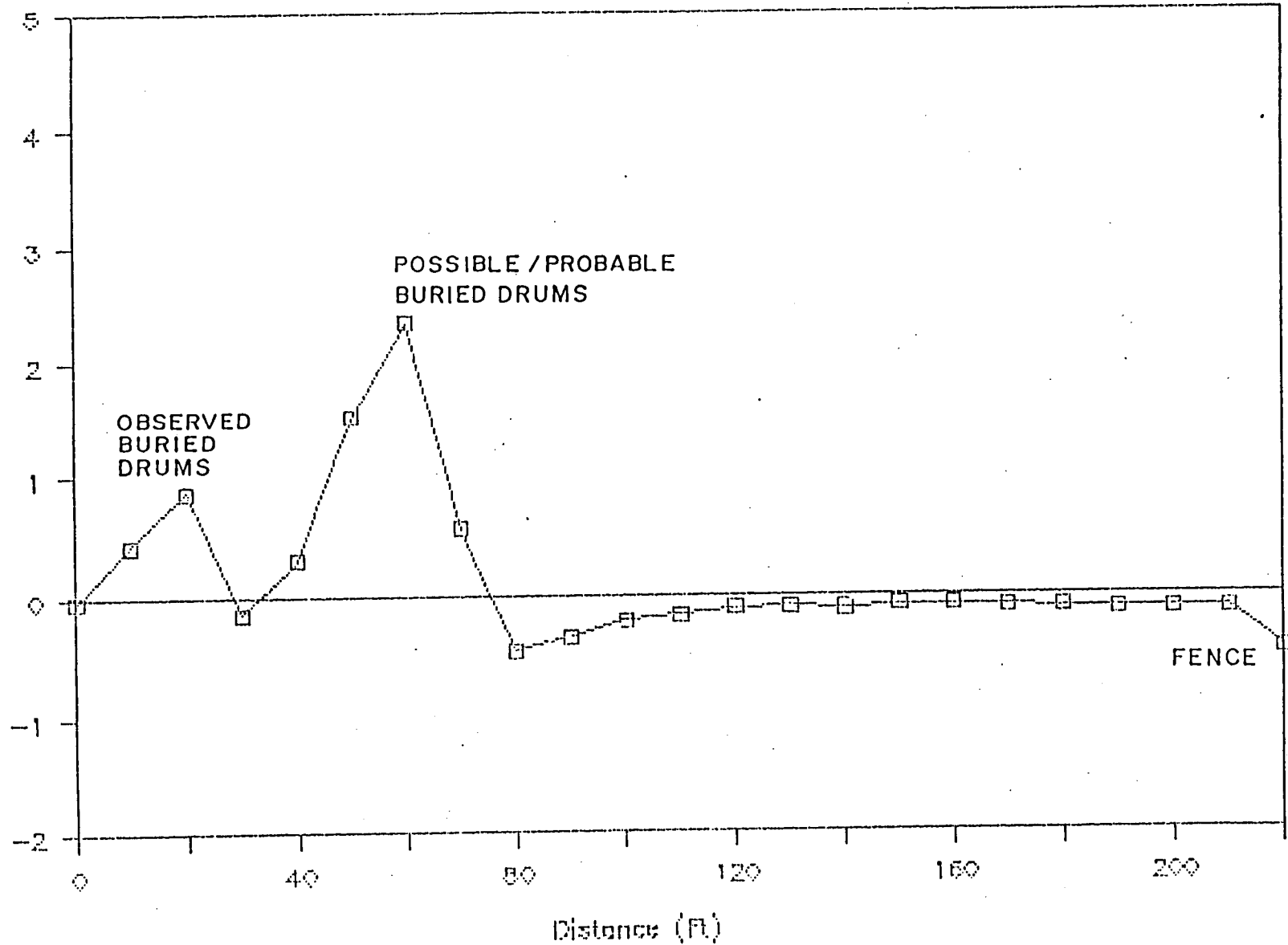


Magnetic Anomaly Graph

Line 10

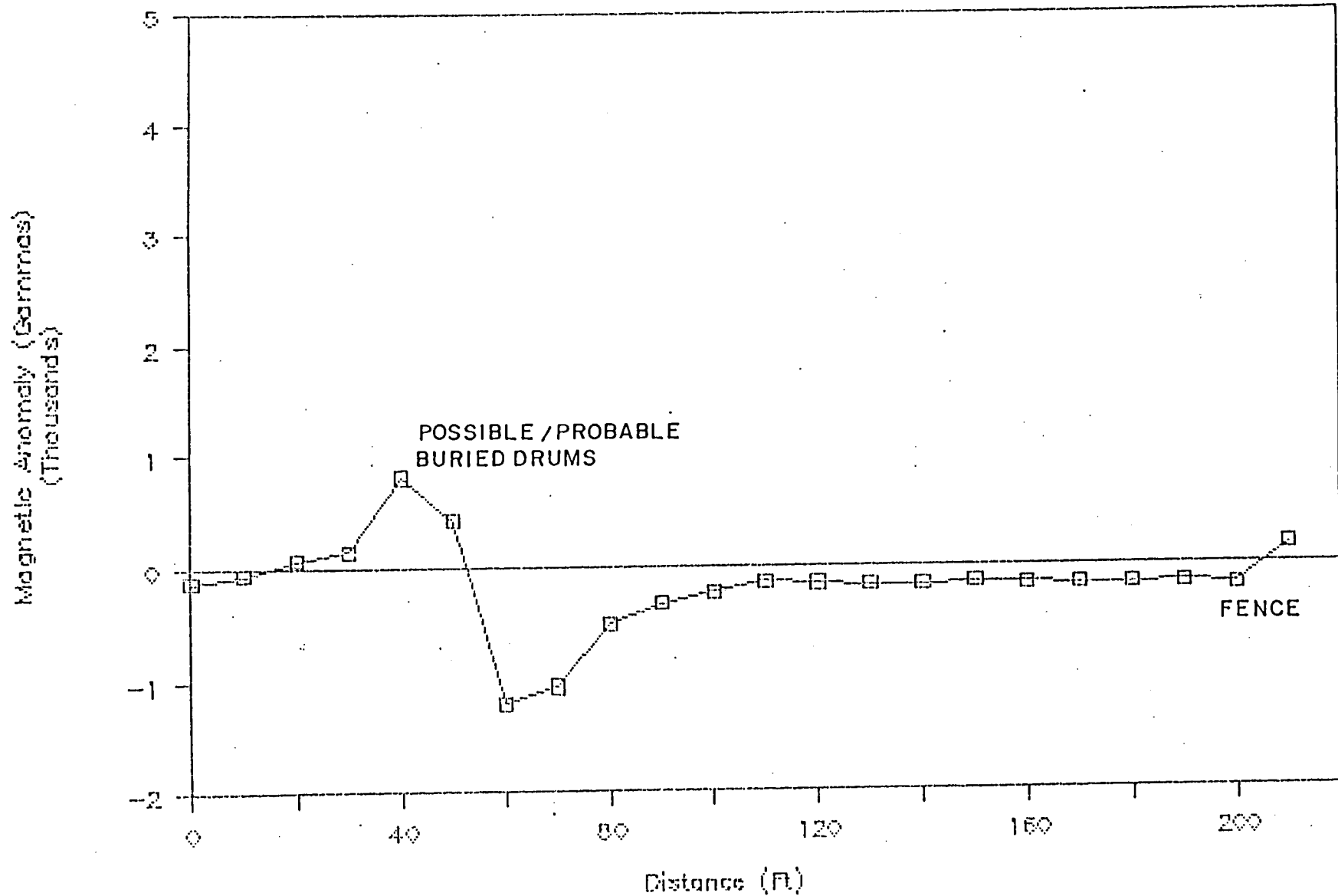


Magnetic Anomaly (Gauss)
(Thousands)



Magnetic Anomaly Graph

Line 11

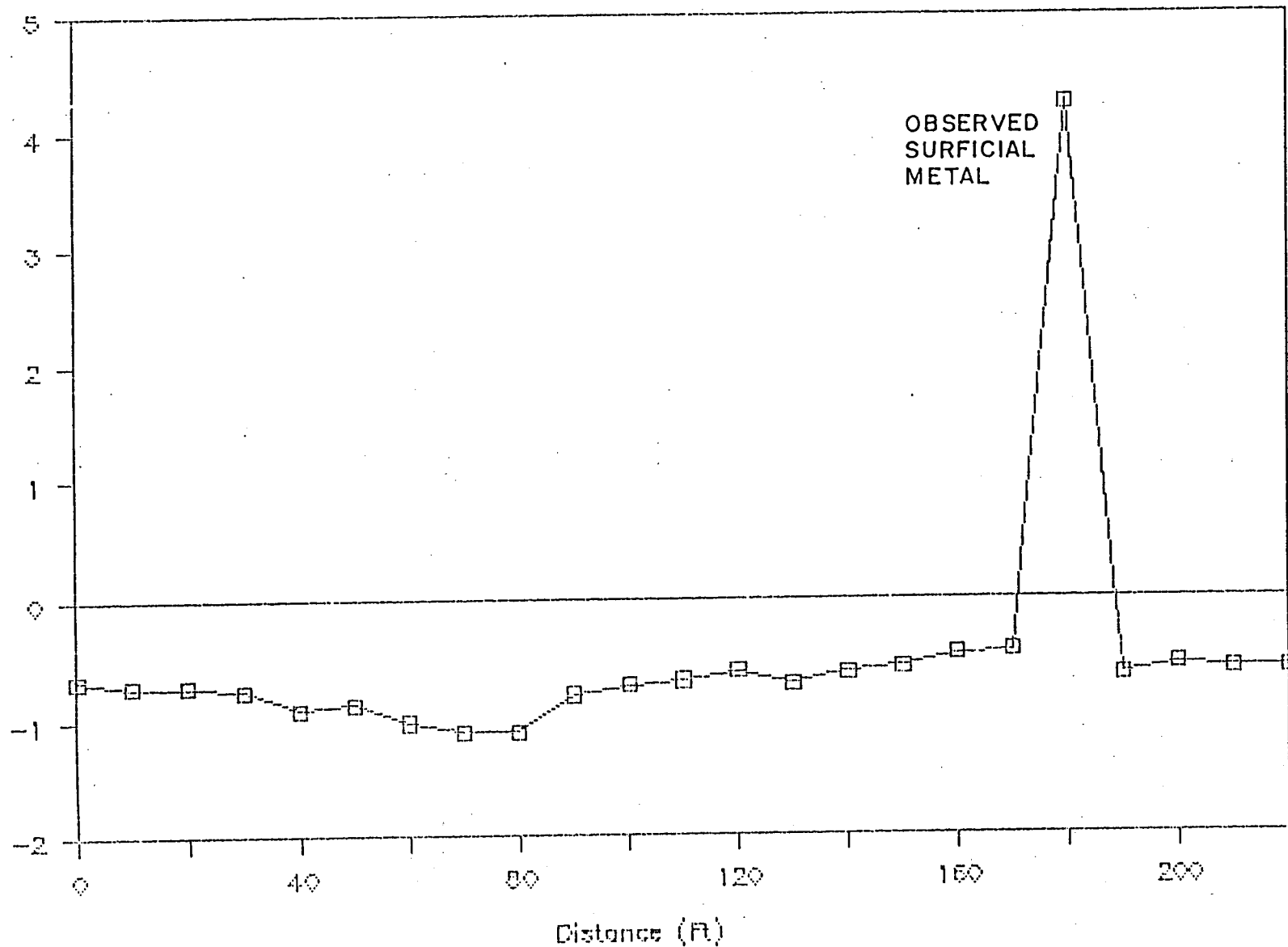


Magnetic Anomaly Graph

Line 12

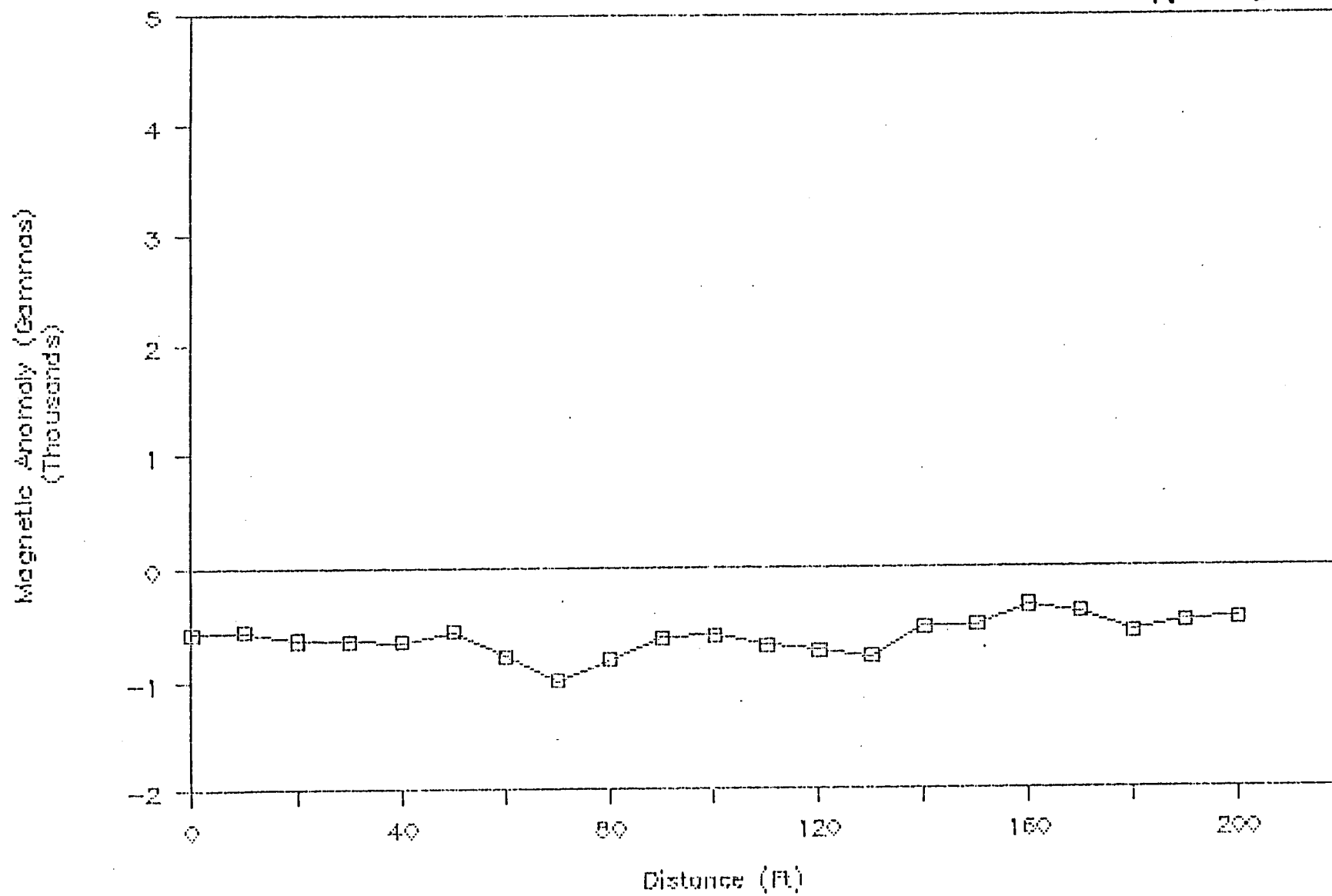


Magnetic Anomaly (Gammas)
(Thousands)

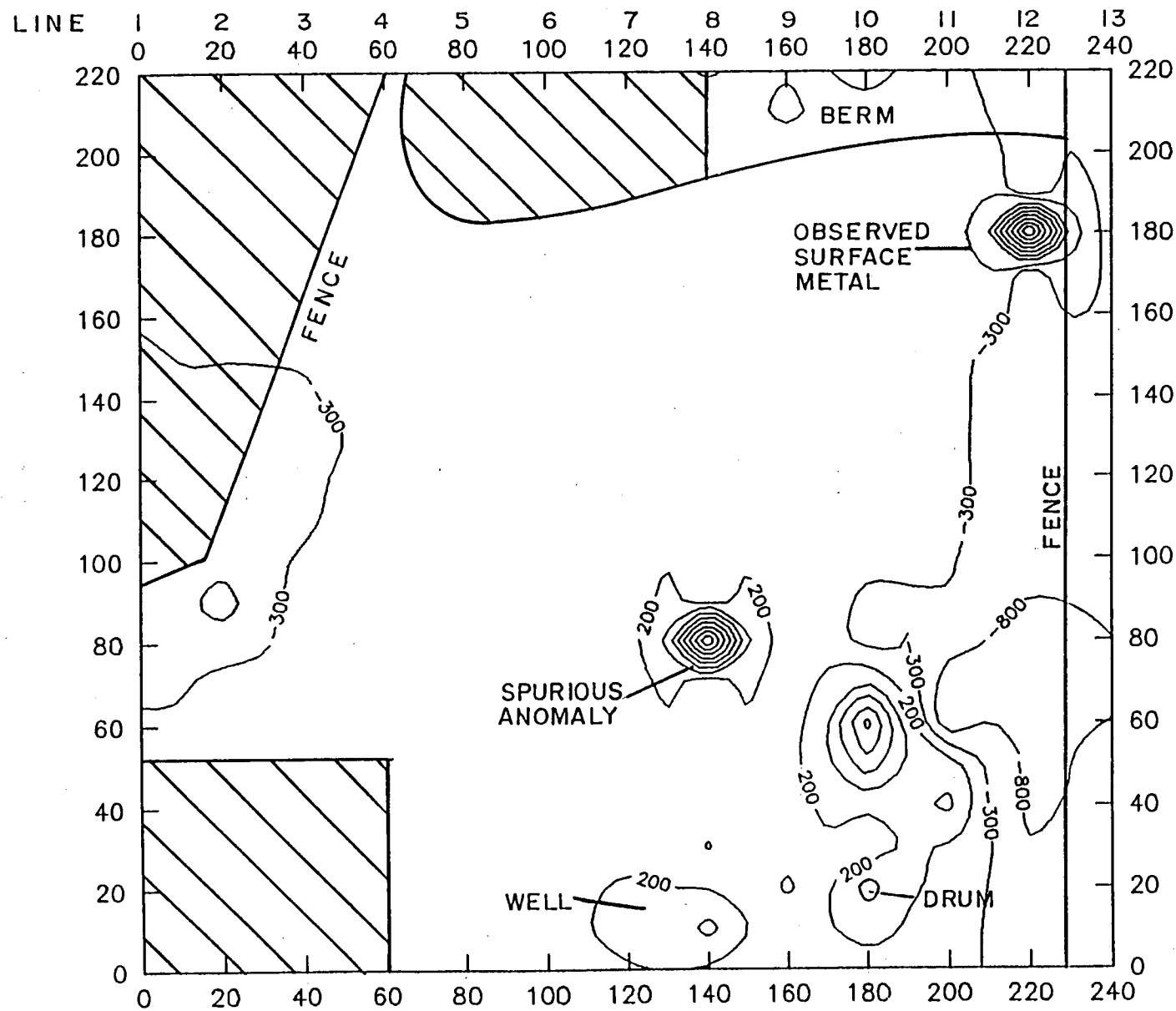


Magnetic Anomaly Graph

Line 13



Magnetometer Survey — King of Prussia Landfill



SCALE 1:40



09/11/90

King of Prussia Landfill Magnetometer Data - As of 09/06

Avg. Background - 54350.5

Line No.	Station Spacing (Ft)	Magnetic Anomaly (Gammas)	Magnetic Reading (Gammas)
1	50	-131.8	54218.7
1	60	-216	54134.5
1	70	-385.6	53964.9
1	80	-660.6	53689.9
2	50	-114	54236.5
2	60	-112.5	54238
2	70	-178.3	54172.2
2	80	-449.5	53901
2	90	-1029.1	53321.4
3	50	-98.4	54252.1
3	60	-108.9	54241.6
3	70	-102.1	54248.4
3	80	-174.3	54176.2
3	90	-182.3	54168.2
3	100	-257.2	54091.3
3	110	-350.2	54000.3
3	120	-330.9	53969.6
3	130	-588.6	53661.9
4	50	-55.5	54295
4	60	-44.3	54306.2
4	70	-22.1	54328.4
4	80	-51.1	54299.4
4	90	-55.1	54295.4
4	100	-48.1	54302.4
4	110	-73.2	54277.3
4	120	-82.6	54267.9
4	130	-122.8	54227.7
4	140	-88.7	54261.8
4	150	-119.5	54231
4	160	-113.2	54237.3
4	170	-175.4	54175.1
4	180	-198.5	54162
4	190	-199.6	54150.9
4	200	-265.6	54084.9
5	0	-5.1	54345.4
5	10	-44.6	54305.9
5	20	-60.8	54269.7
5	30	-72.1	54278.4
5	40	-53	54297.5
5	50	-83.1	54262.4
5	60	-81.2	54269.3
5	70	-70.2	54280.3
5	80	-76.7	54273.8
5	90	-77.7	54272.8
5	100	-73.4	54277.1

09/11/90

King of Prussia Landfill Magnetometer Data - As of 09/06

Avg. Background - 54350.5

Line No.	Station Spacing (Ft)	Magnetic Anomaly (Gauss)	Magnetic Reading (Gauss)
5	110	-65.2	54285.3
5	120	-84.7	54265.8
5	130	-97.1	54253.4
5	140	-104.6	54245.9
5	150	-114.7	54235.8
5	160	-115.7	54234.8
5	170	-160.3	54190.2
6	0	-67.4	54283.1
6	10	-47.3	54301.2
6	20	-76.5	54274
6	30	-80.4	54270.1
6	40	-84.1	54266.4
6	50	-76.4	54274.1
6	60	-71	54279.5
6	70	-85.3	54265.2
6	80	-76.5	54274
6	90	-59.5	54291
6	100	-82.1	54263.4
6	110	-59.3	54291.2
6	120	-66.4	54284.1
6	130	-92.7	54257.8
6	140	-64.7	54265.8
6	150	-81.3	54269.2
6	160	-112	54238.5
6	170	-112.8	54237.7
7	0	104.5	54455
7	10	606.9	54957.4
7	20	367.2	54717.7
7	30	-183.4	54167.1
7	40	-176.3	54174.2
7	50	-113.7	54236.9
7	60	-64.3	54266.2
7	70	-50.5	54270
7	80	-58.9	54291.6
7	90	-75	54275.5
7	100	-50.3	54300.2
7	110	-90.6	54259.9
7	120	-177.1	54173.4
7	130	-89	54261.5
7	140	-68.8	54281.7
7	150	-90.1	54260.4
7	160	-55.9	54294.6
7	170	-69.8	54290.7
7	180	-79.8	54270.7
8	0	132.2	54482.7

09/11/90

King of Prussia Landfill Magnetometer Data - As of 09/06

Avg. Background - 54350.5

Line No.	Station Spacing (Ft)	Magnetic Anomaly (Gammas)	Magnetic Reading (Gammas)
8	10	833.4	55183.9
8	20	178.6	54529.1
8	30	-320.4	54030.1
8	40	-162.4	54188.1
8	50	-141.3	54209.2
8	60	-65.5	54285
8	70	-74.7	54275.8
8	80	4210.3	53560.8
8	90	-54.7	54265.8
8	100	-52.1	54298.4
8	110	-12.8	54337.7
8	120	-94.1	54255.4
8	130	-49.2	54281.3
8	140	-77.8	54272.7
8	150	-71.2	54279.3
8	160	-54.3	54286.2
8	170	-67.3	54283.2
8	180	-75.9	54274.6
8	190	-81.2	54269.3
8	200	-125.8	54224.7
8	210	-146	54204.5
8	220	-325.4	54025.1
9	0	-35.7	54314.8
9	10	93.7	54444.2
9	20	-371.1	53979.4
9	30	-108.1	54242.4
9	40	-9.3	54341.2
9	50	5.5	54356
9	60	-81	54269.5
9	70	-134.5	54216
9	80	-152.6	54197.9
9	90	-125.2	54225.3
9	100	-107.2	54243.3
9	110	-82.7	54267.8
9	120	-85.8	54264.7
9	130	-73.2	54277.3
9	140	-70.9	54279.6
9	150	-87	54263.5
9	160	-74.9	54275.6
9	170	-91.1	54259.4
9	180	-97.4	54253.1
9	190	-85.6	54264.9
9	200	-135	54215.5
9	210	-367.2	53983.3
10	0	-43.5	54307

09/11/90

King of Prussia Landfill Magnetometer Data - As of 09/06

Avg. Background - 54350.5

Line No.	Station Spacing (Ft)	Magnetic Anomaly (Gauss)	Magnetic Reading (Gauss)
10	10	425.3	54775.8
10	20	862.5	55213
10	30	-140.8	54209.7
10	40	301.6	54652.1
10	50	1520.1	55870.6
10	60	2341	56691.5
10	70	554.6	54905.1
10	80	-463.7	53836.9
10	90	-350.4	54000.1
10	100	-212	54139.5
10	110	-163.9	54181.6
10	120	-106.9	54243.6
10	130	-97.5	54253
10	140	-113.9	54236.6
10	150	-89	54261.5
10	160	-87.6	54262.9
10	170	-99.3	54251.2
10	180	-106.6	54243.9
10	190	-123.9	54226.6
10	200	-121.3	54229.2
10	210	-124.1	54226.4
10	220	-163.2	53887.3
11	0	-126.4	54224.1
11	10	-66.4	54284.1
11	20	71.3	54421.8
11	30	149.6	54500.1
11	40	798.6	55149.1
11	50	420.8	54771.3
11	60	-1194.3	53156.2
11	70	-1051.3	53299.2
11	80	-503.9	53846.6
11	90	-333	54017.5
11	100	-237.4	54113.1
11	110	-146.5	54204
11	120	-160.9	54189.6
11	130	-171.9	54175.6
11	140	-172.6	54177.9
11	150	-154.2	54196.3
11	160	-161.6	54188.9
11	170	-173.2	54177.3
11	180	-170.8	54179.7
11	190	-164.7	54185.8
11	200	-185.4	54165.1
11	210	166.6	54517.1
12	0	-670.2	53680.3

09/11/90

King of Prussia Landfill Magnetometer Data - As of 09/06

Avg. Background - 54350.5

Line No.	Station Spacing (Ft)	Magnetic Anomaly (Gauss)	Magnetic Reading (Gauss)
12	10	-726.2	53624.3
12	20	-729.8	53620.7
12	30	-764.2	53586.3
12	40	-920.2	53430.3
12	50	-880.1	53470.4
12	60	-1027.2	53323.3
12	70	-1108.1	53242.4
12	80	-1107.1	53243.4
12	90	-799	53551.5
12	100	-721.9	53626.6
12	110	-687.7	53662.8
12	120	-612.5	53738
12	130	-718.7	53631.8
12	140	-622.8	53727.7
12	150	-580.8	53769.7
12	160	-474.4	53876.1
12	170	-453	53897.5
12	180	4245.1	53595.6
12	190	-646.8	53703.7
12	200	-563.7	53786.8
12	210	-601.7	53746.8
12	220	-603.9	53746.6
13	0	-579.5	53771
13	10	-562.3	53752.2
13	20	-639.5	53711
13	30	-645	53705.5
13	40	-654.1	53696.4
13	50	-567.4	53785.1
13	60	-782.5	53568
13	70	-997.2	53353.3
13	80	-814.8	53535.7
13	90	-526	53724.5
13	100	-598.8	53751.7
13	110	-690.1	53660.4
13	120	-733.4	53617.1
13	130	-792.2	53558.3
13	140	-535.8	53814.7
13	150	-517	53833.5
13	160	-345.8	54004.7
13	170	-407.3	53943.2
13	180	-574.5	53776
13	190	-487.6	53862.9
13	200	-466.2	53884.3



Suite 201, 1090 King Georges Post Road,
Edison, NJ 08837, • (201) 225-6116 • FAX (201) 225-7037

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE REMOVAL AND PREVENTION
EPA CONTRACT 68-01-7367

TAT-02-F-06103

MEMORANDUM

TO: Mark Ellis, REAC

FROM: Rohan Tadas, TAT II PM AB FOR RT
Beverly Lawson, TAT II QC (10)

DATE: October 19, 1990

SUBJECT: King of Prussia Site

Attached please find the data from the magnetometer survey conducted at the King of Prussia site on Tuesday, October 16, 1990. This data represents readings from several key points in the sampling grid. All EM31 readings are in mMH0/meter, and all magnetometer readings are in nTesla/meter. If you have any questions, please don't hesitate to contact me.

KING OF PRUSSIA MAGNETOMETER SURVEY

TUESDAY, OCTOBER 16, 1990

KOP 2.2023

POINT	EM31	MAGNETOMETER
100 N, 100 E	7.5	74.21
270 N, 100 E	11.0	2.83
270 N, 100 E	8.6	-.19
155 N, 110 E		Hi Gradient
150 N, 110 E		Hi Gradient 1229.25
145 N, 110 E		Hi Gradient 2409.44
140 N, 110 E		Hi Gradient - 408
100 N, 110 E	8.5	5.85
100 N, 120 E	8.2	
270 N, 120 E	7.4	5.80
160 N, 130 E		-1503.82
155 N, 130 E		No Signal
150 N, 130 E		2745.57
100 N, 130 E	8.1	
100 N, 140 E	7.7	-11.03
150 N, 140 E		1225.67
155 N, 140 E		No Signal
165 N, 140 E		-1007.67
270 N, 140 E	6.0	-3.17
270 N, 150 E	6.0	-7.35
100 N, 150 E	7.8	-15.55
100 N, 160 E	6.0	56.26
165 N, 160 E	Anomaly	
170 N, 160 E	Anomaly	
175 N, 160 E	Anomaly	
180 N, 160 E	Anomaly	
185 N, 160 E	Anomaly	
190 N, 160 E	Anomaly	
195 N, 160 E	Anomaly	
200 N, 160 E	Anomaly	
205 N, 160 E		Hi Gradient 2329.87
210 N, 160 E		Hi Gradient 1597.14
215 N, 160 E		Hi Gradient 2579.46
220 N, 160 E	Anomaly	No Signal
225 N, 160 E	Anomaly	
240 N, 160 E	6.7	-3.05
240 N, 170 E	7.0	44.01
225 N, 170 E	Exposed Drum	Exposed Drum
220 N, 170 E	Exposed Drum	Exposed Drum
210 N, 170 E		Hi Gradient
205 N, 170 E		No Signal
200 N, 170 E		Hi Gradient
180 N, 170 E	High Reading	

TUESDAY, OCTOBER 16, 1990

KOP 2.2024

<i>POINT</i>	<i>EM31</i>	<i>MAGNETOMETER</i>
175 N, 170 E	High Reading	
170 N, 170 E	High Reading	
165 N, 170 E	High Reading	
160 N, 170 E	High Reading	348.46
155 N, 170 E	High Reading	
100 N, 170 E	7.0	-15.37
100 N, 180 E	6.6	0.76
175 N, 180 E	Anomaly	
210 N, 180 E		Hi Gradient 1605.51
220 N, 180 E		Hi Gradient 1315.19
225 N, 180 E		Hi Gradient - 1814.01
240 N, 180 E	7.7	63.37
240 N, 190 E	8.0	-10.87
220 N, 190 E		-1133.78
215 N, 190 E		-1064.10
210 N, 190 E		Hi Gradient
195 N, 190 E	Anomaly	Hi Gradient 1516.75
190 N, 190 E	Anomaly	
185 N, 190 E	Anomaly	
180 N, 190 E	Anomaly	
175 N, 190 E	Anomaly	
170 N, 190 E	Anomaly	
165 N, 190 E	Anomaly	
160 N, 190 E	Anomaly	
155 N, 190 E	Anomaly	
150 N, 190 E	Anomaly	
145 N, 190 E	Anomaly	
100 N, 190 E	6.8	1.41
100 N, 200 E	6.6	-1.44
160 N, 200 E	Anomaly	
170 N, 200 E	Anomaly	
195 N, 200 E	Anomaly	
210 N, 200 E	14.0	-283.80
100 N, 210 E	7.0	-20.41
150 N, 210 E	7.0	-20.76
160 N, 210 E	15.0	
100 N, 220 E	19.5	-36.67
100 N, 240 E	13.5	
210 N, 240 E	6.7	
150 N, 230 E	7.0	
240 N, 230 E	7.0	
100 N, 250 E	5.5	

CHAIN OF CUSTODY RECORD

KOP 2.3001

ENVIRONMENTAL PROTECTION AGENCY - REGION 1
ENVIRONMENTAL SERVICES DIVISION
EDISON, NEW JERSEY 08817

T2 08938

Name of Unit and Address: **USERM-TAT-2**
KOP-1053
Bldg 209
Woodbridge Ave
Edison, NJ 08837
EPA - PM
Eugene Dammach
908-321-6666

Sample Number	Description of Sample	For Lab Use Only
03-01	Liquid, High Concentration for Sulfides, TS, Phenol, TOX	Date Samples Received
02	Same as above	
01	Same as above	
04	Same as above	
12/05	Sludge, High Concentration for Sulfides, % Solids, Phenol, TOX	Received By:
06	Same as above	
07	Same as above	
08	Same as above	
09	Soil, High Concentration for Sulfides, Phenol, TOX	Sample Condition on Receipt at Lab
10	Same as above	
11	Same as above	
12	Same as above	
13	Same as above	
14	Same as above	

Sample Number	Relinquished By	Received By	Time	Date	Reason for Change of Custody
01	Amal Diaz	Amal Diaz			
02	Amal Diaz	Amal Diaz			
03	Amal Diaz	Amal Diaz			
04	Amal Diaz	Amal Diaz			
05	Amal Diaz	Amal Diaz			
06	Amal Diaz	Amal Diaz			
07	Amal Diaz	Amal Diaz			
08	Amal Diaz	Amal Diaz			
09	Amal Diaz	Amal Diaz			
10	Amal Diaz	Amal Diaz			
11	Amal Diaz	Amal Diaz			
12	Amal Diaz	Amal Diaz			
13	Amal Diaz	Amal Diaz			
14	Amal Diaz	Amal Diaz			

CHAIN OF CUSTODY RECORD

KOP 2.3002

ENVIRONMENTAL PROTECTION AGENCY REGIONAL
Environmental Services Division
EDISON, NEW JERSEY 08817

Name of Unit and Address
USEPA TAT-2
KOP1053

Bldg 200
Woodbridge Ave
Edison, NJ 08857

EPA-PH
Eugene Dominach
908-3246666

Sample Number	Number of Containers	Description of Sample
98-0311	1	Sludge, High Concentration for Sulfides, 2 Solids, Phenols & TOX
12	1	Same as above
13	1	Soil, High Concentration for Sulfides, Phenol & TOX
14	1	Same as above
15	1	Same as above
16	1	Same as above

Person Assuming Responsibility for Sample:

Victor Vicenty

Time Date

1600

1/29/91

Sample Number	Relinquished By	Received By	Time	Date	Reason for Change of Custody
All	V Vicenty				Shipment to Lab.

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL PROTECTION AGENCY - REGION II
ENVIRONMENTAL SERVICES DIVISION
EDISON, NEW JERSEY 08817

T2 00992

Name of Unit and Address						
USEPA-REGION II WOODBRIIDGE AVE. EDISON, NJ 08837 ATTN: OSC E. DOMINACH						
Sample Number	Number of Containers	Description of Samples				
1	1	803. WHITE SLUDGE				
2	"	"				
3	"	"				
4	"	"				
5	"	"				
6	"	"				
7	"	"				
8	"	"				
9	"	"				
10	"	802. BROWN SLUDGE				
Person Assuming Responsibility for Sample:					Time	Date
JAMES MANFREDA					1445	12/14/70
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody	
ALL	James Manfreda					
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody	
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody	
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody	

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL PROTECTION AGENCY - REGION II
ENVIRONMENTAL SERVICES DIVISION
EDISON, NEW JERSEY 08817

T2 00995

Name of Unit and Address						
USEPA REGION II WOODBIDGE AVE. EDISON NJ 08837 ATTN: OSC E. DOMINACH						
Sample Number	Number of Containers	Description of Samples				
11	1	80Z. WHITE SLUDGE				
12	"	"				
13	"	"				
14	"	80Z. SOIL				
15	"	"				
16	"	"				
17	"	"				
18	"	"				
19	"	80Z. SOLID				
Person Assuming Responsibility for Samples:					Time	Date
JAMES MANFREDA					1445	12/4/90
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody	
ALL	James Manfreda					
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody	
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody	
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody	

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL PROTECTION AGENCY - REGION II
 ENVIRONMENTAL SERVICES DIVISION
 EDISON, NEW JERSEY 08817

T2 00996

Name of Unit and Address:		USEPA REGION II WOODBRIIDGE AVE. EDISON, NJ 08837 ATTN: OSC E. DOMINACH			
Sample Number	Number of Containers	Description of Samples			
20	1	WIPE SAMPLES - 80Z.			
21	1	" " "			
22	1	"			
23	1	8 OZ. LIQUID			
24	1	"			
25	1	"			
26	1	"			
Person Assuming Responsibility for Sample:					
JAMES MANFREDA					
					Time 1445
					Date 12/14/90
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
ALL	James Manfreda				
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody

CHAIN OF CUSTODY RECORD

KOP 2.3006

ENVIRONMENTAL PROTECTION AGENCY - REGION II
ENVIRONMENTAL SERVICES DIVISION
EDISON, NEW JERSEY 08817

T2 00997

Name of Unit and Address:						USEPA REGION II WOODBIDGE, NJ 08837		ATTN: OSC E. DOMINACH	
Sample Number	Number of Containers	Description of Samples							
27	1	8 OZ. LIQUID							
28	1	8 OZ. LIQUID							
Person Assuming Responsibility for Samples:								Time	Date
JAMES MANFREDA								1445	12/14/90
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody				
ALL	<i>James Manfreda</i>								
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody				
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody				
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody				

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL PROTECTION AGENCY - REGION II
ENVIRONMENTAL SERVICES DIVISION
EDISON, NEW JERSEY 08817

T2 08930

Name of Unit and Address:

USEPA REGION II
WOODBIDGE AVE.

EDISON, NJ 08837

ATTN: EUGENE DOMINACH

Sample Number	Number of Containers	Description of Samples
1	1	803. WHITE SLUDGE
2	"	"
3	"	"
4	"	"
5	"	"
6	"	"
7	"	"
8	"	"
9	"	"

Person Assuming Responsibility for Samples:

ROHAN TADAS / USEPA TAT

Time

Date

1130

12/5/90

Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
ALL	Tadas				
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL PROTECTION AGENCY - REGION II
ENVIRONMENTAL SERVICES DIVISION
EDISON, NEW JERSEY 08817

T2 08932

Name of Unit and Address USEPA REGION II WOODBIDGE AVE. EDISON, NJ 08837 ATTN: EUGENE DOMINACH					
Sample Number	Number of Containers	Description of Samples			
10	1	8 OZ. BROWN SLUDGE			
11	"	8 OZ. WHITE SLUDGE			
12	"	"			
13	"	"			
14	"	8 OZ. SOIL			
15	"	"			
16	"	"			
17	"	"			
18	"	"			
Person Assuming Responsibility for Samples ROHAN TADAS / USEPA TAT			Time 1130	Date 12/5/90	
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
ALL	Rohan Tadas				
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody

30F3

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL PROTECTION AGENCY - REGION II
ENVIRONMENTAL SERVICES DIVISION
EDISON, NEW JERSEY 08817

T2 08933

Name of Unit and Address		USEPA REGION II WOODBRIIDGE AVE. EDISON, NJ 08837		ATTN - EUGENE DOMINACH	
Sample Number	Number of Containers	Description of Samples			
19	1	802. SOLID			
20	"	802 WIPE SAMPLE			
21	"	"			
22	"	"			
23	"	802. LIQUID			
24	"	"			
25	"	"			
26	"				
27	"				
Person Assuming Responsibility for Samples				Time	Date
ROHAN TADAS / USEPA TAT				11:30	12/15/91
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
ALL	Rohan Tadas				
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody

2 OF 2
KOP 2.3010

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL PROTECTION AGENCY - REGION II
ENVIRONMENTAL SERVICES DIVISION
EDISON, NEW JERSEY 08817

T2 08927

Name of Unit and Address USEPA REGION II WOODBRIIDGE AVE. EDISON, NJ 08837 ATTN: EUGENE DOMINACH						
Sample Number	Number of Containers	Description of Samples				
1	1	802. WHITE SLUDGE				
2	"	"				
3	"	"				
4	"	"				
5	"	"				
6	"	"				
7	"	"				
8	"	"				
9	"	"				
Person Assuming Responsibility for Sample: ROHAN TADAS / USEPA TAT					Time 1415	Date 12/5/90
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody	
ALL	Rohan Tadas					
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody	
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody	
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody	

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL PROTECTION AGENCY - REGION II
 ENVIRONMENTAL SERVICES DIVISION
 EDISON, NEW JERSEY 08817

T2 08928

Name of Unit and Address: USEPA REGION II WOODBRIDGE AVE. EDISON, NJ 08837						ATTN: EUGENE DOMINACH		
Sample Number	Number of Containers	Description of Samples						
10	1	80Z. BROWN SLUDGE						
14	"	80Z. SOIL						
15	"	"						
16	"	"						
17	"	"						
18	"	"						
19	"	80Z. SOLID						
26	"	80Z. LIQUID						
Person Assuming Responsibility for Sample:							Time	Date
ROHAN TADAS / USEPA TAT							1415	12/5/90
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody			
ALL	Rohan Tadas							
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody			
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody			
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody			

CHAIN OF CUSTODY RECORD

KOP 2.3012

ENVIRONMENTAL PROTECTION AGENCY - REGION II
ENVIRONMENTAL SERVICES DIVISION
EDISON, NEW JERSEY 08817

T2 04781

Name of Unit and Address:

US EPA TAT ; EDISON , NJ.

Sample Number	Number of Containers	Description of Samples
038	1	8OZ JAR WITH WHITE SOLID

Person Assuming Responsibility for Sample:

RICHARD M. SETZER

DATE TIME
5/17/91 1130

Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
ALL	Don Setzer	<i>[Signature]</i> M. T. ...	4:15 pm	5/17/91	Received by Lab.
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody

Page No.

1/1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

KOP 2.4001

DATE: January 8, 1980

SUBJECT: Organics and Metals Results, King of Prussia Disposal Site, Winslow Township, N.J.

FROM: Francis T. Brezenski, Chief
Technical Support BranchTO: Fred Rubel, Chief
Emergency Response and Hazardous Materials
Inspection Branch

Four liquid and two sediment samples collected in the area of the King of Prussia Disposal Site, Winslow Township, N.J. were analyzed for organics according to EFG Priority Pollutant Protocols (EPA Method Nos. 624 and 625) using GC/MS/DS. Purgeable Organics results for the four liquid samples were reported in a previous memorandum. The samples were identified as follows:

<u>EPA Lab. Sample No.</u>	<u>Sample Source</u>
56731	Well water collected from the Fish and Game, Shellfisheries Southern District Office, Hollow Road, Williamstown, N.J.
56732	Well water collected from well KP1
56733	Well water collected from well KP4
56734	Composite sediment at 5 locations (depth 2" to 12")
56735	Sediment (purple color) collected southwest of well locations
56736	Liquid sample collected from a drainage ditch which flows west towards Great Egg Harbor River

Purgeable Organics - Sediments

The two sediment samples were analyzed for purgeable organics by GC/MS/DS - results are presented in Table I.

In general, the sediments contained small amounts of several priority pollutant purgeable organics. Sample 56734 did, however, contain 23ug/kg of ethylbenzene and 29 ug/kg of toluene. (These same samples when analyzed for Base/Neutral Extractables showed high concentrations of hexachloroethane and phthalate esters.) (Sample 56734 in addition contained approximately 3500 ug/kg of Mirex.)

Other purgeable organics (not on the priority pollutant list) were detected:

<u>Compounds</u>	<u>EPA Sample No. 56734</u>	<u>EPA Sample No. 56735</u>
acetone (oxetane)	+	
butylacetate	+	
2-methyl propanol		+
butanal		+
3,3 dimethyl oxetane		+

+ = Found but not quantitated

Base/Neutral Extractables

The six samples were extracted for Base/Neutral priority pollutants according to EFG protocol and analyzed by GC/MS/DS. Compounds on the base/neutral priority pollutant list were identified and quantitated using an ADP routine. All other peaks were manually identified. (The base/neutral extract for Sample 56733 was lost during preparation. The Pesticide/PCB extract was used in its place.)

Results for the Base/Neutral analyses are presented in Table II. Samples indicated by an asterisk are sediments, consequently results are expressed in ug/kg whereas all other results are expressed in ug/l. Blank spaces indicate that values were below minimum detection limits of the test (< 0.1 ug/l for water and <10 ug/kg for sediments).

With the exception of the two sediment samples base/neutral compounds were absent or in small amounts. In the sediments, levels of 740,000 ug/kg in Sample 56734 and 49,000 ug/kg for hexachloroethane were recorded. Elevated levels of butyl benzyl phthalate (1,300 and 570 ug/kg) and Di-n-butyl phthalate (210 and 240 ug/kg) were observed in the sediments.

Acid Extractables

The four liquid samples were carried through the EFG protocol for acid extractables. The extracts were analyzed by GC/MS/DS (electron impact). Extract 56733 was lost during preparation, consequently results for the acid extract compounds for this sample are not available.

Results are as follows:

Acid Extractable Priority Pollutants (ug/l)

<u>Compound</u>	<u>56731</u>	<u>56732</u>	<u>56736</u>	<u>Detection Limit</u>
2-chlorophenol	-	-	-	0.5
2-nitrophenol	-	-	-	0.5
phenol	-	-	0.23	0.08
2,4-dimethylphenol	-	-	-	0.5
2,4-dichlorophenol	-	-	-	0.5
2,4,6-trichlorophenol	-	-	-	0.5
4-chloro-3-methylphenol	-	-	-	0.5
2,4-dinitrophenol	-	-	-	20
4,6-dinitro-2-methylphenol	-	-	-	10
pentachlorophenol	-	-	-	1.0
4-nitrophenol	-	-	-	1.0

Recoveries based on surrogate standards were lower than those normally received for this analysis. Recovery data for the surrogates are presented below.

<u>Surrogate Compd.</u>	<u>EPA Sample No.</u>	<u>Surrogate added (ug)</u>	<u>Surrogate found (ug)</u>	<u>Percent recovery (%)</u>
pentafluorophenol	56731	104.4	28.6	27.5
	56732	104.4	18.5	17.3
	56736	104.4	67.2	64.4
trifluoro-m-cresol	56731	105.5	33.1	31.8
	56732	105.5	39.8	37.2
	56736	105.5	77.8	64.4

Other Compounds

Additional compounds found in the samples are as follows:

<u>Compound</u>	<u>56731</u>	<u>56732</u>	<u>56733</u>	<u>56734</u>	<u>56735</u>	<u>56736</u>
petroleum oil			+	+		
phosphoric acid- tributyl ester			+			
benzaldehyde			+			
cyclohexanone			+			
9,10-anthracenedione				+		
benzene 1,1'-sulfanyl bis-2-methyl				+		
chloromethyl phenanthrene				+		
mirex				3500 ug/kg		
methyl phenanthrene				+		
benzene 1,1'-sulfanyl bis				+		
tetrachlorobenzene				+		
benzene 1,1'-ethenylidenbis				+		

4

<u>Compound</u>	<u>56731</u>	<u>56732</u>	<u>56733</u>	<u>56734</u>	<u>56735</u>	<u>56736</u>
diphenylmethanone				+		
C ₆ -substituted				+		
naphtalene				+		
bromoxylene				+		

+ = Identified but not quantitated.

Blank spaces indicate that the compound was not detected.

Metals

The six samples were analyzed for trace elements by inductively coupled plasma - atomic emission spectrometry (ICAP) using the Jarrell Ash Model 1160, Plasma ATCOMP Direct Reading Spectrometer System plus the following: N + 1 channel; advanced automatic background correction system; autosampler and VT 52 DEC Scope.

Results are as follows:

Concentration in ug/l

<u>EPA Lab.</u> <u>Sample No.</u>	<u>Ag</u>	<u>As</u>	<u>Be</u>	<u>Se</u>	<u>Cd</u>	<u>Cr</u>	<u>Cu</u>	<u>Ni</u>	<u>Pb</u>	<u>Sb</u>	<u>Zn</u>	<u>Tl</u>	<u>ug</u>
56731	<7	<1	<1	<4	<3	10	20	110	<30	<20	2400	<4	<0.
56732	<7	7.2	<1	<4	<3	10	95	30	<30	<20	160	<4	<0.
56733	<7	1000	2200	400	600	5600	3900	3900	600	3500	13,000,000	400	0.4
56736	<7	10	5	<4	4	340	950	190	<30	<20	12,000	<4	1.4

Concentration in ug/kg

56734	0.7	90	120	<20	7.9	2500	13,000	2400	84	<0.4	3600	<40	0.3
56735	<0.1	2.3	0.1	0.17	<0.06	10	21	2.1	1	<0.4	6.7	< 2	0.0

* = Hg assay performed according to flameless AA procedure
(Cold Vapor Technique)

A high concentration of metals was noted for specific samples. For example, two well samples had high levels of copper (2400 ug/l and 13,000,000 ug/l for samples 56731 and 56733 respectively). The well water sample (56733) was highly contaminated with Be, Cd, Cr, Cu, Ni, Pb and . The sediment sample 56734 contained extremely high concentrations of AS, Cr, Cu, Ni, Pb and Zn - (90, 2500, 13,000, 2400, 84 and 3600 mg/kg respectively).

cc: B. Metzger
R. Spear
K. Burger
G. Shanahan

King of Prussia - Sediments

TABLE I

PURGEABLE ORGANICS

CONCENTRATION $\mu\text{g}/\text{kg}$ KOP 2.4005

Compound Name	No.	Stored no.	Laboratory Number					
			56 734	56 735				
Benzene	4	34030	.38					
Carbon Tetrachloride	6	32102	.29					
Chlorobenzene	7	34301						
1,2-Dichloroethane	10	32103	5.2					
1,1,1-Trichloroethane	11	34506						
1,1-Dichloroethane	13	34496						
1,1,2-Trichloroethane	14	34511						
1,1,2,2-Tetrachloroethane	15	34516	2.6	.05				
Chloroethane	16	34311						
Bis (chloromethyl) ether	17	34268						
2-Chloroethyl vinyl ether (mixed)	19	34576						
Chloroform	22	32106	4.5	.35				
1,1-dichloroethylene	29	34501						
1,2-dichloroethylene	30	34546						
1,2-dichloropropane	32	34541						
1,3-Dichloropropylene (1,3-dichloropropene)	33	34561						
Phenylbenzene	38	34371	23					
ethylene Chloride (Dichloromethane)	44	34423	2.1	1.7				
Methyl Chloride (Chloromethane)	45	34418						
Methyl bromide (Chloromethane)	46	34413						
Bromoform (Trichloromethane)	47	32104						
Bromodichloromethane	48	32101						
Trichlorofluoromethane	49	34488						
Dichlorodifluoromethane	50	34663						
Dibromochloromethane	51	32105						
Tetrachloroethylene	85	34475						
Toluene	86	34010	29					
Trichloroethylene	87	39180	18					
Vinyl chloride	88	39175						
Acrolein	2	34210						
Acrylonitrile	3	34215						
<u>Recoveries</u>			<u>Percent Recovered</u>					
Surrogate Std #1			96	83				
" " #2			88	77				
" " #3			114	88				

TABLE II

King of Prussia

BASE/NEUTRAL EXTRACTABLES

CONCENTRATION ug/l

* CONCENTRATION ug/l (Sediment Sample)

Detection Limit (liquid)	0.1 ug/l	56751	56752	56753	56754	56755	56756
Acenaphthene	1	34205					
1,2,4-Trichlorobenzene	8	34551			120		
Hexachlorobenzene	9	39700					
Hexachloroethane	12	34396			740,000	49,000	
Bis(2-chloroethyl) ether	18	34273					
2-Chloronaphthalene	20	34581					
1,2-Dichlorobenzene	25	34536					
1,3-Dichlorobenzene	26	34566					
1,4-Dichlorobenzene	27	34571					
3,3-Dichlorobenzidine	28	34631					
2,4-Dinitrotoluene	35	34611					
2,6-Dinitrotoluene	36	34626					
1,2-Diphenylhydrazine	37	34346					
Fluoranthene	39	34376			20		
4-chlorophenyl phenyl ether	40	34641					
4-Bromophenyl phenyl ether	41	34636					
Bis(2-chloroisopropyl) ether	42	34283					

56757

Bis(2-chloroethoxy)methane	43	34278					
Hexachlorobutadiene	52	39702					
Hexachlorocyclopentadiene	53	34386					
Isophorone	54	34408					
Naphthalene	55	34696			200		
Nitrobenzene	56	34447					
N-nitrosodimethylamine	61	34438					
N-nitrosodiphenylamine	62	34433					
N-nitrosodi-n-propylamine	63	34428					
Bis(2-ethylhexyl) phthalate	66	39100	0.45	3.5	4.0	1,300	570 9.1
Butyl benzyl phthalate	67	34292					
Di-n-butyl phthalate	68	39110	0.26	0.49	1.5	210	240 0.81
Di-n-octyl phthalate	69	34596					
Diethylphthalate	70	34336			4.9	88	
Dimethylphthalate	71	34341			0.35		
Benzo(a)anthracene (1,2,3-benzanthracene)	72	34526					
Benzo(a) pyrene	73	34247					
Benzo(b) fluoranthene	74	34230					
Benzo(k) fluoranthene	75	34242					
Chrysene	76	34320					
Acenaphthylene	77	34200					
Anthracene	78	34220					
Benzo(ghi) perylene (1,2,3,4,9-benzoperylene)	79	34521					
Fluorene	80	34381					
Phenanthrene	81	34461				110	
Dibenzo(a,h) anthracene (1,2,3,9-dibenzanthracene)	82	34556					
Indeno (1,2,3-cd) pyrene	83	34403					
7,7,3,3-tetrachlorodibenzo- p-dioxin (TCDD)	129	34675					
Benzidine	5	39120					
Pyrene	84	34469					

56733 = RUN ON Pest./PCB Extract

U.S. ENVIRONMENTAL PROTECTION AGENCY

MEMORANDUM

DATE: July 10, 1990

TO: Eugene Dominach
USEPA Region 2

FROM: Anibal Diaz
TAT Review Team

SUBJECT: QA/QC Compliance Review Summary

As requested, quality control and performance measures for the data packages noted have been examined and compared to EPA standards for compliance. Measures for the following general areas were evaluated:

Data Completeness
Spectra Matching Quality
Surrogate Spikes
Matrix Spikes/Duplicates
Calibration

Blanks
DFTPP and BFB Tuning
Chromatography
Holding Times
Compound ID (HSL, TIC)

Any statistical measures used to support the following conclusions are attached so that the review may be reviewed by others.

Summary of Results

	<u>Other</u>	<u>I</u> <u>Volatiles</u>	<u>II</u> <u>B/N/A</u>	<u>III</u> <u>Pesticide</u>	<u>IV</u> <u>Metals</u>
Acceptable as Submitted	☒	☒	☒	☒	☐
Acceptable with Comments	☐	☐	☐	☐	☒
Unacceptable, Action Pending	☐	☐	☐	☐	☐
Unacceptable	☐	☐	☐	☐	☐

Data Reviewed by:

Anibal Diaz

Date:

7/10/90

Review Authorized By:

TAT Contacts

Date:

Signature:

Anibal Diaz

Area Code/Phone No.:

201-225-6116

NARRATIVE

Site Name

King of Prussia

Laboratory Name

First Environmental LabIntroduction

The laboratory's portion of this Case consisted of 3 liquid samples collected on February 19, 1990.

The laboratory reported no problem(s) with the receipt of these samples.

The laboratory reported no problems with the analyses of _____ compounds.

The evaluator has commented on the criteria specified under each fraction heading. All criteria have been assessed, but no discussion is given where the evaluator has determined that criteria were adequately performed or require no comment.

- ☒ Holding Times
- ☐ GC/MS Tuning
- ☐ Calibration, Initial
- ☐ Calibration, Continuing
- ☒ Blank
- ☒ Surrogate Recovery

- ☒ MS/MSD
- ☐ Compound ID (HSL, TIC)
- ☒ Spectra Quality
- ☒ Standards
- ☒ Chromatography
- ☐ Data Completeness

Comments:

II. Base/Neutral/Acids

- ☒ Holding Times
- ☒ GC/MS Tuning
- ☒ Calibration, Initial
- ☒ Calibration, Continuing
- ☒ Blank
- ☒ Surrogate Recovery

- ☒ MS/MSD
- ☐ Compound ID (HSL, TIC)
- ☒ Standards
- ☒ Chromatography
- ☐ Data Completeness

Comments: _____

Data Qualified Due to QA Deficiency

<u>Sample</u>	<u>SIN</u>	<u>Qualified</u>	<u>Reason</u>
Aniline		T	Calibration Out of Control
Benzic Acid		T	
4 chloro-aniline		T	
Hexachloro cyclopentadiene		T	

As

This does not affect the results reported for the samples because none of the samples had a positive value for the given parameter.

III. Pesticides/PCBs

☒ Holding Times	☐ Calibration Linearity
☐ Instrument Performance	☐ Calibration, Continuing
☐ DDT RT/12 Minute?	☒ Blank
☐ Retention Time Window	☒ Surrogate Recovery
☐ Analytical Sequence	☒ MS/MSD
☐ DDT/Endrin Degradation	☐ Compound ID (HSL, TIC)
☐ RT Check for DBC	☐ Standards
☐ Resolution Check	☐ Chromatography
	☐ Data Completeness

Comments:

IV. Inorganic:

- ☒ Data Summary / Tabulated Results
- ☐ Initial and Continuing Calibration
- ☐ Blanks
- ☐ ICP Interference Check
- ☐ Spike Sample Recovery
- ☐ Duplicates
- ☐ Detection Limits
- ☐ Standard Addition Results
- ☐ ICP Serial Dilutions
- ☒ Holding Times
- ☐ ICP Interelement Correction Factors
- ☐ ICP Linear Ranges
- ☒ Chain of Custody
- ☐ Raw Data
- ☐ Quantitation, Conversions, Dilutions, etc.

Comments:

SN-2409-001 included error in qualifier; the value for zinc should not have been qualified with "U".

V. OTHER: RCRA +

☒ Chain of Custody

☒ Holding Time

☐ Calibration

☐ Raw Data

☐ Duplicates

☐ Data Completeness

Special Circumstances

FIRST ENVIRONMENTAL LABORATORIES, INC.



RECEIVED
MAR 15, 1990
TAT REG II

Test Report

<Acid Waste>

in

COPY

Roy F. Weston
Job Number: 2272
Report Date: March 14, 1990

FIRST ENVIRONMENTAL LABORATORIES, INC.

TEST REPORT

Roy F. Weston
1090 King Georges Post Road, Suite 201
Edison, New Jersey 08837
Attn: Anibal Diaz

Job Number: 2272

Subject: Three (3) samples submitted 02/20/90 and identified by the client as 2409-001, 2409-002, and 2409-003 from Project 2409.

Authorization: As per purchase order #16-01010.

Analysis: Samples were analyzed for Disposal Analyses; Incineration.

Methodology: Samples were analyzed according to the Standard Methods, ASTM, and USEPA SW-846.

Results: Attached


Jane M. Dunn
QA/QC Director


Seyed M. Dastgheyb
Laboratory Director

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL PROTECTION AGENCY - REGION II
Environmental Services Division
EDISON, NEW JERSEY 08817

Name of Unit and Address			
USEPA Raritan River Edison NJ 08837 SITE NAME: 3409		Eugene Domroch (201) 321-6666	

Sample Number	Number of Containers	Description of Samples
	1	1 x 302 wide-mouth - Volatiles, Extractables (GVA), Pesticides/PCBs
	1	1 x 302 wide-mouth - Total Metals, Cyanides
	1	1 x 302 wide-mouth - TOC, TOX, Sulfides, pH, Density, Reactivity, Ignitability
	1	1 x 16 oz wide-mouth - Phenolics
	1	1 x 32 oz wide-mouth - TSS
	1	1 x 32 oz wide-mouth - EP TOX
	1	1 x 32 oz wide-mouth - Volatiles, Extractables (GVA), PCB/Pesticides
	1	1 x 302 wide-mouth - Total Metals, Cyanides
	1	1 x 302 wide-mouth - TOC, TOX, Sulfides, pH, Density, Reactivity, Ignitability
	1	1 x 16 oz wide-mouth - Phenolics
	1	1 x 32 oz wide-mouth - TSS
	1	1 x 32 oz wide-mouth - EP TOX
3409-043	2	2 x 302 wide-mouth - Field Blanks

Person Assuming Responsibility for Sample					Time	Date
Sample Number	Relinquished By	Received By	Time	Date	Reason for Change of Custody	
Sample Number	Relinquished By	Received By	Time	Date	Reason for Change of Custody	
Sample Number	Relinquished By	Received By	Time	Date	Reason for Change of Custody	
Sample Number	Relinquished By	Received By	Time	Date	Reason for Change of Custody	

I- Volztiles

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MAR 4 1990 98

TAT REG II

CLIENT: ROY F. WESTON, INC.
 JOB NUMBER: 2272
 MATRIX: OIL
 DIL. FACTOR: 10
 UNITS: MG/L

DATE RECEIVED: 02/20/90
 DATE ANALYZED: 02/21/90
 DATE OF REPORT: 03/01/90

 CLIENT SAMPLE IDENTIFICATION: 2409-001

 VOLATILE FRACTION

COMPOUND -----	AMOUNT -----
CHLOROMETHANE	ND [100]
BROMOMETHANE	ND [100]
VINYL CHLORIDE	ND [100]
CHLOROETHANE	ND [100]
METHYLENE CHLORIDE	ND [50]
ACETONE	ND [100]
CARBON DISULFIDE	ND [50]
1,1-DICHLOROETHENE	ND [50]
1,1-DICHLOROETHANE	ND [50]
1,2-DICHLOROETHENE (TOTAL)	ND [50]
CHLOROFORM	ND [50]
1,2-DICHLOROETHANE	ND [50]
2-BUTANONE (MEK)	1540
1,1,1-TRICHLOROETHANE	ND [50]
CARBON TETRACHLORIDE	ND [50]
VINYL ACETATE	ND [100]
BROMODICHLOROMETHANE	ND [50]
1,2-DICHLOROPROPANE	ND [50]
CIS-1,3-DICHLOROPROPENE	ND [50]
TRICHLOROETHENE	ND [50]
DIBROMOCHLOROMETHANE	ND [50]
1,1,2-TRICHLOROETHANE	ND [50]
BENZENE	ND [50]
TRANS-1,3-DICHLOROPROPENE	ND [50]
BROMOFORM	ND [50]
4-METHYL-2-PENTANONE (MIBK)	ND [100]
2-HEXANONE	ND [100]
TETRACHLOROETHENE	30
1,1,2,2-TETRACHLOROETHANE	ND [50]
TOLUENE	80
CHLOROBENZENE	ND [50]
ETHYL BENZENE	ND [50]
STYRENE	ND [50]
XYLENES (TOTAL)	ND [50]

 ND = NONE DETECTED, DETECTION LIMIT IN BRACKETS, []

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TAT REG II

CLIENT: ROY F. WESTON, INC.
 JOB NUMBER: 2272
 MATRIX: OIL
 DIL. FACTOR: 0
 UNITS: MG/L

DATE RECEIVED: 02/20/90
 DATE ANALYZED: 02/21/90
 DATE OF REPORT: 03/01/90

 CLIENT SAMPLE IDENTIFICATION: 2409-002

 VOLATILE FRACTION

COMPOUND -----	AMOUNT -----
CHLOROMETHANE	ND [100]
BROMOMETHANE	ND [100]
VINYL CHLORIDE	ND [100]
CHLOROETHANE	ND [100]
METHYLENE CHLORIDE	70
ACETONE	ND [100]
CARBON DISULFIDE	ND [50]
1,1-DICHLOROETHENE	ND [50]
1,1-DICHLOROETHANE	ND [50]
1,2-DICHLOROETHENE (TOTAL)	ND [50]
CHLOROFORM	ND [50]
1,2-DICHLOROETHANE	ND [50]
2-BUTANONE (MEK)	1780
1,1,1-TRICHLOROETHANE	ND [50]
CARBON TETRACHLORIDE	ND [50]
VINYL ACETATE	ND [100]
BROMODICHLOROMETHANE	ND [50]
1,2-DICHLOROPROPANE	ND [50]
CIS-1,3-DICHLOROPROPENE	ND [50]
TRICHLOROETHENE	ND [50]
DIBROMOCHLOROMETHANE	ND [50]
1,1,2-TRICHLOROETHANE	ND [50]
BENZENE	ND [50]
TRANS-1,3-DICHLOROPROPENE	ND [50]
BROMOFORM	ND [50]
4-METHYL-2-PENTANONE (MIBK)	ND [100]
2-HEXANONE	ND [100]
TETRACHLOROETHENE	30
1,1,2,2-TETRACHLOROETHANE	ND [50]
TOLUENE	70
CHLOROBENZENE	ND [50]
ETHYL BENZENE	ND [50]
STYRENE	ND [50]
XYLENES (TOTAL)	ND [50]

 ND = NONE DETECTED, DETECTION LIMIT IN BRACKETS, []

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TAT REG II

CLIENT: ROY F. WESTON, INC.
 JOB NUMBER: 2272
 MATRIX: WATER
 DIL. FACTOR: 1
 UNITS: UG/L

DATE RECEIVED: 02/20/90
 DATE ANALYZED: 02/21/90
 DATE OF REPORT: 03/01/90

 CLIENT SAMPLE IDENTIFICATION: 2409-003

VOLATILE FRACTION

COMPOUND -----	AMOUNT -----
CHLOROMETHANE	ND [10]
BROMOMETHANE	ND [10]
VINYL CHLORIDE	ND [10]
CHLOROETHANE	ND [10]
METHYLENE CHLORIDE	ND [5.0]
ACETONE	ND [10]
CARBON DISULFIDE	ND [5.0]
1,1-DICHLOROETHENE	ND [5.0]
1,1-DICHLOROETHANE	ND [5.0]
1,2-DICHLOROETHENE (TOTAL)	ND [5.0]
CHLOROFORM	ND [5.0]
1,2-DICHLOROETHANE	ND [5.0]
2-BUTANONE (MEK)	ND [10]
1,1,1-TRICHLOROETHANE	ND [5.0]
CARBON TETRACHLORIDE	ND [5.0]
VINYL ACETATE	ND [10]
BROMODICHLOROMETHANE	ND [5.0]
1,2-DICHLOROPROPANE	ND [5.0]
CIS-1,3-DICHLOROPROPENE	ND [5.0]
TRICHLOROETHENE	ND [5.0]
DIBROMOCHLOROMETHANE	ND [5.0]
1,1,2-TRICHLOROETHANE	ND [5.0]
BENZENE	ND [5.0]
TRANS-1,3-DICHLOROPROPENE	ND [5.0]
BROMOFORM	ND [5.0]
4-METHYL-2-PENTANONE (MIBK)	ND [10]
2-HEXANONE	ND [10]
TETRACHLOROETHENE	ND [5.0]
1,1,2,2-TETRACHLOROETHANE	ND [5.0]
TOLUENE	ND [5.0]
CHLOROBENZENE	ND [5.0]
ETHYL BENZENE	ND [5.0]
STYRENE	ND [5.0]
XYLENES (TOTAL)	ND [5.0]

 ND = NONE DETECTED, DETECTION LIMIT IN BRACKETS, []

II- BNA's

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TAT REG II

PAGE 1 OF 2

CLIENT: ROY F. WESTON, INC.
JOB NUMBER: 2272
MATRIX: OIL
DIL. FACTOR: 1
UNITS: MG/L

DATE RECEIVED: 02/20/90
DATE ANALYZED: 02/27/90
EXTRACTION DATE: 02/21/90
DATE OF REPORT: 03/01/90

CLIENT SAMPLE IDENTIFICATION: 2409-001

SEMIVOLATILE FRACTION

COMPOUND

AMOUNT

N-NITROSO-DIMETHYLAMINE	ND	[	10	]
ANILINE	ND	[	10	]
PHENOL	ND	[	10	]
BIS(2-CHLOROETHYL) ETHER	ND	[	10	]
2-CHLOROPHENOL	ND	[	10	]
1,3-DICHLOROBENZENE	ND	[	10	]
1,4-DICHLOROBENZENE	ND	[	10	]
BENZYL ALCOHOL	ND	[	10	]
1,2-DICHLOROBENZENE	ND	[	10	]
2-METHYL PHENOL	ND	[	10	]
BIS(2-CHLOROISOPROPYL) ETHER	ND	[	10	]
4-METHYL PHENOL	ND	[	10	]
N-NITROSO-DI-N-PROPYLAMINE	ND	[	10	]
HEXACHLOROETHANE	ND	[	10	]
NITROBENZENE	ND	[	10	]
ISOPHORONE	ND	[	10	]
2-NITROPHENOL	ND	[	10	]
2,4-DIMETHYLPHENOL	ND	[	10	]
BENZOIC ACID	ND	[	50	]
BIS(2-CHLOROETHOXY) METHANE	ND	[	10	]
2,4-DICHLOROPHENOL	ND	[	10	]
1,2,4-TRICHLOROBENZENE	ND	[	10	]
NAPHTHALENE	ND	[	10	]
4-CHLOROANILINE	ND	[	10	]
HEXACHLOROBUTADIENE	ND	[	10	]
4-CHLORO-3-METHYLPHENOL	ND	[	10	]
2-METHYLNAPHTHALENE	ND	[	10	]
HEXACHLOROCYCLOPENTADIENE	ND	[	10	]
2,4,6-TRICHLOROPHENOL	ND	[	10	]
2,4,5-TRICHLOROPHENOL	ND	[	50	]
2-CHLORONAPHTHALENE	ND	[	10	]
2-NITROANILINE	ND	[	50	]

 CLIENT SAMPLE IDENTIFICATION: 2409-001

SEMIVOLATILE FRACTION

COMPOUND -----	AMOUNT -----
DIMETHYLPHTHALATE	ND [10]
ACENAPHHYLENE	ND [10]
2,6-DINITROTOLUENE	ND [10]
3-NITROANILINE	ND [50]
ACENAPHTHENE	ND [10]
2,4-DINITROPHENOL	ND [50]
4-NITROPHENOL	ND [50]
DIBENZOFURAN	ND [10]
2,4-DINITROTOLUENE	ND [10]
DIETHYLPHTHALATE	ND [10]
4-CHLOROPHENYL PHENYL ETHER	ND [10]
FLUORENE	ND [10]
4-NITROANILINE	ND [50]
1,2-DIPHENYLHYDRAZINE	ND [10]
4,6-DINITRO-2-METHYLPHENOL	ND [50]
N-NITROSODIPHENYLAMINE	ND [10]
4-BROMOPHENYL PHENYL ETHER	ND [10]
HEXACHLOROBENZENE	ND [10]
PENTACHLOROPHENOL	ND [50]
PHENANTHRENE	ND [10]
ANTHRACENE	ND [10]
DI-N-BUTYL PHTHALATE	ND [10]
FLUORANTHENE	ND [10]
BENZIDINE	ND [10]
PYRENE	ND [10]
BUTYLBENZYLPHTHALATE	ND [10]
3,3'-DICHLOROBENZIDINE	ND [20]
BENZO(A)ANTHRACENE	ND [10]
CHRYSENE	ND [10]
BIS(2-ETHYLHEXYL)PHTHALATE	280
DI-N-OCTYL PHTHALATE	ND [10]
BENZO (B) FLUORANTHENE	ND [10]
BENZO (K) FLUORANTHENE	ND [10]
BENZO (A) PYRENE	ND [10]
INDENO(1,2,3-CD)PYRENE	ND [10]
DIBENZO(A,H)ANTHRACENE	ND [10]
BENZO(G,H,I)PERYLENE	ND [10]

 ND = NONE DETECTED, DETECTION LIMIT IN BRACKETS, []

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PAGE 1 OF 2

CLIENT: ROY F. WESTON, INC.
 JOB NUMBER: 2272
 MATRIX: OIL
 DIL. FACTOR: 1
 UNITS: MG/L

DATE RECEIVED: 02/20/90
 DATE ANALYZED: 02/27/90
 EXTRACTION DATE: 02/21/90
 DATE OF REPORT: 03/01/90

 CLIENT SAMPLE IDENTIFICATION: 2409-002

SEMIVOLATILE FRACTION

COMPOUND -----	AMOUNT -----
N-NITROSO-DIMETHYLAMINE	ND [10]
ANILINE	ND [10]
PHENOL	ND [10]
BIS(2-CHLOROETHYL) ETHER	ND [10]
2-CHLOROPHENOL	ND [10]
1,3-DICHLOROBENZENE	ND [10]
1,4-DICHLOROBENZENE	ND [10]
BENZYL ALCOHOL	ND [10]
1,2-DICHLOROBENZENE	ND [10]
2-METHYL PHENOL	ND [10]
BIS(2-CHLOROISOPROPYL) ETHER	ND [10]
4-METHYL PHENOL	ND [10]
N-NITROSO-DI-N-PROPYLAMINE	ND [10]
HEXACHLOROETHANE	ND [10]
NITROBENZENE	ND [10]
ISOPHORONE	ND [10]
2-NITROPHENOL	ND [10]
2,4-DIMETHYLPHENOL	ND [10]
BENZOIC ACID	ND [50]
BIS(2-CHLOROETHOXY) METHANE	ND [10]
2,4-DICHLOROPHENOL	ND [10]
1,2,4-TRICHLOROBENZENE	ND [10]
NAPHTHALENE	ND [10]
4-CHLOROANILINE	ND [10]
HEXACHLOROBUTADIENE	ND [10]
4-CHLORO-3-METHYLPHENOL	ND [10]
2-METHYLNAPHTHALENE	ND [10]
HEXACHLOROCYCLOPENTADIENE	ND [10]
2,4,6-TRICHLOROPHENOL	ND [10]
2,4,5-TRICHLOROPHENOL	ND [50]
2-CHLORONAPHTHALENE	ND [10]
2-NITROANILINE	ND [50]

 CLIENT SAMPLE IDENTIFICATION: 2409-002

SEMIVOLATILE FRACTION

COMPOUND -----	AMOUNT -----
DIMETHYLPHTHALATE	ND [10]
ACENAPHHYLENE	ND [10]
2,6-DINITROTOLUENE	ND [10]
3-NITROANILINE	ND [50]
ACENAPHTHENE	ND [10]
2,4-DINITROPHENOL	ND [50]
4-NITROPHENOL	ND [50]
DIBENZOFURAN	ND [10]
2,4-DINITROTOLUENE	ND [10]
DIETHYLPHTHALATE	ND [10]
4-CHLOROPHENYL PHENYL ETHER	ND [10]
FLUORENE	ND [10]
4-NITROANILINE	ND [50]
1,2-DIPHENYLHYDRAZINE	ND [10]
4,6-DINITRO-2-METHYLPHENOL	ND [50]
N-NITROSODIPHENYLAMINE	ND [10]
4-BROMOPHENYL PHENYL ETHER	ND [10]
HEXACHLOROBENZENE	ND [10]
PENTACHLOROPHENOL	ND [50]
PHENANTHRENE	ND [10]
ANTHRACENE	ND [10]
DI-N-BUTYL PHTHALATE	ND [10]
FLUORANTHENE	ND [10]
BENZIDINE	ND [10]
PYRENE	ND [10]
BUTYLBENZYLPHTHALATE	ND [10]
3,3'-DICHLOROBENZIDINE	ND [20]
BENZO(A)ANTHRACENE	ND [10]
CHRYSENE	ND [10]
BIS(2-ETHYLHEXYL)PHTHALATE	43
DI-N-OCTYL PHTHALATE	ND [10]
BENZO (B) FLUORANTHENE	ND [10]
BENZO (K) FLUORANTHENE	ND [10]
BENZO (A) PYRENE	ND [10]
INDENO(1,2,3-CD)PYRENE	ND [10]
DIBENZO(A,H)ANTHRACENE	ND [10]
BENZO(G,H,I)PERYLENE	ND [10]

 ND = NONE DETECTED, DETECTION LIMIT IN BRACKETS, []

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MAY 4, 1990
TAT REG II

PAGE 1 OF 2

CLIENT: ROY F. WESTON, INC.
JOB NUMBER: 2272
MATRIX: WATER
DIL. FACTOR: 10
UNITS: UG/L

DATE RECEIVED: 02/20/90
DATE ANALYZED: 02/27/90
EXTRACTION DATE: 02/21/90
DATE OF REPORT: 03/01/90

CLIENT SAMPLE IDENTIFICATION: 2409-003

SEMIVOLATILE FRACTION

COMPOUND -----	AMOUNT -----
N-NITROSO-DIMETHYLAMINE	ND [100]
ANILINE	ND [100]
PHENOL	ND [100]
BIS(2-CHLOROETHYL) ETHER	ND [100]
2-CHLOROPHENOL	ND [100]
1,3-DICHLOROBENZENE	ND [100]
1,4-DICHLOROBENZENE	ND [100]
BENZYL ALCOHOL	ND [100]
1,2-DICHLOROBENZENE	ND [100]
2-METHYL PHENOL	ND [100]
BIS(2-CHLOROISOPROPYL) ETHER	ND [100]
4-METHYL PHENOL	ND [100]
N-NITROSO-DI-N-PROPYLAMINE	ND [100]
HEXACHLOROETHANE	ND [100]
NITROBENZENE	ND [100]
ISOPHORONE	ND [100]
2-NITROPHENOL	ND [100]
2,4-DIMETHYLPHENOL	ND [100]
BENZOIC ACID	ND [500]
BIS(2-CHLOROETHOXY) METHANE	ND [100]
2,4-DICHLOROPHENOL	ND [100]
1,2,4-TRICHLOROBENZENE	ND [100]
NAPHTHALENE	ND [100]
4-CHLOROANILINE	ND [100]
HEXACHLOROBUTADIENE	ND [100]
4-CHLORO-3-METHYLPHENOL	ND [100]
2-METHYLNAPHTHALENE	ND [100]
HEXACHLOROCYCLOPENTADIENE	ND [100]
2,4,6-TRICHLOROPHENOL	ND [100]
2,4,5-TRICHLOROPHENOL	ND [500]
2-CHLORONAPHTHALENE	ND [100]
2-NITROANILINE	ND [500]

 CLIENT SAMPLE IDENTIFICATION: 2409-003

SEMIVOLATILE FRACTION

COMPOUND -----	AMOUNT -----
DIMETHYLPHTHALATE	ND [100]
ACENAPHHYLENE	ND [100]
2,6-DINITROTOLUENE	ND [100]
3-NITROANILINE	ND [500]
ACENAPHTHENE	ND [100]
2,4-DINITROPHENOL	ND [500]
4-NITROPHENOL	ND [500]
DIBENZOFURAN	ND [100]
2,4-DINITROTOLUENE	ND [100]
DIETHYLPHTHALATE	ND [100]
4-CHLOROPHENYL PHENYL ETHER	ND [100]
FLUORENE	ND [100]
4-NITROANILINE	ND [500]
1,2-DIPHENYLHYDRAZINE	ND [100]
4,6-DINITRO-2-METHYLPHENOL	ND [500]
N-NITROSODIPHENYLAMINE	ND [100]
4-BROMOPHENYL PHENYL ETHER	ND [100]
HEXACHLOROBENZENE	ND [100]
PENTACHLOROPHENOL	ND [500]
PHENANTHRENE	ND [100]
ANTHRACENE	ND [100]
DI-N-BUTYL PHTHALATE	ND [100]
FLUORANTHENE	ND [100]
BENZIDINE	ND [100]
PYRENE	ND [100]
BUTYLBENZYLPHTHALATE	ND [100]
3,3'-DICHLOOROBENZIDINE	ND [200]
BENZO(A)ANTHRACENE	ND [100]
CHRYSENE	ND [100]
BIS(2-ETHYLHEXYL)PHTHALATE	ND [100]
DI-N-OCTYL PHTHALATE	ND [100]
BENZO (B) FLUORANTHENE	ND [100]
BENZO (K) FLUORANTHENE	ND [100]
BENZO (A) PYRENE	ND [100]
INDENO(1,2,3-CD)PYRENE	ND [100]
DIBENZO(A,H)ANTHRACENE	ND [100]
BENZO(G,H,I)PERYLENE	ND [100]

 ND = NONE DETECTED, DETECTION LIMIT IN BRACKETS, []

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III - PCB/Pesticides

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TAT REG II

CLIENT: ROY F. WESTON
JOB NUMBER: 2272
MATRIX: OIL
DIL. FACTOR: 100
UNITS: UG/L

DATE RECEIVED: 02/20/90
DATE ANALYZED: 02/27/90
DATE OF REPORT: 03/01/90
DATE OF EXTR: 02/21/90

CLIENT SAMPLE IDENTIFICATION: 2409-001

PESTICIDE FRACTION

COMPOUND

AMOUNT

ALPHA - BHC	ND [5.000]
BETA - BHC	ND [5.000]
DELTA - BHC	ND [5.000]
LINDANE	ND [5.000]
HEPTACHLOR	ND [5.000]
ALDRIN	ND [5.000]
HEPTACHLOR EPOXIDE	ND [5.000]
ENDOSULFAN I	ND [5.000]
DIELDRIN	ND [10.000]
4,4' - DDE	ND [10.000]
ENDRIN	ND [10.000]
ENDOSULFAN II	ND [10.000]
4-4' - DDD	ND [10.000]
ENDOSULFAN SULFATE	ND [10.000]
4,4' - DDT	ND [10.000]
METHOXYCHLOR	ND [50.000]
ENDRIN KETONE	ND [10.000]
ALPHA - CHLORDANE	ND [50.000]
GAMA - CHLORDANE	ND [50.000]
TOXAPHENE	ND [100.00]
AROCLOR - 1016	ND [50.000]
AROCLOR - 1221	ND [50.000]
AROCLOR - 1232	ND [50.000]
AROCLOR - 1242	ND [50.000]
AROCLOR - 1248	ND [50.000]
AROCLOR - 1254	ND [100.00]
AROCLOR - 1260	ND [100.00]

ND = NONE DETECTED, DETECTION LIMIT IN BRACKETS, []

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TAT REG II

CLIENT: ROY F. WESTON
JOB NUMBER: 2272
MATRIX: OIL
DIL. FACTOR: 10
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DATE OF EXTR: 02/21/90

CLIENT SAMPLE IDENTIFICATION: 2409-002

PESTICIDE FRACTION

COMPOUND

AMOUNT

ALPHA - BHC	ND [0.500]
BETA - BHC	110.00
DELTA - BHC	ND [0.500]
LINDANE	ND [0.500]
HEPTACHLOR	50.400
ALDRIN	ND [0.500]
HEPTACHLOR EPOXIDE	179.00
ENDOSULFAN I	ND [0.500]
DIELDRIN	ND [1.000]
4,4' - DDE	ND [1.000]
ENDRIN	196.00
ENDOSULFAN II	ND [1.000]
4-4' - DDD	ND [1.000]
ENDOSULFAN SULFATE	ND [1.000]
4,4' - DDT	ND [1.000]
METHOXYCHLOR	ND [5.000]
ENDRIN KETONE	ND [1.000]
ALPHA - CHLORDANE	385.00
GAMA - CHLORDANE	503.00
TOXAPHENE	ND [10.000]
AROCLOR - 1016	ND [5.000]
AROCLOR - 1221	ND [5.000]
AROCLOR - 1232	ND [5.000]
AROCLOR - 1242	ND [5.000]
AROCLOR - 1248	ND [5.000]
AROCLOR - 1254	ND [10.000]
AROCLOR - 1260	ND [10.000]

ND = NONE DETECTED, DETECTION LIMIT IN BRACKETS, []

RECEIVED

4 900

TAT REG II

CLIENT: ROY F. WESTON
 JOB NUMBER: 2272
 MATRIX: WATER
 DIL. FACTOR: 1
 UNITS: UG/L

DATE RECEIVED: 02/20/90
 DATE ANALYZED: 02/27/90
 DATE OF REPORT: 03/01/90
 DATE OF EXTR: 02/21/90

 CLIENT SAMPLE IDENTIFICATION: 2490-003

PESTICIDE FRACTION

COMPOUND -----	AMOUNT -----
ALPHA - BHC	ND [0.050]
BETA - BHC	ND [0.050]
DELTA - BHC	ND [0.050]
LINDANE	ND [0.050]
HEPTACHLOR	ND [0.050]
ALDRIN	ND [0.050]
HEPTACHLOR EPOXIDE	ND [0.050]
ENDOSULFAN I	ND [0.050]
DIELDRIN	ND [0.050]
4,4' - DDE	ND [0.100]
ENDRIN	ND [0.100]
ENDOSULFAN II	ND [0.100]
4-4' - DDD	ND [0.100]
ENDOSULFAN SULFATE	ND [0.100]
4,4' - DDT	ND [0.100]
METHOXYCHLOR	ND [0.500]
ENDRIN KETONE	ND [0.100]
ALPHA - CHLORDANE	ND [0.500]
GAMA - CHLORDANE	ND [0.500]
TOXAPHENE	ND [1.000]
AROCLOR - 1016	ND [0.500]
AROCLOR - 1221	ND [0.500]
AROCLOR - 1232	ND [0.500]
AROCLOR - 1242	ND [0.500]
AROCLOR - 1248	ND [0.500]
AROCLOR - 1254	ND [1.000]
AROCLOR - 1260	ND [1.000]

 ND = NONE DETECTED, DETECTION LIMIT IN BRACKETS, []

IV - Metals

RECEIVED

13, 1990

TAT REG II

INORGANIC ANALYSIS DATA SHEET

1

CLIENT SAMPLE ID

LAB NAME: FIRST ENVIRONMENTAL LABORATORIES

2409-001

CLIENT: ROY F. WESTON

LAB CODE: FEL

JOB NO.: 2272

MATRIX (SOIL/WATER): OIL

LAB SAMPLE ID: 2272-01

LEVEL (LOW/MEDIUM): LOW

DATE RECEIVED: 02/21/90

CONCENTRATION UNITS (UG/L OR MG/KG DRY WEIGHT): MG/KG

CAS NO.	ANALYTE	CONCENTRATION	C	Q	M
7429-90-5	ALUMINUM	2280	-		P
7440-36-0	ANTIMONY	204			P
7440-38-2	ARSENIC	0.61	U		F
7440-39-3	BARIUM	8.6	B		P
7440-41-7	BERYLLIUM	123			P
7440-43-9	CADMIUM	2.6	U		P
7440-70-2	CALCIUM	910	B		P
7440-47-3	CHROMIUM	612			P
7440-48-4	COBALT	1590			P
7440-50-8	COPPER	44200			P
7439-89-6	IRON	220000			P
7439-92-1	LEAD	63.4			F
7439-95-4	MAGNESIUM	18.3	U		P
7439-96-5	MANGANESE	1720			P
7439-97-6	MERCURY	0.13	U		CV
7440-02-0	NICKEL	7540			P
7440-09-7	POTASSIUM	31.4	U		P
7782-49-2	SELENIUM	0.89	U		F
7440-22-4	SILVER	24.4			P
7440-23-5	SODIUM	354	B		P
7440-28-0	THALLIUM	0.79	U		F
7440-62-2	VANADIUM	1.9	U		P
7440-66-6	ZINC	24800	U		P
	CYANIDE	1.0	U		C

COLOR BEFORE: BROWN

CLARITY BEFORE: CLEAR

TEXTURE: OILY

COLOR AFTER: CLEAR

CLARITY AFTER: CLEAR

ARTIFACTS: NONE

COMMENTS: NONE

RECEIVED

13 90 00

INORGANIC ANALYSIS DATA SHEET

TAT-REG II

1

CLIENT SAMPLE ID

FROM BY: XEROX TELESCOPIER 7010 : 8-13-90 4:00PM ;

SCITT 834

74236: # 2

LAB NAME: FIRST ENVIRONMENTAL LABORATORIES

2409-002

CLIENT: ROY F. WESTON

LAB CODE: FEL

JOB NO.: 2272

MATRIX (SOIL/WATER): OIL

LAB SAMPLE ID: 2272-02

LEVEL (LOW/MEDIUM): LOW

DATE RECEIVED: 02/21/90

CONCENTRATION UNITS (UG/L OR MG/KG DRY WEIGHT): MG/KG

CAS NO.	ANALYTE	CONCENTRATION	C	Q	M
7429-90-5	ALUMINUM	1100	-		P
7440-36-0	ANTIMONY	114			P
7440-38-2	ARSENIC	0.48	U		F
7440-39-3	BARIUM	0.50	U		P
7440-41-7	BERYLLIUM	57.2			P
7440-43-9	CADMIUM	0.60	U		P
7440-70-2	CALCIUM	242	B		P
7440-47-3	CHROMIUM	294			P
7440-48-4	COBALT	770			P
7440-50-8	COPPER	20200			P
7439-89-6	IRON	130000			P
7439-92-1	LEAD	36.2			F
7439-95-4	MAGNESIUM	18.3	U		P
7439-96-5	MANGANESE	840			P
7439-97-6	MERCURY	0.10	U		CV
7440-02-0	NICKEL	3600			P
7440-09-7	POTASSIUM	31.4	U		P
7782-49-2	SELENIUM	0.70	U		F
7440-22-4	SILVER	11.6			P
7440-23-5	SODIUM	34.6	U		P
7440-28-0	THALLIUM	0.70	U		F
7440-62-2	VANADIUM	1.9	U		P
7440-66-6	ZINC	12500			P
	CYANIDE	1.0	U		C

COLOR BEFORE: BROWN

CLARITY BEFORE: CLEAR

TEXTURE: OILY

COLOR AFTER: CLEAR

CLARITY AFTER: CLEAR

ARTIFACTS: NONE

COMMENTS: NONE

RECEIVED

13, 90 0

TAT REG II

INORGANIC ANALYSIS DATA SHEET

1

CLIENT SAMPLE ID

LAB NAME: FIRST ENVIRONMENTAL LABORATORIES

2409-003

CLIENT: ROY F. WESTON

LAB CODE: FEL

JOB NO.: 2272

MATRIX (SOIL/WATER): WATER

LAB SAMPLE ID: 2272-03

LEVEL (LOW/MEDIUM): LOW

DATE RECEIVED: 02/21/90

CONCENTRATION UNITS (UG/L OR MG/KG DRY WEIGHT): UG/L

CAS NO.	ANALYTE	CONCENTRATION	C	Q	M
7429-90-5	ALUMINUM	50.1	U		P
7440-36-0	ANTIMONY	26.7	U		P
7440-38-2	ARSENIC	2.4	U		F
7440-39-3	BARIUM	2.4	U		P
7440-41-7	BERYLLIUM	2.1	U		P
7440-43-9	CADMIUM	2.8	U		P
7440-70-2	CALCIUM	126	U		P
7440-47-3	CHROMIUM	5.1	U		P
7440-48-4	COBALT	5.0	U		P
7440-50-8	COPPER	4.3	U		P
7439-89-6	IRON	17.4	U		P
7439-92-1	LEAD	2.6	U		F
7439-95-4	MAGNESIUM	91.6	U		P
7439-96-5	MANGANESE	2.5	U		P
7439-97-6	MERCURY	0.20	U		CV
7440-02-0	NICKEL	7.9	U		P
7440-09-7	POTASSIUM	157	U		P
7782-49-2	SELENIUM	3.5	U		F
7440-22-4	SILVER	4.4	U		P
7440-23-5	SODIUM	173	U		P
7440-28-0	THALLIUM	3.1	U		F
7440-62-2	VANADIUM	9.4	U		P
7440-66-6	ZINC	3.2	U		P
	CYANIDE	10.0	U		C

COLOR BEFORE: CLEAR

CLARITY BEFORE: CLEAR

TEXTURE: N/A

COLOR AFTER: CLEAR

CLARITY AFTER: CLEAR

ARTIFACTS: N/A

COMMENTS: NONE

VI - RCRA + Dispose!

FIRST ENVIRONMENTAL LABORATORIES, INC.

Client: Roy F. WestonJob Number: 2272Results: Disposal Analysis, Incineration

	<u>2409-001</u>	<u>2409-002</u>	<u>2409-003</u>
Flashpoint	No Flash ¹	No Flash ¹	No Flash ¹
Density	1.53	1.56	1.00
BTU, BTU/lb	No value obtained	No value obtained	No value obtained
Ash	13.28%	11.96%	<0.01%
Chlorine	42500. ppm	49000. ppm	<100. ppm
Bromine	<100. ppm	<100. ppm	<100. ppm
Iodine	<100. ppm	<100. ppm	<100. ppm
Fluorine	<100. ppm	<100. ppm	<100. ppm
Sulfur ²	28.83%	32.40%	NA
Cyanide, Total	<1.0 ppm	<1.0 ppm	<1.0 ppm
Sulfide, Total	4000. ppm	7600. ppm	<1.0 ppm
Chloride, Total	26.2%	26.1%	NA
Reactivity			
Cyanide	<0.04 ppm	<0.04 ppm	<0.04 ppm
Sulfide	<0.09 ppm	<0.09 ppm	<0.09 ppm
Corrosivity ³	1.09×10^{-5} mm/yr	1.17×10^{-5} mm/yr	NA
pH	7.08 (1.75) ⁵	7.11 (1.45) ⁵	7.05
% Solids ⁴	69.2	68.8	<1.0
Phosphate	236. ppm	238. ppm	NA

¹ Test discontinued at 104°C, no flash to this point² Sulfur analysis performed by X-Ray due to high level of sulfur in sample.³ 1:1 dilution of sample (sample:water)⁴ Test conducted at 103°C. Above value represents total sample remaining at 103°C (not necessarily solids).⁵ 1:1 dilution of sample (sample:water)

FIRST ENVIRONMENTAL LABORATORIES, INC.

Client: Roy F. WestonJob Number: 2272Results: pH (titrated with 1.25N NaOH)

Sample ID: 2409-002

<u>pH</u>	<u>mL of NaOH Added</u>
1.45	0
1.48	1
1.59	2
1.77	5
1.86	7
1.96	10
2.02	14
2.15	20
2.42	23
3.06	24.2
3.22	25
3.47	26
3.69	27
4.04	28
4.50	29
5.28	30
5.90	31
6.37	32
7.55	33
9.33	34
10.83	35
11.42	36
11.82	37
12.14	38
12.38	39
12.49	40
12.56	41
12.63	42
12.78	45
12.88	48
12.95	50
13.04	55
13.12	60
13.18	65
13.27	75

MAR 11 1991

BONNER ANALYTICAL TESTING COMPANY
658 Weathersby Road
Hattiesburg, MS 39402
(601) 264-2854

KOP 2.4039

RECEIVED

MAR 11 1991

S & W BRANCH

Client: Roy F. Weston

File Number: RFW0130-19-25
Collected By: ClientSample Date/Time: 11/27/91
Date/Time Rec'd: 1/30/91 @ 1000
Date/Time Rec'd: 1/30/91 @ 1000

SAS Number 5979B-84

Sample I.D.	BTU/lb	Ash %	Sulfur %	Bottom Sediment/H2O
5979B-04-01	ND	52.81	ND	---
5979B-04-02	ND	52.30	ND	---
5979B-04-03	ND	50.67	ND	---
5979B-04-04	ND	47.26	ND	---
5979B-04-05	ND	23.46	0.01	1.8/ND
5979B-04-06	ND	21.13	0.59	4.8/ND
5979B-04-07	ND	0.01	ND	ND/ND
5979B-04-07-DUP	ND	0.01	ND	ND/ND

Data reported in mg/l unless otherwise noted. All analyses performed in accordance with 40 CFR 136 and amendments.

MDL = Method Detection Limit.

*Note: Duplicate performed for QA/QC purposes.

Calorimeter standardization with 0.977 grams benzoic acid yielded a net corrected value of 6299 cal/gram. Standard value for benzoic acid is 6318 cal/gram. Recovery of 99.70% obtained. The energy equivalent of the bomb was computed as 2429.4 cal/gram. This value was used in all calculations.

Certified by:

Michael S. Bonner, Ph.D.
BONNER ANALYTICAL TESTING COMPANY

ldb

BONNER ANALYTICAL TESTING COMPANY
658 Weathersby Road
Hattiesburg, MS 39402
(601) 264-2854

Client: Roy F. Weston

File Number: RFW0130-26-31
Collected By: Client

Sample Date/Time: 1/29/91 @ 7
Date/Time Rec'd: 1/30/91 @ 1000
Date/Time Recun: 1/30/91 @ 1000

SAS Number 5979B-04

Sample I.D. TAT Sample BTU/lb Ash Sulfur

5979B-04-08 (13)	3135	34.42	0.88
5979B-04-09 (12)	ND	50.12	0.04
5979B-04-10 (18)	ND	70.06	0.01
5979B-04-11 (17)	ND	45.84	0.06
5979B-04-12 (14/15)	52	89.37	ND
5979B-04-13 (14)	172	91.86	ND

check appearance

Data reported in no/1 unless otherwise noted. All analyses performed in accordance with 40 CFR 136 and amendments.

MDL = Method Detection Limit.

*Note: Duplicate performed for QA/QC purposes.

BTU analyzed on 2/19/91 @ 0830 by RWC/KAD.
Ash analyzed on 2/19/91 @ 1630 by MAB.
Sulfur analyzed on 2/19/91 @ 1400 by KAD.
BS & W analyzed on 2/19/91 @ 1030 by RML.

Certified by:

Michael S. Bonner, Ph.D.
BONNER ANALYTICAL TESTING COMPANY

ldb

OTHER ANALYTES WORK TABLE

KOP 2.4041

PROJECT

KOP

PAGE 1 OF 5

SAMPLING DATE

TAT PM

E. Dominick

SFS 5937B-02 <Chemtech>

SAMPLE #/CONCENTRATION ()

METALS/CN ANALYTE	Minimum Detection Range	01	02	03	04	05	06
131. Aluminum		250000	241600.0	2126600	270570.0	226000.0	239560.0
132. Antimony		30.6 N					
133. Arsenic							
134. Barium		159BN	18.8 BN	14.1 BN		14.8 BN	37.9 BN
135. Beryllium							
136. Cadmium				3.2 BN	1.4 BN		2.2 BN
137. Calcium		797.4 B	353.8	362.8 B	382.4 B	303.5 B	3116.6 B
138. Chromium		149 B	5.4 B	1.12 B		9.6 B	16.5 B
139. Cobalt							
140. Copper		230 BN		11.5 BN			
141. Iron		464.0	32576	349	183.2 B	411.8	304.3
142. Lead							
143. Magnesium					25.2 B	56.4 B	
144. Manganese		41.4	46.2 B	27.1 B			16.7 B
145. Mercury		0.239	1.14	0.44	0.24	0.38	0.32
146. Nickel		1.89					4.7 B
147. Potassium							
148. Selenium							
149. Silver		3.6 BN	16684.0	235780	~~112500~~	~~87500~~	40100 B
150. Sodium		11448.0		12540.1 N	13280.0	5780.0	7716.0
151. Thallium			157 N	904 B		71.0 B	152.1 B
152. Vanadium							
153. Zinc		1336	714	54.4	58.6	91.0	23.4 B
154. Cyanide							
% Solids							

March 29, 1991

OTHER ANALYTES WORK TABLE

KOP 2.4042

PROJECT KOPPAGE 2 OF 5

SAMPLING DATE _____

TAT PM _____

SAMPLE #/CONCENTRATION ()

METALS/CN ANALYTE	Minimum Detection Range	mg/Kg					
		-07	-08	-09	-10	-11	-12
131. Aluminum		21556.0	22696.0	24908.0	26760.0	286700.0	299240.0
132. Antimony							
133. Arsenic							
134. Barium			18.2 B		79.4 BN	9.1 BN	
135. Beryllium							
136. Cadmium		2.4 BN	2.4 B	2.4 B	4.3 B	2.2 BN	3.1 BN
137. Calcium		170.4 B	316.6 B	191.0 B	281.7 B	189.2	186.6 B
138. Chromium		2.4 B	0.2 B	3.2 B	797.3	136.4	135.0
139. Cobalt					9.0 B		
140. Copper			45.6		56.2	16.8 BN	
141. Iron			32.6	440.0	2632.0	442.0	463.6
142. Lead		(2135)					
143. Magnesium		22.4 B					41.5 B
144. Manganese			21.7 B	8.5 B	55.6	22.1 B	29.0 B
145. Mercury		0.84	0.24	0.34	0.24	0.24	0.30
146. Nickel		74.3	16.9 B		885.2	66.1	109.7
147. Potassium							
148. Selenium							
149. Silver							
150. Sodium		10508.0	8184.0	7984.0	1872.4	111.33.0	14748.0
151. Thallium		86.0 B	218.8 B	119.5 B	213.6 B	751.2 B	217.2 B
152. Vanadium							
153. Zinc		298.8 B	38.4	78.6	82.4	91.0	84.1
154. Cyanide							
% Solids							

March 29, 1991

OTHER ANALYTES WORK TABLE

KOP 2.4043

PROJECT _____

PAGE 3 OF 5

SAMPLING DATE _____

TAT PM _____

SAMPLE #/CONCENTRATION ()

METALS/CN ANALYTE	Minimum Detection Range	Mg/Kn					
		73	-14	-15	-16	-17	-18
131. Aluminum		2451200	8076.0	10092.0	4320.0	7541.40	28992.0
132. Antimony						110.85	2880.05
133. Arsenic						91.5	100.6
134. Barium			4050.6	53.43	32.88	32.63	35.13
135. Beryllium						34.63	9.53
136. Cadmium		2.33	53.3	5.63	2.23	26.43	34.2
137. Calcium		343.23	638.43	7063.6N	964.0N	1455.0N	3795.20N
138. Chromium		177.5	57.0	17.23	27.23	11.81.0	397.4
139. Cobalt			19.43	6.53	5.43	219.6	95.13
140. Copper			1751.2			5433.6	3564.8
141. Iron		575.6	7843.3	12164.0	5804.0	241780.0	39510.0
142. Lead			73.43	217.6	104.3		53.23
143. Magnesium			5028.3	726.33	211.43	1840.8	2360.0
144. Manganese		3443	12.80	86.7	47.2	1083.6	1946.8
145. Mercury			0.240	1.25		0.24	
146. Nickel		64.3	85.0	72.13		1355.2	520.0
147. Potassium							20.0
148. Selenium						20.0	20.0
149. Silver				41.6	53.3	6.33	6.23
150. Sodium		12604.0	3887.0N	1408.43	388.73N	25584.0N	2315.06N
151. Thallium		130.73	41.0.8	395.33	411.7	1050.3	
152. Vanadium			121.3N		10.33		
153. Zinc		77.5	484.6	51.6	14.63	-392.7	796.3N
154. Cyanide							
% Solids							

March 29, 1991

OTHER ANALYTES WORK TABLE

KOP 2.4044

PROJECT _____

PAGE 1 OF 2

SAMPLING DATE _____

TAT PM _____

SAMPLE #/CONCENTRATION ()

METALS/CN ANALYTE	Minimum Detection Range	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		-19	-20	-21	-22	-23
131. Aluminum		6528.0				2.366
132. Antimony						
133. Arsenic						
134. Barium		23.2 B				
135. Beryllium						
136. Cadmium		2.4 B				0.0326
137. Calcium		1076.8 N				0.9452 B
138. Chromium		55.8				3.1846
139. Cobalt		9.2 B				0.9625
140. Copper		317.0				72.09
141. Iron		7704.0				301.9
142. Lead		11.8 B				0.0399 B
143. Magnesium		192.8 B				0.4570
144. Manganese		417.6				1.279
145. Mercury						
146. Nickel		30.5 B				1.471
147. Potassium						
148. Selenium						
149. Silver						0.0586 N
150. Sodium						0.7226 B
151. Thallium		142.6 B				0.1045 B
152. Vanadium						
153. Zinc		34.8 B				22.42
154. Cyanide						
% Solids						

March 29, 1991

KOP 2.4045

KCP

PAGE 5 OF 5

TAT PM _____

CONCENTRATION _____

SAMPLE # _____

[illegible]

SAS# 5437B-01

OTHER ANALYTES WORK TABLE

KOP 2.4046

PROJECT

King of Prussia

PAGE 1 OF 3

SAMPLING DATE

TAT PM

J. Manfreda

RECD / BNA + PCB/Pest - Wipes

SAMPLE #/CONCENTRATION (ug/wipe)

SEMI-VOLATILES/BNA's	Minimum Detection Range	#01 20	#02 21				
34. Phenol		11	15				
35. bis(2-Chloroethyl) ether							
36. 2-Chlorophenol							
37. 1,3-Dichlorobenzene							
38. 1,4-Dichlorobenzene							
39. 1,2-Dichlorobenzene		25	7				
40. 2-Methylphenol							
41. 2,2-oxybis(1-chloropropane)*							
42. 4-Methylphenol			26				
43. N-Nitroso-D-n-propylamine							
44. Hexachloroethane							
45. Nitrobenzene							
46. Isophorone							
47. 2-Nitrophenol							
48. 2,4-Dimethylphenol							
49. bis(2-Chloroethoxy) methane							
50. 2,4-Dichlorophenol							
51. 1,2,4-Trichlorobenzene							
52. Naphthalene							
53. 4-Chloroaniline							
54. Hexachlorobutadiene							
55. 4-Chloro-3-methylphenol							
56. 2-Methylnaphthalene							
57. Hexachlorocyclopentadiene							
58. 2,4,6-Trichlorophenol							
59. 2,4,5-Trichlorophenol							
60. 2-Chloronaphthalene							
61. 2-Nitroaniline							
62. Dimethyl Phthalate							
63. Acenaphthylene							

* previously known as bis(2-chloroispropyl)ethyl

March 29, 1991

OTHER ANALYTES WORK TABLE

KOP 2.4047

PROJECT _____

PAGE 2 OF 3

SAMPLING DATE _____

TAT PM _____

SAMPLE #/CONCENTRATION (ug/wipe)

SEMI-VOLATILES/BNA's	Minimum Detection Range	#1 20	#1 DL	#02 20	#2 DL	#03 22	#3 DL
64. 2,6-Dinitrotoluene							
65. 3-Nitroaniline							
66. Acenaphthene							
67. 2,4-Dinitrophenol							
68. 4-Nitrophenol							
69. Dibenzofuran							
70. 2,4-Dinitrotoluene							
71. Diethylphthalate		2RT		5R		7R	
72. 4-Chlorophenyl Phenyl ether							
73. Fluorene							
74. 4-Nitroaniline		2RT					
75. 4,6-Dinitro-2-methylphenol							
76. N-nitrosodiphenylamine							
77. 4-Bromophenyl Phenyl ether							
78. Hexachlorobenzene							
79. Pentachlorophenol							
80. Phenanthrene							
81. Anthracene							
82. Carbazole							
83. Di-n-butylphthalate		19R		6R		16R	
84. Fluoranthene							
85. Pyrene							
86. Butyl Benzyl Phthalate							
87. 3,3'-Dichlorobenzidine							
88. Benzo(a)anthracene							
89. Chrysene							
90. bis(2-ethylhexyl)phthalate		1100RE	37000	1460RE	18000R	1400RE	12000RD
91. Di-n-octyl Phthalate							
92. Benzo(b)fluoranthene							
93. Benzo(k)fluoranthene							
94. Benzo(a)pyrene							
95. Indeno(1,2,3-cd)pyrene							
96. Dibenz(a,h)anthracene							
97. Benzo(g,h,i)perylene							

March 29, 1991

DL = Diluted

OTHER ANALYTES WORK TABLE

KOP 2.4048

PROJECT _____

PAGE 3 OF 3

SAMPLING DATE _____

TAT PM _____

SAMPLE #/CONCENTRATION (ug/wipe)

SEMI-VOLATILES/BNA's	Minimum Detection Range	#4					
64. 2,6-Dinitrotoluene							
65. 3-Nitroaniline							
66. Acenaphthene							
67. 2,4-Dinitrophenol							
68. 4-Nitrophenol							
69. Dibenzofuran							
70. 2,4-Dinitrotoluene							
71. Diethylphthalate		485					
72. 4-Chlorophenyl Phenyl ether							
73. Fluorene							
74. 4-Nitroaniline							
75. 4,6-Dinitro-2-methylphenol							
76. N-nitrosodiphenylamine							
77. 4-Bromophenyl Phenyl ether							
78. Hexachlorobenzene							
79. Pentachlorophenol							
80. Phenanthrene							
81. Anthracene							
82. Carbazole							
83. Di-n-butylphthalate		148					
84. Fluoranthene							
85. Pyrene							
86. Butyl Benzyl Phthalate							
87. 3,3'-Dichlorobenzidine							
88. Benzo(a)anthracene							
89. Chrysene							
90. bis(2-ethylhexyl)phthalate		258					
91. Di-n-octyl Phthalate							
92. Benzo(b)fluoranthene							
93. Benzo(k)fluoranthene							
94. Benzo(a)pyrene							
95. Indeno(1,2,3-cd)pyrene							
96. Dibenz(a,h)anthracene							
97. Benzo(g,h,i)perylene							

March 29, 1991

OTHER ANALYTES WORK TABLE

KOP 2.4049

PROJECT KOPPAGE 1 OF 2

SAMPLING DATE _____

TAT PM J. ManfuteAquatic/Organics (Case #15577)

SAMPLE #/CONCENTRATION (mg/Kg)

VOLATILES	Minimum Detection Range	Top	Bottom	BDL19	BDL26		
		BDL10-11 mg/Kg	BDL10-12				
1. Chloromethane							
2. Bromomethane							
3. Vinyl Chloride							
4. Chloroethane							
5. Methylene Chloride							
6. Acetone							
7. Carbon Disulfide							
8. 1,1-Dichloroethene							
9. 1,1-Dichloroethane							
10. trans-1,2-Dichloroethene							
11. Chloroform							
12. 1,2-Dichloroethane							
13. 2-Butanone							
14. 1,1,1-Trichloroethane			380J				
15. Carbon Tetrachloride							
16. Bromodichloromethane							
17. 1,2-Dichloropropane							
18. cis-1,3-Dichloropropene							
19. Trichloroethene			360J	1600			
20. Dibromochloromethane							
21. 1,1,2-Trichloroethane							
22. Benzene							
23. trans-1,3-Dichloropropene							
24. Bromoform					30000		
25. 4-Methyl-2-pentanone							
26. 2-Hexanone							
27. Tetrachloroethene		110000	65000E	39000			
28. Toluene		1800	800J	450J			
29. 1,1,2,2-Tetrachloroethane							
30. Chlorobenzene							
31. Ethyl Benzene		29000	14000	8000			
32. Styrene							
33. Total Xylenes (o,m,p)		190000E	95000	84000			

March 29, 1991

OTHER ANALYTES WORK TABLE

KOP 2.4050

PROJECT _____

PAGE 2 OF 2

SAMPLING DATE _____

TAT PM _____

SAMPLE #/CONCENTRATION ()

SEMI-VOLATILES/BNA's	Minimum Detection Range	BDL10-11 mg/kg	BDL10-12	BDL19			
34. Phenol							
35. bis(2-Chloroethyl) ether							
36. 2-Chlorophenol							
37. 1,3-Dichlorobenzene							
38. 1,4-Dichlorobenzene				3600			
39. 1,2-Dichlorobenzene		21000	6100	22000			
40. 2-Methylphenol			3200	8700			
41. 2,2-oxybis(1-chloropropane)*							
42. 4-Methylphenol							
43. N-Nitroso-D-n-propylamine							
44. Hexachloroethane							
45. Nitrobenzene							
46. Isophorone							
47. 2-Nitrophenol							
48. 2,4-Dimethylphenol							
49. bis(2-Chloroethoxy) methane							
50. 2,4-Dichlorophenol							
51. 1,2,4-Trichlorobenzene			945	10005			
52. Naphthalene							
53. 4-Chloroaniline							
54. Hexachlorobutadiene							
55. 4-Chloro-3-methylphenol							
56. 2-Methylnaphthalene							
57. Hexachlorocyclopentadiene							
58. 2,4,6-Trichlorophenol							
59. 2,4,5-Trichlorophenol							
60. 2-Chloronaphthalene							
61. 2-Nitroaniline							
62. Dimethyl Phthalate							
63. Acenaphthylene							

* previously known as bis(2-chloroisopropyl)ethyl

March 29, 1991

GENERAL CHEMISTRY RESULTS

5979B-02-01

DATE/TIME SAMPLED: 12/05/91 13:00:00

Test	Concentration	Units	POL	DF
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/kg(ppm)	0.29	-
Reactive Sulfide	35.6	mg/kg(ppm)	29.4	-
pH @ 20 deg.C	12.9	S.U.	-	-

5979B-02-02

DATE/TIME SAMPLED: 12/05/91 13:15:00

Test	Concentration	Units	POL	DF
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/kg(ppm)	0.29	-
Reactive Sulfide	BQL	mg/kg(ppm)	29.4	-
pH @ 20 deg.C	12.5	S.U.	-	-

5979B-02-03

DATE/TIME SAMPLED: 12/05/91 13:30:00

Test	Concentration	Units	POL	DF
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/kg(ppm)	0.30	-
Reactive Sulfide	BQL	mg/kg(ppm)	29.7	-
pH @ 20 deg.C	12.4	S.U.	-	-

5979B-02-04

DATE/TIME SAMPLED: 12/05/91 13:45:00

Test	Concentration	Units	POL	DF
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/kg(ppm)	0.30	-
Reactive Sulfide	35.9	mg/kg(ppm)	29.6	-
pH @ 20 deg.C	13.1	S.U.	-	-

5979B-02-05

DATE/TIME SAMPLED: 12/05/91 14:00:00

Test	Concentration	Units	POL	DF
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/kg(ppm)	0.28	-
Reactive Sulfide	34.4	mg/kg(ppm)	28.4	-
pH @ 20 deg.C	13.1	S.U.	-	-

5979B-02-06

DATE/TIME SAMPLED: 12/05/91 14:15:00

<u>Test</u>	<u>Concentration</u>	<u>Units</u>	<u>POL</u>	<u>DF</u>
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/kg(ppm)	0.30	-
Reactive Sulfide	41.9	mg/kg(ppm)	30.0	-
pH @ 20 deg.C	13.1	S.U.	-	-

5979B-02-07

DATE/TIME SAMPLED: 12/05/91 14:30:00

<u>Test</u>	<u>Concentration</u>	<u>Units</u>	<u>POL</u>	<u>DF</u>
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/kg(ppm)	0.30	-
Reactive Sulfide	BQL	mg/kg(ppm)	28.2	-
pH @ 20 deg.C	12.2	S.U.	-	-

5979B-02-08

DATE/TIME SAMPLED: 12/05/91 09:00:00

<u>Test</u>	<u>Concentration</u>	<u>Units</u>	<u>POL</u>	<u>DF</u>
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/kg(ppm)	0.28	-
Reactive Sulfide	45.2	mg/kg(ppm)	28.2	-
pH @ 20 deg.C	12.5	S.U.	-	-

5979B-02-09

DATE/TIME SAMPLED: 12/05/91 09:30:00

<u>Test</u>	<u>Concentration</u>	<u>Units</u>	<u>POL</u>	<u>DF</u>
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/kg(ppm)	0.30	-
Reactive Sulfide	36.1	mg/kg(ppm)	29.8	-
pH @ 20 deg.C	12.9	S.U.	-	-

5979B-02-10-11

DATE/TIME SAMPLED: 12/05/91 10:00:00

<u>Test</u>	<u>Concentration</u>	<u>Units</u>	<u>POL</u>	<u>DF</u>
Reactive Cyanide	BQL	mg/l (ppm)	0.30	10
Reactive Sulfide	42.0	mg/l (ppm)	30.0	10
pH @ 20 deg.C	1.3	S.U.	-	-

5979B-02-10-12

DATE/TIME SAMPLED: 12/05/91 10:00:00

<u>Test</u>	<u>Concentration</u>	<u>Units</u>	<u>POL</u>	<u>DF</u>
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/kg(ppm)	0.28	-
Reactive Sulfide	BQL	mg/kg(ppm)	28.2	-
pH @ 20 deg.C	3.1	S.U.	-	-

EIRAENVIRONMENTAL INDUSTRIAL
RESEARCH ASSOCIATES, INC.

5979B-02-14
DATE/TIME SAMPLED: 12/05/91 10:30:00

Test	Concentration	Units	POL	DF
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/kg(ppm)	0.28	-
Reactive Sulfide	BQL	mg/kg(ppm)	28.5	-
pH @ 20 deg.C	8.2	S.U.	-	-

5979B-02-15
DATE/TIME SAMPLED: 12/05/91 11:00:00

Test	Concentration	Units	POL	DF
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/kg(ppm)	0.29	-
Reactive Sulfide	70.1	mg/kg(ppm)	29.4	-
pH @ 20 deg.C	2.8	S.U.	-	-

5979B-02-15 DUP
DATE/TIME SAMPLED: 12/05/91 11:00:00

Test	Concentration	Units	POL	DF
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/kg(ppm)	0.28	-
Reactive Sulfide	40.0	mg/kg(ppm)	28.6	-
pH @ 20 deg.C	2.7	S.U.	-	-

5979B-02-16
DATE/TIME SAMPLED: 12/05/91 11:15:00

Test	Concentration	Units	POL	DF
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/kg(ppm)	0.29	-
Reactive Sulfide	BQL	mg/kg(ppm)	28.9	-
pH @ 20 deg.C	10.0	S.U.	-	-

5979B-02-17 TK1
DATE/TIME SAMPLED: 12/05/91 11:30:00

Test	Concentration	Units	POL	DF
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/kg(ppm)	0.29	-
Reactive Sulfide	BQL	mg/kg(ppm)	28.0	-
pH @ 20 deg.C	10.0	S.U.	-	-

5979B-02-18 TK2
DATE/TIME SAMPLED: 12/05/91 12:00:00

Test	Concentration	Units	POL	DF
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/kg(ppm)	0.28	-
Reactive Sulfide	39.8	mg/kg(ppm)	28.4	-
pH @ 20 deg.C	9.2	S.U.	-	-

5979B-02-19

DATE/TIME SAMPLED: 12/05/91 12:15:00

Test	Concentration	Units	POL	DF
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/kg(ppm)	0.29	-
Reactive Sulfide	BQL	mg/kg(ppm)	28.7	-
pH @ 20 deg.C	2.9	S.U.	-	-

5979B-02-26

DATE/TIME SAMPLED: 12/05/91 12:30:00

Test	Concentration	Units	POL	DF
Flash Point	>60	deg C	-	-
Reactive Cyanide	BQL	mg/l (ppm)	0.03	-
Reactive Sulfide	3.0	mg/g (ppm)	5.0	-
pH @ 20 deg.C	4	S.U.	-	-

QUALITY CONTROL LAB BLANK

Test	Concentration	Units	POL
Reactive Cyanide	BQL	mg/l (ppm)	0.03
Reactive Cyanide	BQL	mg/kg(ppm)	0.30

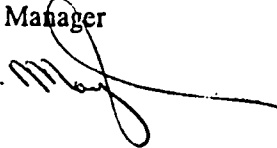
BQL : Below Quantitation Limit
 DF : Dilution Factor
 POL : Practical Quantitation Limit
 SL : Spike Level

EIRAENVIRONMENTAL INDUSTRIAL
RESEARCH ASSOCIATES, INC.



REAC PROJECT
GSA RARITAN DEPOT
2890 WOODBRIDGE AVENUE
BLDG. 209 ANNEX
EDISON, NJ 08837-3679

TO: George Prince, EPA Work Assignment Manager

THRU: Craig Moylan, REAC Section Chief 

FROM: Mark Ellis, REAC Task Leader 

SUBJECT: KING OF PRUSSIA TECHNICAL CORPORATION SITE, WINSLOW, NJ
WORK ASSIGNMENT #2-441 - TRIP REPORT

DATE: November 2, 1990

BACKGROUND

The King of Prussia Technical Corporation (KOP) site is a parcel of land approximately ten acres in size and is located on the border of the Winslow Wildlife Management Area in southern New Jersey's pinelands region (Figure 1).

The site was previously used as a waste water treatment and disposal facility for hazardous industrial wastes and was closed in 1975. At the time that operations were taking place, six lagoons capable of treating 3.5 million gallons of waste water were utilized. Some of these lagoons are still visible on site as are deteriorated liners.

The New Jersey Department of Environmental Protection (NJ DEP) performed several post-closure site inspections and later referred the site to the Environmental Protection Agency (EPA) for reasons related to security. In July, 1988 a fence was erected around the site, but it is believed that illicit dumping may have occurred prior to this and after site abandonment.

In 1976, investigations at the site prompted the EPA to install four groundwater monitor wells. Results of sampling efforts focusing on soil, sediment and groundwater eventually led to this site being listed on the National Priority List (NPL) in September, 1983. Subsequent investigations uncovered several buried drums which were also sampled. The analytical results from these investigations indicated that extensive contamination exists at this site with a potential for migration off site. The contaminants found on site thus far consisted of the Target Analyte List (TAL) metals and various organic compounds.

The Environmental Response Team/Response Engineering and Analytical Contract (ERT/REAC) was asked by the US EPA Region II On-Scene Coordinator (OSC), Eugene Dominach, to perform two geophysical surveys in an effort to confirm the location of suspected buried drums.

FINDINGS AND OBSERVATIONS

On Tuesday, October 16, 1990, Michael Solecki (ERT), Mark Ellis (REAC) and John Williams of Roy F. Weston, Inc. met Eugene Dominach (OSC), Jim Manfreda and Rohan Tadas of the Technical Assistance Team (TAT) at the KOP site (Figure 2).

The area suspected of containing buried drums had been designated the previous week using pin flags. A line grid was set up with lines running north-south and progressively eastward from the stake designated 100N, 100E. The number of sample stations along these lines decreased to the east due to the presence of the site fence, which intersected the grid near 120N, 225E. The two geophysical techniques employed at the site were both susceptible to interferences as we got closer to the metal fence.

The instruments used to perform the surveys were the EM-31 terrain conductivity meter and a GEM Systems magnetometer/gradiometer. With respect to the conductivity measurements, both inphase and quadrature readings were made. Inphase measurements are more representative of buried metallic objects than quadrature phase measurements. The quadrature phase component measures the electrical conductivity of the earth's surface (i.e., geological structures). This phase can detect anomalies related to buried metal objects, but only to a depth of about six feet. On the other hand, using the inphase component, metal objects can be detected at depths up to fifteen feet. The magnetometer/gradiometer measures both the total magnetic field of the earth and the magnetic field gradient between the instrument's two sensors. A significant deviation (± 200 gammas) from the total field is indicative of nearby ferrous objects, while a high gradient measurement represents a near-surface anomaly.

The terrain conductivity survey was performed first and was completed on the east side of the fence where three grid lines were extended. There were no anomalies present on this side of the fence. Figure 3 depicts the contours for the inphase data collected during this survey. There were several anomalous areas present. The most significant of these was centered around stake 215N, 170E. Four other areas, 125N, 130E; 150N, 110E; 155N, 135E and 170N, 170E also produced readings that varied significantly from background measurements. The anomaly at 150N, 110E was most likely produced by the presence of a monitor well which was visible in that area.

Next the magnetometer/gradiometer survey was performed. This survey did not continue on the east side of the fence due to interferences from the fence and lack of anomalous data collected during the EM-31 survey. Figure 4 depicts the magnetometer contour lines confirming those anomalies. However, the centers were shifted approximately five feet to the south. No measurements were made along line 170E from 210N to 165N due to the gradiometer being overwhelmed by what are likely to have been near-surface, ferrous, metallic objects. This resulted in a software interpretation depicting two "hot spots" centered on lines 160E and 180E.

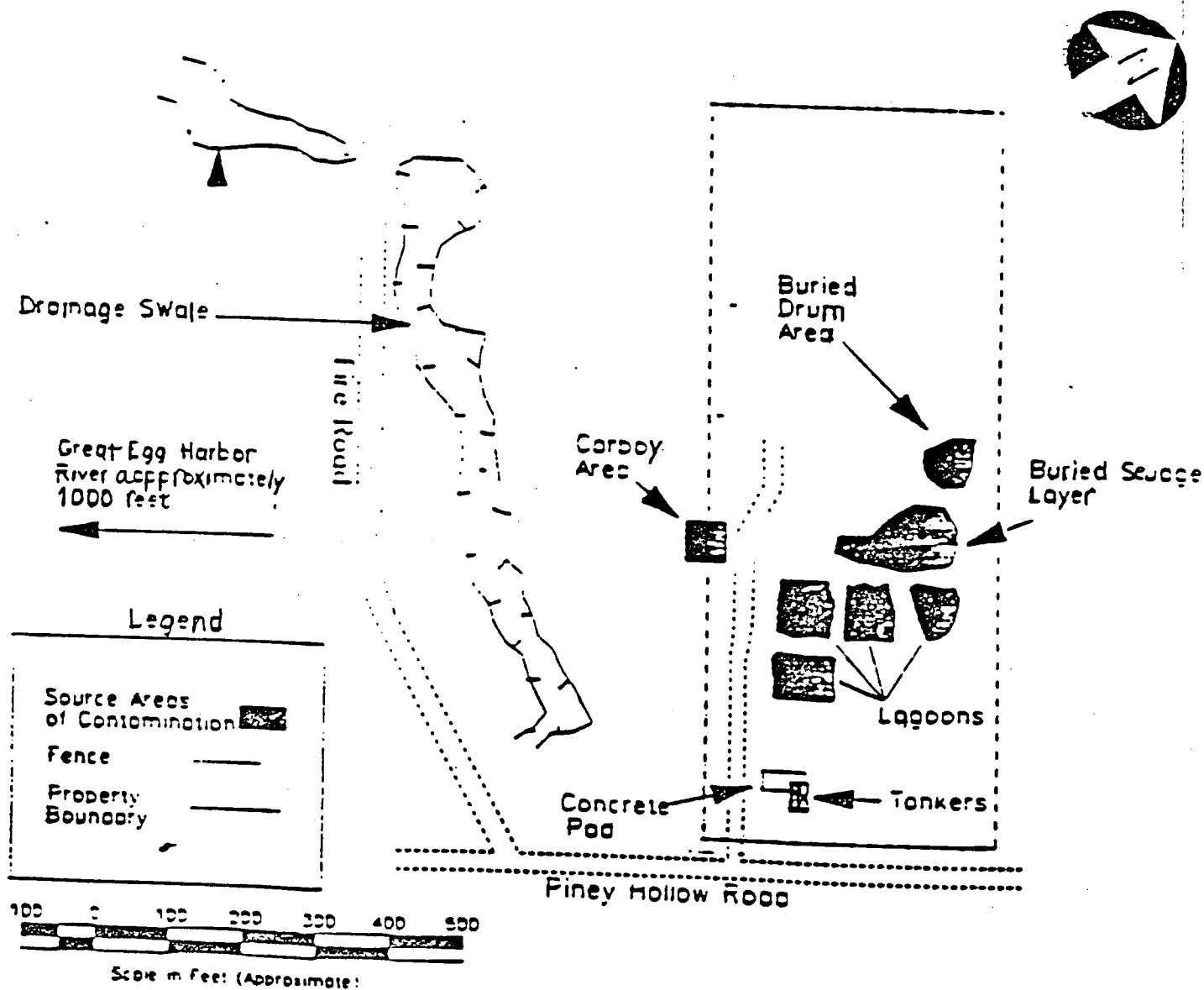
The magnetic gradient contours in Figure 5 indicate high gradients in the same relative positions for each of the anomalies detected by the EM-31 and magnetometer. Therefore, it is likely that the anomalies are near the surface (i.e., <10 feet below the surface).

Following each of the surveys, the data was promptly downloaded and saved on a backup computer diskette. A quick overview of potential anomalies was discussed with the OSC before packing up all of the equipment. The ERT/REAC team departed the site at 1545.

CONCLUSIONS

The two geophysical surveys performed at the King of Prussia Technical Corporation site on October 16, 1990 were successful in delineating several anomalies within the survey grid.

The most prominent of these anomalies was centered near stake 215N, 170E. There was a partially surfaced drum in this vicinity as well as stained soil. The anomalous area continues in a trench-like fashion to the southwest and probably indicates metallic objects buried just below the surface.



SOURCE: ROY F. WESTON INC. SPILL PREVENTION AND EMERGENCY RESPONSE
TECHNICAL ASSISTANCE TEAM

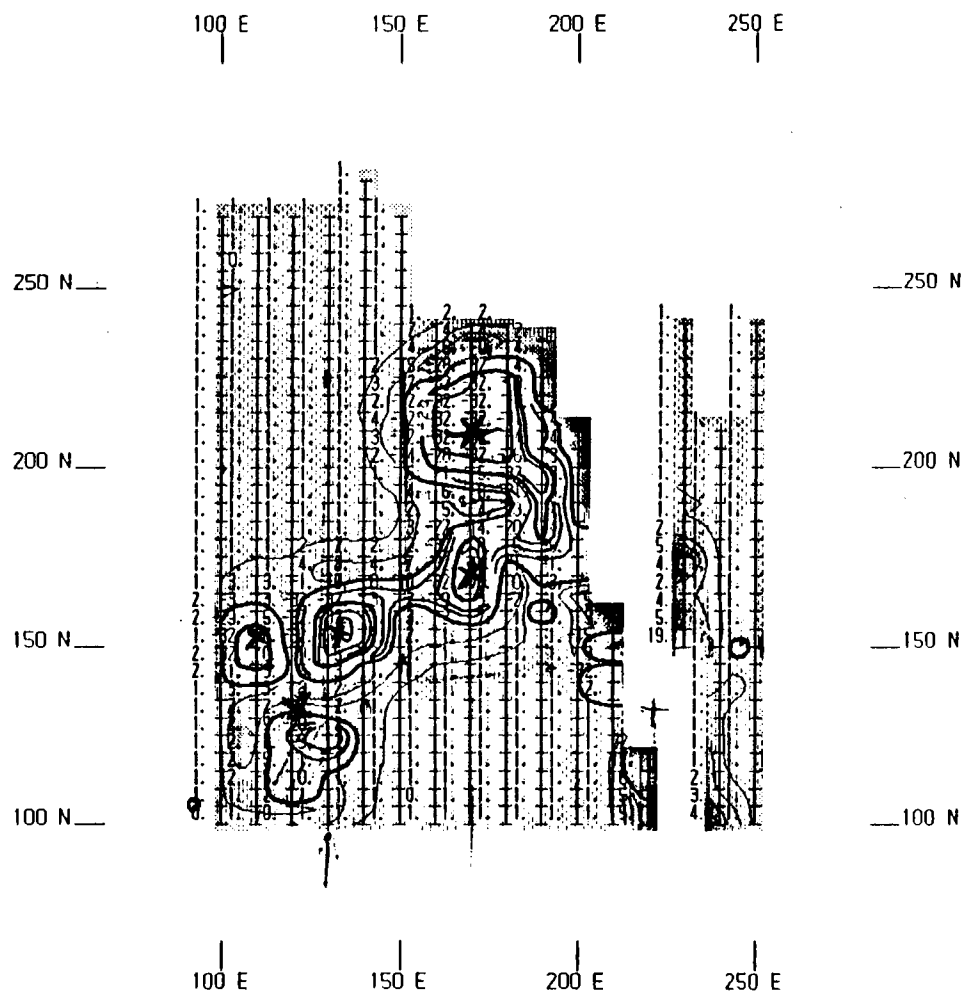
US EPA ENVIRONMENTAL RESPONSE TEAM
RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-03-3482

KING OF PRUSSIA TECHNICAL CORP. SITE

WINSLOW, NJ
OCTOBER 16, 1990
3347-21-11-3441

FIGURE 2

SITE MAP



Scale 1:500
25 0 25 50 75 100 125
(feet)

FIGURE 3

US EPA ENVIRONMENTAL RESPONSE TEAM

KING OF PRUSSIA SITE
EM-31 IN-PHASE DATA

RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-03-3482
3347-21-01-3441

OCTOBER 16, 1990

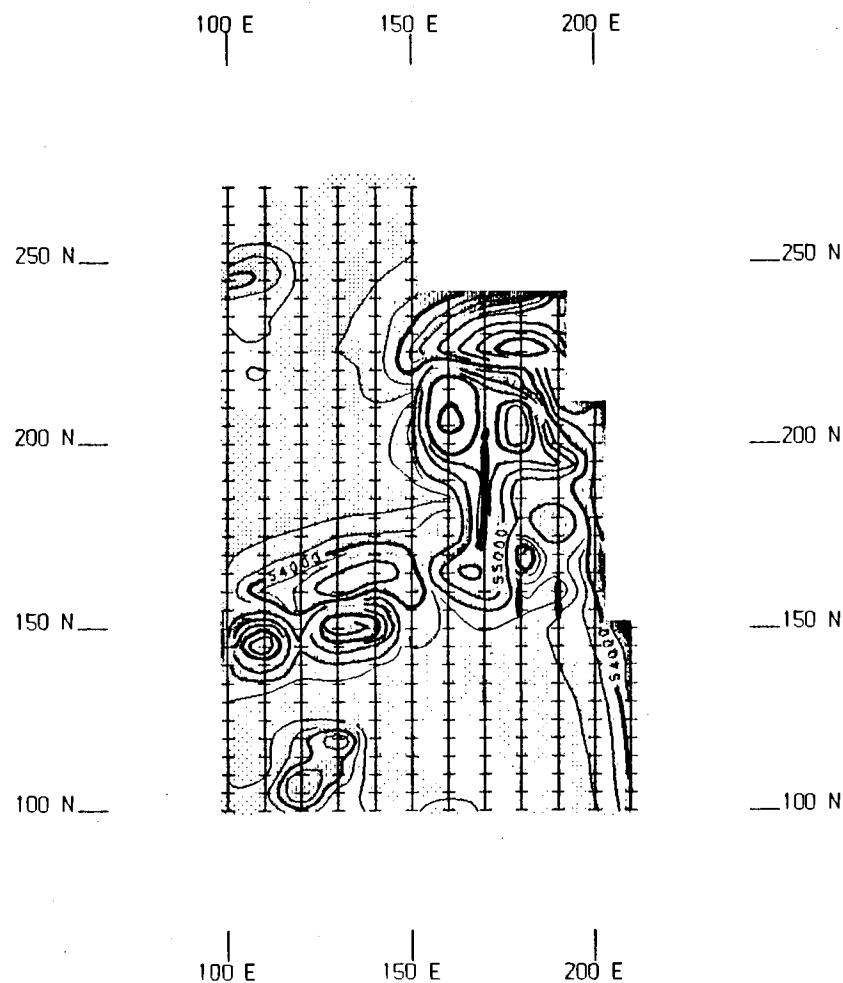


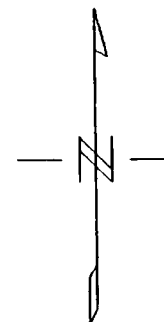
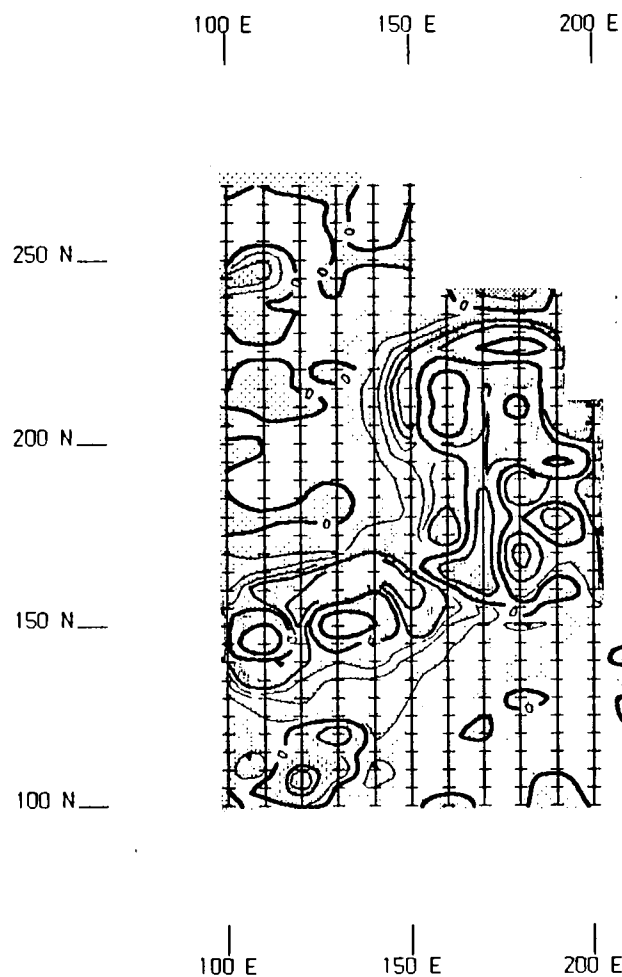
FIGURE 4

US EPA ENVIRONMENTAL RESPONSE TEAM

KING OF PRUSSIA SITE
MAGNETIC FIELD CONTOURS

RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-03-3482
3347-21-01-3441

OCTOBER 16, 1990



Scale 1:500
25 0 25 50 75 100 125
(feet)

FIGURE 5

US EPA ENVIRONMENTAL RESPONSE TEAM

KING OF PRUSSIA SITE
MAGNETIC GRADIENT CONTOURS

RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-03-3482
3347-21-01-3441

OCTOBER 16, 1990

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II

KOP 2.6001

DATE: MAY 11 1989

SUBJECT: Preliminary Assessment and CERCLA/SARA Removal Funding Request
for the King of Prussia Landfill Site, Winslow Township, Camden
County, New Jersey - ACTION MEMORANDUM

FROM: Eugene G. Dominach, On-Scene Coordinator
TO: Removal Action Branch

S. Luftig

William J. Muszynski, P.E.
Acting Regional Administrator

Stephen D. Luftig, Director
Emergency and Remedial Response Division

S. Luftig

I. EXECUTIVE SUMMARY

The King of Prussia site is an abandoned hazardous waste disposal facility in the midst of a State Wildlife Management Area. Aside from several gravel pits, a chemical company, and the municipal landfill, the site setting is quite rural. Despite its isolated location and prior to the Potentially Responsible Parties' (PRPs) fencing the site, hunters, trash dumpers and operators of off-road vehicles frequented the site. Assessments performed by the United States Environmental Protection Agency (EPA), the New Jersey Department of Environmental Protection (NJDEP) and PRPs have confirmed the presence of hazardous contaminants in the soil and groundwater. Present at the site are: an undetermined number of buried drums, partially buried plastic carboys and an adjacent stressed area, two deteriorated tank trailers containing an unknown substance, and six lagoons (two which have been back filled). In addition to the above, in several areas throughout the site, the soil is stained a deep purple.

On May 6, 1988, at the request of the Site Compliance Branch (SCB), the Response and Prevention Branch (RPB) initiated proceedings to provide interim emergency measures as part of a long-term CERCLA/SARA cleanup of the site. As a result of this effort, the PRPs installed a perimeter fence.

All indications are that the site is grossly contaminated by heavy metals and unknowns which pose an immediate threat to a sensitive ecosystem and a potential threat to human health. The removal action proposed is to sample the carboy disposal area, remove the buried and partially buried carboys and remove approximately 315 cubic yards of grossly contaminated soil in the highly stressed area. The PRPs have adamantly refused to remove the carboys, as no one in the group has claimed responsibility for sending this material to the site. On February 9, 1989, the New Jersey Compliance Branch (NJCB) requested the Removal Action Branch (JRAB) to assess the carboy disposal area for a removal action.

The initial action is designed to mitigate the threat of the carboy's contents to discharge or discharge further into the groundwater. No liner is present under the carboys to prevent further releases to the environment.

The cost for sampling and removal of the carboys and contaminated soil is estimated at \$593,000 of which \$439,000 is for mitigation contracting.

II. BACKGROUND

A. Site Setting/Description

The King of Prussia Landfill is an abandoned hazardous waste management facility located along Piney Hollow Road, Winslow Township, Camden County, New Jersey. The property is bounded on three sides by a State Wildlife Management Area and the fourth side borders on Piney Hollow Road. Along the southern perimeter of the site is an intermittent wetland which feeds directly into the Great Egg Harbor River less than a quarter of a mile away (Figure 1). The site is in a rural/remote area. The nearest residence is within a quarter mile of the site. Several gravel operations, a chemical manufacturer, an asphalt plant and the municipal landfill are all within a quarter mile of the site.

The King of Prussia property consists of a cleared ten-acre area which is devoid of vegetation except for grasses, scrub brush, and an occasional pine tree. Within these ten acres are the following points of special concern: six lagoons, two deteriorated tank trailers, several areas of soil discolored by an undetermined purple substance, partially buried carboys and drums, one exposed drum of unknown content and a large area of stressed vegetation on the southern perimeter (Figure 2).

Prior to fencing the ten-acre site by the PRPs, the site lacked any form of security. A deer blind and numerous tire tracks throughout the site clearly indicated that the site was subject to trespassing by hunters and operators of off-road vehicles. There is clear evidence that illegal dumping has occurred.

B. Brief History

Based upon information previously gathered by the EPA and the NJDEP, a brief history of the activities at the site follows.

At an unspecified date prior to 1975, the Evor-Phillips Leasing Company and Interchemical Corporation began operating the King of Prussia site as a liquid chemical waste treatment/disposal facility. During this time the facility was used primarily by five companies that now make up the current group of PRPs. An undetermined amount of illicit dumping of chemical materials is

believed to have continued long after the facility was abandoned in 1975.

C. Quantity and Types of Substances Present

The King of Prussia site has numerous containers of varying types and sizes, which have deteriorated, releasing their contents onto the ground. Included in this list of deteriorated containers are the following:

1) six lagoons: two backfilled, four open

Three lagoons are 70 feet long, 50 feet wide and 15 feet deep (working capacity 350,000 gallons each). The larger lagoons are 100 feet long, 80 feet wide and 15 feet deep (working capacity of 800,000 gallons each). At a working capacity of 90% the plant storage capability was 3.5 million gallons.

Grossly deteriorated liners are visible in three of the open lagoons. No liquid retention capabilities are possible.

2) partially buried drums and carboys

There are two areas where the burial of drums and carboys is clearly evident. The number of drums is estimated at twenty and the number of carboys at ten. Excavation is necessary to obtain an accurate count.

3) two badly deteriorated tank trailers

The trailers are positioned side by side and are the predominant visible aspects of the site. A total of approximately 10 cubic yards of an inert solid remains inside the tankers.

In addition to the containers listed, there exist several areas where soil contamination/discoloration is clearly visible and of undetermined depth.

Analytical results for samples taken of the groundwater, lagoon sediment, surface runoff, the carboys and the purple discolored soil all verify varying degrees of contamination.

The following is a partial list of the hazardous substances identified by studies conducted prior to 1988.

<u>Contaminant</u>	<u>Concentration</u>	<u>Media</u>	<u>Statutory Source Under CERCLA</u>
Bis (2-ethylhexyl)phthalate	1,200 ug/kg	L.S.	2,4
1,2,4 Trichlorobenzene	120 ug/kg	L.S.	2
Hexachlorobenzene	1,300 ug/kg	L.S.	2,4
Hexachloroethane	740,000 ug/kg	L.S.	2,4
Arsenic	330,000 ug/kg	L.S.	2,3
Trichloroethene	360 ug/l	M.W.	1,2,4
Chromium	5,600 ug/l	M.W.	2
Copper	3,900 ug/l	M.W.	2
Cadmium	600 ug/l	M.W.	2
Arsenic	1,000 ug/l	M.W.	2,3
Beryllium	2,200 ug/l	M.W.	2,3,4
Mercury	1.44 ug/l	M.W.	2,3,4
Lead	600 ug/l	M.W.	2
Chromium	1,400,000 ug/l	CBY.	2
Copper	2,400,000 ug/l	CBY.	2
Cadmium	21,000 ug/l	CBY.	2
Lead	61,000 ug/l	CBY.	2
Vinyl chloride	29 ug/l	CBY.	2,3,4
Phenol	1,700 ug/l	CBY.	1,2,4

1. 311(b)(4) of the Clean Water Act
2. 307(a) of the Clean Water Act
3. 112 of the Clean Air Act
4. RCRA section 3001

Media Symbols: M.W.= monitoring well
 CBY.= carboy
 L.S.= lagoon sediment

Current data (1988) from the PRP surficial sampling of the carboy area during the recent RI/FS have identified the presence of the following: Copper (1550 mg/kg), Chromium (185 mg/Kg), Lead (15 mg/Kg) and Zinc (517 mg/kg).

D. National Priorities List

This site is on the National Priorities List.

III. THREAT

A. Threat of Public Exposure:

The King of Prussia facility is a high-risk site. The property prior to fencing by the PRPs lacked any form of security. Its remote location made it an obvious choice for hunters as evidenced by the presence of a deer blind and off-road vehicle users as evidenced by numerous motorcycle tracks.

Since the King of Prussia facility ceased operations in 1975, there have been alleged instances of youths contracting rashes of unknown origin after riding their dirt bikes at the site. As of May 11, 1988, the Winslow Township Police were unable to deny or confirm such allegations.

The high levels of toxic compounds known to exist in the upper portion of the soil present an unacceptable health risk to the targeted population. Many of the compounds found thus far are known to be carcinogenic, teratogenic and mutagenic. The potential for exposure to the known and unknown compounds on site warrants the continued restriction of unauthorized persons from the site.

Aside from the threat of direct contact with the hazardous and toxic compounds on site, the threat of inhalation is also a major concern. The sandy and wind-swept nature of the site make the likelihood of inhaling airborne particles highly possible.

B. Threat to the Environment

All analyses conducted thus far indicate that contamination of the site is pervasive. Almost the entire southern perimeter of the site consists of stressed and dead vegetation. Surface water contamination was identified during a study conducted by EPA during October of 1979. Analytical results of runoff water from a ditch revealed a significant amount of contaminants including the following: Mercury (1.44 ppb), Arsenic (10 ppb), Chromium (340 ppb), Beryllium (5 ppb), Cadmium (4 ppb), Copper (950 ppb), Nickel (190 ppb), Phenol (0.23 ppb), Bis 2-Ethylhexyl Phthalate (9.1 ppb) and Di-N-Butyl Phthalate (0.81 ppb).

The sandy soil conditions of southern New Jersey have a high percolation rate, which decreases the potential for off-site surface migration but does not totally eliminate the possibility for migration to the wetlands and the Great Egg Harbor River which is one quarter of a mile from the southern boundary of the site.

The high percolation rate greatly increases the potential to contaminate the subsurface soils and the underlying Cohansey aquifer. The analytical results of the groundwater samples taken during October of 1979 verify that such contamination has occurred.

The 1979 analytical results of the major contaminants from monitoring well #1, located between the lagoons and the carboy disposal and stressed vegetation areas, are as follows: Chloroform (0.34 ppb), Vinyl Chloride (7.3 ppb), Arsenic (7.2 ppb), Chromium (10 ppb), Copper (95 ppb), Bis 2-Ethylhexyl Phthalate (3.5 ppb) and Di-N-Butyl Phthalate (0.49 ppb).

The most recent round of surficial sampling, performed during June of 1988 revealed that organic and inorganic contaminants are present in the first three inches of soil throughout much of the site. Contamination of the upper layers of soil was found to be consistent with results previously found in samples taken of surficial runoff and groundwater. Contamination of this particular substrate is cause for concern because the contaminants can migrate into the ground and surface water through the actions of wind, rain and human activities.

Aerial photography of 1975 indicates that two horizontal chemical storage tanks and two tank trailers were located on or adjacent to the carboy disposal area. Ground stains are evident in the vicinity of the lagoons. Spillage or runoff from any or all of the above due to site topography would flow in the direction of the carboy disposal area. Since the lagoons are upstream of the carboy area, a leak in a lagoon liner could also contribute to contamination of the carboy area. Site runoff flows into a small unnamed tributary which then flows two thousand feet due west into the Great Egg Harbor River.

C. Evidence of Extent of Release

The analytical data and on-site observations performed thus far are indicative of the off-site release of contaminants. The available information indicates that a release of contaminants has been occurring for a number of years and unless mitigation means are implemented will continue for many years.

Contaminated soils and groundwater (documented by laboratory analysis) and a large area of stressed vegetation located off-site are strong indicators that contaminants are migrating off-site via the air, surface water and groundwater.

D. Previous Actions to Abate Threat

On April 17, 1985, the EPA and the PRPs (Cabot Corp., Carpenter Technology Corp., Johnson Matthey Inc., Ruetgers-Nease Chemical Co. and LNP Corp.) entered into an agreement through a Consent Order whereby the PRPs would undertake a Remedial Investigation and Feasibility Study (RI/FS).

The NJCB has indicated that the PRPs have twice covered the carboy area with soil. This action has proven ineffective. The stained soil is repeatedly exposed when the added soil is eroded by wind and rain.

The PRPs in 1988 installed a perimeter fence during the RI/FS activity, decreasing the possibility for intimate contact.

E. Current Actions to Abate Threat

EPA, NJDEP and the Winslow Township Police currently observe the hazardous waste site on a regular basis.

IV. ENFORCEMENT

During 1976-1977, after the facility's closure in 1975, the NJDEP conducted several on-site inspections but no enforcement action was taken. The NJDEP maintained the lead on all enforcement matters until an unspecified date during 1979, at which time the site was referred to EPA for the purpose of addressing site security and mitigation efforts.

On October 9, 1979, EPA conducted a site investigation which included the sampling of monitoring wells, lagoon sediment, liquid runoff and soil.

To date, no reliable information is available that details the installation of the monitoring wells. Indications are that the wells were installed sometime prior to the issuance of a site report by Geraghty and Miller during 1975-1976. Analytical results showed that the shallow groundwater was severely contaminated.

As a result of the EPA's efforts, a Consent Order was signed on April 17, 1985, in which the PRPs agreed to conduct a RI/FS at the site. In July 1986, the PRPs submitted a Draft Remedial Investigation report. Upon review of the report, the NJDEP and the EPA determined that the details did not fully address the extent of contamination at the site and, therefore, requested the PRPs to conduct a Phase II RI. On May 16, 1988, the PRPs' consultant, Environmental Resources Management of Exton, Pa., mobilized at the site to begin supplemental field activities that were completed in November 1988.

The site was referred to the Response and Prevention Branch and a preliminary assessment was performed on February 11, 1989. Before an Action Memorandum that requested funding to install a fence, post hazard warning signs and cover the stained soil in the carboy area could be approved, the PRPs installed the perimeter fence in July 1988.

A review of existing files indicates that Interchemical Corporation with the Evor-Phillips Leasing Corporation operated the facility. In addition, Valley Forge Engineering of Pennsylvania or its principles may have been involved in the operation. Since the PRPs have refused to remediate the carboy area the current action includes removal of the carboys and the adjacent highly contaminated soil to eliminate further contamination.

V. PROPOSED PROJECTS AND COSTS

If the PRPs are willing to undertake the aforementioned corrective action in a timely manner, all or part of the funds requested herein may not be necessary.

A. Objective of the Project's Action

The main objective of the removal action is to excavate and dispose of all carboys and to excavate and dispose of a volume of contaminated soil within a circle approximately sixty feet in diameter and three feet deep (315 cubic yards). The material will be disposed at an approved facility.

Estimated Site Budget Extramural Costs

1. Labor

(includes but not limited to the following:
Response Manager, Chemist, Clerk, (2) Lab.

Techs., (2) Laborers, (1) Equipment Operator,
(1) Ind.Hyg./Safety Eng.)
**includes per diem.....\$ 72,650

2. Equipment

(includes but not limited to the following:
porta-johns, office and decon trailers, vehicles,
heavy equipment, portable radios, safety showers,
generators).....\$ 17,540

3. Materials

(includes but not limited to the following:
Geotech Fabric, visqueen, personal protective
clothing, safety supplies, warning tape, tape,
road stone).....\$ 9,000

4. Gravel/sand/backfill

(Includes truck and driver)..... \$ 10,000

5. Security \$ 6,300

6. Analytical..... \$ 50,000

7. Disposal

(includes truck, driver,

and liner)..... \$200,000
 Contracting Cost..... \$365,490
 20 % Contingency..... \$ 73,100
 Total Mitigation Contracting Cost.....\$438,590
 Total Mitigation Contracting Cost Rounded.....\$439,000

Extramural Costs (TAT)

1. Field Support\$ 25,600
 2. Office Support\$ 6,125

Total TAT Costs.....\$ 31,725
 Total TAT Costs Rounded.....\$ 32,000

Subtotal Extramural Costs\$471,000
 15 % Contingency of Above Costs (Rounded).....\$ 71,000
 Total Extramural Costs.....\$542,000

Intramural Direct Costs

1. Direct Regional Costs\$ 15,000
 2. Indirect Costs\$ 34,000
 3. Headquarters Costs (10% of Direct Costs) ..\$ 1,500
 4. Total Intramural Costs.....\$ 50,500

Total Extramural Costs Rounded.....\$ 51,000

Total Removal Project Ceiling Estimate.....\$593,000

VI. PROJECTS SCHEDULE

The project can be initiated within three weeks upon approval of this Action Memorandum. The time required for completion of this action is not expected to exceed the 12-month statutory limit for removal actions.

The proposed mitigative tasks are outlined below.

Upon Project Approval

- 1) Prepare a work plan for carboy and soil removal based on preassessment sampling results.
- 2) Prepare a detailed design and location for a truck and equipment decon pad.
- 3) Get PRP acceptance to 1 & 2 above.

Mobilization

- 4) Mobilize equipment and manpower.
- 5) Initiate guard service.
- 6) Construct decon facilities.
- 7) Stake out soil and carboy removal area.
- 8) Soil and carboy disposal at a accepted facility.

VII. RECOMMENDATION

I recommend your approval of the proposed removal action as detailed and justified above. The proposed removal action contributes to the efficient performance of any long-term remedial action at this site. Under 40 CFR 300.65 of the National Oil and Hazardous Substances Pollution Contingency Plan, a removal action is appropriate at this site due to the existence of:

- 1) Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations, animals, or food chain [300.65(b)(2)(i)];
- 2) Actual or potential contamination of drinking water supplies or sensitive ecosystems [300.65(b)(2)(ii)];
- 3) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate [300.65(b)(2)(iv)];
- 4) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released [300.65(b)(2)(v)];
- 5) The availability of other appropriate Federal or State response mechanisms to respond to the release [300.65(b)(2)(vii)];
- 6) Other situations or factors which may pose threats to public health or welfare or the environment [300.65(b)(2)(viii)];

The estimated project ceiling of the King of Prussia site Removal Funding Request is \$593,000 of which \$439,000 is for mitigation contracting.

Your authority to approve this request is established by Administrator Lee Thomas' interim delegation 14-1-A of September 21, 1987.

Sufficient funding is available in our current Advice of Allowance to finance this project.

Approved: James R. Monball

Date: 5/11/89

Disapproved: _____

Date: _____

cc: (after approval is obtained)

S. Luftig, 2ERR

R. Salkie, 2ERR-ADREPP

G. Zachos, 2ERR-RAB

G. Pavlou, 2ERR-ADEP

J. Frisco, 2ERR-ADRP

M. Randol, 2OEP

R. Gherardi, 2OPM-FIN

S. Anderson, PM-214F (Express Mail)

T. Fields, OS-210

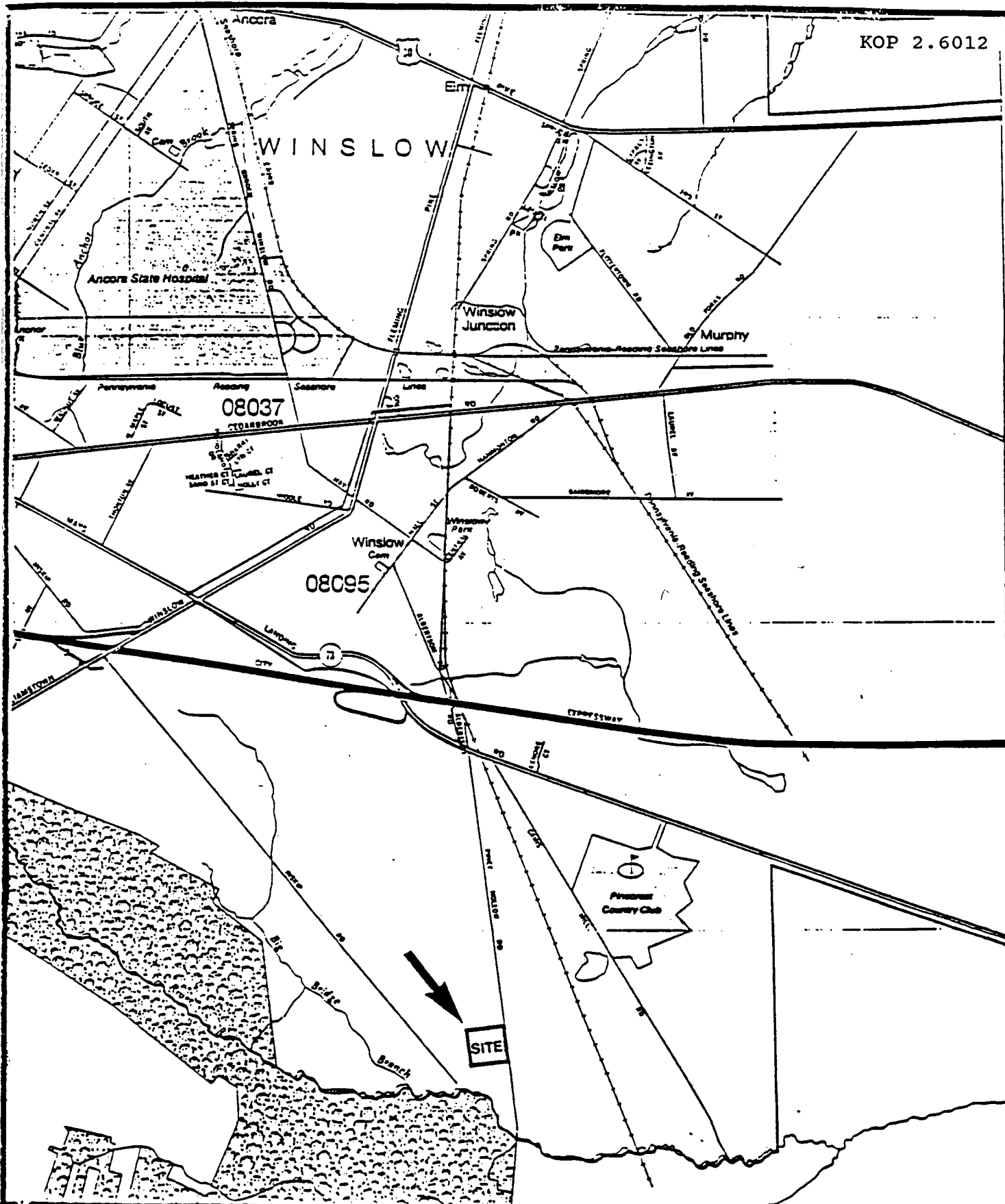
G. McCann, NJDEP

P. McKechnie, 2IG

C. Moyik, 2ERR-PS

J. Rosianski, 2OEP

L. Guarneiri, OS-210


WESTERN

 SPILL PREVENTION &
EMERGENCY RESPONSE DIVISION

EPA PM

DOMINACH

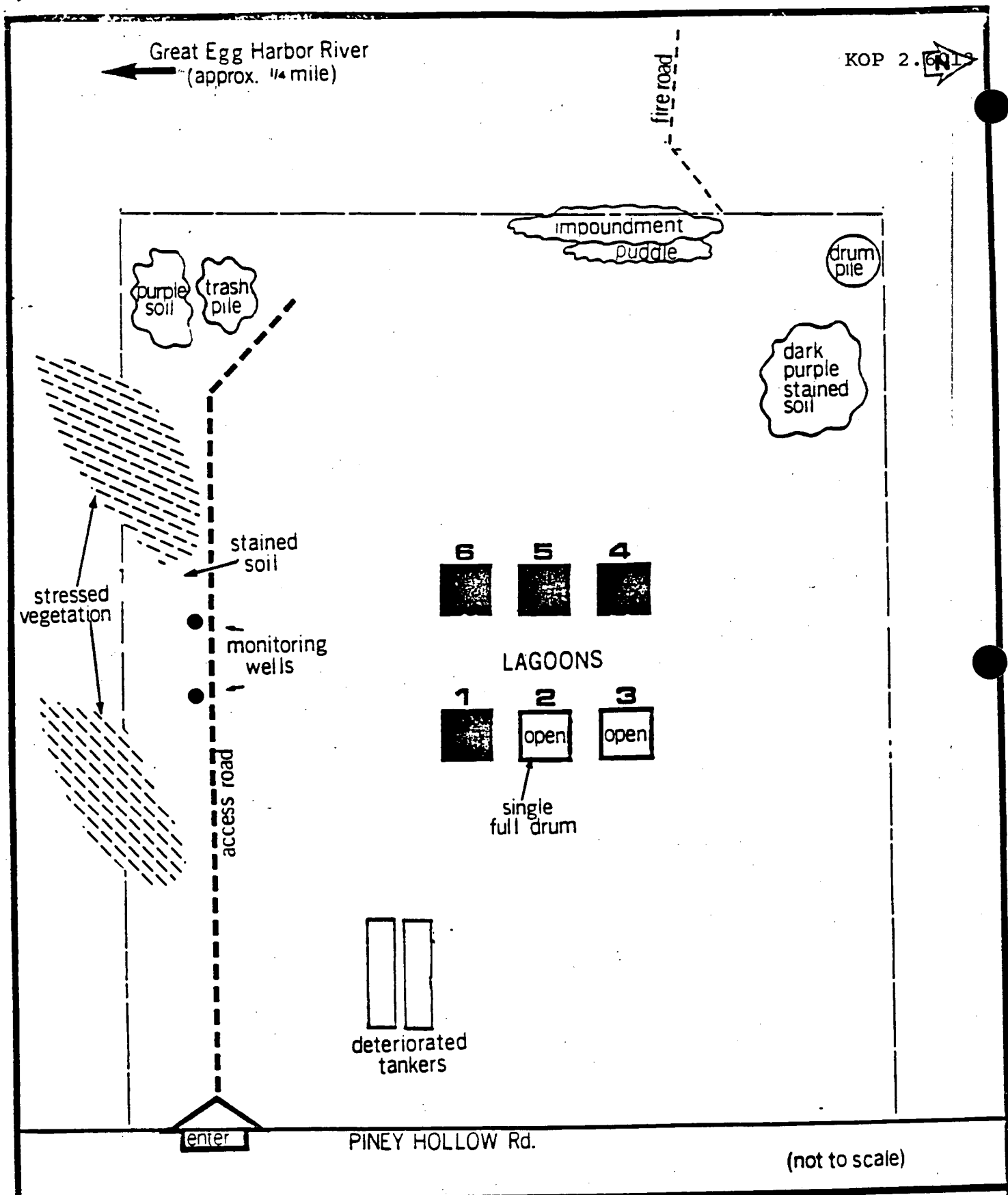
LOCATION MAP

 In Association with ICF Technology Inc., C.C. Johnson & Associates,
Inc., Resource Applications, Inc., Geo/Resource Consultants, Inc.,
and Environmental Toxicology International, Inc.

TAT PM

GRAHAM

FIGURE 1



WESTERN

SPILL PREVENTION &
EMERGENCY RESPONSE DIVISION

EPA PM

DOMINACH

**K.O.P. LANDFILL
SITE MAP**

In Association with ICF Technology Inc., C.C. Johnson & Associates,
Inc., Resource Applications, Inc., Geo/Resource Consultants, Inc.,
and Environmental Toxicology International, Inc.

TAT PM

GRAHAM

FIGURE 2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II

JUL 16 1990

KOP 226014
Phase II

DATE:

SUBJECT:

Request for a Ceiling Increase, a Change in Scope and a Twelve Month Exemption for the King of Prussia Technical Corporation Site, Winslow Township, Camden County, New Jersey - ACTION MEMORANDUM

FROM:

Eugene G. Dominach, On-Scene Coordinator
Removal Action Branch *Eugene G. Dominach*

TO:

Constantine Sidamon-Eristoff
Regional Administrator

THRU:

Richard L. Caspe, P.E., Director
Emergency and Remedial Response Division *RL Caspe*

Site ID: 15

Category of Removal: Time Critical

National Significance: NPL Site

I. ISSUE

The King of Prussia Technical Corporation (KOP) site continues to meet the criteria for a removal action under the Comprehensive Environmental Response, Compensation, and Liability Act as described in Section 300.400 of the National Contingency Plan (NCP) dated March 8, 1990. The removal under the scope of actions described herein is anticipated to cost less than \$2 million.

A Twelve Month Exemption is needed to complete the removal of 250 cubic yards of heavy metal contaminated soil, 150 gallons of spent acid and 120 plastic carboys remaining on-site from the initial carboy removal activity. The Twelve Month Exemption is also required to allow this removal action to continue to mitigate the threat posed by the on-site buried deteriorating drums.

The current issue is the removal of buried drums, their contents and the excavation and stockpiling of the adjacent soil that is potentially contaminated with heavy metals and volatile organic compounds released from the drums. Although a Remedial Investigation/Feasibility Study (RI/FS) is currently in progress, the Potentially Responsible Parties (PRPs) have disavowed responsibility for the drums and the associated contaminated site soil. On October 5, 1989, at the request of the New Jersey Compliance Branch (NJCB), the United States Environmental Protection Agency (EPA) Removal Action Branch (RAB) initiated proceedings to provide interim emergency measures as part of a long-term CERCLA cleanup of the site.

At this time, the NJCB has requested that the tankers, their contents and the associated contaminated soil will be addressed as a future separate action. It is uncertain as to who will perform the removal action and final disposition of hazardous materials.

Other issues of concern are:

- 1) The severe contamination of the groundwater.
- 2) The contamination of the Great Egg Harbor River.
- 3) The potential impact on the nearby New Jersey fish and wildlife area.
- 4) The possible human exposure to the contaminated surface and groundwater; The wildlife area and the Great Egg Harbor River attracts numerous visitors for recreational activities, such as hiking, camping, fishing, hunting and wading.

II. BACKGROUND

A. Site Description

1. LOCATION OF THE SITE

The KOP site is an abandoned hazardous waste disposal facility in the midst of the 6,000 acre, Winslow Wildlife Management Area. This site is located in Southern New Jersey's Pinelands Region, which in itself is a highly sensitive ecosystem and in addition is situated above the Cohansey Aquifer. The KOP site is located on Piney Hollow Road, Winslow Township, Camden County, New Jersey and is classified as remote/rural. The nearest residence, several gravel operations, a chemical manufacturer, an asphalt plant and a municipal landfill are all within a quarter mile of the site which is currently owned by Winslow Township.

2. GENERAL CHARACTERISTICS OF THE SITE

The KOP site consists of a cleared sandy ten acre area which is devoid of most vegetation except for some grass, scrub brush and an occasional pine tree. The following are of special concern: remnants of six waste water treatment lagoons, two deteriorated tank trailers, buried drums, and a large area of stressed vegetation. Surface drainage discharges to the southern perimeter of the site forming an intermittent wetland which feeds directly into the Great Egg Harbor River, less than a quarter mile away. See Figure A, pg. 20, for a site location map and Figure B, pg. 21, for a site map.

Aerial photographs taken in 1975 when the facility was in operation, indicate that two chemical storage tanks and two tank trailers were located on or adjacent to the former carboy disposal area. Ground stains are evident in the vicinity of the lagoons. Recent aerial photographs, August 1984, show the lagoons empty or partially filled with liquid and significant tree and ground cover stress downhill of the site. Spillage or runoff from the lagoons, due to site topography, would flow in the direction of the former carboy disposal area and eventually enter the river. Prior to July 1988, when the PRPs fenced the site, no form of security existed. A deer blind and numerous tire tracks throughout the site clearly indicated that the site was subject to trespassing by hunters and operators of off-road vehicles. The fence has curtailed trespassing and suspected illegal dumping.

3. National Priorities List Status

In July 1989, this hazardous waste site ranked 228 on the National Priorities List (NPL).

B. Incident/Release Characteristics

Assessments performed by the EPA, the New Jersey Department of Environmental Protection (NJDEP) and the published results from the RI by the PRPs have confirmed the presence of hazardous contaminants in the soil, surface water and groundwater.

The KOP site, which is characterized by the presence of Target Compound List (TCL) metals and volatile organics in the soil and groundwater, was used as a waste treatment and disposal facility for hazardous industrial wastes. The TCL metals found at the site exceed the NJDEP risk-based soil cleanup standards.

While in operation and long after the facility was abandoned in 1975, an undetermined amount of illicit chemical material dumping is believed to have occurred.

During heavy rains and/or periods of high groundwater, water from the site drains toward the southwest boundary into a natural swale forming a small pond about 400 feet from the site. The collected water then flows to the Great Egg Harbor River.

Data from a recent magnetic survey has located metallic debris in the northwest corner of the site that is believed to be buried drums to a depth of 12 feet. Discharges from these containers is one of the suspected sources of the groundwater and soil contamination.

C. Quantity and Types of Substances Present

1. HAZARDOUS SUBSTANCES PRESENT

The KOP site contains the remnants of six lagoons; buried containers, which have or are about to deteriorate, releasing their contents into the ground; two deteriorated tankers. Listed below is added information on the storage of the known hazardous substances.

a) Six lagoons: four improperly backfilled, two open.

Three lagoons 70 feet long and 50 feet wide and three lagoons 100 feet long and 80 feet wide. At a working capacity of 90%, the plants treatment capability was approximately 3.5 million gallons. Deteriorated liners are visible in the open lagoons and no liquid retention capabilities are possible. Analytical results of samples obtained from the lagoons has demonstrated that contamination exceeds the NJDEP clean up guidelines for arsenic, beryllium, cadmium, copper, lead, nickel and zinc.

b) Buried drums

An irregular shaped drum burial area of approximately 2,500 square feet has been confirmed by both visual and geophysical means. On March 20, 1989, the PRPs' consultant sampled a drum that had surfaced. Analytical results confirmed the presence of high concentrations of volatile organics, see Table 1, pg. 16.

The drums are believed to contain volatile and semi-volatile organics. This project is based on the removal of 150 drums, their contents and the excavation and stockpiling of the adjacent contaminated soil. Should the estimated quantity of drums be exceeded the transportation and disposal costs of the drums and their contents will increase. On-site soil treatment methods will be investigated during the RI/FS stage.

c) Tankers

Two rusting and deteriorated tankers are estimated to contain 10 cubic yards of solid hazardous waste. Samples taken on May 18, 1988, by the PRPs' consultants, show high concentrations of TCL metals. The analyses of these samples are shown in Table 2, pg. 17.

In addition to the above, samples were collected from the groundwater, swale area, surface runoff. Analytical results from these samples verify significant degrees of contamination. Table 3, pg. 18, depicts the analytical results for a partial list of the hazardous substances found at the site.

Soil contamination consists principally of the TCL metals. The highest concentrations were found for chromium, copper, nickel, zinc, beryllium and mercury, all exceeding NJDEP cleanup objectives.

Groundwater from the monitoring wells exceeds New Jersey Drinking Water Guidance Criteria for chromium, copper, mercury, 1,1-dichloroethene, trans-1,2-dichloroethene, 1,1,1-trichloroethane, trichloroethene, tetrachloroethane, and bis(2-ethylhexyl) phthalate.

Drainage swale surface water exceeds New Jersey Drinking Water Guidance Criteria for chromium and lead.

Drainage swale sediment exceeds NJDEP soil cleanup objectives for beryllium, chromium, copper and selenium.

Contaminated soil and groundwater (documented by laboratory analysis) and a large area of stressed vegetation located off-site indicate that contaminants are migrating off-site via the air, surface water and groundwater. The analytical data and on-site observations indicate that these off-site releases of contaminants have been occurring for a number of years.

D. State and Local Authorities Roles

During 1976-1977, after the facility's closure in 1975, the NJDEP conducted several on-site inspections. In 1979, the site was referred to EPA for the purpose of addressing site security and mitigative efforts.

On May 6, 1988, the NJCB requested that the EPA RAB provide interim emergency measures as part of a long-term CERCLA cleanup of the site.

E. Other Actions to Date

On April 17, 1985, the EPA and the PRPs entered into an agreement through a Consent Order whereby the PRPs would undertake a RI.

In July, 1986, the PRPs submitted a Draft RI report. Upon review of this report, the NJDEP and the EPA determined that the details did not fully address the extent of contamination at the site, and therefore, requested that the PRPs conduct a Phase II RI. On May 16, 1988, the consultant, Environmental Resources Management of Exton, Pennsylvania (ERM), mobilized to the site to begin supplemental field activities that were completed in September 1988.

In 1988, the PRPs installed a perimeter fence during the RI, thereby decreasing the possibility for trespassing and direct contact.

The RAB reassessed the carboy area and submitted an Action Memorandum on March 14, 1989, for funding to remove the carboys and a maximum of 315 cubic yards of contaminated soil.

The EPA RAB received funding to remove the carboys, the carboy liquids and the adjacent contaminated soil. The removal was delayed pending issuance of an Administrative Order On Consent (AOC) to the PRPs and their response to the proposed removal. The PRPs declined to perform the actual removal and are currently considering a monetary settlement.

On August 17, 1989, the RAB was advised to proceed with the Phase I removal action, which consisted of the removal of 120 carboys, the recovery of 150 gallons of waste acid, and the removal of approximately 250 cubic yards of contaminated soils. All materials are stored on-site awaiting disposal. An estimated 1,650 gallons of acid, based on carboy volume, may have been released into the soil.

On March 20, 1989, the consultant, ERM, sampled a drum in the drum burial area. A lab analysis showed that the drums contained high concentrations of volatile organic compounds, semi-volatile organic compounds, phenols, and inorganics. Volatile and semi-volatile organics were the main constituents. (See Table I, pg. 16.)

III. THREAT

The NJDEP has prepared a health assessment of the site for the Agency For Toxic Substances and Disease Registry. The following threat section information is quoted from that report.

Exposure pathways of concern at this site include:

1. Inhalation
2. Dermal absorption
3. Ingestion
4. Ingestion of contaminated aquatic biota

A. Threat of Public Exposure

Analysis of soil samples, collected during Phase I of the RI, detected priority TCL compounds in shallow soils, including heavy metals, volatile organic compounds, and other organic compounds. The high levels of toxic compounds present in the upper portion of soil presents an unacceptable health risk to the targeted population. Human exposure to the contaminated surface soils on and off-site may occur via ingestion or dermal contact. One of the major concerns of the sandy and wind-swept nature of the site

is the inhalation of contaminated airborne particles. Many of the compounds found thus far are known to be carcinogenic, teratogenic and mutagenic. Health effects from compounds identified on-site are shown in Figure C, pg. 22.

B. Threat to the Environment

All analyses conducted thus far indicate that contamination of the site is extensive. Almost the entire southern perimeter of the site consists of stressed and dead vegetation. Surface water contamination was identified during a study conducted by EPA during October of 1979. Analytical results of runoff revealed a significant amount of contaminants leaving the site.

A large groundwater plume and sediments being carried by surface water are the major pathways of off-site migration. Estimates of the depth of the plume range from 35 to 80 feet beneath the ground surface. Stressed vegetation indicates that runoff is an environmental pathway of concern. During periods of wet weather, a small pond forms adjacent to the site that drains into a swale that conducts runoff toward the Great Egg Harbor River.

Sampling by EPA's consultant demonstrated that heavy metals are transported by this swale and/or the groundwater beneath the swale toward the river. At the time the sampling occurred (March 1986), surface water quality in the Great Egg Harbor River had been altered only with respect to copper. Copper was not in the river above the KOP site. Below the site, copper was present in water at a concentration of 0.11 ppm, which is less than the protection limit for human health (1.0 ppm), but slightly greater than the protection limit for freshwater aquatic biota (0.043 ppm). The high percolation rate of the site's sandy soil greatly increases the potential to contaminate the subsurface soils and potentially the underlying Cohansey aquifer. The analytical results of the groundwater samples taken during October of 1979, verify that contamination of soils has occurred.

Surficial sampling, performed during June of 1988, revealed that organic and inorganic contaminants were present in the first three inches of soil throughout much of the site. Soil depths below three inches were not investigated. Contamination of the upper layers of soil was found to be consistent with results found in samples taken of surficial runoff and groundwater. Contamination of this particular substrate is cause for concern because the contaminants have migrated into the ground and surface water through the actions of wind, rain, and human activities.

IV. ENFORCEMENT

A. Enforcement Strategy

1. SUMMARY OF ENFORCEMENT STRATEGY

During 1976-1977, the NJDEP conducted several on-site inspections but no enforcement action was taken. In 1975 the EPA began investigations at the site and in 1976 installed four groundwater monitoring wells. Follow up sampling and investigative work continued until 1980. The NJDEP maintained the lead on all enforcement matters until 1979, at which time the site was referred to EPA for site security and mitigation efforts. A proposal to place the site on the NPL was made in December 1982 and the site was formally listed in September of 1983.

2. SUMMARY OF ENFORCEMENT ACTIONS

Pursuant to an AOC, the KOP site committee was formed to conduct a RI/FS for the site. SMC Martin, Inc., engaged by the committee members, began the RI in July 1985, in accordance with a Work Plan approved by EPA as part of a Consent Order dated April 17, 1985. Upon review of the report EPA requested that supplemental work be performed to address site contamination. In March of 1988, ERM, was retained to conduct the supplemental RI work. On May 16, 1988, ERM mobilized to the site to begin supplemental field activities that were completed in September 1988.

On March 27, 1987 and again on May 6, 1988, the SCB requested that the site be evaluated for a removal action, specifically security and removal of buried carboys. As a result of an Action Memorandum by the RAB the PRPs installed a perimeter fence before the required funding was obtained negating the removal activity.

On February 9, 1989, the SCB requested the RAB to assess the carboy disposal area for a removal action. Funding was approved on May 11, 1989, to excavate and dispose of the buried carboys and approximately 315 cubic yards of contaminated soil. The RAB was given the order to proceed with the removal on August 17, 1989, by the New Jersey Compliance Branch since the PRPs agreed to finance the operation in lieu of performing the work. This activity is nearing completion.

The Enforcement Branch on October 5, 1989, requested the RAB to consider expanding the current action to remove the buried drums and their contents, since the PRPs have disavowed responsibility for the drums and have declined to take timely action.

V. PROPOSED PROJECTS AND COSTS

If the PRPs do undertake the aforementioned corrective action in a timely manner, all or part of the funds requested herein may not be necessary.

A. Proposed Project

1. DESCRIPTION OF PROPOSED ACTIONS

The proposed scope of work includes removing and properly disposing of the buried drums, their contents and the stockpiling the associated contaminated soil. Disposal of the drum contents may be accomplished by on-site treatment, off-site disposal, or a combination of the two methods.

A magnetic survey will be conducted to define the drum removal area. The drums will then be removed using a backhoe and a drum grapppler attachment and depending on condition, placed in an overpack or moved directly to a staging area. A drum staging area will be designated on-site where the excavated drums can be safely stored. The staging area will be constructed of geotech fabric placed on the ground with a confining peripheral clay berm. The drums will be covered with plastic after sampling has been completed.

Drum removal and sampling of the drums contents will be done simultaneously. The drum samples will be tested for compatibility and incineration characteristics using on-site analytical techniques. Upon receipt of confirming analyses, the compatible waste groups will be bulked. The solid waste groups, slated for incineration, will be packaged in fiber drums at a quantity based on the BTU/metals characteristic of the waste. Liquid waste not acceptable for incineration will be subjected to on-site treatment technologies to satisfy the local municipal wastewater plant permit parameters.

The empty metal drums will be crushed and placed in a bulk container for landfill disposal. Excavated contaminated soil will be stockpiled until on-site treatment technologies can be investigated. Waste slated for off-site disposal will require receipt of analyses, completion of waste profile sheets and submission to disposal facilities for acceptance and finally manifesting and shipment.

2. PROJECT SCHEDULE

The project can be initiated within three weeks after the approval of this Action Memorandum. The time required for completion of this action is expected to exceed 12 months.

The proposed mitigative tasks are detailed below and are shown on the project schedule diagram in Figure D, pg. 23.

- a) Prepare work plan for drum removal, staging, sampling and disposal
- b) Initiate guard service
- c) Define drum removal area by geophysical means;
- d) Stockpile contaminated soils
- e) Dispose of all drum and recovered waste
- f) Dispose of decon waters and empty drums

3. ALTERNATIVE ACTIONS

No alternative actions exist at this time. The contaminated soil will remain on-site and disposal will depend on treatment studies conducted during the RI/FS stage of cleanup. Landfilling is disallowed due to the Land Ban restrictions and therefore, treatment studies for the cleanup of the contaminated soil must be conducted to select the best demonstrated treatment technology. Successful on-site treatment of the soils would eliminate the need for removal/disposal.

B. Estimated Site Budget

The estimated costs for completion of this project are summarized below:

1. Subtotal, Mitigation Costs (ERCS)	\$ 563,501
Contingency 15%	\$ 84,525
Subtotal Mitigation Costs	\$ 648,026
2. TAT Costs	
(2) TATs	\$ 138,000
Subtotal Extramural Direct Costs	\$ 786,026
Contingency 15%	\$ 117,904
3. TOTAL, EXTRAMURAL COSTS	\$ 903,930
4. Intramural Costs	
Direct Costs	\$ 33,000
Headquarters (10% of D.C.)	\$ 3,300
Indirect Costs	\$ 74,800
TOTAL INTRAMURAL COSTS	\$ 111,100
5. TOTAL PROJECT COSTS	\$ 1,327,742

NEW PROJECT CEILING

	PHASE I <u>BUDGETED</u>	PHASE I <u>ESTIMATED</u>	PHASE II <u>BUDGETED</u>	NEW PROJECT <u>CEILING</u>
ERCS	\$ 439,000	\$ 157,991	\$ 648,026	\$ 806,017
TAT	\$ 32,000	\$ 76,455	\$ 138,000	\$ 214,455
CONT.	\$ 71,000	\$ 35,166	\$ 117,904	\$ 153,070
EPA	\$ 51,000	\$ 43,100	\$ 111,100	\$ 154,200
TOTAL	\$ 593,000	\$ 312,712	\$1,015,030	\$ 1,327,742

Ceiling Increase

\$1,327,742 - \$593,000 = \$734,742

Mitigation Contracting Increase

\$806,017 - \$439,000 = \$367,017

See Appendix C for a detailed cost estimate.

VI. EXEMPTIONS FROM STATUTORY LIMITS

Continued Response Actions are Otherwise Appropriate and Consistent with the Remedial Action to be taken

Under the AOC, the PRPs agreed to conduct an RI/FS to: characterize the nature and extent of contamination associated with the site, identify off-site contamination and its impact on the environment and public health, and determine the remedial measures to mitigate the impact of the site on public health and the environment. The presence of the buried drums and associated contaminated soils have been defined and they have declined to remove them, while the public has requested this be done immediately. The RAB agrees that an immediate threat exists from the hazardous materials which is supported by the NJDEP.

The proposed project will remove the potentially hazardous materials released or subject to release from the buried drums. This action will prevent further contamination of the adjacent soil and groundwater and will contribute to the efficient performance of the overall long-term remedial actions with respect to the threats from this site.

This removal action is potentially designed to stop further discharges from the drums into the soil and groundwater thereby protecting human health and the environment.

Identification of other applicable or relevant and appropriate requirements will be addressed in the ongoing remedial phase.

VII. EXPECTED CHANGE IN THE SITUATION SHOULD NO ACTION BE TAKEN OR ACTION BE DELAYED

If no immediate action is taken, the drums will continue to deteriorate, potentially discharging any or all remaining volatile organic contaminants into the soil and groundwater. This delay will result in a larger area of contamination and a longer more costly removal. A continued threat to humans and the environment will exist.

VIII. RECOMMENDATION

Approval of the proposed removal action, including an exemption from the 12-month time limit, as detailed and justified above, is recommended. The proposed removal action contributes to the efficient performance of any long-term remedial action at the site. Under 40 CFR 300.400 of the NCP, a removal action is appropriate at this site due to the existence of:

- 1) Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations, animals, or food chain [300.415(b)(2)(i)];
- 2) Actual or potential contamination of drinking water supplies or sensitive ecosystems [300.415(b)(2)(ii)];
- 3) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate [300.415(b)(2)(iv)];
- 4) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released [300.415(b)(2)(v)];
- 5) The availability of other appropriate Federal or state response mechanisms to respond to the release [300.415(b)(2)(vii)], and
- 6) Other situations or factors which may pose threats to public health or welfare or the environment [300.415(b)(2)(viii)].

The estimated new project ceiling of the KOP site Removal Funding Request is \$1,327,742 of which \$806,017 is for mitigation contracting. This request is for a ceiling increase of \$734,742 of which \$367,017 is the estimated increase for mitigation contracting.

Your authority to approve this request is established by Administrator Lee Thomas' Interim Delegation 14-1-A of September 21, 1987.

Sufficient funding is available in our current Advice of Allowance to finance this project.

Your signature below also approves the exemption for mitigation contracting to the 12 month time limit and ceiling increase of \$734,742 for the KOP site according to current Delegation of Authority.

Approved: _____

Constantine Sidamon-Eristoff
Regional Administrator

Date: 7/18/90

Disapproved: _____

Constantine Sidamon-Eristoff
Regional Administrator

Date: _____

cc: (after approval is obtained)

- C. Sidamon-Eristoff, 2RA
- R. Caspe, 2ERR
- R. Salkie, 2ERR-ADREPP
- G. Zachos, 2ERR-RAB
- J. Frisco, 2ERR-ADNJP
- J. Marshall, 2OEP
- R. Borsellino, 2ERR-NJRAB
- D. Karlen, 2ORC-NJSUP
- R. Gherardi, 2OPM-FIN
- P. Cutts, OPM-FAM
- S. Luftig, OS-210
- J. Trela, NJDEP
- C. Moyik, 2ERRD-PS
- L. Guarneiri, OS-210
- J. Rosianski, 2OEP
- D. Henne, TATL

King of Prussia

APPENDIX A

Table 1	Hazardous Substances	Drum
Table 2	Hazardous Substances	Tankers
Table 3	Hazardous Substances	Site

APPENDIX B

Figure A	Site Location Map
Figure B	Site Map
Figure C	Toxicological Effects of Identified Substances
Figure D	Work Schedule

APPENDIX C

Detailed Cost Estimate

APPENDIX A

TABLE 1LIST OF HAZARDOUS SUBSTANCES FOUND IN
THE SAMPLE OF A BURIED DRUM

<u>Contaminant</u>	<u>Concentrations</u> <u>(mg/kg)</u>
Trichloroethene	7,800
Tetrachloroethene	4,400
Toluene	1,100 J
Ethylbenzene	43,000
Phenol	1,300 J
1,4 Dichlorobenzene	99 J
1,2 Dichlorobenzene	18,000
2,4 Dimethylphenol	21 J
1,2,4 Trichlorobenzene	72 J
Total Phenols	4,650
Chromium	2.9
Copper	24 J
Lead	0.59
Zinc	13.9

<u>Contaminant TICs</u>	<u>Concentrations</u> <u>(mg/kg)</u>
2 Butanone	2,250 J
1,4 Dimethylbenzene	350,000 J
1,2 Dimethylbenzene	250,000 J
3 Ethylhexane	620 J
4 Ethyl-2-Methylhexane	280 J
(1 Methylethyl)benzene	550 J
Propylbenzene	240 J
Ethylmethylbenzene Isomers	670 J
Trimethylbenzene Isomers	210 J
2 Methylphenol	2,400 J
4 Methylbenzaldehyde	150 J
(1 Butylheptyl)benzene	110 J
(1 Methyldecyl)benzene	98 J
(1 Butyloctyl)benzene	100 J
(1 Methylundecyl)benzene	78 J
Total Unknowns	180,000 J

Note: Sample taken on March 20, 1989 by the PRP's consultant.
J = Estimated Value

TABLE 2

LIST OF HAZARDOUS SUBSTANCES FOUND IN SAMPLES FROM THE TANKERS

Tanker #1

<u>Hazardous Substances</u>	<u>Concentration</u> <u>(mg/kg)</u>		<u>NJ Soil</u> <u>Standards</u>
	Tanker #1	Tanker #2	
Antimony	--	24	10
Arsenic	22	--	20
Beryllium	38	38	1
Cadmium	--	1.8	3
Chromium	6,450	1,430	100
Copper	8,940	10,080	170
Lead	35	30	100
Nickel	6,580	1,790	250
Zinc	317	--	350
Cyanide	3	1.4	12

NOTE: Sample taken by the PRP's consultant on May 18, 1988.

TABLE 3

PARTIAL LIST OF HAZARDOUS SUBSTANCES FOUND ON THE SITE

<u>Contaminant</u>	<u>Concentration</u>	<u>Sample Media</u>	<u>Statutory Source Under CERCLA</u>
1,2,4 Trichloro-benzene	0-120 mg/kg	L.S.	2
Hexachloro-ethane	740 mg/kg	L.S.	2,4
Chromium	5.6 mg/l	M.W.	2
Copper	3.9 mg/l	M.W.	2
Cadmium	0.6 mg/l	M.W.	2
Arsenic	1.0 mg/l	M.W.	2,3
Beryllium	2.2 mg/l	M.W.	2,3,4
Mercury	1.44 mg/l	M.W.	2,3,4
Lead	0.6 mg/l	M.W.	2
Vinyl Chloride	0.029 mg/l	M.W.	2,3,4
Phenol	1.7 mg/l	M.W.	1,2,4
Beryllium	9.30	S.S.	2,3,4
Chromium	703	S.S.	2
Copper	206	S.S.	2
Mercury	1.10	S.S.	2,3,4

1. 311(b)(4) of the Clean Water Act
2. 307(a) of the Clean Water Act
3. 112 of the Clean Air Act
4. RCRA section 3001

Media Symbols: M.W.= monitoring well
L.S.= lagoon sediment
S.S.= swale sediment

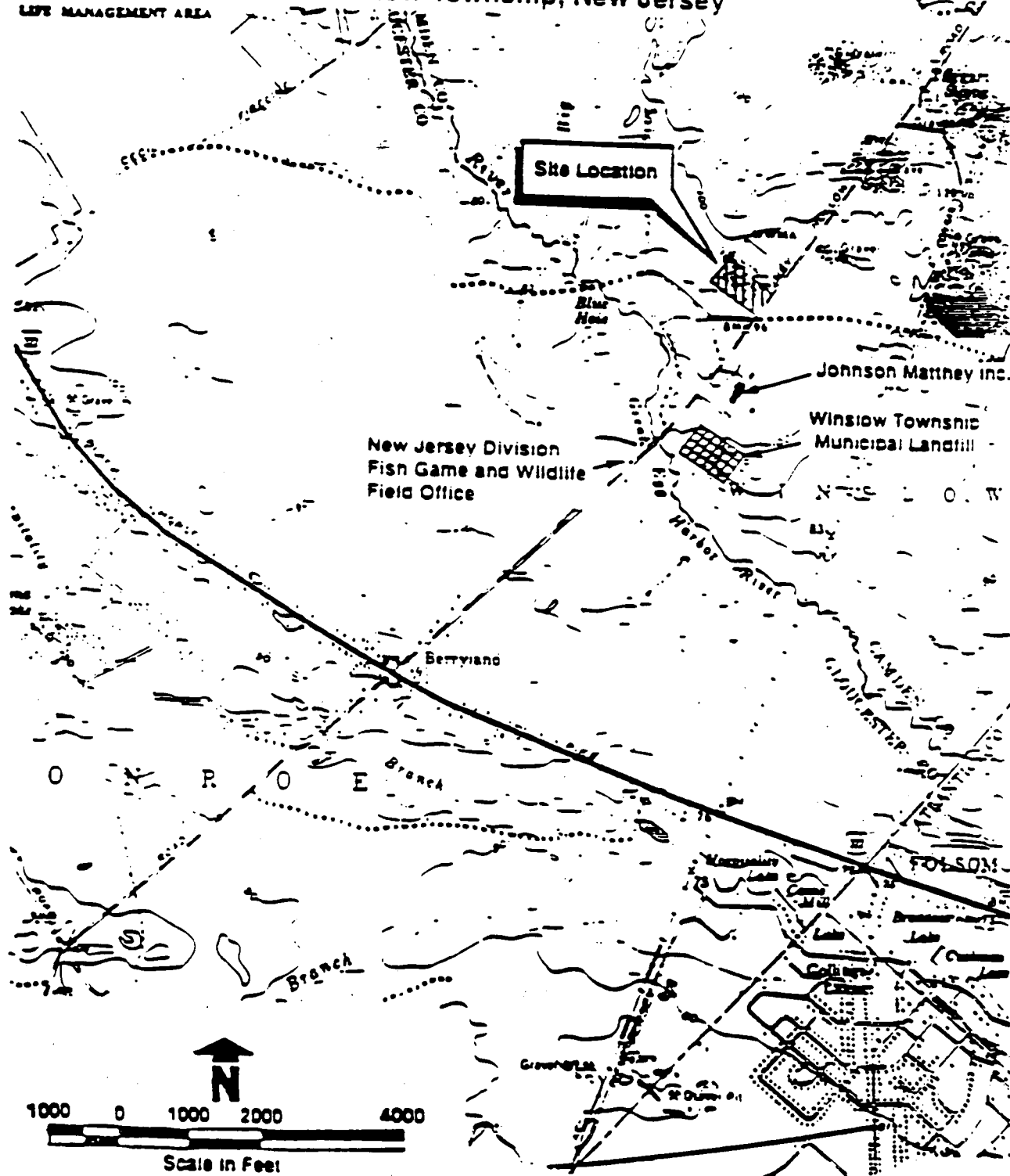
APPENDIX B

Site Location and Regional Topographic Map

King of Prussia Technical Corporation Site

Winslow Township, New Jersey

WINSLOW
LEFT MANAGEMENT AREA



WESTON

SPILL PREVENTION &
EMERGENCY RESPONSE

In Association with ICF Technology Inc., C.C. Johnson & Malhotra, P.C., Resource Applications, Inc. and R.E. Sarriera Associates

EPA PM

E. Dominach

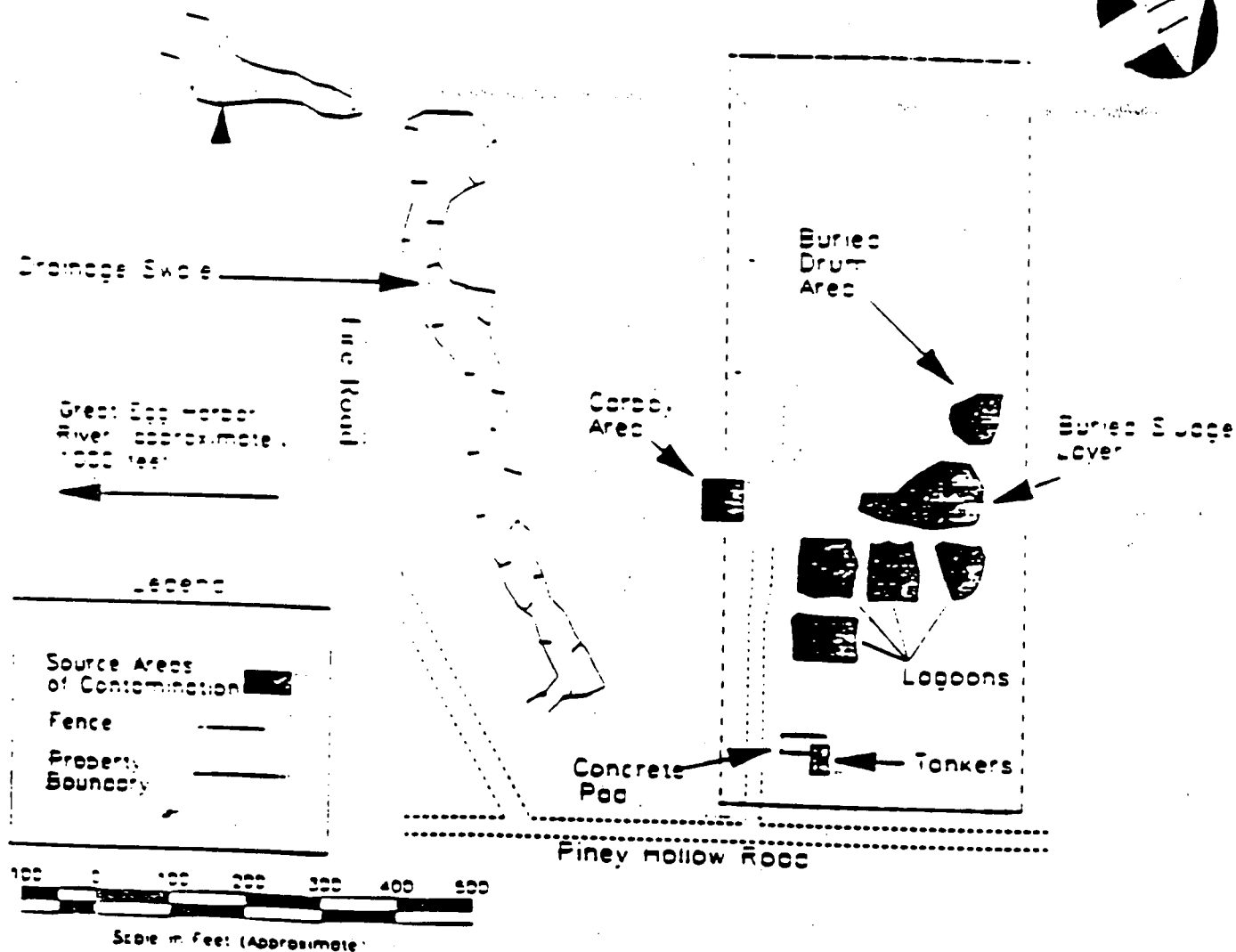
TAT PM

J. Manfreda

Site Location Map

Figure A

Site Map


WESTERN

 SPILL PREVENTION &
EMERGENCY RESPONSE

EPA PM

E. Dominach

Site Map

 In Association with ICF Technology Inc., C.C. Johnson &
Malhotra, P.C., Resource Applications, Inc. and
R.E. Sarriera Associates

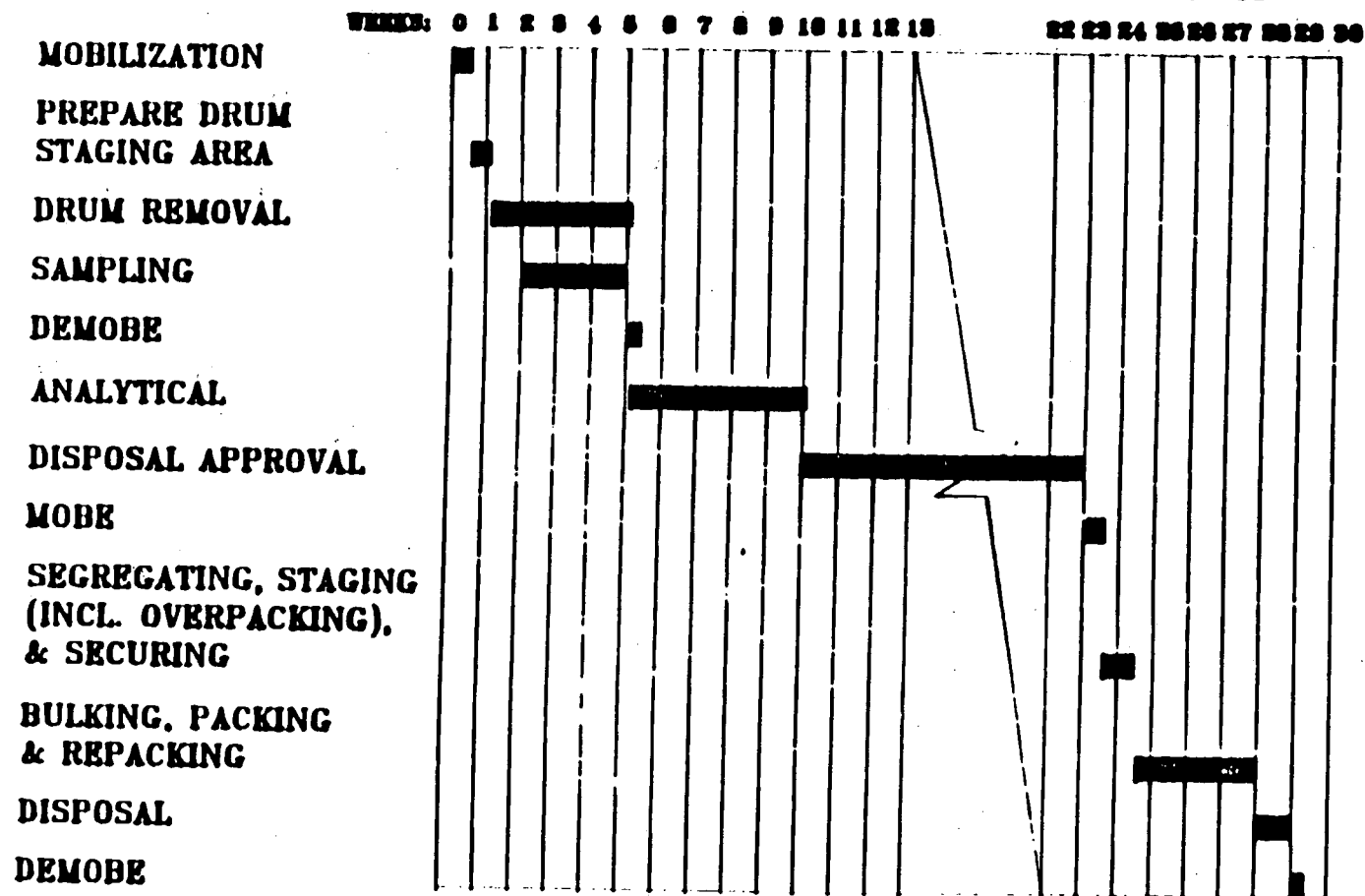
TAT PM

J. Manfreda

Figure B

KING OF PRUSSIA

PROPOSED WORK SCHEDULE FOR REMOVAL OF BURIED DRUMS



REVISED: 06-05-90
 DATE: 06-01-90
 DWN. #2600

WESTON

SPILL PREVENTION &
 EMERGENCY RESPONSE DIVISION

In Association with H F Technology Inc., C.C. Johnson & Associates, Inc., Resource Applications, Inc., Geo/Resource Consultants, Inc., and Environmental Toxicology International, Inc.

EPA PM
 E. Dominach

IAT PM
 J. Manfreda

Work Schedule

Figure D

APPENDIX C

KING OF PRUSSIA DETAILED COST ESTIMATE
FOR DRUM REMOVAL
WINSLOW TOWNSHIP, CAMDEN COUNTY, N.J.

Phase II

The estimated cost for the removal, disposal, and transportation of the buried drums is as follows:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II

DATE: JAN 24 1991

SUBJECT: Request for a Removal Action, Ceiling Increase, Change in Scope and a Twelve Month Exemption for the King of Prussia Technical Corporation Site, Winslow Township, Camden County, New Jersey

FROM: Eugene G. Dominach, On-Scene Coordinator
Removal Action Branch *Eugene G. Dominach*

TO: Constantine Sidamon-Eristoff
Regional Administrator

THRU: Richard L. Caspe, P.E., Director
Emergency and Remedial Response Division *R. L. Caspe*

Site ID: 15

I. PURPOSE

The purpose of this Action Memorandum is to request and document approval of the proposed removal action at the King of Prussia Technical Corporation (KOP) site located on Piney Hollow Road, Winslow Township, New Jersey, 08095. The New Jersey Compliance Branch (NJCB) has requested that the Removal Action Branch (RAB) remove two deteriorated tankers and their contents from the site. A Change in Scope and a Twelve Month Exemption are needed to complete the removal action. Two previous responses were enacted under approved Action Memorandums.

II. SITE CONDITIONS AND BACKGROUND

A. Site Description

1. Removal Site Evaluation

The KOP site is an abandoned hazardous waste disposal facility. Located at the site are six lagoons and two rusting tankers. Drum and carboy burial sites have been addressed by the Environmental Protection Agency (EPA) in a previous and an ongoing removal activity. On-site contamination consists principally of heavy metals namely chromium, copper, nickel and zinc. The probable sources of contamination are buried drums and carboys, lagoons and rusted and leaking tankers. Surface water runoff transports contaminants via erosion and sedimentation and discharges to the southern perimeter of the site forming an intermittent wetland which feeds directly into the Great Egg Harbor River. See Figure B, page 14, for site map.

2. Physical Location

The site is located on Piney Hollow Road, Winslow Township, Camden County, New Jersey. The facility is in the midst of the Winslow Wildlife Management Area and situated above the Cohansey Aquifer. See Figure A, pg. 13, for a site location map. The area is rural and the nearest residence, several gravel operations, a chemical manufacturer, an asphalt plant and a municipal landfill are all within a quarter mile of the site.

3. Site Characteristics

The KOP site consists of a cleared sandy ten acre area which is fenced but devoid of most vegetation. The site was purchased in 1970 and was used by KOP from 1970 through 1973 when operations ceased. After the township resumed ownership in 1976 for default in taxes, illegal dumping and disposal of hazardous materials is believed to have occurred.

4. Release or threatened release into the environment of a hazardous substance, or pollutant or contaminant.

The KOP site, which is characterized by the presence of Target Compound List (TCL) metals and volatile organics in the soil and groundwater, was used as a waste treatment and disposal facility for hazardous industrial wastes. Priority pollutant metals exceeding the New Jersey Department of Environmental Protection (NJDEP) soil cleanup action levels are found at the site. Appendix A, page 13, lists the ten most prevalent Comprehensive Environmental Response Compensation and Liability Act (CERCLA) hazardous substances listed in 40 CFR Table 302.4.

During heavy rains the tankers are receptacles for water. Rain enters via the broken, leaking and torn open sections. The resultant contaminated leachate and contaminated site water combine and drain toward the southwest boundary into a natural swale. Ponding occurs 400 feet from the site and eventually discharges to the Great Egg Harbor River.

5. National Priority List Status

In July 1989, this hazardous waste site ranked 228 on the National Priority List (NPL) and is ranked 40 on the New Jersey listing of NPL sites.

6. Site Location Map, Site Map and Toxicology Chart

See pages 15, 16 and 17, respectively, for the above.

B. Other Actions to Date

1. Previous Actions

On August 17, 1989, the RAB started field work associated with the Phase I removal action, which consisted of the removal of 120 plastic carboys, the recovery of 150 gallons of waste acid and the removal of approximately 160 cubic yards of contaminated soils. The acid and soils have been removed from the site and disposed of at approved facilities and the carboys via recycling. The Phase I Removal Action was completed on September 6, 1990.

2. Current Actions

Phase II of the removal action approved on July 18, 1990 provides for a Twelve Month Exemption and properly removing and disposing of buried drums and their contents. This activity was initiated on August 29, 1990 with geophysical investigations to determine the area of contamination. Field work began on November 12, 1990, and to date, 200 rusted and deteriorated steel drums and 235 plastic carboys have been excavated. Sampling is in progress for compatibility, disposal and enforcement support. The removal of the tankers and their contents will be a restart.

C. State and Local Authorities' Roles

1. State and local actions to date

This case was referred to EPA by NJDEP with a request that EPA take legal action to initiate a cleanup. EPA performed a site inspection on October 10, 1979.

2. Potential for continued State/local response

With the exception of the actions by EPA mentioned herein, no current mitigative effort is known to be underway or planned for removal of the tankwagons and their contents.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

The New Jersey Department of Environmental Protection (NJDEP) has prepared a health assessment of the site for the Agency For Toxic Substances and Disease Registry. The following threat section information is quoted from that report.

Exposure pathways of concern at this site include:

1. Inhalation
2. Dermal absorption
3. Ingestion
4. Ingestion of contaminated aquatic biota

A. Threat of Public Health or Welfare

1. Quantities and types of substances present

Surficial sampling and analyses confirm the presence of organic and inorganic contaminants in the soil. Surface water runoff and a large groundwater plume are the major pathways of off-site migration which carries these contaminants to the Great Egg Harbor River.

The two rusting and deteriorated tankers contain approximately 10 cubic yards of solid hazardous waste. Samples taken on May 18, 1988, by the Potentially Responsible Party (PRPs) consultants, show high concentrations of TCL metals (listed CERCLA hazardous substances). The analyses of these samples are shown in Table 1, page 11.

2. Potential health and toxicological effects

Human exposure to the contaminated surface soils, including the hazardous substances found in and beneath the tankers, on and off-site may occur via ingestion or dermal contact. One of the major concerns of the sandy and wind-swept nature of the site is the inhalation of contaminated airborne particles. Many of the compounds found thus far are known to be carcinogenic, teratogenic and mutagenic. Health effects from compounds identified on-site are shown in Figure C, pg. 15.

B. Threats to the Environment

Contaminated soil and groundwater (documented by laboratory analysis) and a large area of stressed vegetation located off-site indicate that contaminants are migrating off-site as airborne particulate and leachate in surface water. The analytical data and on-site observations indicate that these off-site releases of listed CERCLA hazardous substances have been occurring for a number of years.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

V. EXEMPTION FROM STATUTORY LIMITS

Continued Response Actions are Otherwise Appropriate and Consistent with the Remedial Action to be Taken

The proposed project will remove the potentially hazardous

materials released or subject to release from the tankers.

A. Consistency

Since the PRPs disavow any responsibility for these materials, then the removal of the two deteriorated tankers and their contents will be consistent with a long-term remedial and enforcement action.

B. Appropriateness

This action will prevent further contamination of the adjacent soil and groundwater and will contribute to the efficient performance of the overall long-term remedial actions with respect to the threats from this site.

Since conditions at the site meet the CERCLA section 104(c) consistency exemption the proposed action qualifies for a 12-month exemption.

VI. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

1. Proposed action description

The objective of this removal activity is to eliminate the threat of discharge to the environment and direct contact with the CERCLA listed hazardous materials within the abandoned and deteriorating tankers. The proper disposal of the solid toxic metal hazardous waste will best be accomplished by stabilization prior to land-filling. Stabilization, which is the current best demonstrated available technology, is required for landfilling by the Land Ban Restrictions.

After the tankers are emptied the steel shells will be cleaned free of particulates by high pressure laser jet washing. The cleaned hulls will be cut up into small sections and recycled as scrap metal. The surficial contaminated soil beneath and around the tankers will be addressed by the future PRP actions at the site.

2. Contributions to remedial performance

Since the PRPs disavow any responsibility for the tankers and their contents their removal by the RAB will prevent further contamination of the adjacent soil and groundwater and will contribute to the efficient performance of the overall long-term remedial actions with respect to threats from the site. Since the conditions at the site meet the CERCLA 104(C) consistency exemption the proposed action qualifies for a 12-month exemption.

3. Description of alternative technologies

Economically the method of disposal proposed is stabilization prior to landfilling due to the small quantity of hazardous material involved. Although extraction techniques are available for removing metals from soils, pilot testing would be required to identify a suitable procedure and hence would not be cost effective for this removal action.

4. EE/CA

Because of the time critical nature of this removal action this section does not apply.

5. Applicable or relevant and appropriate requirements (ARARs)

Federal

Federal ARARs determined to be practicable for the KOP site are the Clean Water Act, the Toxic Substances Control Act, the Occupational Safety and Health Act (OSHA) and land ban restrictions pursuant to the Resource Conservation and Recovery Act (RCRA), as amended, 42 U.S.C. 6901.

State

State ARARs will be met by removing the hazardous materials from within the tankers thereby preventing future discharges that will further contaminate the soil and groundwater.

6. Project Schedule

The project can be initiated within two weeks after approval and is expected to be completed within six (6) months (see Figure D, p.17 for the work schedule diagram).

B. Estimated Costs - Phase III

1. Regional Allowance Costs

Total Cleanup Contractor Costs(ERCS)	\$	60,000

Contingency 15%	\$	<u>9,000</u>

Total Contractor Costs	\$	69,000

2. Other Extramural Costs Not Funded From The Regional Allowance

TAT	\$	<u>13,800</u>

Subtotal Extramural Costs	\$	82,800

Extramural Costs Contingency 15%	\$	<u>12,420</u>

3. TOTAL, EXTRAMURAL COSTS	\$	95,220

4. Intermural Costs

Direct Costs	\$	6,000
Headquarters (10% of D.C.)	\$	600
Indirect Costs	\$	<u>13,600</u>
TOTAL, INTRAMURAL COSTS	\$	20,200

5. TOTAL, REMOVAL PROJECT CEILING	\$	115,420
TOTAL, REMOVAL PROJECT CEILING ROUNDED	\$	<u>115,000</u>

NEW PROJECT CEILING

	<u>PHASE I & II</u> <u>BUDGETED</u>	<u>PHASE III</u> <u>ESTIMATED</u>	<u>NEW PROJECT</u> <u>CEILING</u>
ERCS	\$ 806,017	\$ 60,000	\$ 866,017
TAT	214,455	13,800	228,255
CONT.	153,070	21,000	174,070
EPA	154,200	20,200	174,400
TOTALS	\$ 1,327,742	\$ 115,000	\$ 1,442,742

Ceiling Increase = \$115,000

Mitigation Contracting Increase = \$60,000

New Project Ceiling = \$1,442,742

See Appendix C, pg. 18, for a detailed cost estimate.

VII. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

If no immediate action is taken, the two rusting tankers will continue to deteriorate and discharge the hazardous waste containing high concentrations of TCL metals (Table 1, page 12) onto the ground. The runoff during heavy rains and periods of high ground water will spread the listed CERCLA hazardous substance to adjacent areas. This will result in a larger area of contamination and a longer more costly removal. The threat to humans and the environment will in turn be expanded over a larger area.

VIII. OUTSTANDING POLICY ISSUES

None.

IX. ENFORCEMENT

The NJDEP maintained the lead on enforcement matters until 1979 when the site was referred to the EPA. The KOP site committee that consists of six PRPs was formed prior to the issuance of an Administrative Order on Consent (AOC). The PRPs conforming with the AOC are currently financing an RI/FS at the site and have agreed to contribute to the Phase I carboy removal activity. The PRPs have disavowed any responsibility for the buried drums (Phase II) and the tankers (Phase III) and have declined to take timely action.

X. RECOMMENDATION

This decision document represents the selected removal action for the King of Prussia site, in Winslow Township, New Jersey, developed in accordance with CERCLA as amended and is consistent with the National Contingency Plan (NCP). This decision is based on the Administrative Record for this site.

Approval of the proposed removal action, as detailed and justified above, is recommended. The proposed removal action contributes to the efficient performance of any long term remedial action at the site. Under 40 CFR 300.415 of the NCP, a removal action is appropriate at this site due to the existence of:

- 1) Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations, animals, or food chain [300.415(b)(2)(i)];
- 2) Actual or potential contamination of drinking water supplies or sensitive ecosystems [300.415(b)(2)(ii)];
- 3) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate [300.415(b)(2)(iv)];
- 4) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released [300.415(b)(2)(v)];
- 5) The availability of other appropriate Federal or state response mechanisms to respond to the release [300.415(b)(2)(vii)]; and
- 6) Other situations or factors which may pose threats to public health or welfare or the environment [300.415(b)(2)(viii)].

The estimated new project ceiling of the KOP site Removal Funding Request is \$1,442,742 of which \$866,017 is for mitigation contracting. This request is for a ceiling increase of \$115,000 of which \$60,000 is the estimated increase for mitigation contracting.

Sufficient funding is available in our current Advice of Allowance to finance this project.

Your signature below approves the 12-month exemption and a ceiling increase of \$115,000 (\$60,000 will be from the Regional allowance) for the KOP site according to current Delegation of Authority.

Approved: _____

Constantine Sidamon-Eristoff
Regional Administrator

Date: 1/29/91

Disapproved: _____

Constantine Sidamon-Eristoff
Regional Administrator

Date: _____

cc: (after approval is obtained)
C. Sidamon-Eristoff, 2RA
R. Caspe, 2ERR
R. Salkie, 2ERR-ADREPP
G. Zachos, 2ERR-RAB
J. Frisco, 2ERR-ADNJP
J. Marshall, 2OEP
R. Borsellino, 2ERR-NJRAB
D. Karlen, 2ORC-NJSUP
R. Gherardi, 2OPM-FIN
P. Cutts, OPM-FAM
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J. Trela, NJDEP
C. Moyik, 2ERRD-PS
L. Guarneiri, OS-210
J. Rosianski, 2OEP
T. Mignone, TATL

NL INDUSTRIES

APPENDIX A

Page

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APPENDIX C

Detailed Cost Estimate.	19

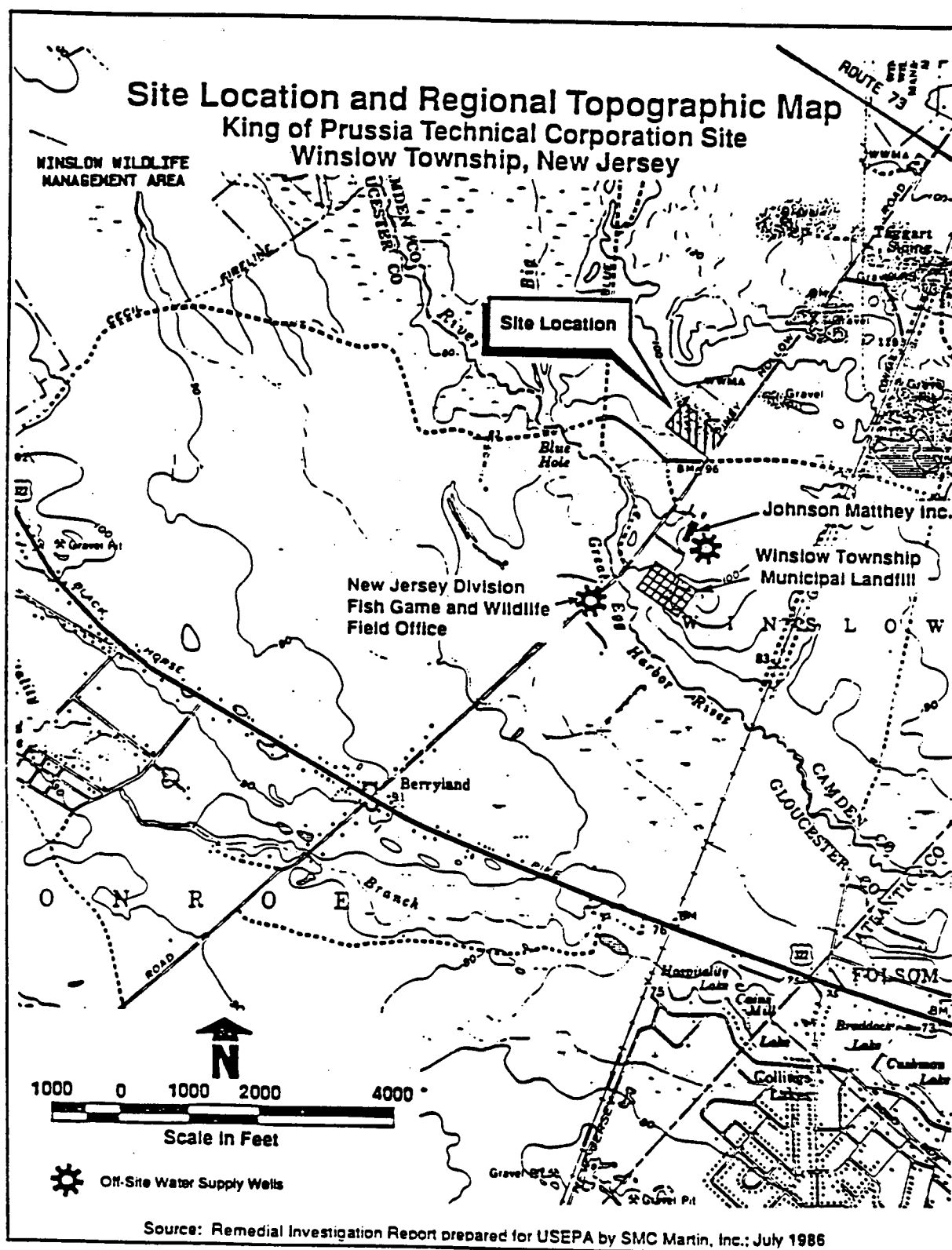
APPENDIX A

LIST OF HAZARDOUS SUBSTANCES
FOUND IN SAMPLES FROM THE TANKERS
PPM

<u>Hazardous Substances</u>	<u>Tanker #1</u>	<u>Tanker #2</u>	<u>NJ Soil Standards</u>
	<u>ppm</u>	<u>ppm</u>	<u>ppm</u>
Antimony	--	24.0	10
Arsenic	22	--	20
Beryllium	38	38.0	1
Cadmium	--	1.8	3
Chromium	6,450	1,430.0	100
Copper	8,940	10,080.0	170
Lead	35	30.0	250
Nickel	6,580	1,790.0	100
Zinc	317	--	350
Cyanide	3	1.4	12

NOTE: Samples taken by the PRPs consultant on May 18, 1988.

APPENDIX B



WESTON Roy F. Weston, Inc.
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In Association with ICF Technology Inc., C.C. Johnson & Malhotra, P.C., Resource Applications, Inc. and R.E. Sarriera Associates

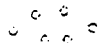
EPA PM
E. Dominach

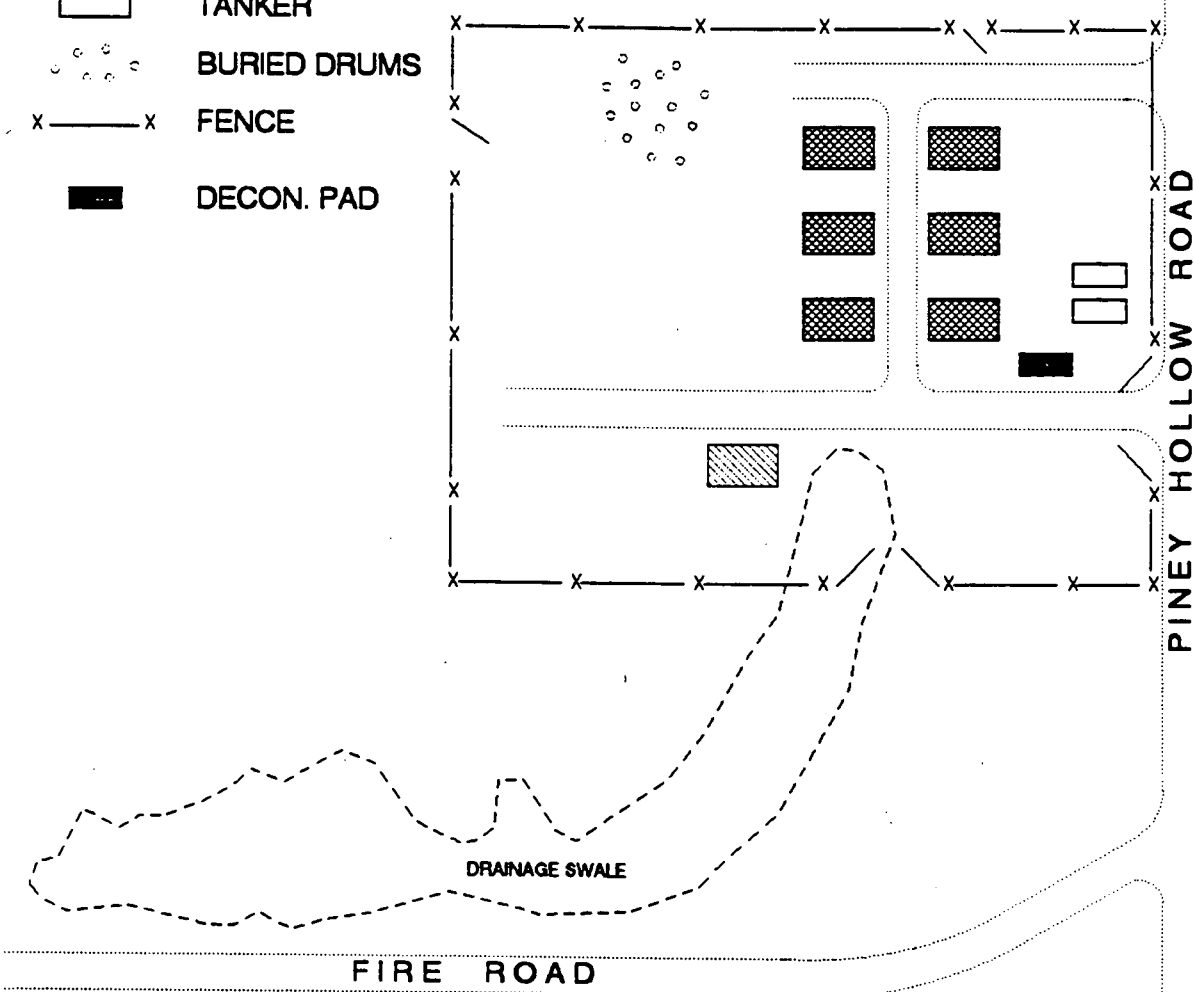
TAT PM
J. Manfreda

King Of Prussia
Winslow, New Jersey

Site Location Map
Figure A

LEGEND:

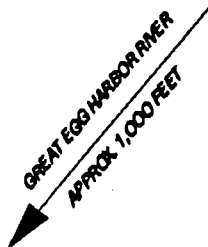
-  FORMER CARBOY AREA
 LAGOON
 TANKER
 BURIED DRUMS
 FENCE
 DECON. PAD



SITE MAP OF:
KING OF PRUSSIA

WINSLOW, NEW JERSEY
 DWN. NOT TO SCALE

DWN. BY: DR.
 REVISED: 12-21-90
 DWN.#2688V



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Site Map

IN ASSOCIATION WITH FOSTER WHEELER CORP.,
 C.C. JOHNSON & MALHOTRA, P.C., RESOURCE
 APPLICATIONS, INC. AND R.E. SARRIERA ASSOCIATES

TAT PM

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Figure B

SUMMARY OF POTENTIAL TOXICOLOGICAL EFFECTS OF
SOME OF THE IDENTIFIED HAZARDOUS CHEMICALS FOR:

KING OF PRUSSIA TECHNICAL CORPORATION

Winslow, New Jersey

	Carcinogenic							
	Teratogenic							
	Toxic by Inhalation, Ingestion, or Dermal Contact							
	Eye, Skin, Respiratory and Mucous Membrane							
	Central Nervous System Damage							
	Liver Damage							
	Kidney Damage							
	Cardio Vascular Damage							
	Lung Damage							
1,1,2 - Trichloroethane	x		x	x	x	x	x	x
Tetrachloroethane	x		x	x	x	x	x	
Toluene				x	x	x	x	
Ethyl benzene			x	x	x	x		
Phenol		x	x		x	x		
1,4 - Dichlorobenzene			x	x		x	x	
1,2,4 - Trichlorobenzene		x	x		x	x		x
Antimony	x		x	x			x	x
Chromium	x		x	x		x	x	x
Nickel			x	x				x
1,2 - Dimethyl benzene			x	x	x	x	x	x
Lead			x		x		x	
Arsenic	x		x	x		x	x	x
Beryllium	x		x					x
Cyanide			x	x	x	x	x	x
Mercury			x	x	x		x	
Vinyl chloride	x		x		x	x		

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MAJOR PROGRAMS DIVISION

EPA PM

E. Dominach

Toxic Effects
Chart

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APPLICATIONS INC AND R.E. SARRIERA ASSOCIATES

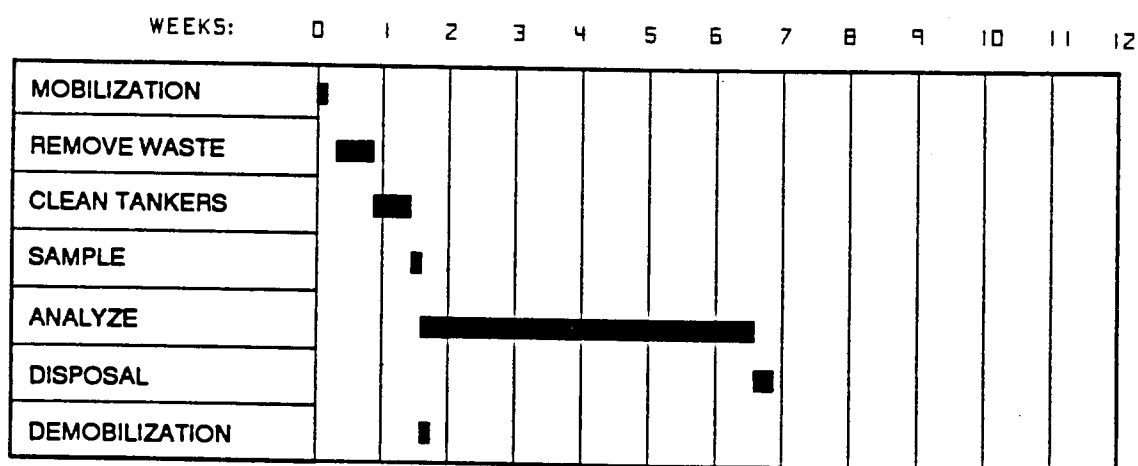
TAT PM

J. Manfreda

Figure C

PROPOSED WORK SCHEDULE FOR
THE REMOVAL OF TANKERS AT:
KING OF PRUSSIA

WINSLOW TOWNSHIP, NEW JERSEY



DWN. BY: DR.
 REVISED: 12-20-90
 DWN.#2688G



Roy F. Weston, Inc.
 MAJOR PROGRAMS DIVISION

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E. Dominach

WORK SHEDULE

IN ASSOCIATION WITH FOSTER WHEELER CORP.,
 C.C. JOHNSON & MALHOTRA, P.C., RESOURCE
 APPLICATIONS, INC. AND R.E. SARRIERA ASSOCIATES

TAT PM

J. Manfreda

Figure D

APPENDIX C

KING OF PRUSSIA DETAILED COST ESTIMATE
WINSLOW TOWNSHIP, CAMDEN COUNTY, N.J.

Phase III

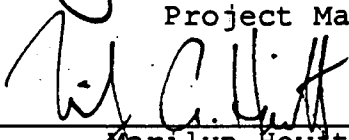
The estimated cost for the removal, disposal, and transportation of the tankers and their contents is as follows:

REVISED
FINAL
REMEDIAL INVESTIGATION REPORT
FOR THE
KING OF PRUSSIA TECHNICAL CORPORATION SITE

14 July 1989


James LaRegina
Senior Project Geologist


Joseph Hochreiter, CGWR
Project Manager


Marilyn Hewitt, P.G.
Project Director

Prepared For:

The King of Prussia Technical Corporation Site Committee

Prepared By:

Environmental Resource Management, Inc.
855 Springdale Drive
Exton, PA 19341

FILE: 704-02

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EXECUTIVE SUMMARY

The King of Prussia Technical Corporation Site ("KOP Site" or "site") operated as an industrial waste treatment facility from the early through mid 1970's. The KOP Site was placed on the National Priorities List by the USEPA. A group of companies formed the King of Prussia Technical Corporation Site Committee ("KOP Site Committee") to conduct a Remedial Investigation/Feasibility Study (RI/FS) for the site. The members of the King of Prussia Technical Corp. Site Committee are Cabot Corporation; Carpenter Technology; Ford Electronics and Refrigeration Corp.; Johnson Matthey; LNP Corp.; and Ruetgers-Nease Chemical Co., Inc. ("the Companies").

The Companies retained the services of SMC Martin, Inc. to conduct the Remedial Investigation (RI) and Feasibility Study (FS) for the site in accordance with a detailed Work Plan approved by USEPA as part of a Consent Order dated April 17, 1985. In July 1986, the Companies submitted SMC Martin's RI Report to the USEPA. In 1987, the USEPA requested further investigation to supplement the information developed by the first phase of the RI. In April 1988, the USEPA approved the Companies' detailed Site Operations Plan to carry out the requested second phase of the RI. ERM, Inc. was selected by the Companies to implement the second phase RI on their behalf.

This RI report summarizes the findings of both the first phase (SMC Martin, 1986) and the second phase (ERM, 1988) of the RI. All data from both phases of the investigation have been fully integrated to provide a comprehensive characterization of site conditions.

Both the first and second phases of the investigation focused on characterization of suspected contaminant source areas and their

impacts on soil, ground water, and surface water and stream bed sediments, in order to characterize the nature and extent of contaminant transport from on-site sources. A data base was developed for this project from surface and borehole geophysical surveys, sampling of source materials, sampling by backhoe of geologic sediments through the vadose zone, the sampling of water and sediments from a drainage swale and the Great Egg Harbor River, the installation and sampling of 28 shallow and deep monitoring wells, the collection of geologic core samples, and the collection of aquifer test and potentiometric surface data.

The conclusions drawn from the combined first and second phase RI results are summarized as follows:

- The lagoon sludges, buried sludges in the soil profile, tanker residues and carboy contents all contain chromium, copper and nickel, with some other minor metals present as well. With few exceptions, these waste materials contain insignificant levels (<0.5 mg/kg) of semivolatile Priority Pollutant organic compounds. However, the soils in the buried drum area suggest that waste residues are present which contain elevated (above background) concentrations of Priority Pollutant volatile organic compounds, pesticides, and unidentified hydrocarbons.
- With the exception of soils in the buried drum area no Priority Pollutant organics were detected in the site soils at elevated levels.
- Most soil sampling and sediment locations contained indicator metals at levels above background, but only limited areas of concentrations of metals which exceed New Jersey soil cleanup guidance levels. The off-site swale sediments contained significantly higher levels of metals than on-site soils analyzed.

- Hydrogeologic conditions in the uppermost 150 feet of subsurface material are characterized by the presence of upper aquifer, middle confining unit, and lower aquifer subzones within the Kirkwood-Cohansey Aquifer System. Potentiometric head measurements indicate that the shallow (upper subzone) ground water system discharges to the river, and that the deep (lower subzone) ground water system underflows the river, with a minor component discharging upward toward the river.
- The upper subzone ground water system contains up to several thousand micrograms per liter (ppb) of volatile organic compounds (at MW-5S). The buried drum area appears to be the source of the contamination. Insignificant concentrations (<10 ug/l) of Priority Pollutant semivolatile organic compounds, pesticides, or PCBs are present in the upper subzone aquifer.
- Several dissolved priority pollutant metals are present in the upper subzone aquifer in excess of background concentrations. Up to 12,500 ug/l copper, 1,040 ug/l chromium, and 4,670 ug/l nickel were detected in the upper subzone ground water system (in MW-5S). The lagoons and the carboy area appear to contribute concentrations generally near or below 500 ug/l of any given metal. The sediments in the swale appear to contribute the highest metal concentrations with concentrations of copper and chromium in the range of 1,000 to 1,250 ug/l in the ground water. The contribution of dissolved metals in groundwater from swale sediments needs to be evaluated further.
- With only minor exceptions, Priority Pollutant organic and inorganic compounds were not detected in the lower subzone aquifer.

- Runoff at the site is minimized by the low topography and the sandy nature of the soils. The off-site swale receives what runoff does occur. Observations of the swale this past spring (1989) following an extended period of frequent precipitation, indicates that the potential for site runoff to discharge directly to the Great Egg Harbor River is remote.
- No Priority Pollutant organic compounds were detected at elevated levels in the surface water and sediment in the Great Egg Harbor River, downstream of the KOP site. Site-related metals are present at concentrations elevated above background in the river surface water and sediment, due to contaminated ground water discharge from the shallow subzone aquifer system.

Based on the results of the Supplemental Remedial Investigation, ERM has determined the need for a limited amount of additional data to verify sources for the volatile organic compounds in ground water beneath the site and the high concentration of metals in ground water beneath the off-site swale. The evaluation and presentation of this data will be included as part of the Feasibility Study. Recommendations for additional data collection are as follows:

- A limited ground water investigation in the upper subzone aquifer should be performed between the drum burial area and well MW-5S to verify the source area for the volatile organics in ground water, and to characterize the source area concentrations.
- A soil sampling/analysis program should be conducted in the off-site swale to determine the areal and vertical extent of contamination in excess of New Jersey guidelines. Limited

sampling of the lagoon sludges for leaching analysis should also be conducted to determine their potential as continuing sources of ground water contamination.

- Assuming that the aforementioned recommendations for additional study are implemented, ERM recommends that the Feasibility Study and Endangerment Assessment proceed with the data obtained in the Initial and Supplemental Remedial Investigations.

SECTION 1

INTRODUCTION

1.1 Site Description

The King of Prussia Technical Corporation (KOP) site is an abandoned industrial waste processing facility located in Winslow Township, Camden County, New Jersey (Figure 1-1). The KOP site is located in southern New Jersey's Pinelands Region, commonly referred to as the Pine Barrens. The site is located within the Pinelands Protection District boundaries, but is not within the area defined as the Pinelands Preservation District. This area is distinctly characterized by its widespread pine forests. The KOP site is located midway between Philadelphia, Pennsylvania (25 miles to the northwest) and Atlantic City, New Jersey (25 miles to the southeast). The Atlantic City Expressway and U.S. Route 322 (Black Horse Pike) are located two miles northeast and southwest of the site, respectively. The Great Egg Harbor River which serves as the boundary between Camden and Gloucester Counties, flows in a southeasterly direction approximately 1000 feet southwest of the KOP site.

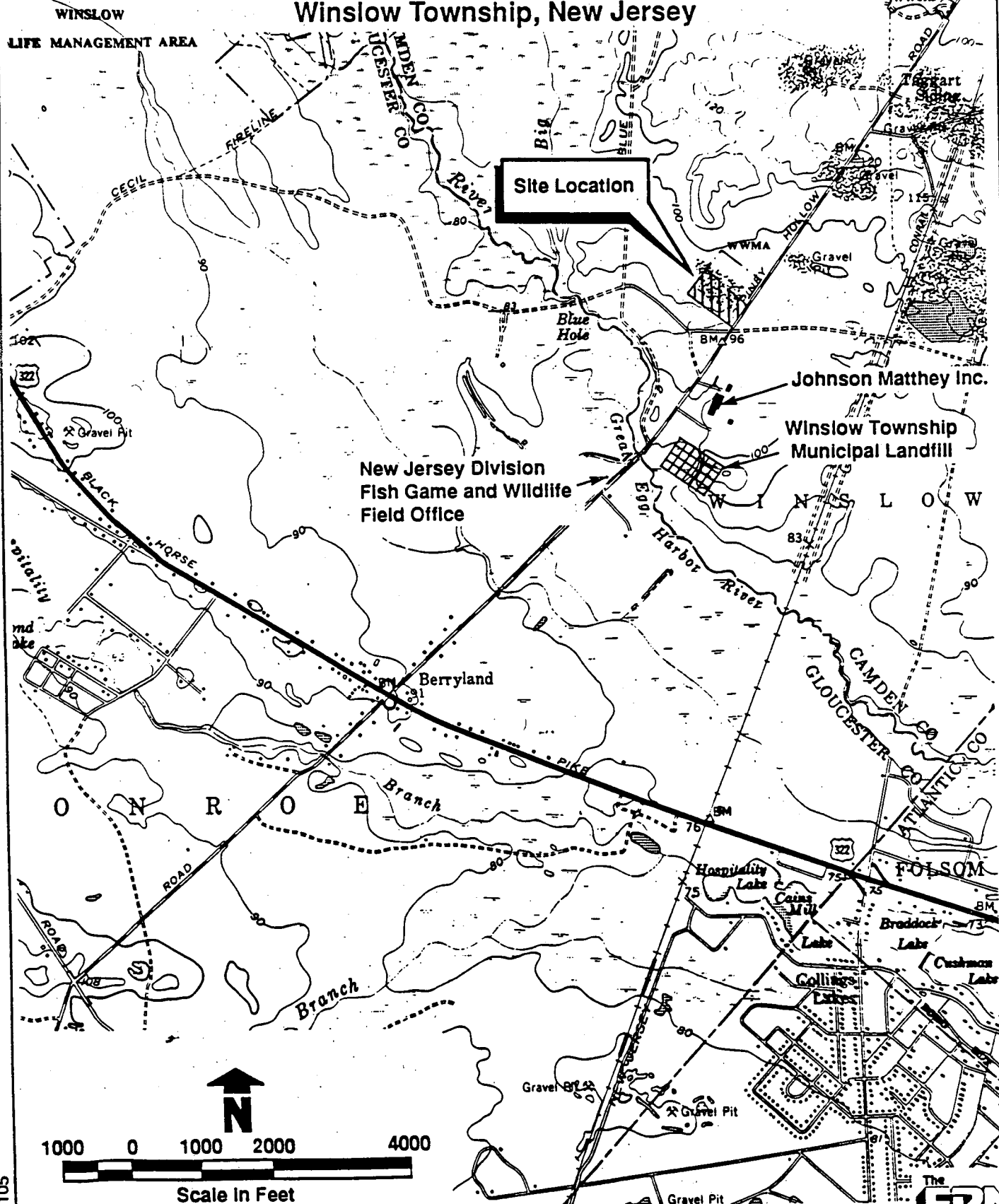
The KOP site is currently owned by Winslow Township, which assumed ownership in 1976. Presently, the KOP site exists as a relatively level, largely barren sandy field of approximately 10.1 acres (written communication, Winslow Township Tax Office, 1988). Vegetation on the site is sparse, consisting for the most part of scattered patches of low-lying grasses and mixed herbaceous plants indigenous to the Pinelands Region, as well as a few isolated patches of the ubiquitous, moisture-seeking reed grass, phragmites. The rectangular-shaped KOP site property is bordered on three sides by the dense pine forest of the state-owned, 6000-acre Winslow Wildlife Management Area. Piney Hollow Road borders

the site to the southeast. An eight-foot high chain-link fence with locking gates, was installed by the Companies conducting the RI/FS for security purposes during the summer of 1988. Direct access to the site is possible via a flat, well-packed sand road perpendicular to Piney Hollow Road. A site plan is included as Figure 1-2 of this report. A detailed site topographic map is found in Plate 1.

During its years of operation, the KOP site was used to process liquid industrial wastes in a series of lagoons. In addition, according to the USEPA, illicit dumping is suspected to have occurred on the then unsecured site after the Township took ownership in 1976 (SMC Martin, 1986). Physical evidence of the past waste handling/treatment activities on the KOP site has been documented by others (see Section 1.3 for a delineation of these previous investigations).

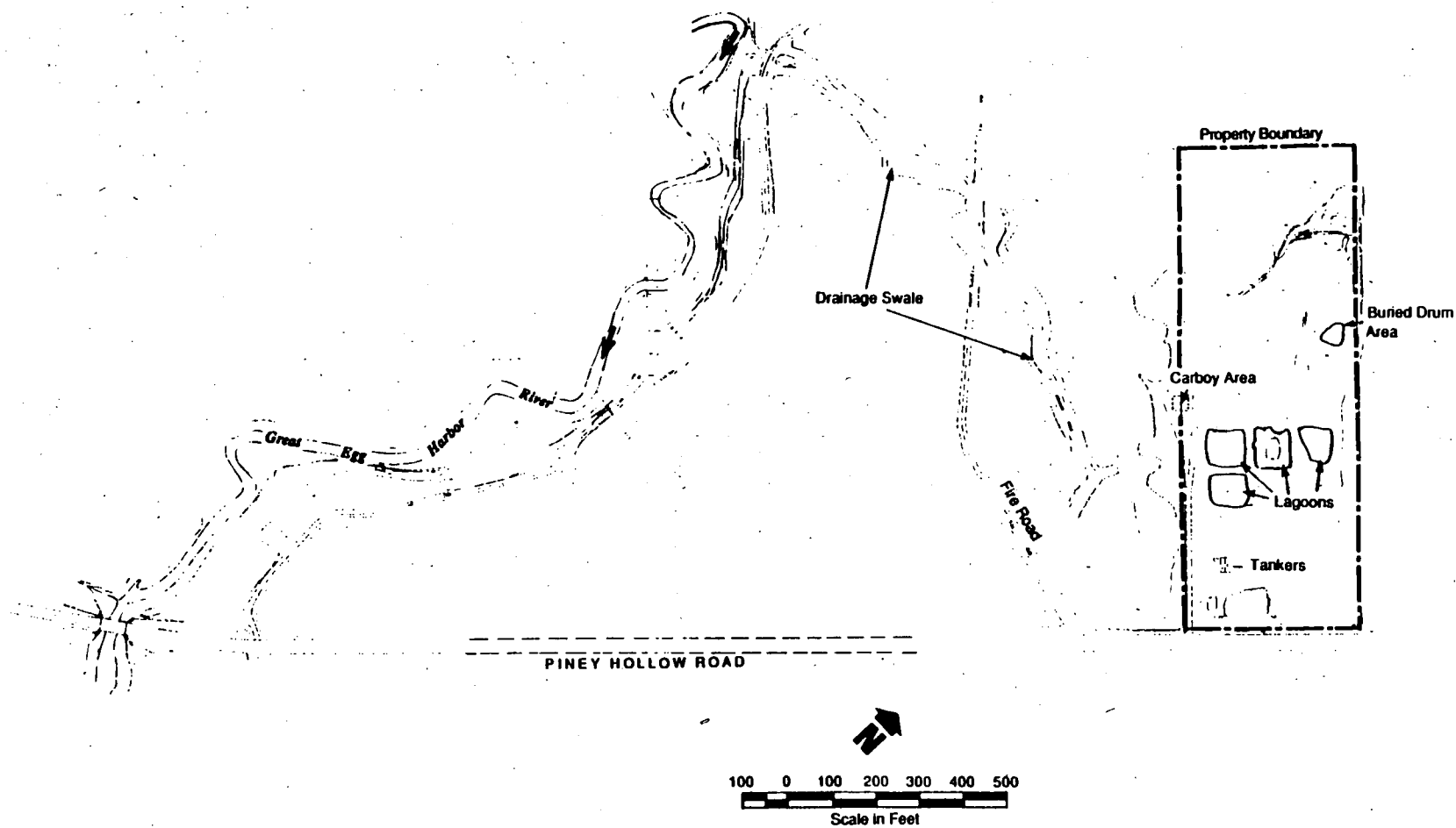
Based upon USEPA interpretation of aerial photography, as many as six lagoons were suspected to have been present on the KOP site during its period of operation (Mack 1980, and Norton and others, 1987). The visible remnants of three lagoons now exist on the site at a slightly elevated setting near the center of the property (see Figure 1-2 and Plate 1). The lagoons, each approximately 100 feet by 80 feet, are presently filled with sand to depths varying from grade to about six feet below grade. What appear to be weathered fragments of synthetic liner material are exposed on the edges of the respective embankments of each of these three lagoons. The existence of a fourth lagoon which is not visible, was documented by subsurface sampling. The lagoon numbering system shown on Plate 1 and utilized throughout this report is a continuation of the numbering system used by SMC Martin, Inc. (SMC) during the initial site Remedial Investigation. Note that the numbering system instituted by SMC and continued by ERM does not coincide with the numbering system used in Mack 1980, and Norton 1987.

Figure 1-1 Site Location and Regional Topographic Map King of Prussia Technical Corporation Site Winslow Township, New Jersey



Source: Remedial Investigation Report prepared for USEPA by SMC Martin, Inc.; July 1986

Figure 1-2
Site Plan
King of Prussia Technical Corporation Site
Winslow Township, New Jersey



In their Remedial Investigation Report (SMC Martin, 1986), SMC reported the observation of apparently significant quantities of sludges in two of the lagoons, and that one of the lagoons contained a "greenish-yellow chemical waste". This material was apparent in the lagoons during the course of ERM's investigation.

Three of the alleged six lagoons at the KOP site are not readily identifiable in the field. On aerial photography obtained by ERM dated after 1971 (see Section 1.2.2 for air photo chronology), the non-visible lagoons appeared as unclear rectangular outlines of orientation and approximate dimension that differ from the known excavations. They were separated from the existing lagoons by a well-packed sand berm accessible by vehicle. In the field, this area appears as a flat, sparsely vegetated expanse, with slight subsidence in the area where Lagoon No. 1 is thought to have existed (see Plate 1).

Physical evidence of other past, possibly related activities also exists on the site. Between Piney Hollow Road and the lagoon area are the remains of two highly corroded and deteriorated thirty-foot long tank trailers which have been torn in several places. SMC Martin, (1986) reported chemical residuals in these tankers. A white powdery residue was noted by ERM during the investigation. A twenty by ten foot concrete pad, badly cracked and weathered, exists near these tankers.

Other physical evidence which could be related to previous activities at the KOP site was noted by ERM during its investigation. Near the excavated lagoon area, a weathered plastic carboy was observed to be protruding through the ground surface in an area of brown ground staining. The ground surface is very soft in this area with liquid saturation apparent just below the surface. SMC Martin, Inc. (SMC Martin, 1986) investigated the carboys to determine their contents.

Towards the northern portion of the site is an area where the Township is reported to have uncovered buried drums during 1980, when the township was levelling, backfilling and excavation portions of the site. (SMC Martin, 1986). Observations in the field by ERM revealed scattered steel drum lids in this area as well as various sorts of steel and plastic debris. Slight ground subsidence and evidence of past ground disturbances were noted in this area. Scattered miscellaneous debris including steel/plastic parts and containers, household waste, and wood were also observed on the site, especially toward the rear (northern) portions of the property. Several areas containing extensive purple stained soil were also observed on the site. This near surface staining was observed in some test pits to be as much as two feet thick. This staining was tentatively identified by the KOP Site Committee as a dye substance.

The site surface topography descends gently to the east, toward a small drainage swale which runs off site from the southwestern border of the property, in the general direction of the Great Egg Harbor River. Sediment chemistry data suggest that this drainage swale may in the past have served as a conduit for surface discharge from the site. Trees and other vegetation in the upper reaches of this swale exhibit visual evidence of distress. The extent of this distress can be seen on aerial photography from 1974 and 1980 (see Section 1.2.2). These photos reveal several areas of apparent vegetation die off. The KOP Site Technical Committee reports that the damage done to vegetation from past activities appears to be improving over time. The swale, however, is and was at the time of site operation blocked by a Fire Road approximately midway between the site and the river. Therefore, it is not expected that runoff from the site directly enters the river.

1.2 Site History

1.2.1 Historical Summary

As noted in the previous section, the King of Prussia Technical Corporation purchased the KOP site from Winslow Township in 1970. According to the Remedial Investigation Report prepared by SMC Martin (1986), the King of Prussia Technical Corporation began operations on the site as a waste processing facility in 1970. Operations are estimated to have ceased sometime between 1973 and 1975. It has been estimated by the USEPA that up to six million gallons of various process wastewaters and caustic/acidic wastes were handled and treated at the site during its three to five year period of operation by the King of Prussia Technical Corporation (SMC Martin, 1986). The site is known to have been abandoned as a waste processing facility since 1975. Winslow Township resumed property ownership in 1976 from the King of Prussia Technical Corporation. After 1975, illicit dumping of various types of waste is thought to have occurred, based upon the physical evidence on the site and the ease of access that was once possible to the site from the main road. The site was not secured until the summer of 1988 when a eight foot high chain link fence with locking gates, completely surrounding the property, was installed by the Companies to provide site security during the SRI.

In 1975 the USEPA began its investigation of the KOP site. A summary of all previously conducted KOP site investigations is included as Section 1.3 of this report. The USEPA installed four ground water monitoring wells on the site in 1976. Subsequent sampling and investigative work between 1976 and 1980 resulted in a proposal for placement of the site on the National Priorities List (NPL) in December, 1982. Winslow Township began construction of a police pistol range in February of 1980, which involved leveling, backfilling, and excavating portions of the site. Shortly thereafter, the USEPA alerted the Township to the status

of the site, and all construction activities were halted. The site was formally listed on the NPL in September of 1983.

1.2.2 Air Photo Chronology

USEPA Reports

As part of its investigation, the USEPA commissioned the Environmental Monitoring Systems Laboratory to conduct an air photo analysis of the KOP site. The analysis summary (Mack, 1980) indicated the following:

"This chemical waste disposal facility was not present on 1970 photography. The existing site and adjoining area in 1970 was undeveloped forestland with no vegetation damage noted... The facility was present on 1974 photography and observed to be in operation, with six pits/lagoons having been constructed; yet, no significant vegetation damage was discerned... The 1980 photography indicates the waste disposal facility apparently has been abandoned, with five pits/lagoons partially filled in. Significant vegetation damage down slope from the facility was observed..."

The Environmental Monitoring Systems Laboratory issued a follow-up interim report (Norton, 1987) using additional sources of imagery in the analysis (i.e. low altitude and infrared photography, analysis of more recent photography). In its analysis of 1975 photography, the report indicates that the site was either active or recently closed, with prominent visible features including wastewater lagoons, tanks, tank trailers, possible ground stains, and fill areas. The report describes a total of six lagoons on the site, five with either dark staining or pooling, and one "less than half full of very dark-toned liquid". This same lagoon is reported as being nearly full of liquid in 1974 (Mack, 1980).

In their analysis of 1980 low altitude aerial photography, (Norton, 1987) indicate that the site was again active as there did not appear to be herbaceous vegetation cover growing on site except for an isolated area, an unusual occurrence after a long inactive period. A major feature in the 1980 photographs was "probable vegetation stress" which shows up as large, irregularly shaped areas of distinct color differentiation (apparently caused by vegetation mortality) on the southwest and northeastern portions of the site periphery. Other changes in the character of the site were also noted in this report, including the appearance of new debris, an abandoned pit, and extensive standing water (reported as possibly standing rain-water or runoff) as well as the relocation of previously identified debris and/or equipment. There was generally little change in the appearance of the six lagoons.

Analysis of photography taken during the summer of 1984 revealed further changes in the KOP site (Norton, 1987). The report indicates several new features identified as yellow mounded material (one pile dumped on site), white mounded material (several piles dumped on site), and tan ground stains. The latter may be the area where buried carboys are now present and the ground is saturated with a dark liquid. In addition, the site appeared to exhibit drier conditions. Although most of the standing liquid pools on site appear diminished or gone, it is not clear whether this occurred through removal or evaporation/infiltration.

ERM Stereo-Pair Photo Chronology

To supplement the earlier USEPA work, ERM obtained additional black and white stereo pair aerial photography from Aero Services, Houston, Texas for the years 1970, 1971, and 1974. An analysis of these photographs revealed the following general features:

April, 1970: The KOP site was not in existence on this photograph. The property shows up as forested uplands adjacent to Piney Hollow Road.

March, 1971: The KOP site was in existence on this photograph. The distinct rectangular outline of the property line clearing is revealed; however, only about 1/3 of the vegetation has been cleared from the property itself. The cleared area supports three rectangular lagoons which appear to be lined and filled with dark liquid. A distinct U-shaped access road has been constructed with two intersections to Piney Hollow Road. This access road passes directly adjacent and to the south of the three lagoons. Two possible tanker trucks or trailers (rectangular objects of an approximate 20-30 foot by 5-10 foot dimension) were tentatively identified on the access road.

April, 1974: The cleared area identified on the 1971 photography had been expanded to encompass roughly 2/3 of the property. The cleared area supported what appears to be a minimum of four and possibly as many as six lagoons, although the outlines of the lagoons on this photography do not appear as distinctly as on the 1971 photography. One of the lagoons appeared full of a dark-toned liquid, one appeared half full of a dark-toned liquid, the others appeared either empty or possibly filled with earth to various depths. The empty lagoons appeared to be stained. A total of up to twelve possible tanker trucks or trailers were tentatively identified on the site (these were observed as rectangular objects of a 20-30 foot by 5-10 foot dimension). The access road did not show up as distinctly in this photograph, apparently due to wear and/or weathering. Some initial evidence of

distressed vegetation was apparent immediately southwest of the lagoons.

1.3 Chronology of Previous Field Investigations

In 1984, the King of Prussia Technical Corporation Site Committee ("KOP Site Committee") was formed by a group of companies to conduct a Remedial Investigation/Feasibility Study for the site, without admitting facts or liability or waiving rights or defenses. The members of the KOP Site Committee are Cabot Corp.; Carpenter Technology Corp.; Ford Electronics and Refrigeration Corp.; Johnson Matthey, Inc.; LNP Corp.; and Ruetgers-Nease Chemical Co., Inc. ("the Companies"). The Companies retained the services of SMC Martin, Inc. to conduct the Remedial Investigation (RI) and Feasibility Study (FS) for the site in accordance with a detailed Work Plan approved by USEPA as part of a Consent Order dated April 17, 1985.

The investigations conducted with respect to the KOP Site prior to ERM involvement include:

- 1975-1976 - USEPA installed four test wells which were subsequently sampled.
- October 1979 - Additional samples from the test wells (monitoring wells) were collected by USEPA
- May 1981 - An Emergency Action Plan was prepared by an EPA Technical Assistance Team (TAT).
- July 1985 - SMC Martin, Inc. began the first phase of the Remedial Investigation.
- June 1986 - SMC Martin, Inc. exposed a portion of the carboy area and collected samples of the carboy liquid.

- July 1986 - SMC Martin, Inc. submitted its initial RI report to EPA.
- July 1987 - NUS Corporation prepared the Supplemental Work Plan for Remedial Investigation Field Activities, King of Prussia Technical Corporation Site, New Jersey.
- Fall 1987 - The Supplemental SOP was developed by the Companies and SMC.
- Spring - The USEPA TAT Team collected solid substrate
Summer samples from many on-site locations, including the
1988 carboy area.

1.4 Scope and Objectives of the Supplemental Remedial Investigation

Based on review of SMC's RI report, USEPA Region II requested that the Companies implement a Supplemental Work Plan for Remedial Field Activities to provide additional or more detailed information to support the Feasibility Study (FS) and Endangerment Assessment (EA) planned for the site. SMC developed the Supplemental Site Operation Plan (SOP) which was approved by EPA. This SOP was written by SMC in accordance with the overall scope of work negotiated by the Companies, SMC, and the EPA. In March of 1988, ERM was retained by the Companies to conduct the second phase of the RI and prepare the FS.

The specific goal of this second phase of the RI is to obtain a more focused characterization of the site geology and hydrogeology. Furthermore, this phase of the RI is intended to define possible sources of contamination, to determine potential or existing pathways of contamination migration, and to determine

the nature and extent of the site contaminants in the soils, surface water, and ground water of the area.

The specific tasks which were conducted during the course of the second phase of the RI include:

- The installation and development of twenty-one shallow and deep monitoring wells on and downgradient (southwest) of the site. These wells were installed to supplement the seven existing SMC monitoring wells. Thus, altogether a total of twenty-eight monitoring wells now exist in the study area.
- The sampling and laboratory analysis of ground water from all twenty-eight monitoring wells, plus ground water samples collected from two nearby water supply wells owned by Johnson Matthey Inc. and the NJDEP Division of Fish, Game and Wildlife (See Figure 1.1 for the location of these two supply wells).
- The sampling and laboratory analysis of soil, sediment, and surface water samples obtained from areas of concern including the drum disposal area, the carboy disposal area, the residual materials present in the deteriorated tankers, the drainage swale, and the Great Egg Harbor River. The USEPA approved Work Plan did not identify the purple stained soils as a source of concern.
- The characterization of the geology and hydrogeology of the study area by the collection of geologic samples, borehole geophysical logging, aquifer testing, and the collection of potentiometric surface data.

The information and data compiled during the course of ERM's field investigation will provide the foundation for ERM's ongoing Feasibility Study and NUS Corporation's Endangerment Assessment.

SECTION 2

PHASE ONE REMEDIAL INVESTIGATION

This section provides a summary of the results of the first phase of the Remedial Investigation conducted by SMC Martin, Inc. ERM augmented SMC's results with background information from additional sources, where appropriate. The complete SMC Phase One RI data are presented in Appendix A of this report.

2.1 Area and Climate

The King of Prussia Technical Corporation site occupies 10.1 acres of land in a predominantly rural and agricultural region of Winslow Township, Camden County, New Jersey. The Winslow Wildlife Management Area, owned by the State of New Jersey, occupies land immediately adjacent to the site on three sides from southwest to northeast. Two relatively large sand and gravel mining operations are located approximately 2,000 feet to the north of the site, and an industrial property owned by Johnson Matthey, Inc. is located one-half mile to the south. The Winslow Township municipal landfill is located approximately 3/4 mile south of the site.

Due to the sparse population of the area, very few domestic, industrial, or irrigation wells are located downgradient of the site. Thus, only two wells were identified within a half mile radius of the site. These are located at the Johnson Matthey Company, and at the field office of the New Jersey Division of Fish, Game and Wildlife south of the site. Neither of these wells serve as potable water supplies.

Vegetation within the fenced area on site is limited primarily to sparse patches of spartina grass and tall seed grass. Dense coniferous and deciduous forested land border the site to the northeast, northwest, and southwest. Species of trees identified

adjacent to the site include oak, walnut, hemlock and birch, among others. Numerous blueberry patches, cranberry bogs, and tuber fields are among the agricultural land uses common to the area.

The climate in this region of New Jersey is referred to as a continental climate, with little oceanic influence on weather patterns. Significant variations in mean summer and winter temperatures are recorded. On average, January is the coldest month with normal daily maximum and minimum temperatures of 40.3°F and 24.3°F, respectively. July is the warmest month with normal daily maximum and minimum temperatures of 85.9°F and 65.2°F, respectively. Average annual precipitation at the Philadelphia Weather Bureau Station for 1931-60 was 42.48 inches (Farlekas and others, 1976).

2.2 Soils, Geology, Hydrogeology

SMC Martin (1986) summarized the general characteristics of the site soils, geology, and hydrogeology. The following is a summary, with appropriate augmentation, of SMC Martin's report:

2.2.1 Soils

Two soil types, as identified by the USDA Soil Conservation Service, are found on the site (U.S. Department of Agriculture, 1961). These soils are known as the Lakewood and the Lakehurst soil series. Both are deep, loose, generally well-drained sandy soils. Topographic lows in these soils tend to be poorly drained and experience high water tables. The Lakewood is the predominant soil type on-site, and it is characteristically acidic. The Lakehurst typically has a low water table in summer, and a highly permeable substratum. A specific yield of approximately 21% and an average infiltration rate of 6.3 inches/hour indicate the good infiltration and storage capabilities of both these soil types (Rhodehamel, 1970).

2.2.2 Geology

The site is underlain by unconsolidated Coastal Plain sediments of the Tertiary and Cretaceous Ages. These sediments consist of unconsolidated sands, gravels and clays which form a southeastern thickening wedge approximately 2000 feet thick. Unconformably underlying these sediments is relatively low permeability metamorphic bedrock.

The Cohansey Sand outcrops at the site. It consists of yellowish-orange fine to coarse-grained quartzitic sand and fine gravel, with discontinuous lenses of silt and clay. This unit strikes northeast-southwest, and dips southeast at 10 to 20 feet per mile. Regionally, formation grain size decreases downdip, as the silt and clay lenses thicken and increase in number and lateral extent to the southeast. It is underlain by the Kirkwood Formation, of similar lithologic character. Underlying that unit is the Piney Point Formation, which is the youngest of several geologic units that comprise a composite confining bed. This confining bed separates the overlying aquifers and the underlying Wenonah-Mount Laurel Aquifer (Zapecza, 1984).

2.2.3 Hydrogeology

The Cohansey Sand, the Kirkwood Formation, and any younger overlying sediments are collectively known in this area as the Kirkwood-Cohansey Aquifer System. Due to the absence of extensive regional confining beds, the Cohansey Sand and the underlying Kirkwood Formation are in hydraulic connection. Regionally, the Kirkwood-Cohansey is a water table aquifer. The bottom of the Kirkwood-Cohansey Aquifer occurs at approximately 150 feet below mean sea level at the site (Zapecza, 1984, Plate 23).

At the KOP site, the ground water flow direction is southwest, toward the Great Egg Harbor River. Overall, the high porosity and permeability of the on-site soils produces rapid infiltration of

precipitation and rapid recharge to the underlying Kirkwood-Cohansey Aquifer. Locally perched water table conditions may exist on top of clay lenses. The aquifer in this area is reported to have a saturated thickness of 220 to 230 feet and a specific yield of 21%.

SMC Martin (1986) cites the following typical aquifer parameters for the Cohansey Sand (from Farlekas and others, 1976): Storage coefficient between 2.7×10^{-3} and 4×10^{-5} ; Transmissivity from 2,420 to 20,100 ft^2/day ; and hydraulic conductivity from 100 to 134 ft/day . Slug tests performed by SMC produced calculated hydraulic conductivities between 3 and 215 feet per day, which correlate well with conductivity values derived by ERM.

Typically, the water in the Cohansey Sand requires treatment prior to consumption, due to an undesirable color, low pH, and high iron concentration. The pH of ground water commonly ranges between 5.3 and 8.4. Where pH is low, iron concentrations may range from less than 0.1 mg/l (ppm) to 3.8 mg/l (ppm). Water hardness is usually less than 25 mg/l (ppm) (Farlekas and others, 1976). Based on water level measurements from the seven initial groundwater monitoring wells, a horizontal hydraulic gradient of 0.0038 ft/ft was calculated, with the flow direction toward the Great Egg Harbor River. Head differences between the shallow and deep wells indicated the presence of a downward vertical gradient. Based upon the slug test results a mean flow velocity of 0.20 ft/day or 73 ft/year , was determined.

2.3 Surface Water Hydrology

The Great Egg Harbor River, with its headwaters near Williamstown, Camden County, drains eastern Camden and all of Atlantic County before discharging to the Atlantic Ocean just north of Ocean City, New Jersey. The river is free flowing (non tidal) in Winslow Township, and receives considerable discharge from highly permeable sand and gravel aquifers (primarily of the Cohansey

Formation) immediately underlying the river along its path of flow.

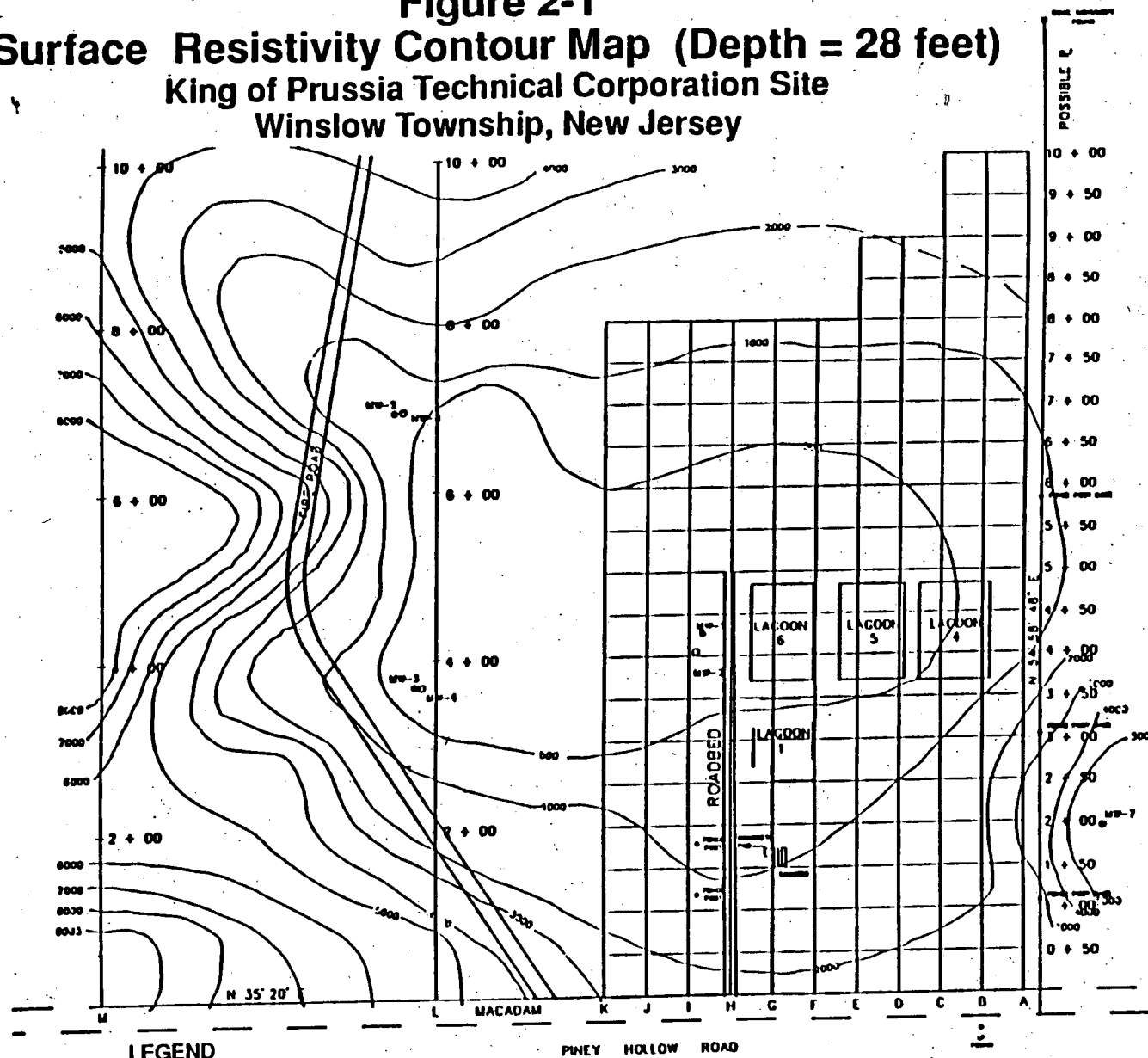
The U. S. Geological Survey has collected continuous discharge records at a station in Folsom, approximately three river miles downstream from Piney Hollow Road, since 1925. On the day that surface water samples were collected for the SRI (27 May 1988), the mean daily discharge at Folsom was 101 cubic feet per second (cfs). Since the average discharge recorded at Folsom for the 62 years of record is 86.3 cfs (Bauersfeld and others, 1987), the samples obtained represent slightly above average flow conditions for the river (U. S. Geological Survey, written comm., 1988). These samples were collected within 48 hours following a nearly one-inch rainfall on 24-25 May 1988, when the ponded water level in the drainage swale was at its highest observed elevation.

Given the highly transmissive properties of the shallow water table aquifer and the very porous nature of the sediments comprising the vadose zone, ERM believes that overland flow from the site to the drainage swale is likely minimal. The expected rapid infiltration of precipitation to the water table suggests that ponded water found in parts of the swale may represent a surface manifestation of the water table during wet periods.

2.4 Geophysical Investigation

SMC used electrical resistivity soundings and profiling techniques to measure the electrical properties of subsurface materials. Apparent resistivity data were recorded from multiple electrode spacings to a maximum spacing of 100 feet at each sounding location. Resistivity profiling was made using two different electrode spacings. Profiling arrays located closest to the lagoons recorded data from a 28-foot depth of investigation and profiles located 700 feet downgradient recorded data from a 42-foot depth of investigation. SMC generated a surface resistivity contour map for the 28-foot depth investigation (see Figure 2-1).

Figure 2-1
Surface Resistivity Contour Map (Depth = 28 feet)
King of Prussia Technical Corporation Site
Winslow Township, New Jersey



Source: SMC Martin 1986

WO# 70402 15

Drawn by / Date: JWG 11/29/88

Checked by / Date:

Revised by / Date: E.J.K 12/16/88

Checked by / Date: J 12/16/88

The ERM

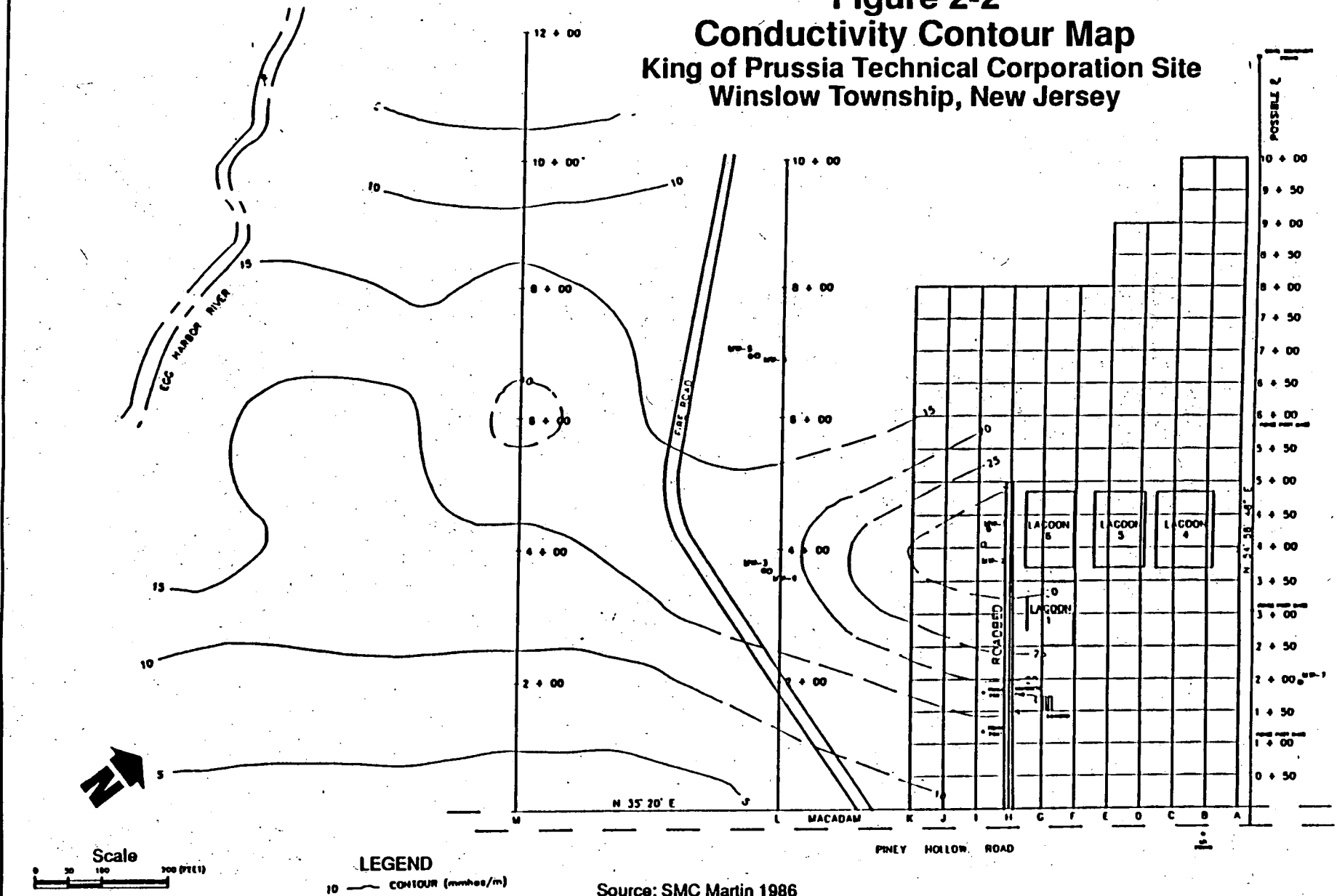
KOP 3.1032

From the resistivity data, SMC drew inference that an area approximately 1000 feet wide, representing possible subsurface contamination, may exist at the southern boundary of the site. The lowest resistivity (i.e. highest probable contamination) appeared to be centered directly downgradient of the observed lagoons. The overall direction of the inferred plume was reported to be in a southwest direction. The resistivity results also suggested that the inferred plume sinks in elevation as it approaches the Great Egg Harbor River, according to SMC. Although SMC concluded that the resistivity results also indicate a two-directional split of the inferred plume, ERM's subsequent investigation indicates that the resistivity survey did not reflect contamination, but rather changes in lithologies.

Electromagnetic techniques were used by SMC to further delineate the inferred plume. This survey focused primarily on the wooded area located about 700-feet downgradient or southwest and south of the site. Conductivity data (using a Geonics EM-34) were recorded at 150-200 foot intervals from effective depths of 50 and 100 feet. The results of the conductivity survey are shown on Figure 2-2. They indicated an area of elevated conductivity located at approximately the same location as the low resistivity contour area downgradient of the lagoons.

Finally, magnetic data were recorded at 25-foot intervals over the entire 10-acre site, refined with readings taken at five to ten foot intervals over magnetic anomalous zones. The data recorded from the magnetic survey suggested several on-site magnetic anomalous zones. SMC's final interpretation of the magnetic data indicated probable metallic debris areas as indicated in Figure 2-3. Three small elongated areas with significant local anomalies were located in the middle of the site, and five small areas were identified near Piney Hollow Road. These areas were interpreted to represent small metallic concentrations.

Figure 2-2
Conductivity Contour Map
King of Prussia Technical Corporation Site
Winslow Township, New Jersey



W00 70402 15

Drawn by / Date: *JWG* 11/21/88

Checked by / Date:

Revised by / Date: E.J.K 12/16/88

Checked by / Date: J.L.R. 12/16/88

Notes:

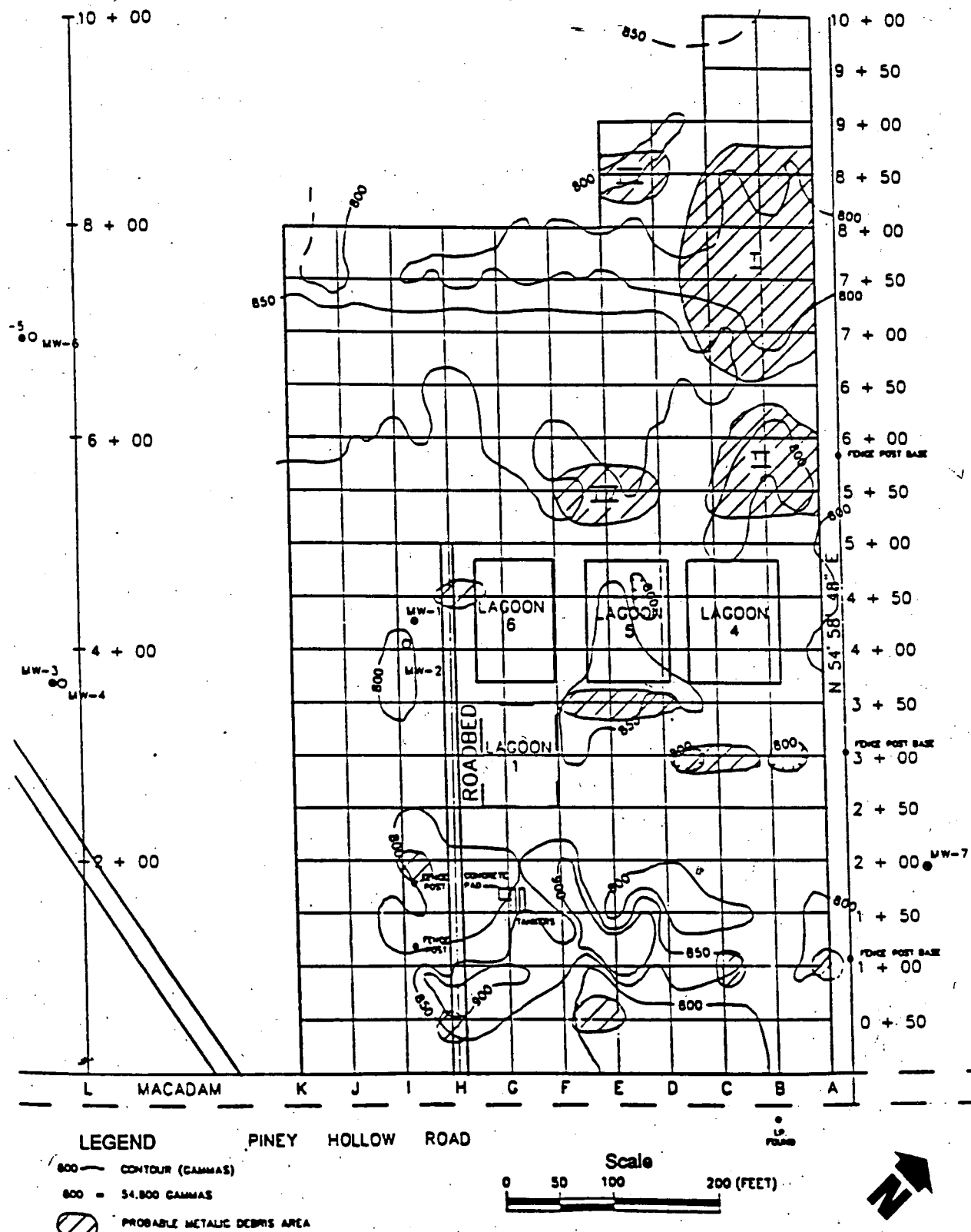


Figure 2-3

Final Magnetic Survey Map

King of Prussia Technical Corporation Site

Winslow Township, New Jersey



W08 70402 15

Drawn by / Date: JWG 11 / 29 / 88

Checked by / Date:

Revised by / Date: E.J.K 12/16/88

Checked by / Date: J.L.R. 12/16/88

THE
ERM
Group

2.5 Data Collection and Analysis

2.5.1 Soils and Sludges

Shallow soils (0-2ft below land surface) and subsurface soils (>2ft) were characterized by SMC in areas of observed or suspected contamination. Subsurface composite samples were collected from auger borings ranging from 5 to 12 feet below grade. A total of 45 shallow soil samples and 22 subsurface profile composite samples were collected for analysis. In addition, backhoe test pits were used to investigate areas of existing or suspected lagoons. Of sixteen test pits, four were excavated in known lagoons, and samples were collected. Analytical parameters for each sample medium are listed in Table 2-1.

Summaries of the analytical data for the shallow soil, subsurface soil and lagoon test pit samples are contained in tables 2-2, 2-3, and 2-4 respectively. Appendix A contains the complete analytical results for the initial phase RI. All sample locations are shown in Figures 2-4 through 2-6. The analytical results showed that the soil is characterized by a lack of Priority Pollutant volatile and semivolatile organic compounds or pesticides. In contrast, nearly all of the priority pollutant metals were detected at individual concentrations ranging up to 50 mg/kg per metal. Higher concentrations of copper, chromium, nickel, and zinc (up to several hundred mg/kg) were identified in 12 discrete areas outside of the four existing lagoons. These areas include the drum burial area, the carboy area, the tanker area, two areas near the entrance to the site, an area in the eastern corner of the site, and six areas in proximity to the lagoons.

A total of six known or suspected lagoon locations were targeted for sampling. Approximate dimensions and estimated volume of waste material for the four known lagoon locations, as calculated by SMC, are presented in Table 2-5.

TABLE 2-1
SUMMARY OF SOIL SAMPLING PARAMETERS FOR THE INITIAL RI
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY

	SHALLOW SOIL		SUBSURFACE SOIL				LAGOON TEST PITS	
SAMPLE LOCATIONS	HA-1 THROUGH HA-43 EXCEPT HA-5	T-1,T-2,AND HA-5	DA-1- B-1,	DA-17, B-2	P-1-P-5	WS-4, WS-6, WS-7	LI, L4-A - L7-B	
METALS								
antimony	X	X		X		X		X
arsenic	X	X		X		X		X
beryllium	X	X		X		X		X
cadmium	X	X		X		X		X
chromium	X	X		X		X		X
copper	X	X		X		X		X
lead	X	X		X		X		X
mercury	X	X		X		X		X
nickel	X	X		X		X		X
selenium	X	X		X		X		X
silver	X	X		X		X		X
thallium	X	X		X		X		X
zinc	X	X		X		X		X
VOLATILE ORGANIC COMPOUNDS								
		X		X				X
ACID EXTRACTABLE COMPOUNDS								
		X		X				X
BASE NEUTRAL COMPOUNDS								
		X		X				X
MISCELLANEOUS								
organic carbon	X	X		X		X		X
organic halogens	X	X		X		X		X
oil and grease	X	X		X		X		X
cyanide		X		.				X
phenols	X	X		X		X		X
pH	X	X		..				X

- DA-9 AND DA-10 ONLY
- • NOT ANALYZED ON ALL SAMPLES
- HA HAND AUGER
- DA DRILL AUGER
- T TANKER
- B BACKGROUND BORING
- P PERIMETER BORING
- L LAGOON
- WS WELL BORING SAMPLE

TABLE 2-2
SHALLOW SOIL DATA SUMMARY FOR THE INITIAL RI
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY

Chemical	HA-1 0-2 ft	HA-2 0-2 ft	HA-3 0-2 ft	HA-4 0-2 ft	HA-5 0-2 ft	HA-6 0-2 ft	HA-7 0-2 ft	HA-8 0-2 ft	HA-9 0-2 ft	HA-10 0-2 ft	HA-11 0-2 ft	HA-12 0-2 ft	HA-13 0-2 ft
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	5.7	ND	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Beryllium	ND	ND	ND	ND	1	ND	ND	10	ND	ND	16	ND	ND
Cadmium	2.6	ND	2	ND	ND	ND	ND	1.2	ND	ND	1.4	ND	ND
Chromium	28	8.9	11	ND	30	480	13	190	25	ND	410	14	24
Copper	17	7.3	13	9.8	58	52	28	620	53	19	970	30	29
Lead	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	15	ND	ND
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	ND	ND	18	7.8	27	17	ND	110	27	18	270	41	22
Selenium	ND	2	1.5	1.8	1.5	1.1	ND	ND	ND	ND	3.5	1.5	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	ND	ND	ND	18	24	10	ND	ND	ND	ND	20	21	ND
Zinc	5	2.8	6.9	2.4	17	3.1	2.7	40	18	2.1	300	8.7	4.9
Organic Carbon	620	370	300	390	1200	1500	2900	2200	2200	890	3000	1300	510
Phenols	ND	ND	1.6	3.1	ND	ND	1.8	ND	ND	ND	ND	ND	ND

Chemical	HA-14 0-2 ft	HA-15 0-2 ft	HA-16 0-2 ft	HA-17 0-2 ft	HA-18 0-2 ft	HA-19 0-2 ft	HA-20 0-2 ft	HA-21 0-2 ft	HA-22 0-2 ft	HA-23 0-2 ft	HA-24 0-2 ft	HA-25 0-2 ft	HA-26 0-2 ft
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Beryllium	ND	ND	ND	ND	15	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	13	11	30	21	330	30	6.9	ND	48	27	49	8.5	9
Copper	12	7.4	38	33	940	66	9.6	ND	87	32	64	ND	5.9
Lead	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	0.25	0.24	ND	ND	ND	0.28	ND	ND
Nickel	18	13	39	30	180	25	34	32	23	14	28	18	10
Selenium	1.8	ND	ND	1.3	ND	1.7	ND	1.6	1.2	ND	1.1	1.1	ND
Silver	ND	ND	ND	18	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	4.4	5.3	29	11	35	12	6.4	3	8.5	6.4	14	2.8	ND
Organic Carbon	730	780	1000	860	3500	3200	2100	1600	1600	1400	630	650	790
Phenols	5.5	1.2	2.4	3.5	4.4	ND	ND	1.4	ND	ND	ND	ND	ND

All concentrations in mg/kg
All samples collected by SMC Martin, November 1985.
ND - Not detected

**TABLE 2-2 (cont.)
SHALLOW SOIL DATA SUMMARY FOR THE INITIAL RI
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY**

Chemical	HA-27 0-2 ft	HA-28 0-2 ft	HA-29 0-2 ft	HA-30 0-2 ft	HA-31 0-2 ft	HA-32 0-2 ft	HA-33 0-2 ft	HA-34 0-2 ft	HA-35 0-2 ft	HA-36 0-2 ft
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	1	1.4	ND	ND	ND
Chromium	ND	6.8	26	13	5	23	14	12	19	ND
Copper	ND	6.6	67	24	36	21	19	31	22	ND
Lead	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	12	18	14	14	28	6.6	17	7.8	ND	10
Selenium	ND	1.1	1.5	1.6	2.2	3.1	1.6	1.1	1.7	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	1.7	2	1.7	4.9	4	1.1	3.7	ND	ND	ND
Organic carbon	1500	1000	830	1300	1600	1800	330	1600	990	1700
Phenols	1.4	ND	ND	ND	ND	1.4	1.5	ND	ND	1.4

Chemical	HA-37 0-2 ft	HA-38 0-2 ft	HA-39 0-2 ft	HA-40 0-2 ft	HA-41 0-2 ft	HA-42 0-2 ft	HA-43 0-2 ft	T-1* 0-2 ft	T-2* 0-2 ft
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND	ND	ND	ND
Beryllium	ND	2.4	ND	ND	ND	ND	1	ND	1.2
Cadmium	1.3	ND	ND	ND	1.7	ND	1.4	ND	ND
Chromium	13	170	22	ND	46	ND	56	37	66
Copper	12	1100	15	ND	130	ND	60	29	170
Lead	ND	11	ND	ND	ND	ND	ND	ND	36
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	100
Nickel	31	110	7.6	8.2	41	11	25	23	32
Selenium	ND	1.6	1.6	1.8	ND	1.3	2	ND	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	9	69	1.7	ND	15	ND	13	7.4	30
Organic carbon	300	960	340	1600	850	1300	190	640	2000
Phenols	ND	ND	ND	ND	ND	ND	2.5	ND	1.4

All concentrations in mg/kg

All samples collected by SMC Martin, November 1985.

ND - Not detected

* Priority Pollutant Organic Compounds detected

TABLE 2-3
SUBSURFACE SOIL DATA SUMMARY FOR THE INITIAL PHASE OF THE RI
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY

Chemical	DA-1	DA-2	DA-3	DA-4	DA-5	DA-6	DA-7	DA-8	DA-9 6.5 ft	DA-10 7.5 ft	DA-11 6.5 ft	DA-12 6.5 ft	DA-13 7 ft	DA-14 6.5 ft	DA-15 5 ft	DA-16	DA-17
Inorganics																	
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	5.4	ND	6.2	6.6	ND	ND	5.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Beryllium	ND	ND	ND	16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	6	ND	ND	3.5	ND	ND	ND	ND	ND
Chromium	20	66	29	570	9	7.3	34	77	ND	ND	7.5	17	9.3	42	62	32	ND
Copper	20	14	15	1100	13	30	22	74	ND	6.1	ND	19	45	71	260	25	13
Lead	ND	ND	33	18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	ND	ND	ND	470	ND	ND	ND	ND	ND	ND	ND	ND	ND	11	40	ND	ND
Selenium	ND	ND	ND	ND	ND	ND	ND	1.8	ND	ND	1	2.9	ND	ND	ND	ND	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	2.4	3.5	4.6	290	1	2	ND	5.2	2.3	2.3	2.7	4	5	5	20	3.7	1.9
Miscellaneous																	
Organic Carbon	400	310	640	230	130	380	340	540	620	560	750	620	1500	780	660	380	120
Phenols	ND	ND	ND	ND	ND	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.1

Chemical	B-1	B-2	P-1 10 ft	P-2 8.5 ft	P-3 10 ft	P-4 5 ft	P-5 10 ft	WS-4	WS-6	WS-7
Inorganics										
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	1.5	ND	ND	ND	ND	ND
Chromium	6.6	8.5	35	24	6.7	37	20	ND	ND	ND
Copper	12	8.4	18	46	15	48	27	ND	ND	ND
Lead	ND	ND	ND	ND	11	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	ND	ND	ND	6.3	ND	ND	ND	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	3.4	1.3	1.9	6.6	5.7	2.6	3.9	5.3	3.0	1.9
Miscellaneous										
Organic Carbon	550	560	860	660	760	650	620	520	160	2300
Phenols	ND	ND	ND	1.2	ND	ND	ND	0.61	ND	ND

All concentrations in mg/kg

All samples collected by SMC Martin, November 1985.

ND: Not detected

NA: Not analyzed

* Also analyzed for PP+40 VOCs; none detected

"P" series samples were also analyzed for complete PP+40 organics, pesticides/PCBs; none were detected.

**TABLE 2-4
LAGOON AREA TEST PIT DATA SUMMARY FOR THE INITIAL RI
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY**

Chemical	L7-A 7 ft	L7-B 7 ft	L6-A 7 ft	L6-B 7 ft	L5-A 3 ft	L5-B 3 ft	L4-A 5.5 ft	L4-B 5.5 ft	L1 13 ft
Inorganics									
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	35	5.1	ND	ND	ND	ND	220	300
Beryllium	ND	45	ND	34	ND	ND	53	60	100
Cadmium	1.4	5.4	ND	4.8	ND	ND	6.4	6.1	18
Chromium	22	2800	6.8	3000	140	20	1100	630	5000
Copper	ND	3500	ND	760	40	5.4	3700	480	2900
Lead	ND	13	ND	18	10	19	110	290	ND
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	6.6	ND	ND	1400	11	ND	1000	368	1100
Selenium	ND	ND	ND	ND	1.9	ND	ND	ND	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	ND	18	ND	ND	ND	ND	45	24	28
Zinc	2.9	140	1.8	100	6.2	ND	1600	300	1200
Miscellaneous									
Organic carbon	470	270	300	460	1300	250	2900	1400	680
Phenols	1	ND	ND	ND	ND	ND	ND	ND	ND
Pesticides and PCBs									
ALPHA BHC	ND	ND	ND	ND	3	ND	ND	ND	ND
DDE	ND	ND	ND	ND	0.17	ND	ND	ND	ND
Semivolatile Organics									
Naphthalene	ND	ND	ND	ND	<0.33	ND	ND	ND	ND
Diethyl phthalate	ND	ND	ND	ND	0.42	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND	1.3	ND	ND	ND	ND
Phenanthrene	ND	ND	ND	ND	0.57	ND	ND	ND	ND
bis (2-Ethylhexyl) phthalate	ND	ND	ND	ND	1.2	<0.33	ND	ND	<0.33
2-Methyl naphthalene	ND	ND	ND	ND	0.38	ND	ND	ND	ND

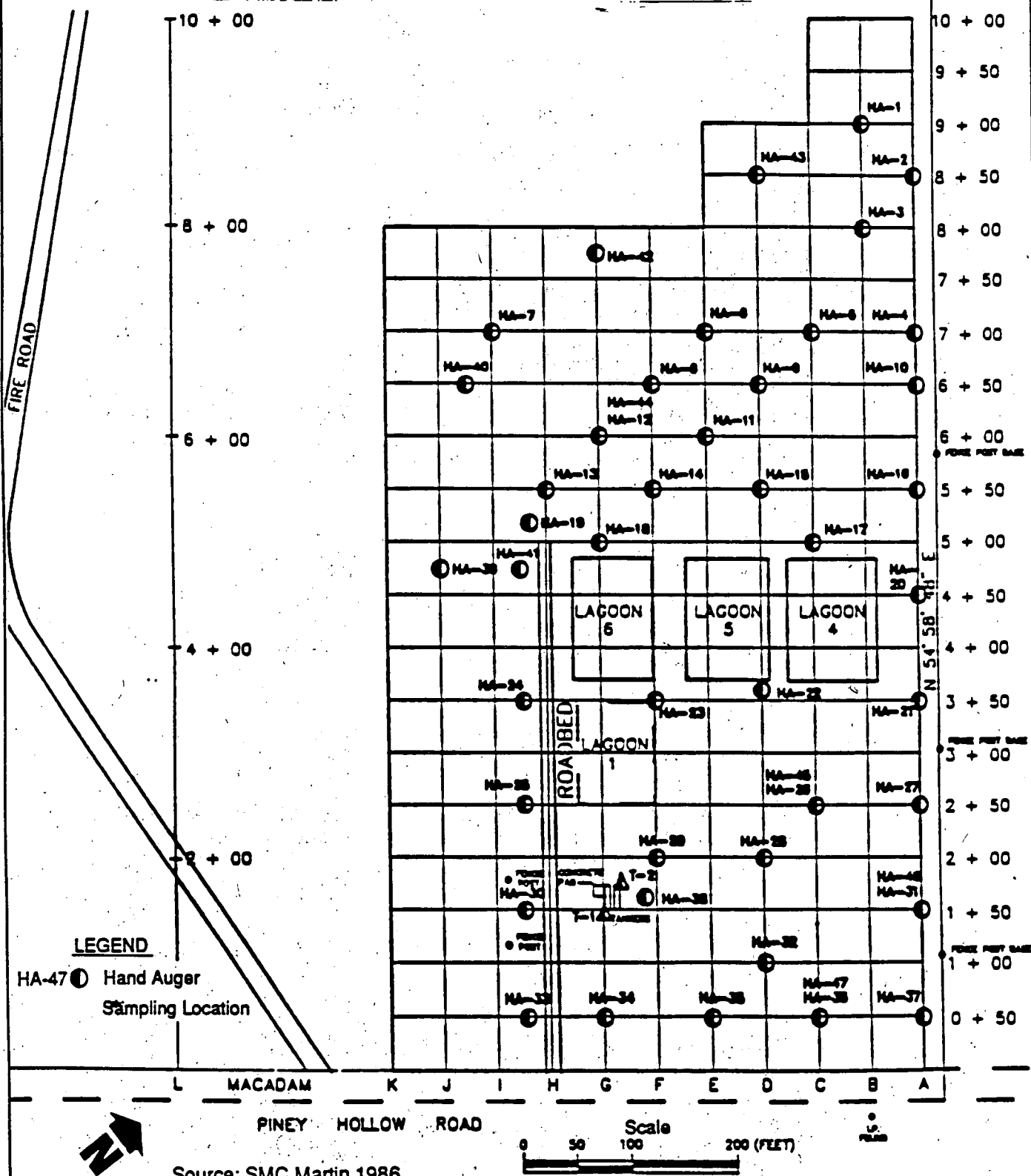
All concentrations in mg/kg

All samples collected by SMC Martin, November 1985.

ND-Not detected

No Volatile Organic Compounds were detected with the exception of Methylene Chloride which was found at concentrations similar to those found in the quality control blanks.

Figure 2-4
Shallow Soils Sampling Locations
King of Prussia Technical Corporation Site
Winslow Township, New Jersey



W0# 70402 15

Drawn by / Date: MEW 12/1/88

Checked by / Date:

Revised by / Date: E.J.K. 12/16/88

Checked by / Date: J.L.R. 12/16/88



Figure 2-5
Subsurface Soils Sampling Locations
 King of Prussia Technical Corporation Site
 Winslow Township, New Jersey

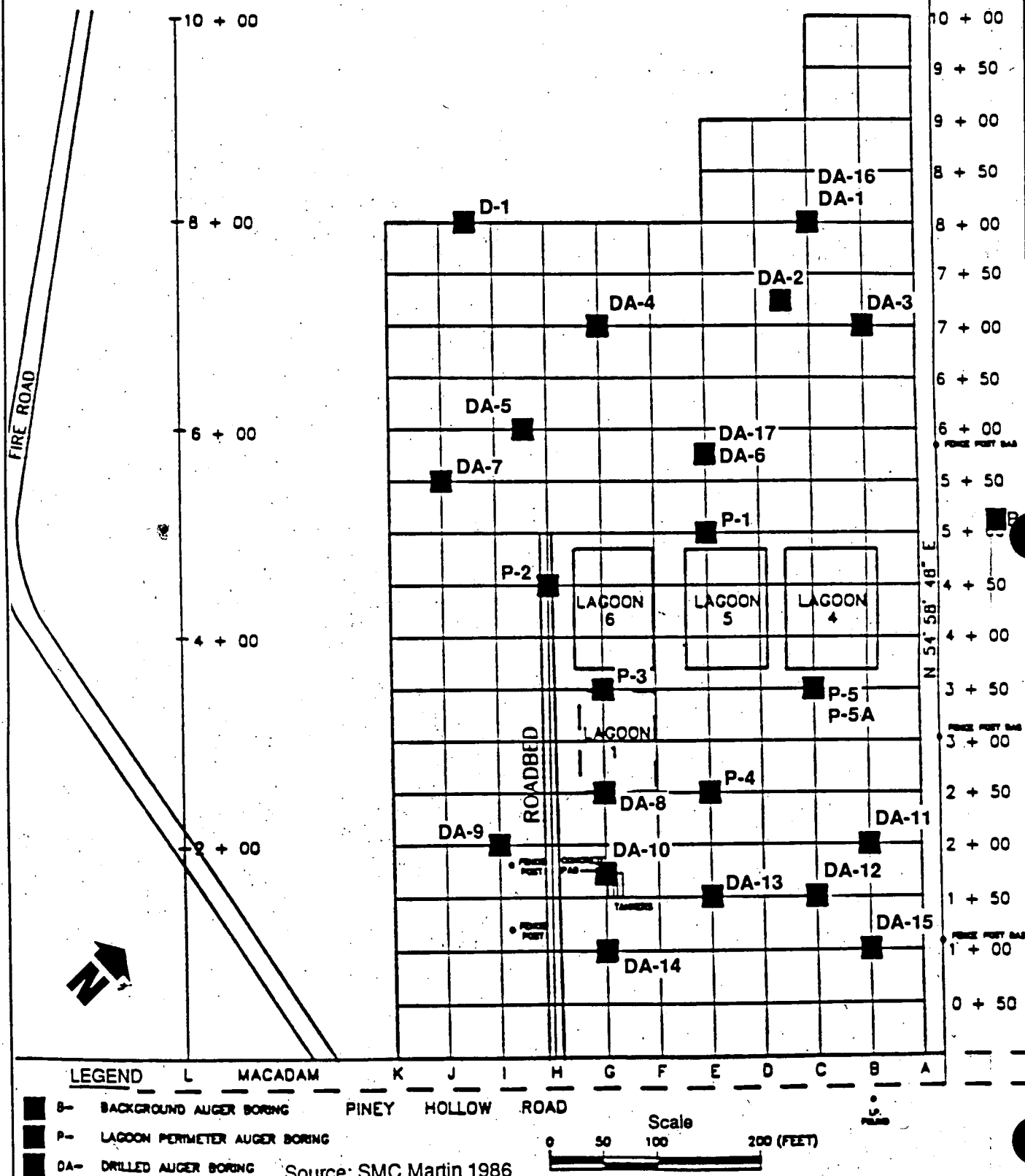
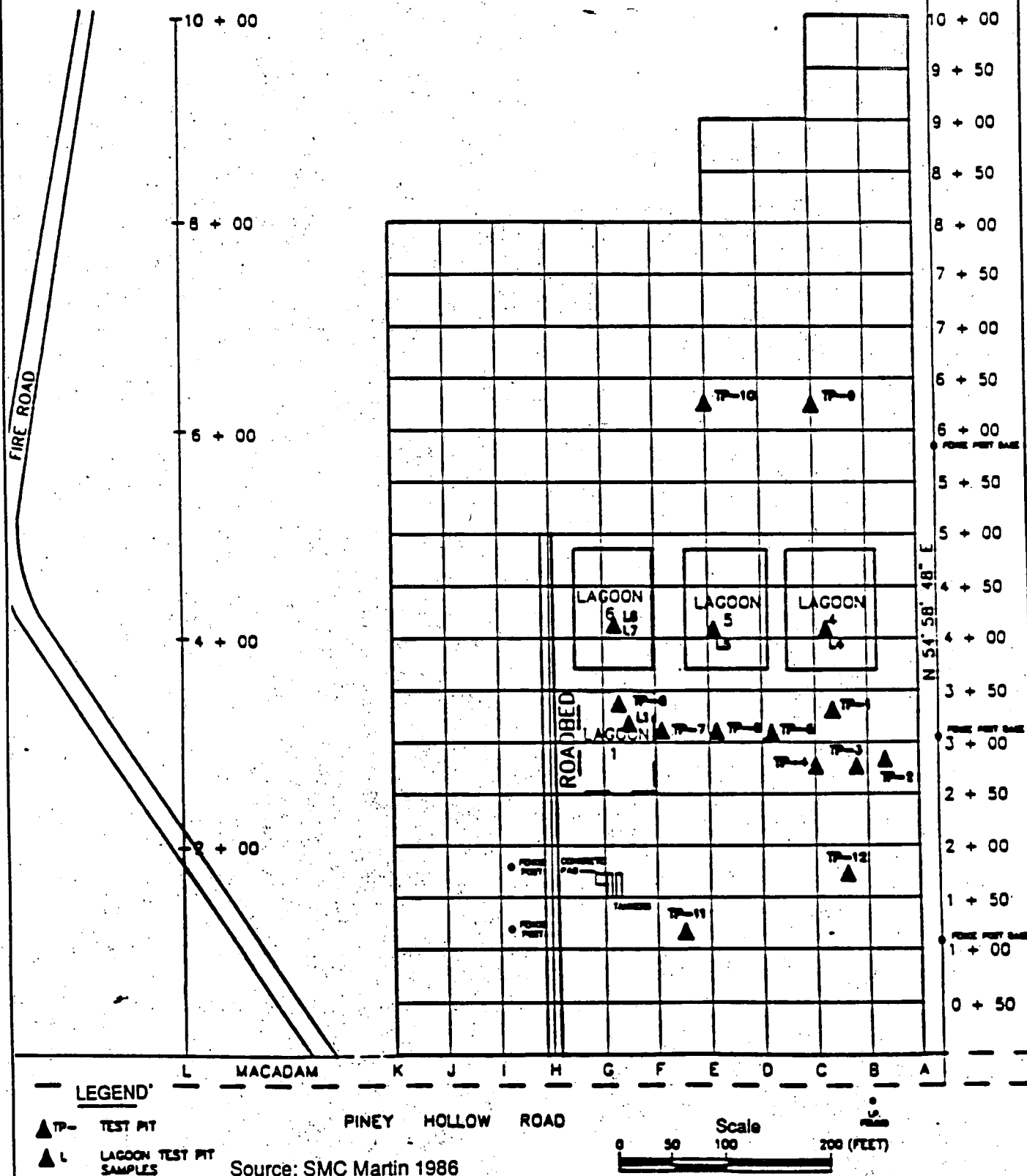


Figure 2-6
Test Pit and Lagoon Sampling Locations
 King of Prussia Technical Corporation Site
 Winslow Township, New Jersey



W0# 70402 15

Drawn by / Date: MEW 12/1/88

Checked by / Date:

Revised by / Date: CSG 12/7/88 CK 12/16/88

Checked by / Date: J.L.R. 12/16/88

ERM
 Group

TABLE 2-5
APPROXIMATE LAGOON DIMENSIONS AND WASTE VOLUMES
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY

<u>LAGOON NO.</u>	<u>LATERAL DIMENSIONS</u>		<u>DEPTH (ft)</u>	<u>WASTE VOLUME (cubic yd)</u>
	<u>LENGTH (FT)</u>	<u>WIDTH (ft)</u>		
1	70	65	3	450
4	90	60/80*	11	2000
5	90	80	1	250
6	90	70	11	2000

* Lagoon 4 is 60 ft wide at one end and 80 ft wide at the other end.

Sludge was encountered in only the four existing lagoons. No other lagoons were identifiable on the basis of the sampling. Each of the nine lagoon samples collected contained concentrations up to several thousand mg/kg of the four priority pollutant metals listed above, but no volatile organic compounds. Six out of the nine samples (L1, L4-A, L4-B, L5-A, L6-B, and L7-B) contained sludge material. Organic carbon concentrations were significant in the soil and appeared to be associated with corresponding high concentrations in and around the lagoons. Lagoon No. 5 contained detectable levels of semi-volatile organic compounds.

2.5.2 Ground Water

One background well (MW-7S) and three downgradient well couplets were installed to characterize hydrogeologic and ground water quality conditions beneath the site. During the installation of wells MW-4i, MW-6i, and MW-7S, individual composite samples of the subsurface profile down to the water table at each well were prepared from continuous split-spoon samples. These samples, designated WS-4, WS-6 and WS-7, were then shipped to the lab for analysis as indicated in Table 2-6. The background well was constructed with a two-screen configuration to monitor both shallow and deeper zones. All wells were then constructed of 2-inch diameter stainless steel screen and riser. The shallow well in each couplet was installed to an average depth below land surface of 25 feet, while the deeper well was installed to an average depth of approximately 60 feet. All wells were then sampled, and the samples analyzed for the parameters listed in Table 2-6. The well locations and corresponding subsurface composite profile sampling locations are shown on Plate 1.

The analytical data for ground water are summarized in Table 2-7. No Priority Pollutant compounds were detected in the background well. Priority Pollutant metals were found in all downgradient wells, with the concentrations higher in on-site wells than in off-site wells, with the exception of MW-5S. Off-site well MW-5S

TABLE 2-6
SUMMARY OF GROUND WATER SAMPLING PARAMETERS FOR THE INITIAL PHASE OF THE RI
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY

SAMPLE LOCATIONS	MW-1S	MW-2I	MW-3S	MW-4I	MW-5S	MW-6I	MW-7S
METALS	X	X	X	X	X	X	X
antimony	X	X	X	X	X	X	X
arsenic	X	X	X	X	X	X	X
beryllium	X	X	X	X	X	X	X
cadmium	X	X	X	X	X	X	X
chromium	X	X	X	X	X	X	X
copper	X	X	X	X	X	X	X
lead	X	X	X	X	X	X	X
mercury	X	X	X	X	X	X	X
nickel	X	X	X	X	X	X	X
selenium	X	X	X	X	X	X	X
silver	X	X	X	X	X	X	X
thallium	X	X	X	X	X	X	X
zinc	X	X	X	X	X	X	X
iron	X	X	X	X	X	X	X
VOLATILE ORGANIC COMPOUNDS	X	X	X	X	X	X	X
ACID EXTRACTABLE COMPOUNDS	X	X	X	X	X	X	X
PESTICIDES/PCBs	X	X	X	X	X	X	X
BASE NEUTRAL COMPOUNDS	X	X	X	X	X	X	X
MISCELLANEOUS							
organic carbon	X	X	X	X	X	X	X
organic halogens	X	X	X	X	X	X	X
oil and grease	X	X	X	X	X	X	X
cyanide	X	X	X	X	X	X	X
phenols	X	X	X	X	X	X	X
pH							

TABLE 2-7
GROUND WATER DATA SUMMARY FOR THE INITIAL PHASE OF THE RI
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY

Chemical	MW-1S	MW-2i	MW-3S	MW-4i	MW-5S	MW-6i	MW-7S
Inorganics							
beryllium	ND	0.04	0.12	0.01	0.1	ND	ND
chromium	0.09	ND	0.55	ND	1.3	ND	ND
copper	0.85	4.4	7.5	1.4	14	ND	ND
mercury	ND	ND	0.003	ND	ND	ND	ND
nickel	0.5	1.4	2.4	0.45	4.7	ND	ND
zinc	0.18	0.68	1.7	0.34	2.3	0.31	0.09
iron	3.7	0.31	5.5	0.22	36	ND	0.09
Miscellaneous							
organic carbon	9.4	ND	13	ND	12	ND	ND
phenols	ND	0.08	0.08	0.13	ND	0.08	ND
Volatile Organics							
1,1-dichloroethene	ND	ND	ND	ND	0.026	ND	ND
1,1-dichloroethane	ND	ND	ND	ND	<0.01	ND	ND
trans-1,2-dichloroethene	ND	ND	<0.01	ND	0.025	ND	ND
1,1,1-trichloroethane	ND	ND	ND	ND	0.28	ND	ND
trichloroethene	0.057	0.017	ND	ND	0.36	ND	ND
benzene	ND	ND	ND	ND	<0.01	ND	ND
1,1,2,2-tetrachloroethane	ND	ND	ND	ND	0.93	0.036	ND
tetrachloroethene	ND	ND	<0.01	ND	1.5	ND	ND
toluene	<0.01	ND	<0.01B	<0.01B	ND	ND	<0.01B
ethylbenzene	ND	ND	ND	ND	0.043	ND	ND
Semivolatile Organics							
bis(2-Ethylhexyl)phthalate	0.025	ND	ND	ND	ND	ND	ND

All concentrations in mg/l

All samples collected by SMC Martin, March 1986.

ND - Not detected

B - Similar concentration found in Quality Control blanks

The metals antimony, arsenic, cadmium, lead, selenium, silver, and thallium were not detected.

contained total volatile organic compounds at a concentration of 3,182 ug/l. Volatile organic compounds were not detected in any on-site wells at concentrations exceeding 50 ug/l. Base/neutral-extractable compounds were essentially not detected.

2.5.3 Surface Water and Sediment

A total of six surface water and surficial sediment samples were collected from both the drainage swale which adjoins the site and the Great Egg Harbor River (see Figure 2-7). Two samples of each matrix were collected from the swale at a point near its headwaters and at an area of impounded water below the site. Four samples were collected from the river in areas both above and below the site as well as below the swale "confluence" and in the expected groundwater discharge zone.

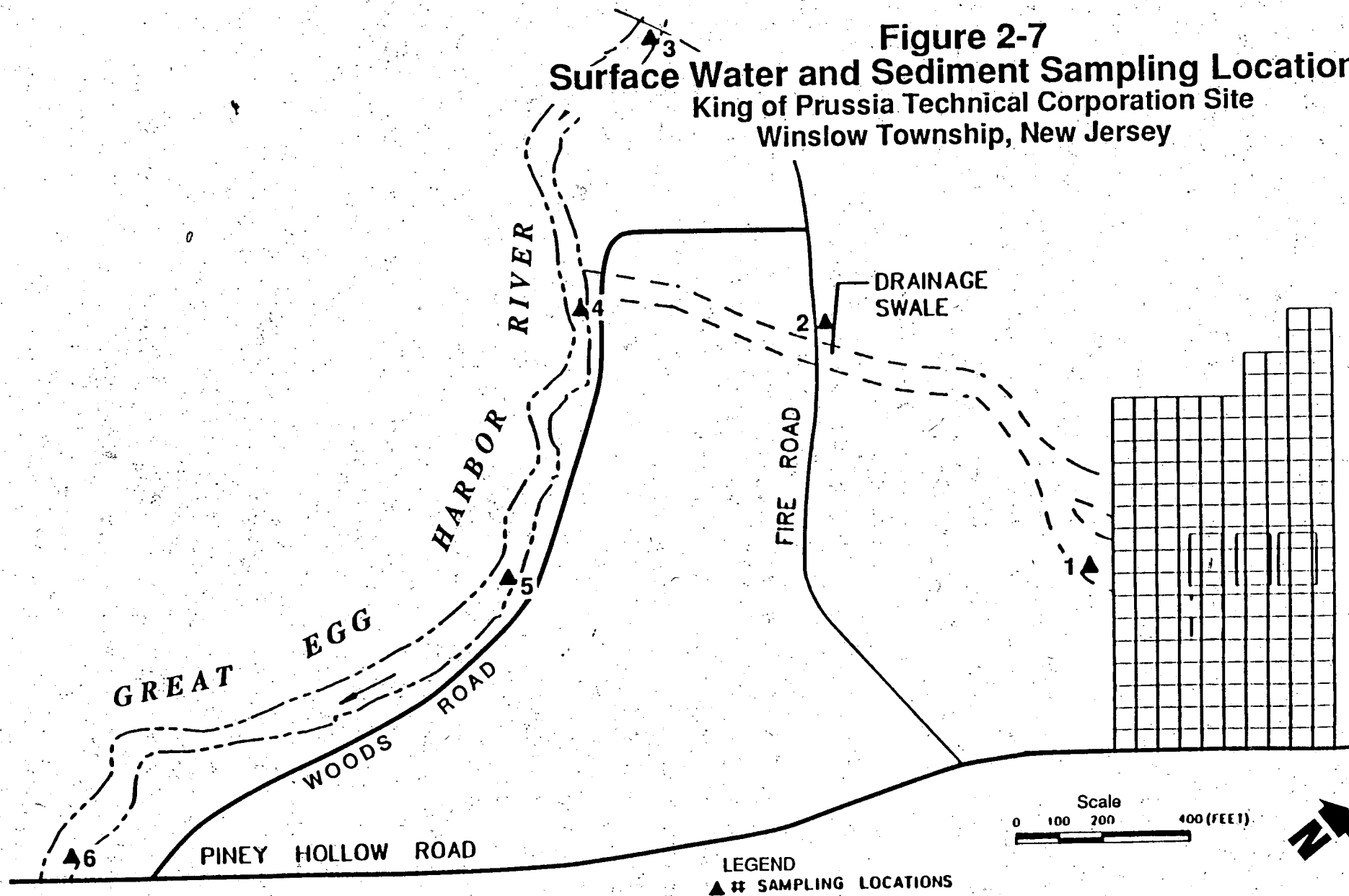
The analytical parameters for both matrices are shown in Table 2-8. Analytical results from swale samples indicated elevated levels of several priority pollutant metals in both surface water and sediment. Metal concentrations decreased as the distance of the sample location from the site increased.

The surface water/sediment analytical data are summarized in Table 2-9. The data from the Great Egg Harbor River indicated an increase in downstream concentrations above background only for copper. Sediment data indicated a marked increase in metal concentrations below the swale/river confluence, compared to background levels. Downstream concentrations, however, showed random variation in metals concentrations, consistent with sediment transport and deposition theory.

2.5.4 Carboys

In June 1986, SMC exposed a portion of the carboy area, uncovering a number of carboys that contained dark-colored liquid. SMC obtained samples of this liquid from three individual carboys for

Figure 2-7
Surface Water and Sediment Sampling Locations
 King of Prussia Technical Corporation Site
 Winslow Township, New Jersey



WO# 70402 15

Drawn by / Date: MEW 12/1/88

Checked by / Date:

Revised by / Date: CSJ 12/7/88 E.J.K 12/16

Checked by / Date: J.L.R. 12/16/88

Notes:



TABLE 2-8
SUMMARY OF SURFACE WATER AND SEDIMENT SAMPLING PARAMETERS FOR THE INITIAL PHASE OF THE RI
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY

SAMPLE LOCATIONS	SW-1/SD-1	SW-2/SD-2	SW-3/SD-3	SW-4/SD-4	SW-5/SD-5	SW-6/SD-6

METALS	X	X	X	X	X	X
antimony	X	X	X	X	X	X
arsenic	X	X	X	X	X	X
beryllium	X	X	X	X	X	X
cadmium	X	X	X	X	X	X
chromium	X	X	X	X	X	X
copper	X	X	X	X	X	X
lead	X	X	X	X	X	X
mercury	X	X	X	X	X	X
nickel	X	X	X	X	X	X
selenium	X	X	X	X	X	X
silver	X	X	X	X	X	X
thallium	X	X	X	X	X	X
zinc	X	X	X	X	X	X
iron	X*	X*	X*	X*	X*	X*

VOLATILE ORGANIC
COMPOUNDS

ACID EXTRACTABLE
COMPOUNDS

BASE NEUTRAL
COMPOUNDS

MISCELLANEOUS						
organic carbon	X	X	X	X	X	X
organic halogens	X	X	X	X	X	X
oil and grease	X	X	X	X	X	X
cyanide						
phenols	X	X	X	X	X	X
pH						

SW SURFACE WATER

SD SEDIMENT

* Iron was analyzed in the surface water (SW) samples only

TABLE 2-9
SURFACE WATER AND SEDIMENT DATA SUMMARY FOR THE INITIAL PHASE OF THE RI
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY

Chemical	Drainage Swale				Great Egg Harbor River		
	SD-1	SD-2	SD-2A	SD-3	SD-4	SD-5	SD-6
beryllium	8.3	ND	ND	ND	ND	2.1	ND
chromium	430	39	49	ND	38	35	40
copper	760	26	34	ND	220	300	35
mercury	0.55	ND	ND	ND	0.43	0.35	0.32
nickel	72	ND	ND	ND	ND	ND	ND
selenium	54	ND	9.6	ND	ND	ND	4.9
zinc	44	1.8	2.2	2.4	4.3	1.9	5.5

Chemical	Drainage Swale			Great Egg Harbor River		
	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6
chromium	0.2	0.05	ND	ND	ND	ND
copper	0.54	0.66	ND	ND	0.11	0.05
nickel	0.11	0.19	ND	ND	ND	ND
zinc	0.22	0.38	0.26	0.14	0.13	0.11
iron	1.1	0.23	0.21	0.23	0.28	0.29

SD - Sediment in mg/kg

SW - Surface water in mg/l

All samples collected by SMC Martin, March 1986

ND - Not detected

SD-2A is a duplicate of SD-2

The metals antimony, arsenic, cadmium, lead, silver, and thallium were not detected in the SD samples.
The metals antimony, arsenic, beryllium, cadmium, lead, mercury, selenium, silver, and thallium were not detected in the SW samples

full Priority Pollutant analysis (inorganic and organic) plus 40 tentatively identified compounds. The results indicated that organic Priority Pollutant-type compounds were essentially absent in all of the samples. Priority Pollutant metals were detected at the concentrations shown in Table 2-10.

2.6 USEPA Request For Additional Study

Following review of the initial phase RI investigation, the USEPA identified several areas where additional information was requested. These data requests were the focus of the second phase of the Remedial Investigation (RI), the results of which are presented in sections 3 and 4 of this report. The tasks to be implemented in the second phase RI were designed to provide additional information on the following:

- additional analysis of source areas, including the contents of the tankers and the soil in the carboy area;
- the nature and three-dimensional extent of subsurface soil contamination in areas identified as geophysical anomalies;
- the quality of shallow and deeper groundwater both off-site and downgradient of source areas;
- the presence and extent of volatile organic compounds in MW-5S;
- site geology to a depth of 150 feet;
- the quality of surface water and sediment in the drainage swale;
- whether or not the Great Egg Harbor River serves as a hydraulic boundary to prevent the westward migration of site related contaminants in the ground water; and
- the environmental effects on the Great Egg Harbor River from site-related contamination.

The second phase RI investigation and results regarding these issues are presented in the following sections.

**TABLE 2-10
RESULTS FOR SAMPLES OF CARBOY LIQUID
ANALYZED FOR METALS, PHENOLS, AND CYANIDE
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY**

PARAMETER	CARBOY 1	CARBOY 2	CARBOY 3
Antimony, total	1.2 J	0.82 J	2 U
Arsenic, total	0.4U	0.4U	0.4U
Beryllium, total	0.5U	0.5U	0.5U
Cadmium, total	22	21	21
Chromium, total	590	1,200	140
Copper, total	740	2,300	2,400
Lead, total	61	23	48
Mercury, total	0.002U	0.002U	0.002U
Nickel, total	7,000	7,400	7,700
Selenium, total	0.4U	0.4U	0.4U
Silver, total	5.0 U	5.0 U	5.0 U
Thallium, total	20	18	20
Zinc, total	1,400	15	17,000
Cyanide, total	0.025U	0.025U	0.025U
Phenolics, as phenol	1.1	1.7	1.3
Units	(mg/l)	(mg/l)	(mg/l)

J = Estimated Value

U = Not Detected

SECTION 3

PHASE TWO REMEDIAL INVESTIGATION

3.1 Introduction

The objective of the second phase of the Remedial Investigation (RI) is to provide a more complete representation of site environmental quality by generating data to complement environmental data obtained during the SMC-Martin Remedial Investigation. Through discussions with the King of Prussia Technical Corporation Site Committee, its technical and legal representatives, the New Jersey Department of Environmental Protection (NJDEP), and the United States Environmental Protection Agency (USEPA) Region II, a work plan was developed. Prior to implementing the work plan, Environmental Resources Management Inc. (ERM) reviewed the field tasks included in the work plan and suggested some supplemental tasks. The field tasks approved for the second phase RI are summarized below:

- Additional Source Area Characterization;
- Additional Test Pit Soil Sampling;
- Additional Great Egg Harbor River and Drainage Swale Sediment and Surface Water Sampling;
- Installation of 21 Additional Ground Water Monitoring Wells and one groundwater observation well;
- Borehole Geophysical Logging of all Deep Monitoring Wells;
- Geologic Core Sampling;
- Electromagnetic Conductivity Survey in the Suspected Drum Burial Area;
- Additional Ground Water Sampling;
- Aquifer Testing; and
- Synoptic Water Level Measurements.

The laboratory analyses in support of these field tasks were conducted by CompuChem Laboratories, Research Triangle Park, North Carolina. All environmental samples were analyzed for appropriate fractions of the Priority Pollutant List, including Tentatively Identified Organic Compounds (TICs), hereinafter referred to as Priority Pollutants +40 or PP +40.

3.2 Source Area Characterization

3.2.1 Purpose and Scope

The objective of the source area characterization investigation was to provide representative Priority Pollutant chemical data on residue samples from areas known or suspected to contain waste. Samples were collected from the residue remaining in the two abandoned steel tankers, the visibly contaminated soils in the plastic carboy area, buried sludges encountered during the soil sampling task, and soils from the suspected drum burial area (see Figure 3-1). Table 3-1 contains the analytical parameters for samples obtained from each source area.

3.2.2 Investigation and Sampling Methods

Tanker Area

ERM collected one composite solids sample from each of the two tankers, using stainless steel spoons. White powdery residue was collected from three locations within each tanker to create one composite sample. Access to each tanker was gained through former hatches or holes that have rusted through the tanker sides. Split volumes of the composite samples were provided to NUS Corporation, USEPA's technical oversight contractor, for independent analyses.

Figure 3-1
Identified Source Areas
 King of Prussia Technical Corporation Site
 Winslow Township, New Jersey

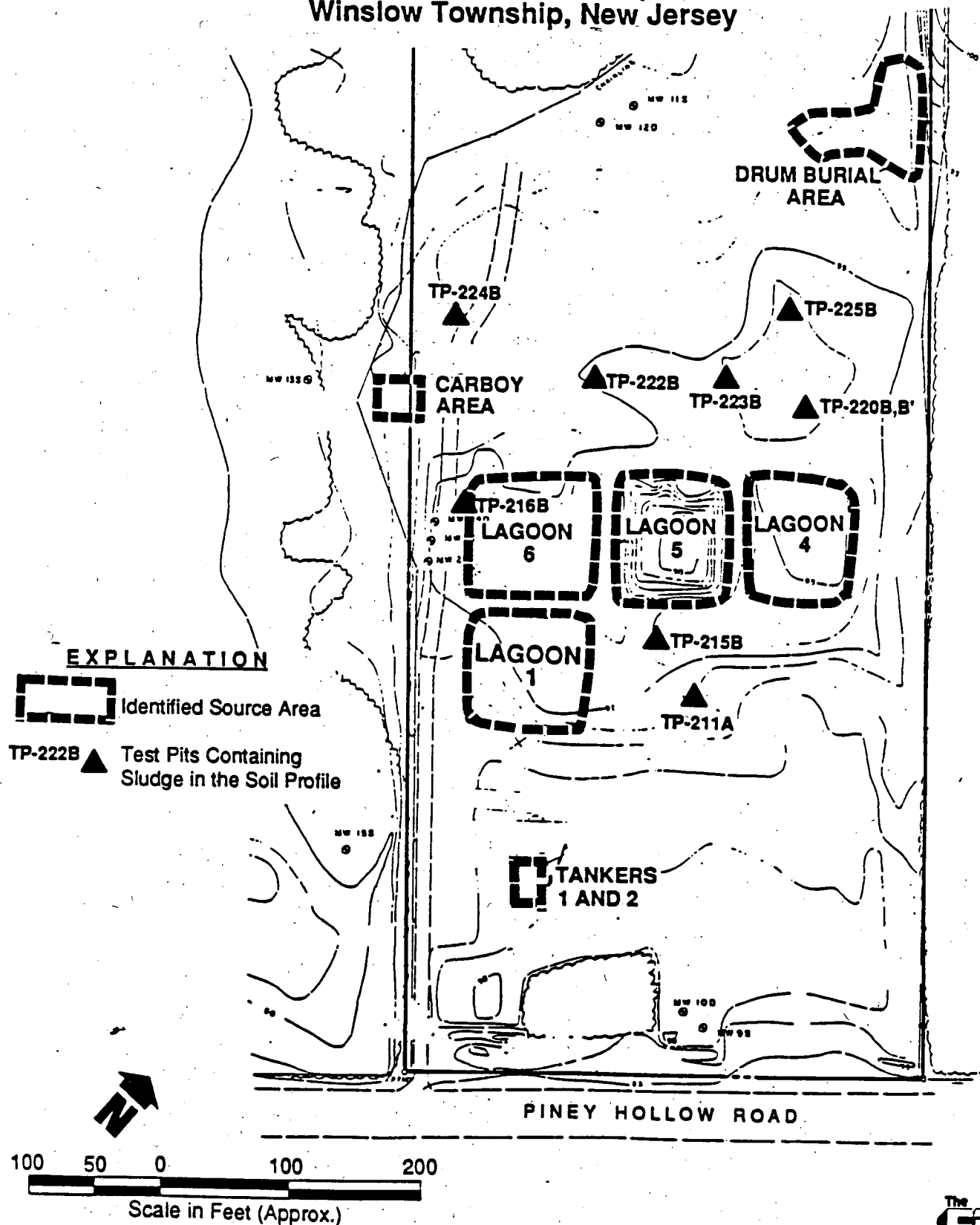


TABLE 3-1
ANALYTICAL PARAMETERS FOR SOURCE AREA SAMPLING LOCATIONS
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY

Sample Location	PP Metals	PP VOA + 15	PP Semi-VOA+25	PP Pest/PCB	Total Phenols	Cyanide	Common Ions	Soil pH
Tanker Residue								
KP-T-201	X	X	X	X	NA *	X		
KP-T-202	X	X	X	X	NA *	X		
Carboy Area								
KP-SS 201	X	X	X	X	NA *	X		
Drum Burial Area								
SS-A		X	X	X			X	X
SS-B		X	X	X			X	X
Buried Sludges								
TP-211 A	X	X	X	X	X	X		
TP-215 B	X	X	X	X	X	X		
TP-216 B	X	X	X	X	X	X		
TP-220 B	X	X	X	X	X	X		
TP-220 B'	X	X	X	X	X	X		
TP-222 B	X	X	X	X	X	X		
TP-223 B	X							
TP-224 B	X							
TP-225 B	X	X	X	X	X	X		

* NOT ANALYZED DUE TO MISINTERPRETATION OF ANALYSIS REQUEST FORM.

Carboy Area

Using stainless steel spoons, a single composite soil sample was prepared from four visibly stained locations in the carboy disposal area. A split volume of the composite sample was provided to NUS for independent analysis.

Buried Sludges

During the course of the soil sampling task, eight test pit locations (TP-211, TP-215, TP-216, TP-220, TP-222, TP-223, TP-224, and TP-225) exhibited an anomalous horizon in the soil profile which appeared to be a sludge material. Samples of the sludge were collected using stainless steel spoons. A complete description of the soil sampling protocol is included in Section 3.3.

Drum Burial Area

A supplemental geophysical conductivity survey was conducted in the suspected buried drum area at the rear of the site. The purpose of the survey was to better define the limits of the geophysical anomaly discovered during the initial RI and to document the existence of any buried drums. An ERM geophysicist utilizing an EM-31 conductivity meter paced the lines of the previously re-established survey grid with the EM-31 set to measure apparent conductivity. Readings were taken at 25 foot grid intervals to an effective depth of 20 feet. The intermediate stations were paced from the established grid locations. Apparent conductivity readings were recorded at each station. As the geophysicist paced the distances between the stations, the in-phase component was continuously monitored. Anomalous areas were marked with pin flags.

After the initial conductivity survey was completed, areas suspected of containing buried metallic objects were confirmed in

the following fashion. The geophysicist traversed away from the anomaly until background readings were obtained (i.e., no meter deflection of the in-phase component). The geophysicist then proceeded about the perimeter of the anomaly, marking the boundaries until the entire anomaly was encompassed. A backhoe was then used to excavate a portion of the area in order to confirm the presence of metal (presumably drums).

ERM collected two soil samples from the drum burial area in locations where strong electromagnetic anomalies were detected. Using a decontaminated stainless steel hand-driven bucket auger, two samples of visibly stained soil were collected from 24 to 48 inches below the ground surface.

3.2.3 Analytical Parameters

Since the potential source areas contain compounds of unknown composition, all samples were collected for complete Priority Pollutant Plus 40 (PP+40) analyses, including metals. Two contaminated soil samples were collected from the drum burial area and one background soil sample was obtained from the nearby wooded area and analyzed for common ions, soil acidity, and soil pH.

3.3 Soil Sampling and Investigation

3.3.1 Purpose and Scope

The objectives of the test pit soil sampling task included: confirming the depth and lateral extent of the geophysical anomalies previously identified; locating buried waste materials, metallic debris, and drums, particularly in the suspected drum burial area; and providing additional data to further delineate the horizontal and vertical extent of contamination over the site.

3.3.2 Soil Sampling Methods

A total of thirty-four new test pits were excavated at the locations shown in Figure 3-2 and Plate 2. The test pit logs are provided in Appendix B. The test pits were located based upon geophysical and sampling anomalies identified by SMC. They can be grouped into the following categories:

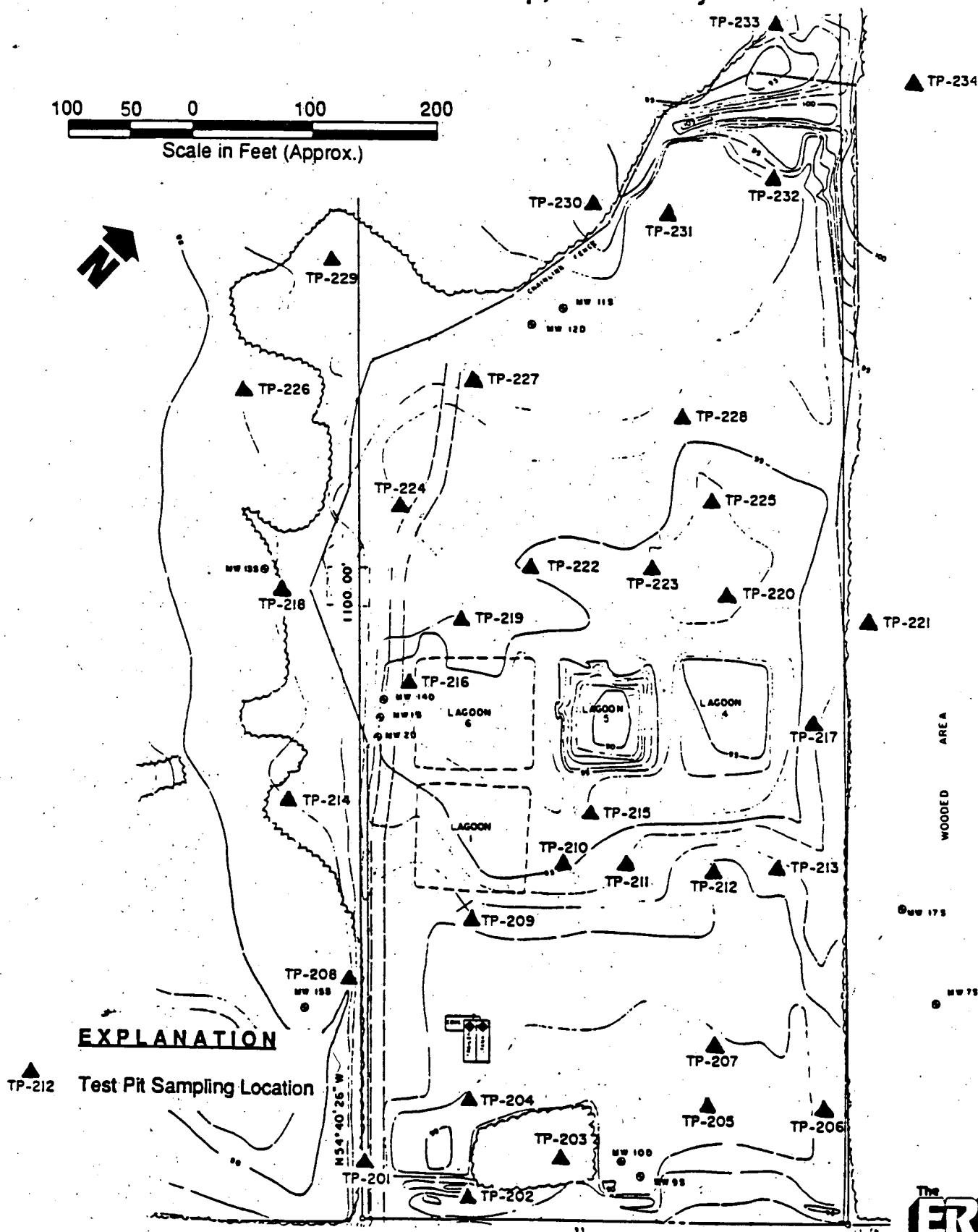
- Areas Containing Probable Buried Metallic Debris
- Areas of Soil Contamination Outside the Lagoons
- Areas of Visual Anomalies Logged During Auger Borings

A backhoe was used to excavate the test pits. Each pit was 1.5 feet wide and approximately 7 feet long. The total depth of each pit varied, depending on depth to the water table. Excavation ceased when ground water was encountered. To prevent cross-contamination between pits, the backhoe was thoroughly steam-cleaned after each test pit was completed.

An ERM hydrogeologist was present at all times to supervise test pit completion and perform soil sample collection. Each sample was collected from the center of the last backhoe bucketful of soil taken from the appropriate depth interval. Stainless steel sampling spoons were used to transfer the soil directly into sample jars. A separate spoon was used for each sample. All spoons were decontaminated according to the procedures outlined in the Quality Assurance Project Plan (QAPP).

Using an Organic Vapor Analyzer (OVA), organic vapor levels in the workspace and the soils in the backhoe bucket were monitored at regular intervals during the excavations. In addition, OVA readings were obtained at each sample interval. OVA readings and soil descriptions for each test pit were recorded in a standard field book by the ERM geologist. Appendix B, the test pit logs, summarizes the soil descriptions, sample depths, OVA readings, and depth to ground water for the thirty-four (34) test pits.

Figure 3-2
Soil Sampling Locations
King of Prussia Technical Corporation Site
Winslow Township, New Jersey



In general, soils samples were collected from the following discrete depths between the surface and the water table: 0-6 inches, 3-4 feet, 6-7 feet, and 9-10 feet. The number of samples collected per pit depended on the depth of the water table. The maximum pit depth was eleven feet below ground surface.

Appropriate exceptions to this sampling protocol were determined by the ERM field geologist, with concurrence from USEPA's oversight contractor. In cases where the presence of significant source material, relatively high OVA readings, or general visual appearance indicated that possible contamination was present, a sample was taken at that point, in place of a sample at the closest prescribed depth.

Each test pit soil sample was labeled with an identification number consisting of the test pit number and a letter designating the relative sample depth within the pit. Unless pit-specific conditions dictated otherwise, samples marked "A" represent the shallowest depth sampled, usually surface to 0.5 feet below grade; samples marked "B" were taken at a specified intermediate depth of 3 to 4 feet; and samples marked "C" were collected from the pit bottom, normally at 6 to 7 foot depths. If pit depth extended to 9 feet or more, the sample at 6 to 7 foot depths was designated as B-prime (B'), indicating a deeper intermediate sample, and the pit bottom sample (usually to 10 feet depth) was called "C". For example, sample numbers TP-227A, TP-227B, TP-227B', and TP-227C represent the shallow, two intermediate, and the bottom soil samples of test pit 227, respectively.

3.3.3 Analytical Parameters

As outlined in the USEPA-approved work plan, certain percentages of the surface, intermediate, and deepest test pit samples were to be analyzed for some combination of the following parameters: complete Priority Pollutants +40 minus volatile organic compounds,

Priority Pollutant volatile organic compounds, and Priority Pollutant metals. Table 3-2 contains the analytical parameters for each sampling horizon.

3.4 Hydrogeological Investigation

3.4.1 Purpose and Scope

The hydrogeological investigation represents the most comprehensive segment of the second phase Remedial Investigation at the KOP site. The purpose of conducting the hydrogeologic investigation was three fold:

- 1) To gain a thorough representation of the subsurface geologic conditions by installing additional test borings and ground water monitoring wells distributed at locations across the site, and downgradient off-site on adjacent Winslow Wildlife Management Area property.
- 2) To conduct physical hydraulic tests to assist in interpretation of the hydrogeology as it relates to ground water flow dynamics, ground water contaminant transport, ground water quality, and other parameters which bear upon the occurrence and spatial variability, and the potential for the abatement of contaminants in the ground water beneath the site.
- 3) To supplement previously collected ground water quality data.

3.4.2 Monitoring Well Installation

During the period of 4 June through 28 June 1988, 20 additional ground water monitoring wells and one observation well were installed on the KOP site and on the adjacent Winslow Wildlife Management Area property. Ten 90-foot wells and ten shallow (25-foot) water table wells were installed. The final well locations

Table 3-2
ANALYTICAL PARAMETERS FOR SOIL SAMPLING LOCATIONS
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY

SAMPLE LOCATION	PP Metals	PP VOA + 15	PP Semi-VOA+25	PP Pest/PCB	Total Phenols	Cyanide
TP 201 A	X		X	X	X	X
TP 201 B	X	X	X	X	X	X
TP 201 C	X	X				
TP 202 A	X					
TP 202 B	X	X	X	X	X	X
TP 202 C	X	X				
TP 203 A	X		X	X	X	X
TP 203 B	X	X	X	X	X	X
TP 203 C	X	X				
TP 204 A	X					
TP 204 B	X	X	X	X	X	X
TP 204 C	X	X				
TP 205 A	X		X	X	X	X
TP 205 B	X					
TP 205 C	X	X		X		
TP 206 A	X					
TP 206 B	X	X	X	X	X	X
TP 206 C	X	X				
TP 207 A	X		X	X	X	X
TP 207 B	X	X	X	X	X	X
TP 208 A	X					
TP 208 B	X	X	X	X	X	X

* SEE TABLE 3-1 FOR ANALYTICAL PARAMETERS

**Table 3-2 (CONT.)
ANALYTICAL PARAMETERS FOR SOIL SAMPLING LOCATIONS
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY**

SAMPLE LOCATION	PP Metals	PP VOA + 15	PP Semi-VOA+25	PP Pest/PCB	Total Phenols	Cyanide
TP 209 A	X					
TP 209 B	X	X	X	X	X	X
TP 209 C	X	X				
TP 210 A	X					
TP 210 B	X					
TP 210 C	X	X				
TP 211 A *						
TP 211 B	X					
TP 211 C	X	X				
TP 212 A	X		X	X	X	X
TP 212 B	X					
TP 212 C	X	X				
TP 213 A	X					
TP 213 B	X	X	X	X	X	X
TP 213 C	X	X				
TP 214 A	X					
TP 214 B	X	X	X	X	X	X
TP 214 C	X	X				
TP 215 A	X					
TP 215 B *						
TP 215 B'	X					
TP 215 C	X	X				

* SEE TABLE 3-1 FOR ANALYTICAL PARAMETERS

**Table 3-2 (CONT.)
ANALYTICAL PARAMETERS FOR SOIL SAMPLING LOCATIONS
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY**

SAMPLE LOCATION	PP Metals	PP VOA + 15	PP Semi-VOA+25	PP Pest/PCB	Total Phenols	Cyanide
TP 216 A	X					
TP 216 B *						
TP 216 B'	X					
TP 216 C	X	X				
TP 217 A	X					
TP 217 B	X	X	X	X	X	X
TP 217 C	X	X				
TP 218 A	X	X	X	X	X	X
TP 218 B	X	X	X	X	X	X
TP 218 C	X	X				
TP 219 A	X					
TP 219 B	X					
TP 219 C	X	X				
TP 220 A	X					
TP 220 B *						
TP 220 B' *						
TP 220 C	X	X				
TP 221 A	X					
TP 221 B	X	X	X	X	X	X
TP 221 C	X	X				

* SEE TABLE 3-1 FOR ANALYTICAL PARAMETERS

Table 3-2 (CONT.)
ANALYTICAL PARAMETERS FOR SOIL SAMPLING LOCATIONS
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY

SAMPLE LOCATION	PP Metals	PP VOA + 15	PP Semi-VOA+25	PP Pest/PCB	Total Phenols	Cyanide
TP 222 A	X					
TP 222 B *						
TP 222 B'	X					
TP 222 C	X	X				
TP 223 A	X		X	X	X	X
TP 223 B *						
TP 223 C	X	X				
TP 224 A	X		X	X	X	X
TP 224 B *						
TP 224 C	X	X				
TP 225 A	X					
TP 225 B *						
TP 225 B'	X	X				
TP 225 C	X	X				
TP 226 A	X					
TP 226 B	X	X	X	X	X	X
TP 226 C	X	X				
TP 227 A	X					
TP 227 B	X	X	X	X	X	X
TP 228 A	X					
TP 228 B	X	X	X	X	X	X

* SEE TABLE 3-1 FOR ANALYTICAL PARAMETERS

**Table 3-2 (CONT.)
ANALYTICAL PARAMETERS FOR SOIL SAMPLING LOCATIONS
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY**

SAMPLE LOCATION	PP Metals	PP VOA + 15	PP Semi-VOA+25	PP Pest/PCB	Total Phenols	Cyanide
TP 229 A	X					
TP 229 B	X	X	X	X	X	X
TP 229 C	X	X				
TP 230 A	X					
TP 230 B	X	X	X	X	X	X
TP 230 C	X	X				
TP 231 A	X					
TP 231 B	X	X	X	X	X	X
TP 231 C	X	X				
TP 232 A	X					
TP 232 B	X	X	X	X	X	X
TP 232 C	X	X				
TP 233 A	X					
TP 233 B	X	X	X	X	X	X
TP 233 B'	X					
TP 233 C	X	X				
TP 234 A	X					
TP 234 B	X	X	X	X	X	X
TP 234 B'	X	X				
TP 234 C	X	X				

* SEE TABLE 3-1 FOR ANALYTICAL PARAMETERS

and depths were mutually agreed upon by the USEPA ,the NJDEP, the KOP technical committee, and ERM. A remaining deep well was installed across the Great Egg Harbor River on 29 July 1988.

Hardin-Huber Inc., of Crofton, Maryland drilled and constructed the 20 ground water monitoring wells and an observation piezometer. Eastern Drilling Inc. of Woodbury Heights, New Jersey drilled and constructed well MW-28D across the Great Egg Harbor River during the period of 27 July through 29 July 1988. All deep monitoring wells were drilled using the mud rotary method, while all shallow wells were installed using six-inch hollow stem augers. In all, a total of 21 monitoring wells and one observation well were installed at the KOP site in 1988. Each new well and the seven previously installed wells were assigned a number one through twenty-eight and modified with a letter suffix indicating the following approximate depths:

- S - shallow (0 - 25)
- i - Intermediate (50 - 60 feet)
- D - Deep (90 feet)

To eliminate cross contamination between wells, the rig-mounted drill pipe and augers were steam cleaned after the completion of each boring. Also, prior to constructing each well, the well casing and well screen was steam cleaned. All decontamination wash water was collected in a temporary plastic lined pit constructed on site. All wash water collected in the pit was pumped into 55 gallon drums and staged on site.

An ERM hydrogeologist was present at all times to supervise well installation and to interpret geologic core samples. An NUS Corporation oversight contractor and a geologist from the NJDEP observed most of the well installations.

Well cuttings and drilling fluids were contained in 55-gallon drums and periodically tested with an OVA by the supervising ERM

hydrogeologist. If a positive instrument response above background was detected from the well cuttings or drilling fluids, the well cuttings and drilling fluids were contained in 55-gallon drums and staged on-site near the equipment decontamination area pending remediation. As no response above background was detected, the well cuttings and drilling fluids were transported and discharged into Lagoon No.4 at the KOP site.

With the exception of production well MW-18D and observation well OW-1, all new monitoring wells are constructed of two-inch I.D. Schedule 5 stainless steel casing with ten feet of 0.010 slot size, Schedule 05 wire wrap, and stainless steel well screen. MW-18D was constructed using four-inch I.D. 0.020 slot stainless steel screen and casing. Piezometer OW-1 was constructed of 1.25-inch I.D. 0.010 slot PVC screen and casing. Approximately three feet of casing extends above the ground surface on all wells. Figure 3-3 shows the well construction design used at the KOP site. To prevent infiltration of surface runoff and to provide security, steel protective casing with hinged and locking caps were cemented into place over the new wells.

The wells were constructed using modified specifications approved by the NJDEP. Schedule 40 stainless steel is routinely specified by the NJDEP for monitoring wells greater than 50 feet in depth. However, Schedule 5 stainless steel well casing was approved by the NJDEP and USEPA for use instead of Schedule 40.

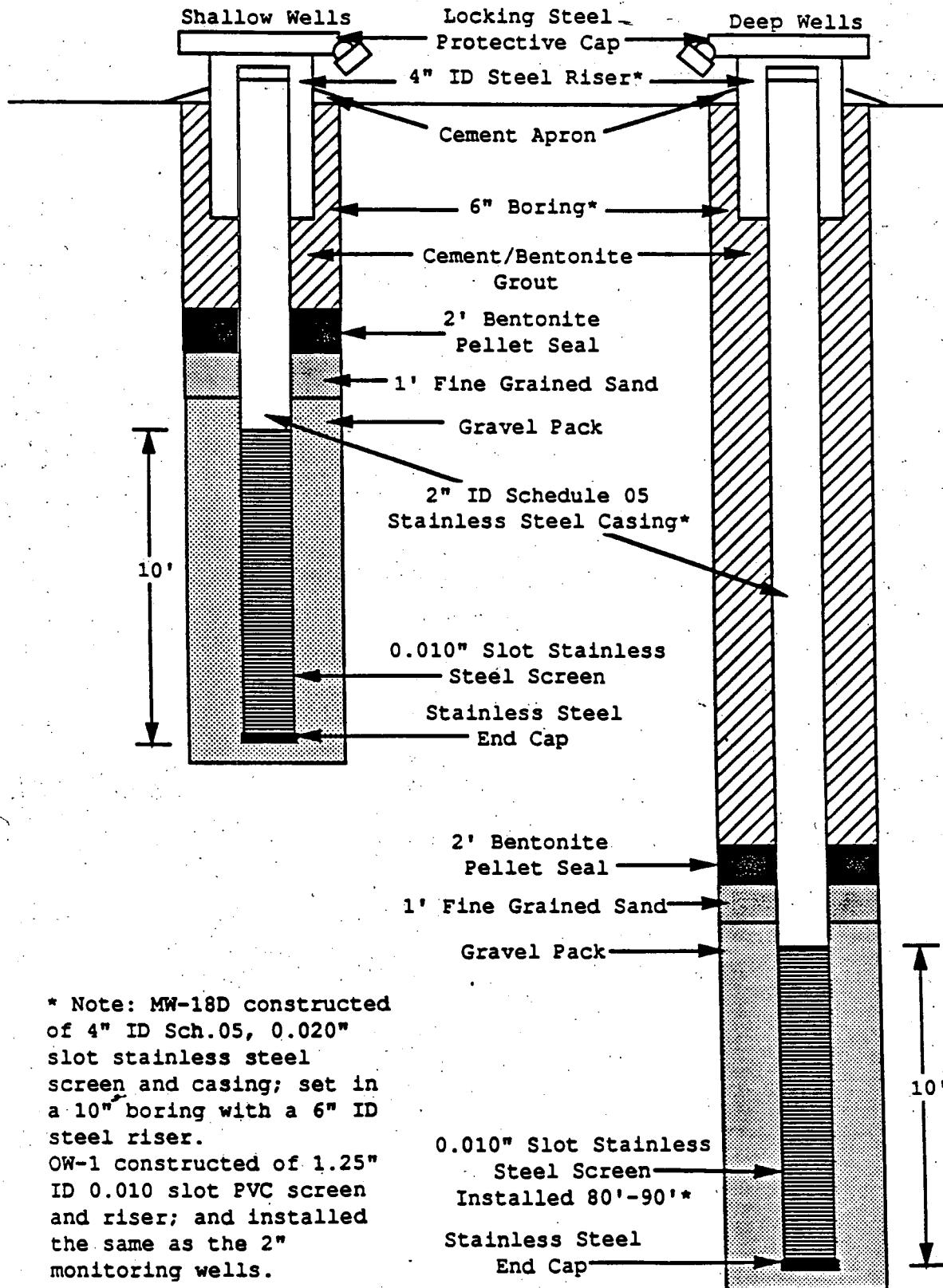
Upon completion, each newly installed ground water monitoring well was developed by air surge techniques using an air compressor equipped with an oil/grease filter. Development was considered complete once all fine silty sand was removed and the water in each well displayed stabilized pH, temperature, and specific conductance values.

All of the ground water displaced during well development was contained in 55-gallon drums. In addition, the water was screened

Figure 3-3

Typical Monitoring Well Construction Schematic

King of Prussia Technical Corporation Site Winslow Township, New Jersey



W06

70402-15

Drawn by / Date: D.L 12/12/88

Revised by / Date: E.J.K 12/16/88

Checked by / Date: J. LaRegina 12/12/88

Checked by / Date: J.L.R. 12/16/88



with an OVA by an ERM hydrogeologist. As no response above background was obtained, the drummed water was pumped from the well head to Lagoon No. 4.

The lower screened zone of existing well MW-7S was sealed by ERM as required in the work plan using bentonite pellets. The screen in the upper subzone remains open to the aquifer, thus converting this well to a shallow subzone monitoring well (MW-7S).

The casing elevation and location of each monitoring well, including all of the wells installed as part of the initial remedial investigation, were surveyed by James M. Stewart, Inc., a New Jersey licensed surveyor. Table 3-3 contains the monitoring well construction details.

3.4.3 Geologic Sampling

Split spoon samples were collected and the lithologies were described at five foot intervals from all monitoring well borings, with the exception of exploration boring 17 (17EB). Continuous split spoon samples were collected and described from exploration boring 17 from 60 to 150 feet to determine if a six-foot thick clay confining layer was present. Organic vapor analysis, using a portable organic vapor analyzer equipped with a flame-ionization detector, was performed on each split spoon sample obtained. The collection of undisturbed in-situ cores of clay using Shelby Tubes was proposed for the four initial exploratory borings (14EB, 16EB, 17EB, and 24EB) if a confining clay layer was present as determined from split spoon samples. A confining clay layer was defined for the purposes of field testing in the approved Supplemental Work Plan as a six foot minimum interval of nearly continuous clay with a hydraulic conductivity of 10^{-7} cm/sec or less.

Interfingered stringers of sandy, grey clay, were found in the split spoon samples from a majority of the monitoring wells, but

TABLE 3-3
MONITORING WELL CONSTRUCTION DETAILS
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY

MONITOR WELL NUMBER*	DEPTH TO BOTTOM OF BORING FEET (BLS)	SCREEN INTERVAL TOP/BOTTOM FEET (BLS)	TOP OF SS CASING ELEVATIONS FEET (MSL)
MW-1S	18	13/18	96.73
MW-2i	58	53/58	97.31
MW-3S	23	18/23	90.03
MW-4i	53	48/53	90.69
MW-5S	23	18/23	89.52
MW-6i	58	53/58	89.09
MW-7S**	53	13/18	94.90
MW-8D	90	80/90	90.53
MW-9S	18	8/18	92.04
MW-10D	90	80/90	92.17
MW-11S	18	8/18	94.76
MW-12D	90	80/90	94.27
MW-13S	17	6/16	93.27
MW-14D	100	80/90	97.03
MW-15S	16	6/16	92.09
MW-16D	100	80/90	90.05
MW-17S	21	10/20	96.24
MW-18D	91.5	81.5/91.5	91.17
MW-19S	21.5	11/21.5	91.28
MW-20D	90	80/90	86.47
MW-21S	18	8/18	84.13
MW-22D	91	81/91	93.55
MW-23S	20	10/20	92.68
MW-24D	100	80/90	97.30
MW-25S	30	20/30	97.97
MW-26D	90	80/90	87.46
MW-27S	22.5	11.5/21.5	87.86
MW-28D	90	80/90	82.51
OW-1	90	80/90	91.86

NOTE:

*S = Shallow

i = Intermediate

D = Deep

**MW-7S was initially installed as a two screen well. It has been subsequently grouted to a depth of approximately 25 feet BLS with a single screen as indicated above.

not at sufficient continuous thickness (6 feet) to meet the definition of a clay confining layer as defined in the Supplemental Work Plan. Since a confining clay layer (as defined in the Supplemental Work Plan) was not encountered, Shelby-Tube samples were not collected. However, as discussed in Section 4, the presence of a confining unit was subsequently indicated by the borehole geophysical and lithological logging techniques. Appendix C contains the geologic and construction logs of all monitoring wells installed during both phases of the RI.

3.4.4 Borehole Geophysics

Prior to constructing each new deep monitoring well, ERM logged each borehole with a geophysical logger provided by Century Geophysical Corporation of Tulsa, Oklahoma. The geophysical sonde used during the logging of the boreholes included gamma ray, spontaneous potential (SP), and resistivity. In addition, continuous velocity (sonic), and caliper logs were run on selected wells. Appendix D includes copies of the geophysical logs generated in the field. These data indicated that the stratigraphic sequence beneath the site includes an upper aquifer and a lower aquifer, separated by a confining unit (see Section 4). Other hydrogeologic data collected during the investigation confirmed this interpretation.

3.4.5 Slug Tests

Slug tests were attempted on MW-10D and MW-14D. An In-Situ Hermit® data logger with a 10 psi transducer was introduced into the well and securely fastened in order to monitor static water level changes during the test. A clean 10-foot section of one inch PVC pipe filled with clean sand was introduced into the well to displace the water. The data logger was switched on to record the water table elevation as it returned to static conditions. Because of the coarse nature of the sediments it was expected that the level would return to at least 90% of its initial level within

ten minutes. The slug would then be withdrawn and the data logger then would record the return of the water table to static conditions. However, because of the rapid nature of recovery in the wells, useful data was not obtained. The data was not useful because the oscillations of water in the well, caused by the introduction of the slug, masked the recovery response. After several attempts, ERM decided to postpone the tests until a suitable alternative could be developed. Upon review of the initial groundwater quality data collected during the first sampling event, the USEPA subsequently agreed that the pump test alone would suffice in characterizing the hydraulic properties of the lower subzone aquifer.

3.4.6 Synoptic Water Level Measurements

Two rounds of synoptic (i.e. effectively simultaneous) water level measurements were collected from all monitoring wells and the staff guage set in the Great Egg Harbor River. Each round was collected over a two hour interval. Measurements were collected using a hand held battery operated depth-to-water meter. Two successive measurements were obtained from each well, and if a difference of greater than 0.02 feet was observed between the two readings, the measurements were discarded and new measurements obtained. The two acceptable measurements were then averaged and subtracted from the top of casing elevation to determine the elevation of the groundwater surface in the well. At the end of the two hour period, the first four wells that were measured were re-measured to determine if any significant change in ground water conditions had occurred during the course of the test.

3.4.7 Aquifer Test

The objective of the aquifer test was to conduct a site specific characterization of the hydraulic properties of the lower subzone aquifer. Because of the highly permeable nature of the subsurface geologic conditions, the pump test was conducted for a 24-hour

period, in order to effect a reasonable drawdown for aquifer analysis.

The aquifer test for the KOP Site was conducted by ERM in two phases:

- Step Drawdown Test to Select the Pumping Rate; and
- Implementation of the Aquifer Test.

Two days before the actual pump test, a step drawdown test was conducted in order to establish the pumping rate for the test. This short duration test of less than two hours involved pumping the designated pumping well, MW-18D, at various pumping rates. A Grundfos four-inch diameter, single phase, three horse power stainless-steel submersible pump was used during the entire aquifer test. After the initial pumping rate was established, the rate was stepped up incrementally until the maximum sustainable yield of ninety-seven (97) gallons per minute was reached. This is the flow rate which was used to conduct the aquifer test.

The second and final phase of the program was the actual implementation of the aquifer test. As specified in the Work Plan, MW-18D was pumped with OW-1, MW-5S, MW-6i, MW-8D, MW-19S, MW-20D, and MW-21S used as the observation wells. MW-18D is a deep well, screened within what proved to be the first confined aquifer beneath the test area. This configuration provided critical hydraulic information on the confined aquifer, as well as leakage data from the confining unit separating the shallow and deep wells.

As with the step drawdown test described above, the Grundfos pump was installed in MW-18D. The pump was installed at a depth well below the maximum drawdown measured during the step drawdown test and connected to the surface with flexible, decontaminated polyethylene tubing. The polyethylene tubing was then connected in series to a PVC flow control valve, a Rockwell International

flow meter, and approximately 400 feet of interconnected flexible fire hose (the discharge hose). Based upon preliminary laboratory analysis of the water quality of a sample from MW-18D, ERM and USEPA decided that the discharge water could recharge into the ground. To avoid the possible hydraulic influence of this artificial recharge on the aquifer system, the discharge was directed 400 feet north of MW-18D, in a direction and distance furthest away from the observation wells. As an additional note, precipitation did not occur in the 24-hour period preceding the test.

Prior to starting the aquifer test, static water level measurements were recorded for the pumping well and all of the observation wells. Water level measurements were obtained at this time and throughout the aquifer test both manually, using a depth-to-water meter, and through the conjunctive use of Hermit Data Loggers. The manual measurements were taken on the hour and used to back up the data obtained by the Hermit Data Logger.

The aquifer test began at 3:35 p.m. on 6 October 1988 with the start of the pump in MW-18D. A sustained flow rate of 97 g.p.m. was immediately established and sustained consistently for the duration of the pumping portion of the aquifer test. The pumping portion of the aquifer test continued for 24 hours, until 3:35 p.m. on the afternoon of 7 October 1988. At that time, the pump was shut off and the aquifer test was continued in order to allow for the measurement of the recovery of the aquifer. The recovery portion of the aquifer test was continued for six hours until 9:35 p.m. on the night of 7 October 1988.

After the field portion of the aquifer test was completed, the compiled data was transmitted to a computer for storage and analysis.

3.5 Ground Water Sampling

3.5.1 Purpose and Scope

The objectives of the ground water sampling program were to:

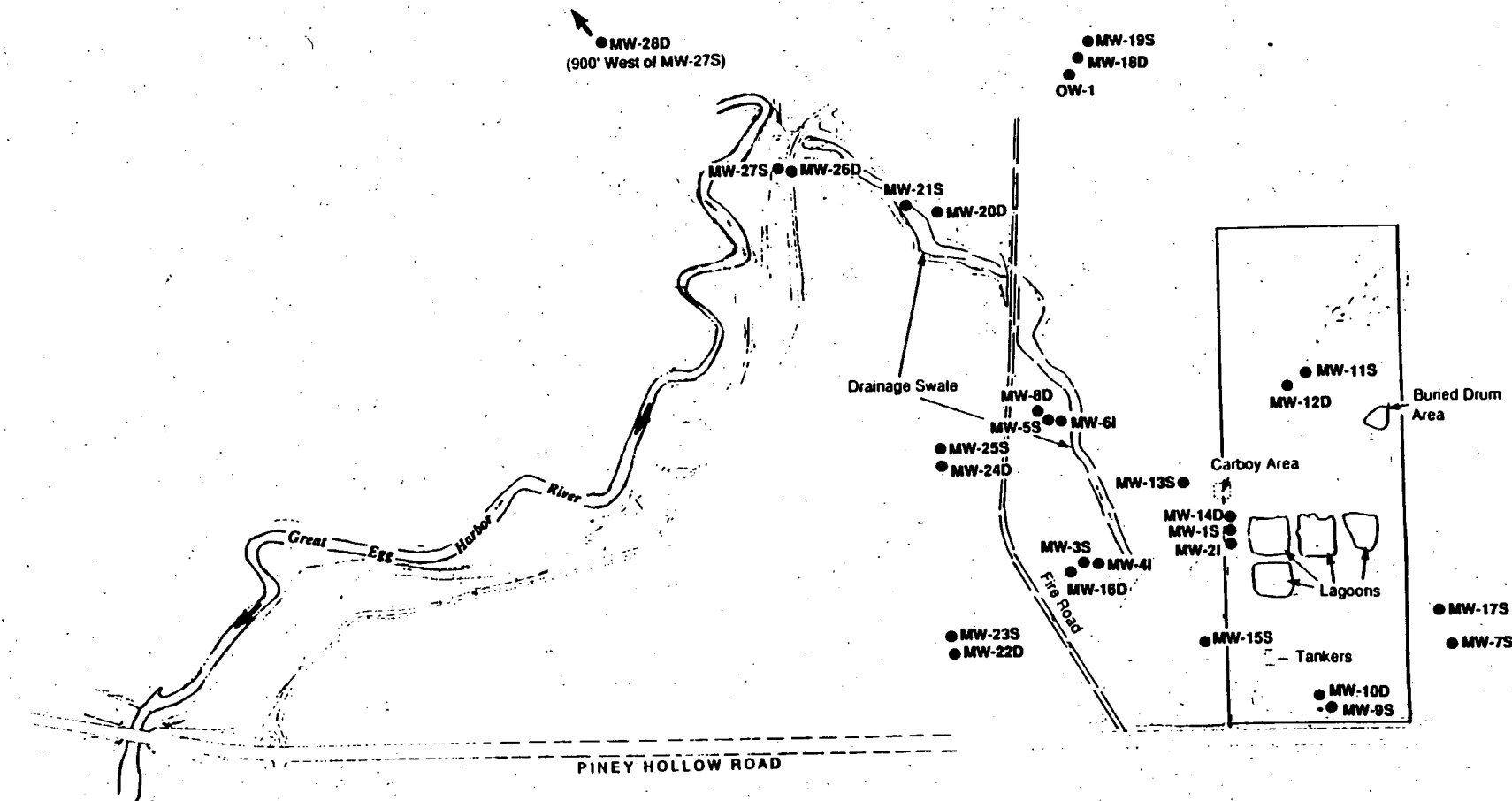
- Identify and evaluate the lateral and vertical extent of ground water contamination from on site source(s) in ground water beneath the site and off-site; and
- Characterize the nature of organic and inorganic contaminants in ground water.

These objectives were pursued through the sampling and laboratory analysis of ground water samples collected from the twenty-eight monitoring wells shown in Figure 3-4 and Plate 1. Two nearby water supply wells, located in a generally downgradient direction from the site, at the Johnson-Matthey Plant and at the Regional Field Office of the NJDEP Division of Fish, Game, and Wildlife respectively, were also sampled (see Figure 1-1). Ground water samples from these two wells were analyzed for Priority Pollutant metals and Priority Pollutant VOA +15.

3.5.2 Ground Water Sampling Methods

All ground water sampling was conducted by a team consisting of an ERM hydrogeologist and an ERM sampling technician. USEPA oversight of the ground water sampling program was provided by the NUS Corporation. An NUS field technician was present for most of the ground water sampling events, documenting sampling protocol and obtaining a predetermined selection of split samples. All samples were collected by ERM, using the same field protocol and procedures throughout; however, NUS was responsible for the handling, shipment, and analysis of their own samples.

Figure 3-4)
Ground Water Sampling Locations
King of Prussia Technical Corporation Site
Winslow Township, New Jersey



EXPLANATION

- MW-12D ● Monitoring Well Location
- S - Shallow
- I - Intermediate
- D - Deep

Based on the analysis of previously collected ground water samples, ground water sampling was conducted in order of anticipated increasing contamination levels, thus minimizing the potential for cross-contamination. At each sampling site (i.e. monitoring well or water supply well) the field protocol is described in the following manner:

1. All field equipment-including pumps, sampling support equipment, and health and safety equipment was mobilized. Any health and safety procedures were implemented as well as the preparation and calibration of field equipment or instruments, as needed. Non-disposable equipment used directly in sampling, or having direct contact with the well or well water, was decontaminated prior to mobilization at the designated on-site decontamination area.
2. After this initial preparation was complete, the well was opened and a headspace reading taken with an OVA meter. Before proceeding, these readings were recorded and any adjustments to the Health and Safety Plan were applied accordingly.
3. Prior to sampling, each well was purged of at least three well volumes, continuing until the specific formation water characteristics (i.e. pH, temperature, and specific conductance) were stabilized. Ground water was purged from the two-inch diameter wells using a gas-operated, suction lift, Tanaka pump. An electric submersible pump was used to purge MW-18D. The water supply wells were purged by opening their respective supply lines and allowing a sufficient period of free flow. Discharge water from the monitoring wells was collected in 55-gallon drums, transported back to the site, and disposed into Lagoon No 4.
4. After purging was completed, ground water was obtained from the wells with a decontaminated, stainless steel bailer.

Sample water was transferred into appropriate containers, filtered and/or preserved in accordance with the QAPP.

3.5.3 Ground Water Sample Analysis

Ground water sampling was completed during two major sampling events. The first event was conducted during July, 1988 and required the initial sampling of seven wells as outlined in the Work Plan. Complete Priority Pollutant analyses of the samples from these wells were to be used to establish ground water indicator parameters for the site. Based upon discussions with the USEPA, all parties agreed that the original list of seven wells could be modified. Substitutions were made based upon evidence of possible contamination discovered during the well installation.

The first seven wells to be sampled included MW-11S, MW-13S, MW-15S, MW-17S, MW-18D, MW-22D, and MW-26D. Following review and validation of the data, ERM prepared a recommended list of indicator parameters for the remaining 21 wells, including Priority Pollutant metals and Priority Pollutant + 15 volatile organic compounds. After reviewing the recommended parameter list, the USEPA requested that Priority Pollutant semi-volatile compounds be analyzed in samples from four selected wells. Table 3-4 lists the wells and the respective analyses performed on these samples.

3.6 Surface Water and Sediment Sampling

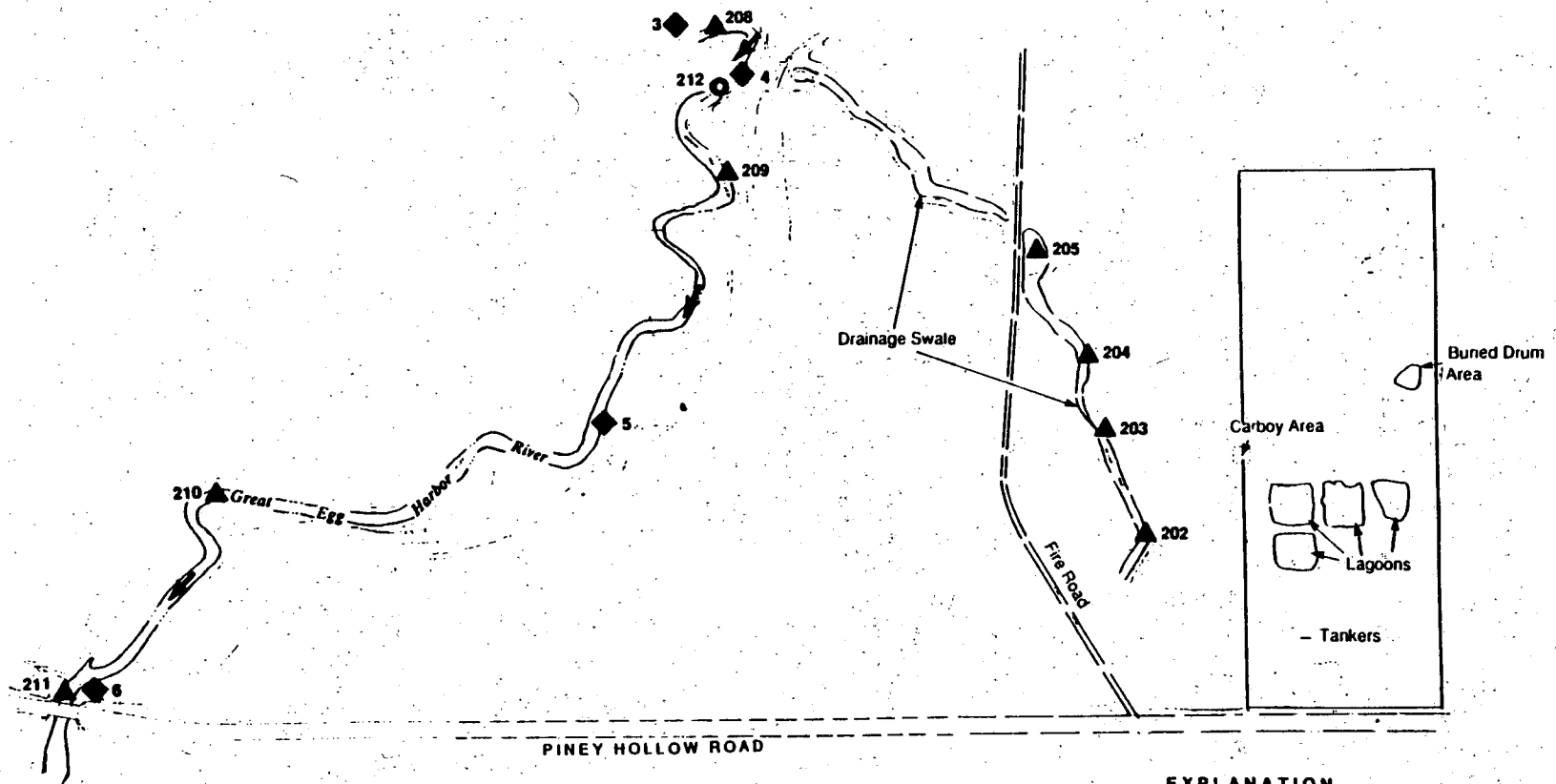
3.6.1 Purpose and Scope

A total of eight surface water and nine sediment samples were collected from the Great Egg Harbor River and the drainage swale leading from the site to the River. Sampling locations are shown in Figure 3-5 and Plate 2. The purpose of this sampling task was to provide data to:

Table 3-4
ANALYTICAL PARAMETERS FOR GROUND WATER SAMPLING LOCATIONS
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY

SAMPLE LOCATION	PP Metals	PP VOA + 15	PP Semi-VOA+25	PP Pest/PCBs	Total phenols	Cyanide
MW-1S	X	X	X			
MW-2i	X	X				
MW-3S	X	X	X			
MW-4i	X	X			X	X
MW-5S	X	X	X			
MW-6i	X	X				
MW-7S	X	X				
MW-8D	X	X				
MW-9S	X	X				
MW-10D	X	X				
MW-11S	X	X	X	X	X	X
MW-12D	X	X				
MW-13S	X	X	X	X	X	X
MW-14D	X	X				
MW-15S	X	X	X	X	X	X
MW-16D	X	X				
MW-17S	X	X	X	X	X	X
MW-18D	X	X	X	X	X	X
MW-19S	X	X	X			
MW-20D	X	X				
MW-21S	X	X				
MW-22D	X	X	X	X	X	X
MW-23S	X	X				
MW-24D	X	X				
MW-25S	X	X				
MW-26D	X	X	X	X	X	X
MW-27S	X	X				
MW-28D	X	X				
Johnson-Matthey Inc.	X	X				
NJ Fish & Game	X	X				

Figure 3-5
Surface Water and Sediment
Sampling Locations
 King of Prussia Technical Corporation Site
 Winslow Township, New Jersey



EXPLANATION

- 202 ▲ Surface Water and Sediment Sampling Location - ERM
- 212 ○ Sediment Sampling Location
- 3 ◆ Surface Water and Sediment Sampling Location - SMC

- characterize Great Egg Harbor River water and bottom sediment chemistry; and
- characterize the chemistry of drainage swale waters (either flowing and/or ponded) and sediments.

3.6.2 Surface Water and Sediment Sampling Methods

Surface water and sediment samples from the Great Egg Harbor River were collected starting at the intersection of Piney Hollow Road and the River, and moving progressively upstream. A small motor boat was used to transport ERM personnel and sampling equipment along the river. At each sampling location, the boat was anchored, and the motor shut off. Samples were taken from the river off the upstream end of the boat, away from the motor. At each sample station, the surface water sample was collected first, and the sediment sample second, to avoid inducing turbidity in the water sample. At most river sampling locations, samples were composited from discrete water and sediment samples obtained from left, center, and right channel verticals. A stainless steel Kemmerer sampler lowered 6 to 18 inches below the water surface was used to collect water samples. An Eckman dredge sampler was used to collect surficial bottom sediment samples. Due to equipment failure, the sediment sample for river station 208 had to be obtained by hand using a stainless steel spoon.

Water was poured directly into sample jars proportionally from each sampling vertical. Sediment was removed from the dredge and placed in sample jars using stainless steel spoons. To prevent cross-contamination, all sampling equipment was properly decontaminated between samples, according to the specifications outlined in the QAPP.

Swale surface water and sediment sample pairs were collected only at those locations (202, 203, 204 and 205) where ponded water was

observed. Since no flow was seen in the swale, even during observed rainy periods, it was not possible to take samples of flowing water in the drainage swale. Water sample bottles were filled by lowering them directly into the ponded water. Stainless steel spoons were used to scoop sediment off the swale bottom and into the sample jars.

3.6.3 Analytical Parameters

Surface water samples were analyzed for either complete Priority Pollutants +40, or for only Priority Pollutant metals, depending upon location. Also depending on the location, sediment samples were analyzed for either Priority Pollutant metals, or Priority Pollutant +40 minus volatiles. Table 3-5 summarizes the sample locations and specific analyses performed.

3.7 Sample Preparation, Preservation and Storage

Prior to collecting a sample and between sampling locations the following decontamination procedure was used.

- . Non-phosphate soap scrub
- . Tap water rinse
- . Nitric acid (10%) rinse
- . Tap water rinse
- . Methanol rinse
- . Hexane rinse
- . Deionized water rinse
- . Air dry
- . Foil wrap

This procedure was applied to the following equipment used in the sampling of the various sample matrices:

- . Stainless steel spoons
- . Stainless steel hand auger

Table 3-5
ANALYTICAL PARAMETERS FOR SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY

SAMPLE LOCATION	PP Metals	PP VOA + 15	PP Semi-VOA+25	PP Pest/PCB	Total Phenols	Cyanide
SWALE: WATER						
SW 202	X					
SW 203	X					
SW 204	X					
SW 205	X	X	X	X	X	X
SWALE: SEDIMENT						
SD 202	X					
SD 203	X					
SD 204	X					
SD 205	X		X	X	X	X
RIVER: WATER						
SW 208	X	X	X	X	X	X
SW 209	X					
SW 210	X					
SW 211	X	X	X	X	X	X
RIVER: SEDIMENT						
SD 208	X		X	X	X	X
SD 209	X					
SD 210	X					
SD 211	X		X	X	X	X
SD 212	X					

- . Stainless steel bailer
- . Eckman dredge
- . Kemmerer sampler
- . Millipore filter

Aqueous samples from the surface water and ground water sampling events were collected and preserved according to the following procedures as outlined in the Supplemental Work Plan:

Metals	0.45 micron filter*, HNO ₃ to pH <2
VOA	HCL to pH <2 (except for surface water samples)
Cyanide	NaOH to pH >12
Phenols	H ₂ SO ₄ to pH <2

- * Applies to groundwater samples only. Dissolved metals were determined for ground water samples; total metals were determined for surface water samples.

All samples from both aqueous and solid phase were packed in styrofoam coolers with frozen blue ice packs to maintain sample temperature at four degrees Centigrade. ERM traffic reports were completed to accompany the samples to the laboratory. Chain-of-custody forms and legal seals were used to document possession of the samples through delivery to the laboratory. The coolers were shipped daily, whenever possible, using overnight express courier. The samples were then analyzed by CompuChem Laboratories of Research Triangle Park, North Carolina.

SECTION 4

RESULTS OF THE FIELD INVESTIGATION

4.1 Site Geology/Hydrogeology

A total of 28 shallow and deep monitoring wells were installed to characterize subsurface hydrogeologic conditions. Four of the wells were initially installed as deep exploratory borings in an attempt to identify a locally continuous clay layer which would serve as a confining unit to prevent the downward migration of contaminants. The first boring installed was exploratory boring 17 (17 EB). This boring, taken to a depth of 150 feet, failed to encounter a clay layer as operationally defined in the Work Plan i.e., a continuous 6-foot thick layer. In accordance with the Work Plan, subsequent exploratory borings (which were later converted into monitoring wells MW-14 D/EB, MW-22 D/EB, and MW-26 D/EB) were advanced to a depth of 100 feet each. Likewise, these borings failed to encounter an operationally-defined significant clay layer.

The subsurface cores from each of the exploratory borings and all deep monitoring well borings (except MW-28D) were logged by the on-site geologist from split spoon samples collected at 5 foot intervals, beginning at prescribed depths as outlined in the Work Plan. For maximum control, 17 EB was logged continuously between 60 and 150 feet. A series of borehole geophysical logging tests was performed on each exploratory boring and deep monitoring well boring, to provide a continuous interpretation of geologic materials. The geophysical logging was verified by ground truth (continuous hand logging) obtained from boring 17 EB.

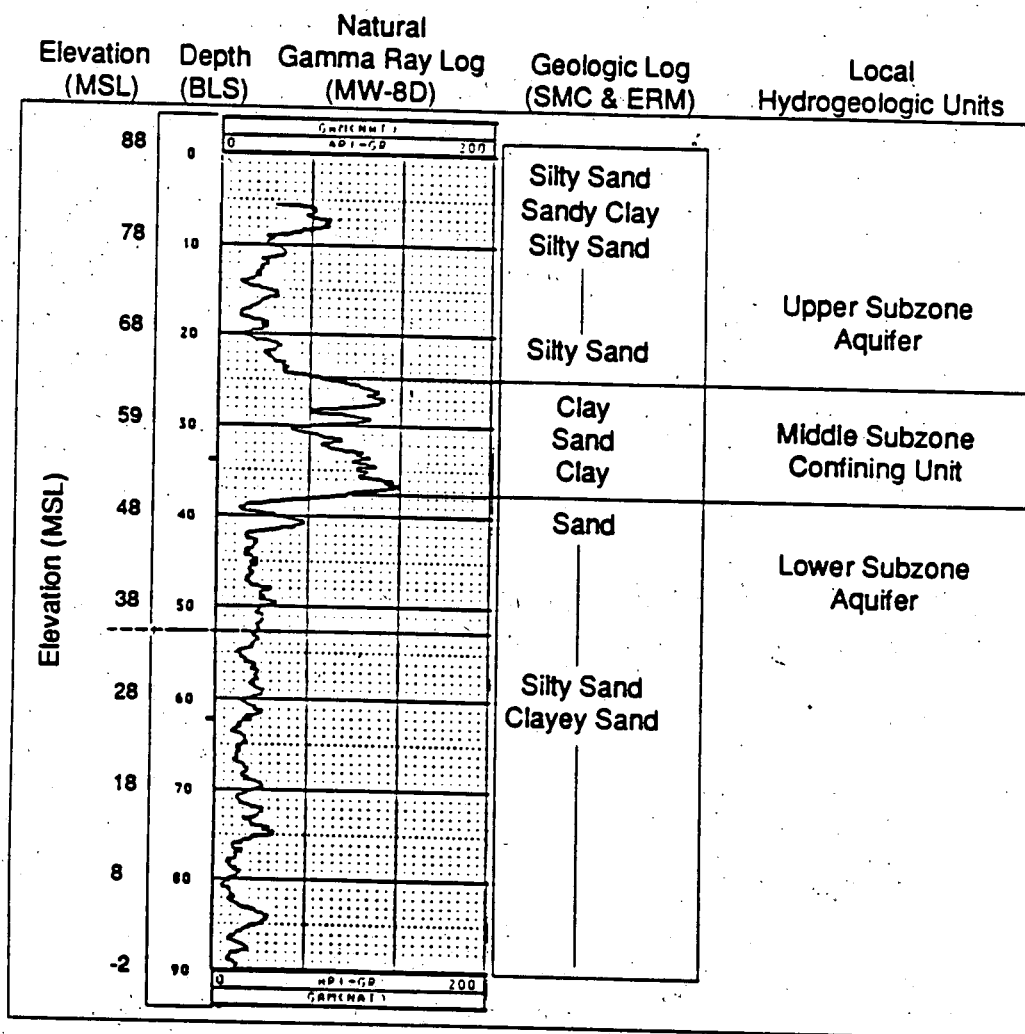
4.1.1 Stratigraphy

The geologic logs developed from the field analysis of core samples did not distinguish an obvious confining clay layer. However, the borehole geophysical logs clearly identified a three-zone stratigraphic sequence. Cross-sections were developed from geological and geophysical logs. Figure 4-1 shows how the gamma-ray log from MW-8D/EB compares with the generalized geologic log, and how the two were stratigraphically interpreted into hydrogeologic subzones. The locations of the cross-sections are provided in Figure 4-2. In order to enhance objectivity in describing the lithologies, the gamma log for each boring was interpreted utilizing the Unified Soil Classification System. The resulting description was then cross checked with the remaining geophysical logs and geologic logs for clarification and fine tuning.

Because of the interfingering and gradation of particle sizes in sedimentary environments, the cross sections were drawn to reflect overall changes in sedimentary textures rather than minor textural changes of limited lateral and vertical extent. Figure 4-3, Section A-A', is oriented NE-SW sub-parallel to the regional strike of the Cohansey Sand. Figures 4-4 and 4-5 represent cross sections B-B' and C-C' respectively and are drawn approximately perpendicular to strike, (i.e. down dip) at locations southwest of the site and the lagoons respectively.

The geologic cross-sections indicate significant interfingering of sand, silt, and clay beneath the study area. However, the presence of three discernable subzones within the Kirkwood-Cohansey Aquifer beneath the site is most evident from the borehole geophysical logs. The three subzones are described below.

Figure 4-1
Interpretation of Borehole Geophysical Log (Typical)
King of Prussia Technical Corporation Site
Winslow Township, New Jersey



Kirkwood-Cohansey Aquifer System

W04

70402-15

Drawn by / Date: D.L. 12/12/88

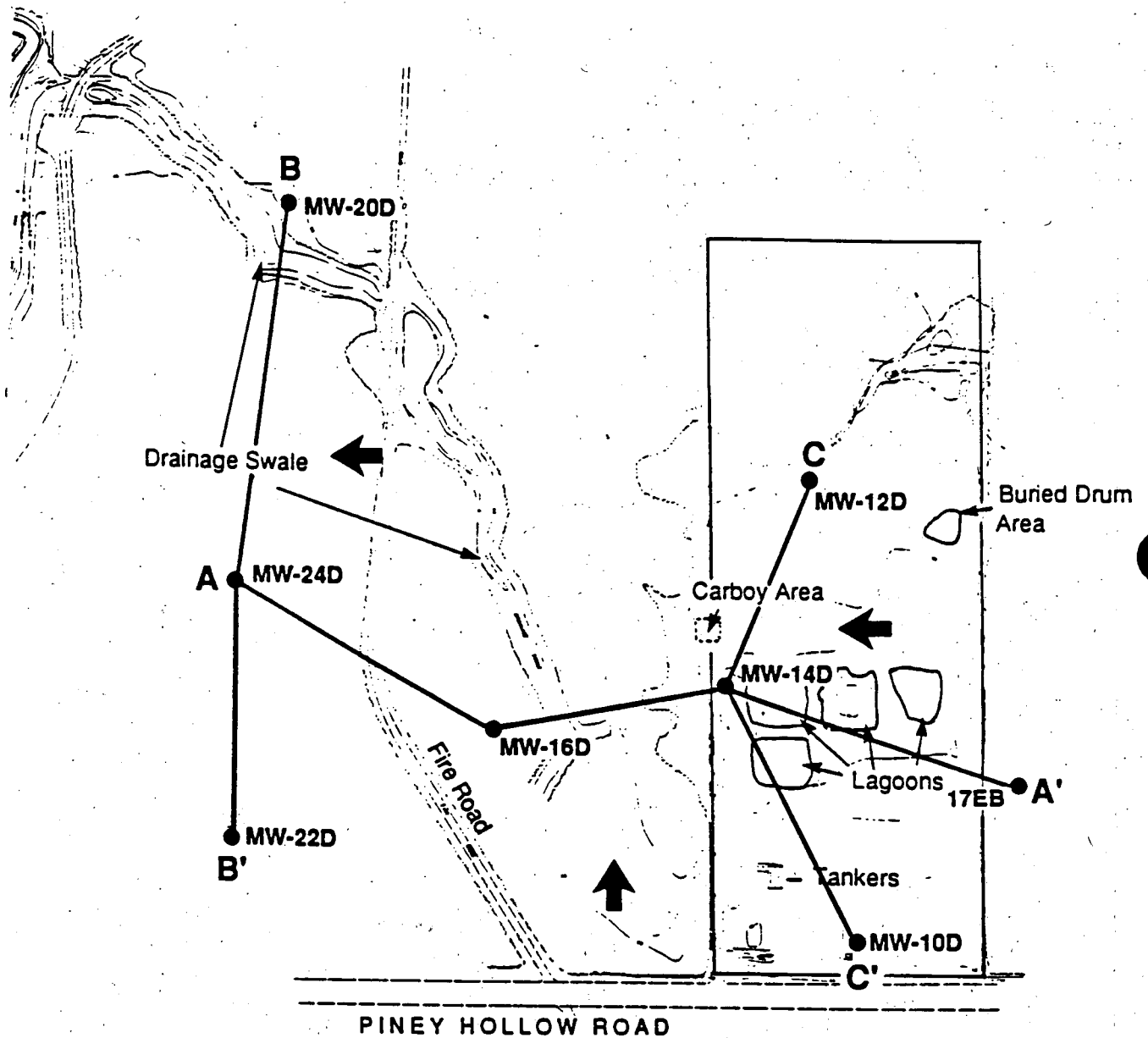
Checked by / Date: J. LaRegina 12/12/88

Revised by / Date:

Checked by / Date:



Figure 4-2
Geologic Cross Section Orientations
 King of Prussia Technical Corporation Site
 Winslow Township, New Jersey



EXPLANATION

A — A' Geologic Cross Section Orientation

← Viewer's Perspective

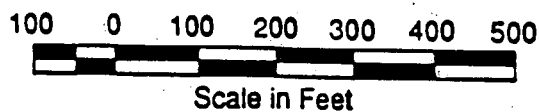


Figure 4-3
Geologic Cross Section A-A'
King of Prussia Technical Corporation Site
Winslow Township, New Jersey

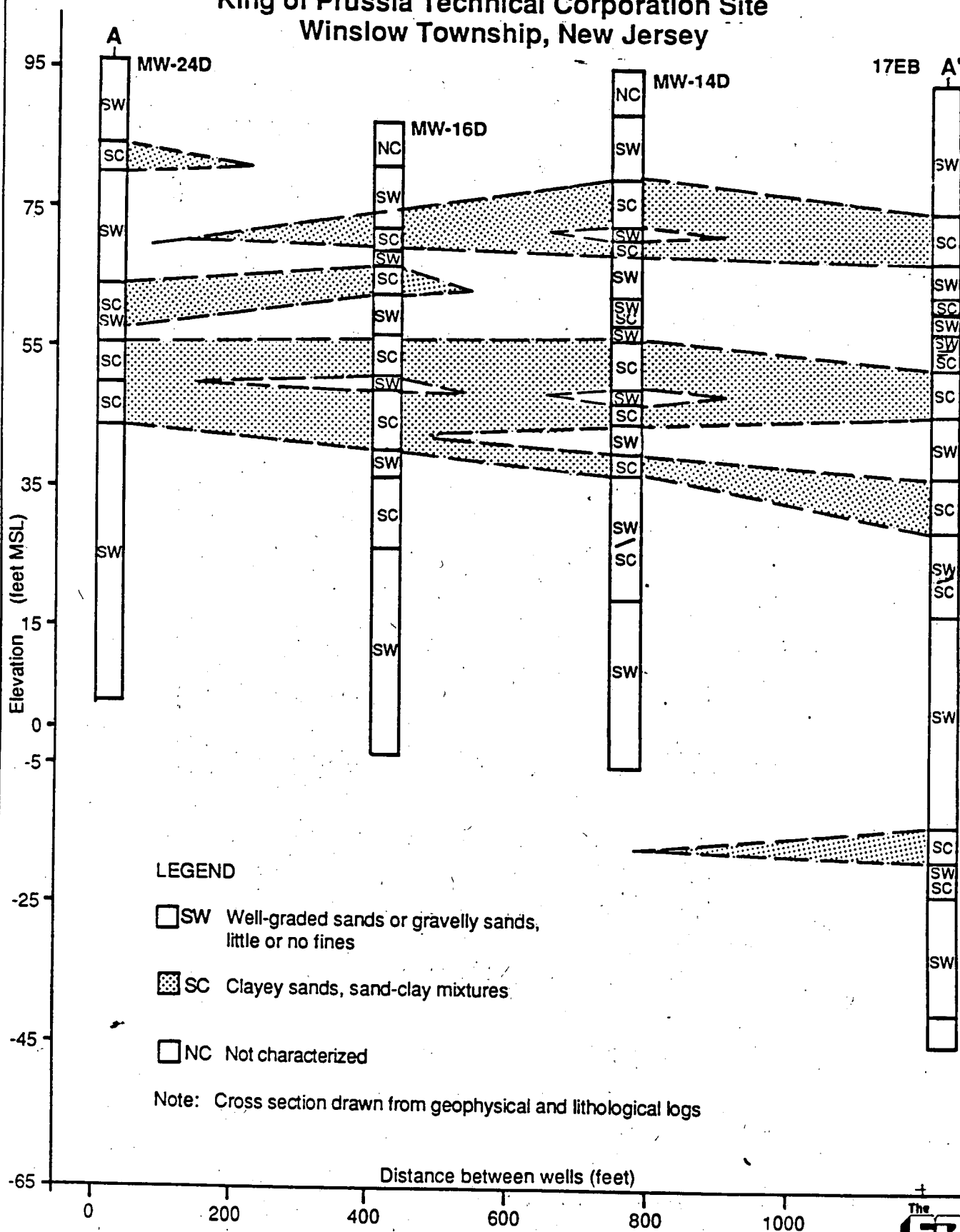


Figure 4-4
Geologic Cross Section B'-B
King of Prussia Technical Corporation Site
Winslow Township, New Jersey

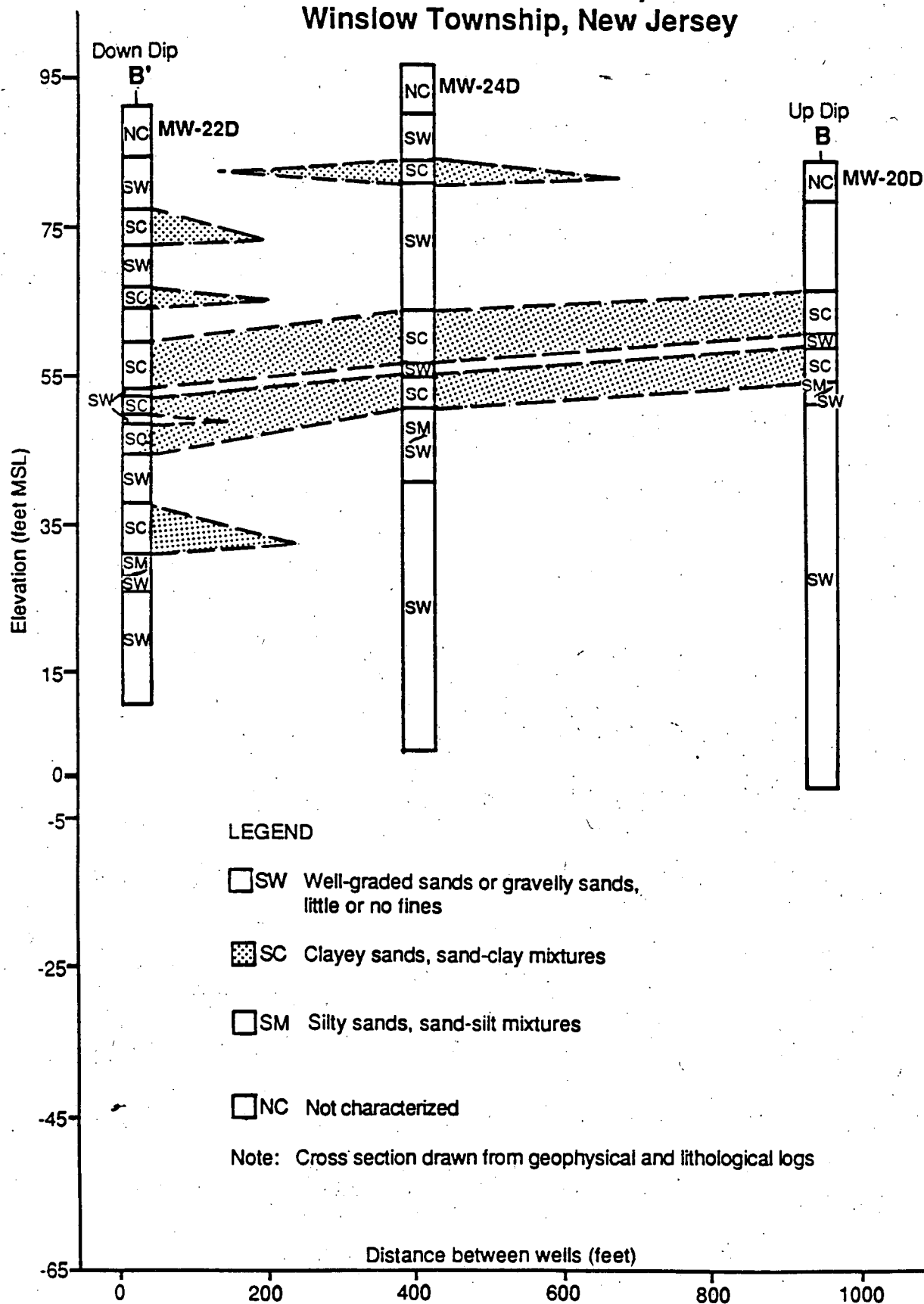
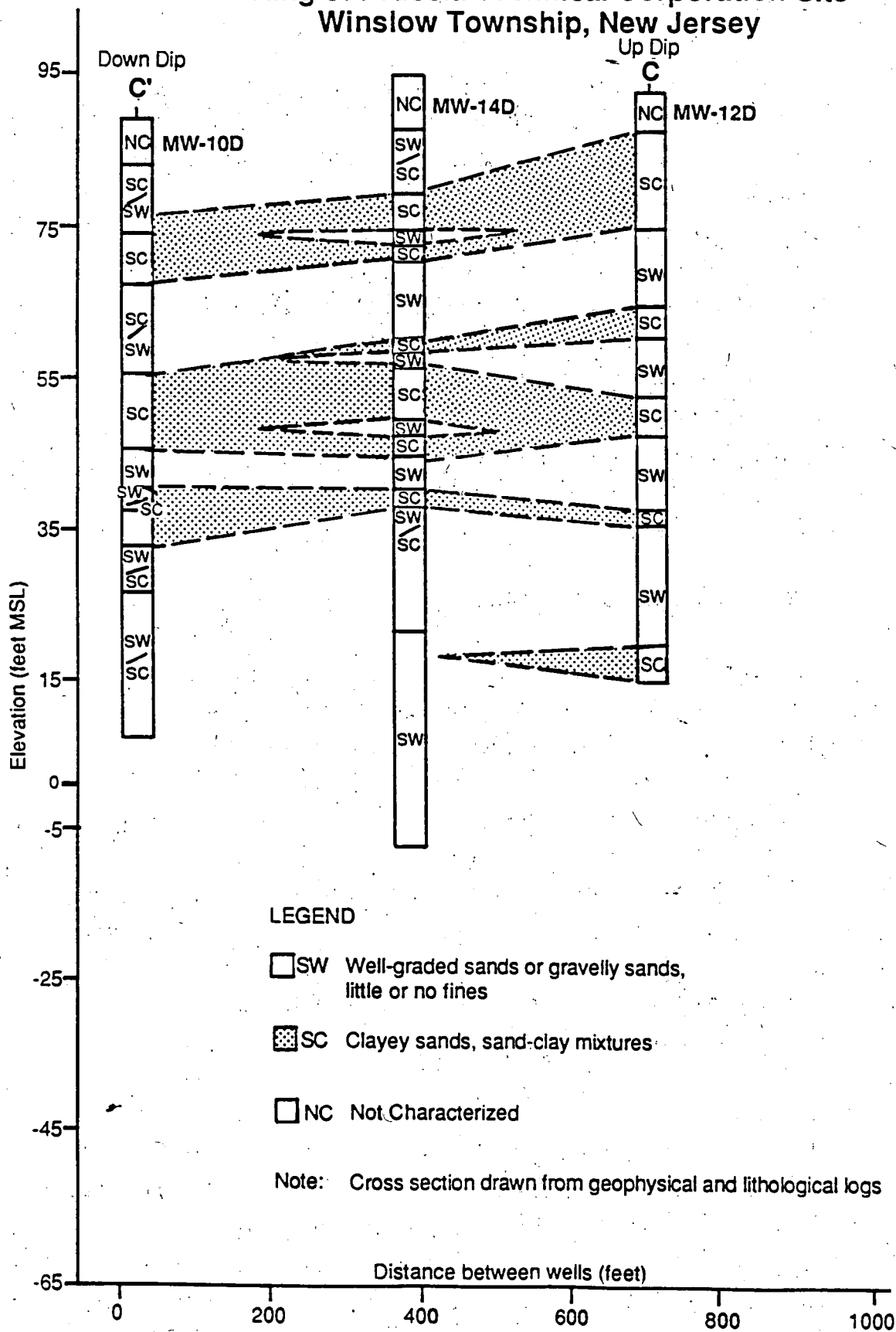


Figure 4-5
Geologic Cross Section C'-C
 King of Prussia Technical Corporation Site
 Winslow Township, New Jersey



Upper Subzone Aquifer

The upper subzone consists of a sand aquifer ranging in depth from the ground surface down to 30-40 feet. The lithology of this interval is described as a tan to light orange well-sorted medium to fine sand with some silt and gravel lenses and tan to brown clayey sand with some fine silt and sand. Significant interfingering of well-sorted sands with some gritty sand and clayey sand is also evident. Section C-C' (Figure 4-5) is located west of the lagoons and indicates the presence of a shallow locally continuous clayey sand layer at a depth of approximately 10 feet and ranging in thickness from 10-12 feet. However, no extensive continuous low permeability layers appear to exist within the 30-40 foot zone that makes up the upper subzone aquifer.

Middle Subzone Confining Unit

Farlekas and others (1976) define a confining bed as "a body of relatively impermeable material stratigraphically adjacent to one or more aquifers. The hydraulic conductivity may range from nearly zero to some value distinctly different from that of the aquifer." The confining bed or unit identified in the middle subzone meets the criteria established for a confining bed by Farlekas. The middle subzone confining unit does consist of relatively impermeable material (clayey sands, sand-clay mixtures) with a vertical hydraulic conductivity (estimated 10^{-5} to 10^{-7} cm/sec) that is distinctly lower than the hydraulic conductivity of the upper and lower subzone aquifers (estimated to be 10^{-2} cm/sec).

The second subzone, hereinafter the middle subzone confining unit, has been interpreted to be present at a depth of approximately 30-40 feet. The composite thickness of this zone ranges from approximately 10-30 feet. This layer consists of tan to light orange sandy clay - silty clay interfingering with medium to fine,

tan-brown sand and small gravel lenses. Based on purely lithologic analysis, this unit would be interpreted as representing a semi-impervious unit. The synoptic water level data, aquifer test results, and water quality data confirm that this layer functions as a confining unit.

Lower Subzone Aquifer

The lower subzone aquifer is located beneath the middle subzone confining unit. This zone is lithologically similar to the upper subzone aquifer, consisting of tan to brown medium to fine well sorted sands with some tan to brown clay and silt lenses. The total thickness of this subzone was not determined in this investigation, but is estimated from existing regional conditions to be approximately 200 feet thick. This subzone is underlain by the regional composite confining unit described by Zapecza (1984).

4.1.2 Synoptic Water Level Measurements

Synoptic water level measurements were obtained on sunny days with no precipitation immediately preceding the measurement. Water level measurements for 6 October and 18 November 1988, are shown in Table 4-1. Table 4-2 presents the data from 6 October generally arranged such that the water levels are shown in the order of decreasing head across the site. Where appropriate, well couplets are arranged so that the respective head differences can be readily compared.

On October 6 1988, the shallow water table in the upper subzone aquifer ranged from a depth of 4 feet (MW-21S) to 11 feet (MW-1S) below land surface. Plate 3 shows the shallow ground water table and deep potentiometric contours for that date. Ground water flow in the shallow subzone aquifer is to the west from the site, toward discharge at the Great Egg Harbor River. A decrease in potentiometric head with distance defines the hydraulic gradient. Looking at the individual components of the water table gradient,

TABLE 4-1
SYNOPTIC WATER LEVEL MEASUREMENTS
KING OF PRUSSIA TECHNICAL CORPORATION SITE
WINSLOW TOWNSHIP, NEW JERSEY

LOCATION	TOP OF CASING ELEVATION ft MSL	10/6/88		11/18/88	
		DEPTH TO WATER ft	WATER TABLE ELEVATION ft MSL	DEPTH TO WATER ft	WATER TABLE ELEVATION ft MSL
MW-1S	96.73	13.66	83.07	14.06	82.67
MW-2i	97.31	17.88	79.43	17.84	79.47
MW-3S	90.03	10.36	79.67	10.39	79.64
MW-4i	90.69	11.79	78.9	11.65	79.04
MW-5S	89.52	10.22	79.3	10.2	79.32
MW-6i	89.09	10.15	78.94	10.2	78.89
MW-7S	94.09	11.97	82.12	12.21	81.88
MW-8D	90.53	11.8	78.73	11.5	79.03
MW-9S	92.04	8.55	83.49	8.74	83.3
MW-10D	92.17	12.59	79.58	12.53	79.64
MW-11S	94.76	11.25	83.51	11.81	82.95
MW-12D	94.27	14.68	79.59	14.64	79.63
MW-13S	93.27	10.86	82.41	10.87	82.4
MW-14D	97.03	17.7	79.33	17.65	79.38
MW-15S	92.09	9.99	82.1	10.47	81.62
MW-16D	90.05	11.29	78.76	11.11	78.94
MW-17S	96.24	12.04	84.2	12.65	83.59
MW-18D	91.17	12.42	78.75	12.23	78.94
MW-19S	91.28	12.29	78.99	12.21	79.07
MW-20D	86.47	7.84	78.63	7.59	78.88
MW-21S	84.13	6.2	77.93	5.95	78.18
MW-22D	93.55	15.15	78.4	14.95	78.6
MW-23S	92.68	13.08	79.6	14.18	78.5
MW-24D	97.30	19.5	77.8	19.45	77.85
MW-25S	97.97	19.78	78.19	19.83	78.14
MW-26D	87.46	9.34	78.12	8.97	78.49
MW-27S	87.68	12.45	75.23	11.97	75.71
MW-28D	82.51	5.01	77.5	4.46	78.05
OW-1	91.86	13.04	78.82	12.9	78.96
RIVER	-	6.85*	73.65	1.61*	78.89

NOTE:

*River stage as measured by staff gauge

TABLE 4-2
ANALYSIS OF POTENTIOMETRIC SURFACE DATA FOR 6 OCTOBER 1988
KING OF PRUSSIA TECHNICAL CORP.
WINSLOW TOWNSHIP, NEW JERSEY

LOCATION	TOP OF CASING ELEVATION ft MSL	DEPTH TO WATER ft	WATER TABLE ELEVATION ft MSL	HEAD DIFFERENCE ft	VERTICAL GRADIENT DIRECTION
UP GRADIENT OF SITE					
MW-7S	94.09	11.97	82.12		
MW-17S	96.24	12.04	84.2		
ON-SITE					
MW-9S	92.04	8.55	83.49		
MW-10D	92.17	12.59	79.58	3.91	DOWNWARD
MW-11S	94.76	11.25	83.51		
MW-12D	94.27	14.68	79.59	3.92	DOWNWARD
MW-1S	96.73	13.66	83.07		
MW-14D	97.03	17.7	79.33	3.74	DOWNWARD
MW-2I	97.31	17.88	79.43		
MW-13S	93.27	10.86	82.41		
MW-15S	92.09	9.99	82.1		
DOWN GRADIENT OF SITE TO FIRE ROAD					
MW-3S	90.03	10.36	79.67		
MW-16D	90.05	11.29	78.76	0.94	DOWNWARD
MW-4I	90.69	11.79	78.9		
MW-5S	89.52	10.22	79.3		
MW-8D	90.53	11.8	78.73	0.54	DOWNWARD
MW-6I	89.09	10.15	78.94		
MW-19S	91.28	12.29	78.99	0.24	DOWNWARD
MW-18D	91.17	12.42	78.75		
OW-1	91.86	13.04	78.82		
DOWNGRADIENT FROM FIRE ROAD TO RIVER					
MW-21S	84.13	6.2	77.93		
MW-20D	86.47	7.84	78.63	-0.7	UPWARD
MW-23S	92.68	13.08	79.6		
MW-22D	93.55	15.15	78.4	1.2	DOWNWARD
MW-25S	97.97	19.78	78.19		
MW-24D	97.3	19.5	77.8	0.39	DOWNWARD
MW-27S	87.68	12.45	75.23		
MW-26D	87.46	9.34	78.12	-2.89	UPWARD
GREAT EGG HARBOR RIVER					
STAFF GAGE		6.85*	73.65		
ACROSS RIVER					
MW-28D	82.51	5.01	77.5		

NOTE:

*River stage as measured by staff gauge

it can be seen that the shallow hydraulic gradient is not constant across the study area. As shown in Table 4-3, the gradient varies from 0.0028 ft/ft across the site to a maximum of 0.0094 ft/ft in the drainage swale area, to 0.0049 ft/ft from the drainage swale to the river. The steepening of the gradient in the swale area may be due to topographic effects. The average shallow hydraulic gradient across the study area is 0.0057 ft/ft.

The lateral hydraulic gradient in the lower subzone aquifer indicates flow to the west-southwest, toward the river. The hydraulic gradient in this system is lower than that of the shallow system, and shows less variation. Values for the hydraulic gradient range between 0.0016 ft/ft and 0.0026 ft/ft, with an average value of 0.002 ft/ft, as summarized in Table 4-3.

Table 4-2 and Plate 3 also show a comparison of the relative head differences (vertical gradient) between the shallow and deep zones beneath the site on 6 October 1988. Similar head relationships were observed in the 18 November 1988 measurement. Couplets MW-9S/10D and MW-11S/12D show the greatest vertical head differences. The downward vertical hydraulic head differences at these locations were 3.91 feet and 3.92 feet respectively. Proceeding southwest near the swale, the downward head diminished to less than 1 foot, with vertical head differences of 0.94 feet, and 0.54 feet respectively at couplets 3S/8D and 5S/16D. Closer to the river the vertical head difference is reduced by an order of magnitude below those on site. In fact, adjacent to the river at couplet 27S/26D, it reverses upwards 2.89 feet. This suggests that not only does a confining unit exist between the shallow and deep flow zones, but also that the potential exists for the river to act as a discharge point for the lower subzone aquifer.

The above comparison of the head differences indicates that the potentiometric heads measured in the shallow wells and those in the deep wells reflect conditions in two different flow systems. If the Kirkwood-Cohansey Aquifer beneath the site were one aquifer

TABLE 4-3
ANALYSIS OF HORIZONTAL GRADIENTS, 6 OCT 88
KING OF PRUSSIA TECHNICAL CORPORATION
WNSLOW TOWNSHIP, NEW JERSEY

LOCATION	UPPER SUBZONE		LOWER SUBZONE	
	HYDRAULIC GRADIENT ft/ft	WELLS USED IN CALCULATION	HYDRAULIC GRADIENT ft/ft	WELLS USED IN CALCULATION
Across Site	0.0028	MW-1S MW-9S MW-17S	0.0017	MW-10D MW-12D MW-14D
Western Site To Drainage Swale	0.0094	MW-1S MW-3S MW-5S	0.0016	MW-8D MW-14D MW-16D
Drainage Swale To River	0.0049	MW-5S MW-25S MW-27S	0.0026	MW-8D MW-24D MW-26D
Study Area Average	0.0057		0.002	

void of significant confining units, the head measurements in each shallow/deep well couplet would be nearly identical. The fact that they are substantially different further supports the conclusion that the middle subzone interpreted from the geophysical borehole logs functions as a confining unit between the upper and lower subzones.

As will be seen from the aquifer pump test and the ground water quality analysis results, the confining nature of the middle subzone is evident at the site. The low permeability of this unit (Section 4.1.3 and Section 4.6.1) indicates that underflow of the Great Egg Harbor River likely occurs in the lower subzone aquifer. However, the high upward vertical gradient near the river indicates that some likely minor component of lower aquifer flow does discharge to the river.

4.1.3 Aquifer Tests

Quantitative Analysis

All aquifer test data were computer analyzed to determine aquifer parameters. Drawdown vs. Time plots for all wells are contained in Appendix E. The responses of the shallow wells to pumping at well MW-18D were very limited. Well MW-19S, located adjacent to the pumping well, exhibited a drawdown of approximately 0.3 feet during the duration of the test. The data from OW-1 was not used due to a malfunction in the electronic data logger. Lesser drawdown values were observed in the other shallow wells located farther from the pumping well. Evaluation of the lithologies and stratigraphic locations of MW-5S, MW-19S and MW-21S revealed that these wells were screened in the upper subzone hydrostratigraphic unit, separated from the pumping well by the middle subzone confining unit. Further, during the course of this test, MW-6i, which is screened within a segment of the middle subzone confining unit, also appeared to be hydraulically separated from the lower

subzone aquifer. Collectively this verifies that there is an effective confining unit between the upper and lower subzones.

After a thorough review of the hydrostratigraphy and the raw test data, only wells MW-8D, MW-18D, and MW-20D, screened in the lower subzone aquifer, were used in the quantitative pump test analysis. The data from MW-8D and MW-20D were used to calculate the transmissivity (T) and storativity (S) of the lower subzone aquifer and the leakance (K'/b' , or vertical hydraulic conductivity/unit thickness) of the middle subzone confining unit.

The data were initially corrected for partial penetration effects before analysis using the Hantush Method (Kruseman and DeRidder, 1976). Two hundred feet was used for the thickness of the lower subzone aquifer. This thickness was based upon the distance between the average depth of the bottom of the middle subzone confining unit on site (40 feet below land surface as determined by the lithological cross-sections) and the top of the composite confining unit (roughly 240 feet below land surface, Zapecza, 1984). Because the distances between observation wells MW-8D, MW-20D, and the pumping well MW-18D were greater than 100 feet, partial penetration corrections did not alter the drawdown values.

The drawdown data from MW-8D and MW-20D were plotted as the log of drawdown vs. the log of time. The resulting Theis Curves were matched with Walton's type curves for a leaky confined aquifer (Walton, 1962). The match point for each curve was determined and the transmissivity, storativity and confining unit leakance determined. The drawdown from the pumping well was plotted as a Jacob Curve, (drawdown versus the log of time), and the transmissivity calculated.

Table 4-4 shows the values of the lower subzone aquifer parameters as determined for each well. The Theis curves are shown in Appendix D. The data indicate that the transmissivity (T) of the lower subzone is approximately 12,400 ft²/day (the higher value

Table 4-4

**AQUIFER TEST RESULTS
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY**

Well	Match point (W(u)=u=1)		r / L	Calculated Values		
	Drawdown (feet)	Time (minutes)		T (ft ² /day)	S	K'/b' 1/days
8D*	0.12	22.43	0.5	12,400	0.0014	0.01
20D*	0.12	3.74	0.5	12,400	0.00064	0.02
18D**				15,000		

r = the distance of the pumping well from the observation well (feet)

T = transmissivity (square feet per day)

S = storativity (dimensionless)

K' = the vertical conductivity of the confining layer (gallons per day per square foot)

b' = the thickness of the confining layer (feet)

L = (Tb'/K') to the one-half power

* The Walton Leaky Aquifer method

** The Jacob straight-line method. This method, applied to the pumping well, 18D, does not require a match point, further, it will not yield a valid S value. Leakance (K'/b') is not considered in the Jacob method.

References:

Cooper, H.H.,JR. and C.E. Jacob. A Generalized Graphical Method for Evaluating Formation Constants and Summarizing Well-Field History. Transactions, American Geophysical Union, 27, 1946: 526 - 534

Walton, W.C. Illinois State Water Survey Bulletin 49 1962.

was calculated at well MW-18D, the pumping well, and is therefore considered less reliable). The hydraulic conductivity (K) of the unit is equal to T divided by the average thickness of the unit (b) (estimated to be 200 feet), or 62 ft/day. Given the similar properties of the upper subzone aquifer, the K of that unit can be considered to be similar.

The leakance of the confining unit is calculated to average 0.015 days^{-1} , from the results shown in Table 4-4. Since leakance is equal to K'/b' , the vertical hydraulic conductivity is calculated to be 0.00075 ft/day or $2.7 \times 10^{-7} \text{ cm/sec.}$, using an average confining unit thickness of 20 feet.

Ground Water Flow Velocity

The velocity of ground water flow in the aquifers of concern can be calculated using the formula:

$V = (Ki) / n$, Where: V = velocity in ft/day

K = hydraulic conductivity, = 62 ft/day

i = average hydraulic gradient, = 0.0057 in the upper subzone, 0.002 in the lower subzone

n = formation porosity, estimated to be 0.3 in both subzones, (Freeze and Cherry, 1979)

Using this formula, the lateral ground water flow velocity in the upper subzone aquifer is approximately 1.18 ft/day, and in the lower subzone aquifer, approximately 0.41 ft/day.

4.2 Source Material Characteristics

Throughout the text and tables of this report, analytical results are presented using the following standard units of measure:

- Micrograms per liter (ug/L) - A unit expressing the concentration of a chemical constituent in solution as the mass (1 microgram = 1×10^{-6} gram) of solute per unit volume (liter) of water. One ug/L is approximately equal to 1 part per billion (PPB) in aqueous solutions of low dissolved-solids concentration.
- Micrograms per gram (ug/g) or kilogram (ug/kg) - A unit expressing the concentration of a chemical constituent as the mass (microgram) of the substance sorbed per unit mass (gram/kilogram) sludge of soil or sediment. One ug/g is equivalent to a concentration of one part per million, while one ug/kg equals one part per billion.
- Milligrams per liter (mg/L) - A unit expressing the concentration of chemical constituents in solution as the mass (1 milligram = 1×10^{-3} gram) of solute per unit volume (liter) of water. One mg/L is approximately equal to 1 part per million (PPM) in aqueous solutions of low dissolved-solids concentration.

In most cases, inorganic results are reported in units of milligrams per liter (mg/L) or per kilogram (mg/kg), while trace organic analyses are usually reported in units of micrograms per liter (ug/L) or per kilogram (ug/kg). Occasionally, trace organic results are presented in a table or figure using parts per million terminology to improve presentation clarity. The following equations can be used, however, to convert between parts-per-million terminology and parts-per-billion:

$$\begin{aligned} \text{mg/L(kg)} \times 1,000 &= \text{ug/L(kg)} \\ \text{ug/L(kg)} \times 0.001 &= \text{mg/L(kg)} \end{aligned}$$

Full Priority Pollutant analyses were performed on all samples of source material. Source materials are defined in this report as tanker residue, soils surrounding leaking carboys in the carboy area, sludges in and around the lagoons, and near-surface (2 to 3 feet below the surface) soils in the buried drum area (see Plate 2-B).

All analytical data can be found in tables located in Appendix F-1 and F-2. The organic and inorganic data for samples collected from the tanker residue, carboy soil, and buried drum source areas are summarized in Tables 4-5 and 4-6 respectively.

4.2.1 Tanker Residue

Priority Pollutant volatile organic, pesticide and PCB compounds were not detected. The analysis of Priority Pollutant semivolatile organic data from tankers 1 (T-201) and 2 (T-202) indicates the presence of estimated concentrations of a selected suite of compounds in tanker 2 that were not found in tanker 1. Tanker 2 contains estimated concentrations of most of the Priority Pollutant polynuclear aromatic hydrocarbons. Regarding metallic elements, both tanker samples appeared to have similar characteristics, the Priority Pollutant metals chromium, copper, and nickel representing the most significant components in the residue. The concentrations are listed below:

<u>LOCATION</u>	<u>CHROMIUM</u>	<u>COPPER</u>	<u>NICKEL</u>
T-201	6450	8940 J	6580 J
T-202	1430	10000 J	1790 J

Note: All units are in mg/kg.

J = Estimated value

Table 4-5
ORGANIC DATA SUMMARY-SOURCE AREAS
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T. R. No.	5947	5948	5949	00010	00011
Sample Location	SS-201	T-201	T-202	LOCATION A	LOCATION B
	Carboy Soil	Tanker	Residue	Buried	Drum Area
Sample Date	5/18/88	5/18/88	5/18/88	9/27/88	9/27/88
Percent Moisture	9 %	45 %	24 %	10 %	9 %
Units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg

Volatile Organics					
methylene chloride	14 B	53 B	37 B	8 B	1900 B
chloroform	1 J			1 B	2 B **
trichloroethene				11	19 **
1,1,2-trichloroethane				2 J	
benzene					4300 B
tetrachloroethene				550 *	270000 J
toluene					17 **
ethylbenzene					6700 B

Tentatively Identified					
Volatile Organic Compounds	ND	ND	ND	ND	
total dimethyl benzene isomers					40000 J

Semi-Volatile Organics					
phenol	ND	ND			140 J
1-4-dichlorobenzene					300 J
1-2-dichlorobenzene					44000 *
1,2,4-trichlorobenzene					480
naphthalene					3200
pentachlorophenol					44 J
phenanthrene			57 J		41 J
fluoranthene			340 J		
pyrene			330 J		
benzo(a)anthracene			330 J		
bis(2-ethylhexyl)phthalate				52 J	100 J
chrysene			330 J		
benzo(b)fluoranthene			210 J		
benzo(k)fluoranthene			340 J		
benzo(a)pyrene			290 J		
indeno(1,2,3-c,d)pyrene			150 J		
dibenzo(a,h)anthracene			53 J		
benzo(g,h,i)perylene			170 J		

Tentatively Identified					
Semi-Volatile Compounds					
total unknown	1100 J		2400 J		573000 J
total unknown hydrocarbons		41000 J		29700	644000 J
unknown fatty acid					99000 J
alkyl substituted benzenes					992000 J
unknown siloxane	1300 J				
4-(1-methylethyl)heptane		690 J			
5-methyl-5-hexyl-2-one		1900 J			

Pesticides/PCBs					
chlordane	ND	ND	ND	192	470 N
4,4'-DDT				400	130 J
4,4'-DDE					19 J
dieldrin				160	230 N
heptachlor				58	10 J
toxaphene				1400	5600 N

Qualifier Codes:

B: This result is qualitatively invalid because the compound was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

ND: None detected.

N: Value reported for duplicate analysis of this sample; results qualitatively and quantitatively uncertain.

* This value is reported from an analysis of the diluted sample.

** This value is reported from a low level analysis of the sample.

Blank spaces indicate none detected.

Table 4-6
INORGANIC DATA SUMMARY-SOURCE AREAS
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T. R. No.	5947	5948	5949
Sample Location	SS-201	T-201	T-202
	Carboy Soil	Tanker	Residue
Sample Date	5/18/88	5/18/88	5/18/88
Percent solids	91 %	55 %	76 %
Units	mg/Kg	mg/Kg	mg/Kg

Inorganics			
antimony			24 J
arsenic	.66 B	22 J	33 J
beryllium	4.4	38	34
cadmium			1.8 B
chromium	185	6450	1430
copper	1550 J	8940 J	10000 J
lead	15	35 J	30 J
nickel	98 B	6580 J	1790 J
zinc	517 J	317 J	

cyanide		3	1.4

Qualifier Codes:

B: This result is qualitatively invalid because the analyte was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

Blank spaces indicate none detected.

4.2.2 Carboy Soil

Analysis of the composite soil sample (SS-201) collected from the stained surface of the carboy area did not indicate the presence of Priority Pollutant semivolatile organic, pesticide, or PCB compounds. TICs were tentatively estimated at 2400 ug/kg. Roughly half of this estimated quantity was characterized as an unknown siloxane. Siloxanes are commonly used in chromatographic columns to separate organic mixtures. The identification of this material in the analysis most likely represents a deterioration of the chromatographic column and not the presence of the compound at the site. No quantifiable level of Priority Pollutant volatile organic compounds were reported. Regarding inorganic contaminants, the soil contained concentrations of chromium, copper, and zinc, at concentrations listed below.

<u>LOCATION</u>	<u>CHROMIUM</u>	<u>COPPER</u>	<u>ZINC</u>
SS-201	185	1550 J	517 J

Note: All units are in mg/kg.

J = Estimated value

Table 2-9 shows SMC's analytical results of the liquid contents of three buried carboys. The composite soil sample described herein was freshly stained by that carboy liquid, pushed to the surface by the sampling team. The soil analysis results closely approximated the liquid results presented in Table 2-9.

4.2.3 Sludge

Buried sludges were present in test pits at locations which were selected on the basis of SMC's surface geophysical survey anomalies. Sludge-type waste materials were encountered in discrete soil horizons in eight of the test pits installed as part of the soil sampling investigation discussed in Section 4.3 (TP-211A, TP-215B, TP-216B, TP-220B,B', TP-222B, TP-223B, TP-224B, and

TP-225B). The organic and inorganic analytical data for these sample locations are included in Table 4-7 and 4-8, respectively. Test pit locations are provided in Plate 2-B. The sludge occurred as two general types. The first sludge-type was multi-colored and contained a total metals concentration of one to three percent (high-metal sludges). These sludges were found at test pit locations TP-211A, TP-220B,B', TP-222B, TP-223B, TP-224B, and TP-225B. The second sludge-type was white in color, appeared at test pit locations TP-215B and TP-216B, and exhibited estimated metals concentrations at or near detection limits (low-metal sludges).

Samples were collected from each of the horizons within the above test pits and with the exception of TP-223B and TP-224B were analyzed for PP+40 analysis including metals. Sludges from TP-223B and TP-224B were analyzed for Priority Pollutant metals. Priority Pollutant organic data indicated that both sludge-types are characterized by the absence of Priority Pollutant pesticide, PCB, and volatile organic compounds. One tentatively identified volatile organic compound (trichlorofluormethane) was detected in TP-225B at an estimated concentration of 9 ug/kg. Priority Pollutant semivolatile compounds were identified in locations TP-220B, TP-220B', TP-222B, TP-223A, and TP-225B in the estimated individual compound concentration range of 74 to 310 ug/kg. The highest total semivolatiles were present in TP-225B which contained 12 compounds classified as polynuclear aromatic hydrocarbons (PNAs).

Six semivolatile unknown compounds or compound classes were tentatively identified in the analysis of the sludges. The compound class "Total Unknowns" represented the highest estimated concentration range of any compound class, from 3,130 to 333,400 ug/kg. Total Unknown Hydrocarbons were tentatively identified in the analysis of samples from test pits TP-222B and TP-225B in the estimated concentration range of 970 to 7870 ug/kg. The remaining four compounds/classes were tentatively identified in the estimated concentration range of 300 to 4400 ug/kg.

Table 4-7
ORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8497	8499	8500	8502	8503	8506	8507	8508	8510
Sample Location	TP-201A	TP-201B	TP-201C	TP-202B	TP-202C	TP-203A	TP-203B	TP-203C	TP-204B
Sample Date	5/23/88	5/23/88	5/23/88	5/23/88	5/23/88	5/24/88	5/24/88	5/24/88	5/24/88
Percent Moisture	7%	8%	8%	9%	11%	52%	15%	15%	12%
units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg

Volatile Organics	NA					NA			
methylene chloride		9 B	8 B	5 B	8 B		8 B	10 B	9 B
chloroform							1 J		1 J

Tentatively Identified									
Volatile Organic Compounds	NA	ND	ND	ND	ND	NA	ND	ND	ND
trichlorofluoromethane									
carbon disulfide									
hexane isomer									

Semivolatile Organics	ND	ND	NA	ND	NA	ND	ND	NA	ND
isophorone									
phenanthrene									
anthracene									
fluoranthene									
pyrene									
benzo(a)anthracene									
bis (2-ethylhexyl)phthalate									
chrysene									
benzo(b)fluoranthene									
benzo(k)fluoranthene									
benzo(a)pyrene									
indeno (1,2,3-c,d)pyrene									
dibenzo(a,h)anthracene									
benzo(g,h,i)perylene									

Tentatively Identified									
Semivolatile Compounds			NA		NA			NA	ND
total unknowns	46240J						2800J		
total unknown hydrocarbons		580J				1000J			
trimethyl benzene isomer									
methyl octane isomer									
siloxanes									
methyl hexenone isomer									
3-ethenyl-3-methyl-2-(1-methylethyl) cyclohexanol				4400J					
substituted alkane									
unknown acid ester									
chlorinated unknown									

Pesticides/PCBs	ND	ND	NA	ND	NA	ND	ND	NA	ND
aroclor 1254									

Qualifier Codes:

B: This result is qualitatively invalid because the compound was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

ND: Not detected.

Blank spaces indicate none detected.

KOP 3.1112

Table 4-7 (continued)
ORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8511	8512	8514	8516	8517	8518	8519	8524	8526
Sample Location	TP-204C	TP-205A	TP-205C	TP-206B	TP-206C	TP-207A	TP-207B	TP-208B	TP-209B
Sample Date	5/24/88	5/24/88	5/24/88	5/24/88	5/24/88	5/24/88	5/24/88	5/24/88	5/24/88
Percent Moisture	23%	11%	10%	14%	21%	8%	14%	15%	9%
units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
Volatile Organics		NA				NA			
methylene chloride	7 B		5 B	4 B	4 B		6 B	9 B	10 B
chloroform			1 B	1 B	1 B		2 B		
Tentatively Identified									
Volatile Organic Compounds	ND	NA	ND	ND	ND	NA	ND	ND	ND
trichlorofluoromethane									
carbon disulfide									
hexane isomer									
Semivolatile Organics	NA		NA	ND	NA	ND	ND	ND	ND
isophorone									
phenanthrene									
anthracene									
fluoranthene									
pyrene									
benzo(a)anthracene		60J							
bis (2-ethylhexyl)phthalate									
chrysene									
benzo(b)fluoranthene									
benzo(k)fluoranthene									
benzo(a)pyrene									
indeno (1,2,3-c,d)pyrene									
dibenzo(a,h)anthracene									
benzo(g,h,i)perylene									
Tentatively Identified									
Semivolatile Compounds	NA		NA		NA		ND	ND	ND
total unknowns		3130J		10400J		6500J			
total unknown hydrocarbons		3130J		900J		2930J			
trimethyl benzene isomer									
methyl octane isomer									
siloxanes									
methyl hexenone isomer									
3-ethenyl-3-methyl-2-(1-methylethyl) cyclohexanol									
substituted alkane									
unknown acid ester									
chlorinated unknown									
Pesticides/PCBs	NA	ND	NA	ND	NA		ND	ND	ND
aroclor 1254						190			

Qualifier Codes:

B: This result is qualitatively invalid because the compound was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

ND: Not detected.

Blank spaces indicate none detected.

Table 4-7 (continued)
ORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8527	8532	8533	8535	8536	8538	8541	8542	8546
Sample Location	TP-209C	TP-210C	TP-211A	TP-211C	TP-212A	TP-212C	TP-213B	TP-213C	TP-214B
Sample Date	5/24/88	5/25/88	5/25/88	5/25/88	5/25/88	5/25/88	5/25/88	5/25/88	5/26/88
Percent Moisture	4%	7%	16%	7%	10%	8%	6%	14%	5%
units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
Volatile Organics					NA				
methylene chloride	7 B	13 B	12 B	9 B		8 B	4 B	8 B	7 B
chloroform			1 B					2 J	
Tentatively Identified									
Volatile Organic Compounds	ND	ND	ND	ND	NA	ND	ND	ND	ND
trichlorofluoromethane									
carbon disulfide									
hexane isomer									
Semivolatile Organics	NA	NA	ND	NA	ND	NA	ND	NA	ND
isophorone									
phenanthrene									
anthracene									
fluoranthene									
pyrene									
benzo(a)anthracene									
bis (2-ethylhexyl)phthalate									
chrysene									
benzo(b)fluoranthene									
benzo(k)fluoranthene									
benzo(a)pyrene									
indeno (1,2,3-c,d)pyrene									
dibenzo(a,h)anthracene									
benzo(g,h,i)perylene									
Tentatively Identified									
Semivolatile Compounds	NA	NA		NA		NA	ND	NA	
total unknowns					850J				
total unknown hydrocarbons									
trimethyl benzene isomer			510J						
methyl octane isomer									
siloxanes									
methyl hexenone isomer			460J						
3-ethenyl-3-methyl-2-(1-methylethyl) cyclohexanol									570J
substituted alkane									
unknown acid ester									
chlorinated unknown									
Pesticides/PCBs	NA	NA	ND	NA	ND	NA	ND	NA	ND
aroclor 1254									

Qualifier Codes:

B: This result is qualitatively invalid because the compound was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

ND: Not detected.

Blank spaces indicate none detected.

Table 4-7 (continued)
ORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8547	8549	8573	8575	8578	8580	8581	8582	8583
Sample Location	TP-214C	TP-215B	TP-215C	TP-216B	TP-216C	TP-217B	TP-217C	TP-218A	TP-218B
Sample Date	5/26/88	5/26/88	5/26/88	5/26/88	5/26/88	5/26/88	5/26/88	5/26/88	5/26/88
Percent Moisture	5%	7%	18%	10%	18%	6%	10%	7%	5%
units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
Volatile Organics									
methylene chloride	13 B	7 B	10 B	6 B	8 B	6 B	10 B	15 B	11 B
chloroform			1 J		1 J		1 J		1 B
Tentatively Identified									
Volatile Organic Compounds	ND	ND	ND	ND	ND	ND	ND	ND	ND
trichlorofluoromethane									
carbon disulfide									
hexane isomer									
Semivolatile Organics									
isophorone	NA	ND	NA	ND	NA	ND	NA		
phenanthrene									
anthracene									
fluoranthene									
pyrene									
benzo(a)anthracene									
bis (2-ethylhexyl)phthalate								170B	48B
chrysene									
benzo(b)fluoranthene									
benzo(k)fluoranthene									
benzo(a)pyrene									
indeno (1,2,3-c,d)pyrene									
dibenzo(a,h)anthracene									
benzo(g,h,i)perylene									
Tentatively Identified									
Semivolatile Compounds	NA		NA		NA		NA		
total unknowns								860J	
total unknown hydrocarbons						430J		620J	760J
trimethyl benzene isomer				4400J					
methyl octane isomer									
siloxanes									
methyl hexanone isomer									
3-ethenyl-3-methyl-2-(1-methylethyl) cyclohexanol									
substituted alkane		520J							630J
unknown acid ester								160J	
chlorinated unknown									
Pesticides/PCBs									
aroclor 1254	NA	ND	NA	ND	NA	ND	NA	ND	ND

Qualifier Codes:

B: This result is qualitatively invalid because the compound was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

ND: Not detected.

Blank spaces indicate none detected.

Table 4-7 (continued)
ORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8584	8588	8636	8637	8638	8591	8592	8594	8596
Sample Location	TP-218C	TP-219C	TP-220B	TP-220B'	TP-220C	TP-221B	TP-221C	TP-222B	TP-222C
Sample Date	5/26/88	5/26/88	6/1/88	6/1/88	6/1/88	5/27/88	5/27/88	5/27/88	5/27/88
Percent Moisture	10%	10%	51%	55%	18%	6%	11%	44%	13%
units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
Volatile Organics									
methylene chloride	30B	19 B	7 B	16 B	21 B	17 B	10 B	14 B	11 B
chloroform							1 B	2 B	
Tentatively Identified									
Volatile Organic Compounds		ND	ND	ND	ND	ND	ND	ND	ND
trichlorofluoromethane									
carbon disulfide									
hexane isomer	8 J								
Semivolatile Organics									
isophorone	NA	NA			NA	53B	NA	100B	NA
phenanthrene				96J					
anthracene									
fluoranthene									
pyrene									
benzo(a)anthracene									
bis (2-ethylhexyl)phthalate								170J	
chrysene									
benzo(b)fluoranthene									
benzo(k)fluoranthene									
benzo(a)pyrene			75J						
indeno (1,2,3-c,d)pyrene									
dibenzo(a,h)anthracene									
benzo(g,h,i)perylene									
Tentatively Identified									
Semivolatile Compounds	NA	NA			NA		NA		NA
total unknowns			58630J	333400J		160J		34700J	
total unknown hydrocarbons						840J		970J	
trimethyl benzene isomer									
methyl octane isomer									
siloxanes									
methyl hexanone isomer									
3-ethenyl-3-methyl-2-(1-methylethyl) cyclohexanol									
substituted alkane									
unknown acid ester									
chlorinated unknown								300J	
Pesticides/PCBs									
aroclor 1254	NA	NA	ND	ND	NA	ND	NA	ND	NA

Qualifier Codes:

B: This result is qualitatively invalid because the compound was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

ND: Not detected.

Blank spaces indicate none detected.

Table 4-7 (continued)
ORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8599	8597	8600	8602	8643	8644	8613	8605
Sample Location	TP-223C	TP-223A	TP-224A	TP-224C	TP-225B	TP-225B'	TP-225C	TP-226B
Sample Date	5/27/88	5/27/88	5/27/88	5/27/88	6/1/88	6/1/88	6/1/88	5/27/88
Percent Moisture	9%	8%	8%	9%	33%	17%	28%	6%
units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg

Volatile Organics		NA	NA					
methylene chloride	10 B			12 B	7 B	6 B	5 B	8 B
chloroform								

Tentatively Identified								
Volatile Organic Compounds	ND	NA	NA	ND		ND	ND	ND
trichlorofluoromethane					9 J			
carbon disulfide								
hexane isomer								

Semivolatile Organics	NA			NA		NA	NA	
isophorone		48B	82B					48B
phenanthrene					89J			
anthracene					110J			
fluoranthene					260J			
pyrene					250J			
benzo(a)anthracene					250J			
bis (2-ethylhexyl)phthalate		85J						
chrysene					310J			
benzo(b)fluoranthene					230J			
benzo(k)fluoranthene					240J			
benzo(a)pyrene					260J			
indeno (1,2,3-c,d)pyrene					140J			
dibenzo(a,h)anthracene					74J			
benzo(g,h,i)perylene					160J			

Tentatively Identified								
Semivolatile Compounds	NA			NA		NA	NA	
total unknowns		450J	23600J		3130J			760J
total unknown hydrocarbons		970J	2730J		7870J			1000J
trimethyl benzene isomer								
methyl octane isomer								
siloxanes								
methyl hexenone isomer								
3-ethenyl-3-methyl-2-(1-methylethyl) cyclohexanol								
substituted alkane								
unknown acid ester								
chlorinated unknown								

Pesticides/PCBs	NA	ND	ND	NA	ND	NA	NA	ND
aroclor 1254								

Qualifier Codes:

B: This result is qualitatively invalid because the compound was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

ND: Not detected.

Blank spaces indicate none detected.

Table 4-7 (continued)
ORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8606	8608	8641	8615	8616	8619	8620	8622	8623
Sample Location	TP-226C	TP-227B	TP-228B	TP-229B	TP-229C	TP-230B	TP-230C	TP-231B	TP-231C
Sample Date	5/27/88	5/27/88	6/1/88	5/31/88	5/31/88	5/31/88	5/31/88	5/31/88	5/31/88
Percent Moisture	11%	5%	6%	5%	12%	5%	5%	5%	10%
units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
Volatile Organics									
methylene chloride	11 B	11 B	5 B	110	37 B	13 B	8 B	7 B	8 B
chloroform		2 B		1 B	1 B	1 B		1 B	
Tentatively Identified									
Volatile Organic Compounds	ND	ND	ND	ND	ND	ND	ND	ND	ND
trichlorofluoromethane									
carbon disulfide									
hexane isomer									
Semivolatile Organics									
isophorone	NA	49B	ND		NA	ND	NA	ND	NA
phenanthrene									
anthracene									
fluoranthene									
pyrene									
benzo(a)anthracene									
bis (2-ethylhexyl)phthalate				130J					
chrysene									
benzo(b)fluoranthene									
benzo(k)fluoranthene									
benzo(a)pyrene									
indeno (1,2,3-c,d)pyrene									
dibenzo(a,h)anthracene									
benzo(g,h,i)perylene									
Tentatively Identified									
Semivolatile Compounds	NA				NA		NA		NA
total unknowns		9290J		2220J					
total unknown hydrocarbons		900J	350J	420J					
trimethyl benzene isomer									
methyl octane isomer						510J		470J	
siloxanes		90600J		24440					
methyl hexanone isomer									
3-ethenyl-3-methyl-2-(1-methylethyl) cyclohexanol									
substituted alkane									
unknown acid ester									
chlorinated unknown									
Pesticides/PCBs									
aroclor 1254	NA	ND	ND	ND	NA	ND	NA	ND	NA

Qualifier Codes:

B: This result is qualitatively invalid because the compound was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

ND: Not detected.

Blank spaces indicate none detected.

Table 4-7 (continued)
ORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8467	8468	8625	8629	8631	8632	8639
Sample Location	TP-232B	TP-232C	TP-233B	TP-233C	TP-234B	TP-234B'	TP-234C
Sample Date	6/1/88	6/1/88	5/31/88	5/31/88	5/31/88	5/31/88	6/1/88
Percent Moisture	7%	8%	5%	5%	3%	3%	3%
units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg

Volatile Organics							
methylene chloride	5 J	5 B	5 B	10 B	6 B	6 B	1 B
chloroform			1 B				

Tentatively Identified							
Volatile Organic Compounds	ND	ND	ND	ND	ND		ND
trichlorofluoromethane							
carbon disulfide						11 J	
hexane isomer							

Semivolatile Organics	ND	NA	ND	NA	ND	NA	NA
isophorone							
phenanthrene							
anthracene							
fluoranthene							
pyrene							
benzo(a)anthracene							
bis (2-ethylhexyl)phthalate							
chrysene							
benzo(b)fluoranthene							
benzo(k)fluoranthene							
benzo(a)pyrene							
indeno (1,2,3-c,d)pyrene							
dibenzo(a,h)anthracene							
benzo(g,h,i)perylene							

Tentatively Identified							
Semivolatile Compounds		NA		NA		NA	NA
total unknowns	5100J		210J		430J		
total unknown hydrocarbons	450J						
trimethyl benzene isomer	130J						
methyl octane isomer			480J				
siloxanes							
methyl hexenone isomer							
3-ethenyl-3-methyl-2-(1-methylethyl) cyclohexanol							
substituted alkane							
unknown acid ester							
chlorinated unknown							

Pesticides/PCBs	ND	NA	ND	NA	ND	NA	NA
aroclor 1254							

Qualifier Codes:

B: This result is qualitatively invalid because the compound was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

ND: Not detected.

Blank spaces indicate none detected.

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Table 4-8
INORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8497	8499	8500	8501	8502	8503	8506	8507
Sample Location	TP-201A	TP-201B	TP-201C	TP-202A	TP-202B	TP-202C	TP-203A	TP-203B
Sample Date	5/23/88	5/23/88	5/23/88	5/23/88	5/23/88	5/23/88	5/24/88	5/24/88
Percent Solids	93%	92%	92%	97%	91%	89%	48%	85%
units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg

antimony								
arsenic	1.3 B		.36 B	.34 B	.71 B	4.3 J	4.2 B	.54 B
beryllium	0.33							
cadmium								
chromium	7.3	2.3	20	13	6.3	3.6	2.8	3.4
copper	5.2 J		17 J	7.9 J	13 J	3.8 J	7.2 J	
lead	3		2.4	2.9	1.6	1.4	18	0.82
mercury								
nickel								
selenium								
thallium								
zinc	6.2 B	3.2 B	4.7 B	2.8 B	5.2 B	2.6 B	9.1 B	3.8 B

cyanide			NA	NA		NA		
phenols	0.87		NA	NA		NA		

Qualifier Codes:

B: This result is qualitatively invalid because the analyte was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

Blank spaces indicate none detected.

Table 4-8 (continued)
INORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8508	8509	8510	8511	8512	8513	8514	8515
Sample Location	TP-203C	TP-204A	TP-204B	TP-204C	TP-205A	TP-205B	TP-205C	TP-206A
Sample Date	5/24/88	5/24/88	5/24/88	5/24/88	5/24/88	5/24/88	5/24/88	5/24/88
Percent Solids	85%	93%	88%	77%	89%	92%	90%	94%
units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg

antimony								
arsenic	.47 B	.40 B		2.3 B	.57 B	.40 B	.68 B	.44 B
beryllium		0.51	0.38	1.2	1.1			0.34
cadmium								
chromium	4.3	21	17	86	60	8.1	11	27
copper		143 J	95 J	83 J	266 J	3.7 J	9.2 J	86 J
lead	0.97	2.1	0.76	20	5.8	0.99	1.1	7.6
mercury								
nickel		11	13	18	25			34
selenium								
thallium								
zinc	15 B	6.3 B	12 B	40	27	2.5 B	3.2 B	13 B

cyanide	NA	NA		NA		NA	NA	NA
phenols	NA	NA		NA		NA	NA	NA

Qualifier Codes:

B: This result is qualitatively invalid because the analyte was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

Blank spaces indicate none detected.

Table 4-8 (continued)
INORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERMT.R. No.	8516	8517	8518	8519	8522	8524	8525	8526
Sample Location	TP-206B	TP-206C	TP-207A	TP-207B	TP-208A	TP-208B	TP-209A	TP-209B
Sample Date	5/24/88	5/24/88	5/24/88	5/24/88	5/24/88	5/24/88	5/24/88	5/24/88
Percent Solids	86%	79%	91%	86%	86%	85%	92%	91%
units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg

antimony								
arsenic		1.8 B	0.72 B	0.71 B	0.68 B	1.5 B	1.5 B	0.64 B
beryllium	0.37						4	1
cadmium								
chromium	72	4.5	48	17	1.3	4.5	175	53
copper	55 J		88	9.3			701	581
lead	8.3	1.2	4.2	2.3	6.1	1.4	10	1.6
mercury	0.098		0.13					
nickel			11				9.2	18
selenium								
thallium								
zinc	5.1 B	2.1 B	8.1	1.8 B	1.9 B	4.2 B	8.6	24

cyanide		NA			NA		NA	0.25
phenols		NA			NA		NA	

Qualifier Codes:

B: This result is qualitatively invalid because the analyte was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

Blank spaces indicate none detected.

Table 4-8 (continued)
INORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8527	8530	8531	8532	8533	8534	8535	8536
Sample Location	TP-209C	TP-210A	TP-210B	TP-210C	TP-211A	TP-211B	TP-211C	TP-212A
Sample Date	5/24/88	5/25/88	5/25/88	5/25/88	5/25/88	5/25/88	5/25/88	5/25/88
Percent Solids	90%	79%	90%	94%	84%	94%	93%	90%
units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg

antimony								
arsenic	0.87 B	.46 B	.39 B		2.3	0.6 B	0.47 B	0.57 B
beryllium	0.98				8.5			0.46
cadmium								
chromium	32	2.6	3.6	2.9	174	4.7	3.1	30
copper	305	5.3 J	3.8 J	4.3 J	766			25
lead	1.6	3.2	0.74		26	2.2	1.7	16
mercury						0.12		
nickel	10				198			
selenium								
thallium								
zinc	6.2 B	7.6 B	4.9 B	6.3 B	154	3.2 B	2.6 B	8.6

cyanide	NA	NA	NA	NA		NA	NA	
phenols	NA	NA	NA	NA		NA	NA	

Qualifier Codes:

B: This result is qualitatively invalid because the analyte was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

Blank spaces indicate none detected.

Table 4-8 (continued)
INORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERMT.R. No.	8537	8538	8540	8541	8542	8545	8546	8547
Sample Location	TP-212B	TP-212C	TP-213A	TP-213B	TP-213C	TP-214A	TP-214B	TP-214C
Sample Date	5/25/88	5/25/88	5/25/88	5/25/88	5/25/88	5/26/88	5/26/88	5/26/88
Percent Solids	95%	94%	93%	92%	86%	90%	94%	95%
units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg

antimony								
arsenic	0.37 B	0.63 B	0.67 B	0.78 B	0.92 B			
beryllium								
cadmium								
chromium	2.2	1.6	8.9	6.9	1.4	4	2.2	1.1
copper				5.1				
lead	1.1		2.6	2.2	0.53	2.7	1.5 B	.55 B
mercury								
nickel	6.8	7						
selenium								
thallium								
zinc	6.1 B	3.4 B	3 B	2.5 B	1.4 B	10	14 J	48 J

cyanide	NA	NA	NA		NA	NA		NA
phenols	NA	NA	NA		NA	NA		NA

Qualifier Codes:

B: This result is qualitatively invalid because the analyte was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

Blank spaces indicate none detected.

Table 4-8 (continued)
INORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8548	8549	8572	8573	8574	8575	8576	8578
Sample Location	TP-215A	TP-215B	TP-215B'	TP-215C	TP-216A	TP-216B	TP-216B'	TP-216C
Sample Date	5/26/88	5/26/88	5/26/88	5/26/88	5/26/88	5/26/88	5/26/88	5/26/88
Percent Solids	90%	93%	95%	82%	76%	90%	90%	81%
units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg

antimony					9.4 J			
arsenic		.65 J					.43 J	.46 J
beryllium	1				7.1	0.76		0.54
cadmium								
chromium	29	4.4	2.3		231	12 J	4.9	17
copper	45		6.7		564	17 J	4.6	65
lead	9.4	3.5 B	1.6 B		19	4.8	3.2 B	3.6 B
mercury								
nickel	12				255	11 J		18
selenium								.73 B
thallium								
zinc	26 J	22 J	14 J	9.6J	147 J	64 J	24 J	31 J

cyanide	NA		NA	NA	NA	0.41	NA	NA
phenols	NA		NA	NA	NA		NA	NA

Qualifier Codes:

B: This result is qualitatively invalid because the analyte was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

Blank spaces indicate none detected.

Table 4-8 (continued)
INORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8579	8580	8581	8582	8583	8584	8586	8587
Sample Location	TP-217A	TP-217B	TP-217C	TP-218A	TP-218B	TP-218C	TP-219A	TP-219B
Sample Date	5/26/88	5/26/88	5/26/88	5/26/88	5/26/88	5/26/88	5/26/88	5/26/88
Percent Solids	91%	94%	90%	93%	96%	91%	92%	94%
units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg

antimony								
arsenic	.59 J	.61 J	1.0 J	.60 J	.51 J	.77 J	1.3 J	.58 J
beryllium	0.62			1.6			3.2	
cadmium								
chromium	16	4.5	3.9	94	35	68	576	33
copper	28		7.7	84	13	16	134	15
lead	57	1.8 B	2.9 B	6	6.4	6.7		3.8
mercury								
nickel	6.2			20			29	
selenium	.52 B	.65 B	.57 B	.77 B	.49 B	.58 B	1.4B	.63 B
thallium								
zinc	35 J	11 J	17 J	28 J	10 J	13 J	25 J	10 J

cyanide	NA		NA	0.11		NA	NA	NA
phenols	NA		NA			NA	NA	NA

Qualifier Codes:

B: This result is qualitatively invalid because the analyte was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

Blank spaces indicate none detected.

Table 4-8 (continued)
INORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8588	8635	8636	8637	8638	8590	8591	8592
Sample Location	TP-219C	TP-220A	TP-220B	TP-220B'	TP-220C	TP-221A	TP-221B	TP-221C
Sample Date	5/26/88	6/1/88	6/1/88	6/1/88	6/1/88	5/27/88	5/27/88	5/27/88
Percent Solids	91%	94%	49%	46%	81%	92%	94%	89%
units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg

antimony								
arsenic		0.96	16	22	0.62	.37 J		
beryllium			361	361	2.7			
cadmium			3.9	27		2		2
chromium	13	3.2 J	5380 J	11300 J	234 J	2.8 B	5.6	5.1 B
copper	11		15600	16300	202	5.1	5.2	5.3
lead	7.7	3.1	53	119	8.3	3.1	1.7	2
mercury				1.7				
nickel			3120	11100	29			6.6
selenium	.72 B						.53 B	
thallium			1.3	2.1				
zinc	27 J	7.7 B	338	1120	12 B	4 B	3.9 B	17

cyanide	NA	NA	0.68		NA	NA		NA
phenols	NA	NA			NA	NA		NA

Qualifier Codes:

B: This result is qualitatively invalid because the analyte was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

Blank spaces indicate none detected.

Table 4-8 (continued)
INORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERMT.R. No.	8593	8594	8595	8596	8597	8598	8599	8600
Sample Location	TP-222A	TP-222B	TP-222B'	TP-222C	TP-223A	TP-223B	TP-223C	TP-224A
Sample Date	5/27/88	5/27/88	5/27/88	5/27/88	5/27/88	5/27/88	5/27/88	5/27/88
Percent Solids	90%	56%	92%	87%	92%	66%	91%	92%
units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg

antimony	10 B	22 B					8.9 B	
arsenic		16 J	.49 J				.51 J	0.92
beryllium	13	112		1.5		93		7.3
cadmium								
chromium	731	5550	19	165	13	5530	5.1 B	165 J
copper		2500	26	51	16	9040	16	325
lead	16	389	5.5	6.1	3.5	102	3.6	14 J
mercury						0.61		
nickel	125	318	6.3		7.1	3490		112
selenium								
thallium								
zinc	41	346	10	7.5	15	1270	2.8 B	82 J

cyanide	NA		NA	NA		NA	NA	0.14
phenols	NA		NA	NA		NA	NA	

Qualifier Codes:

B: This result is qualitatively invalid because the analyte was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

Blank spaces indicate none detected.

Table 4-8 (continued)
INORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8601	8602	8642	8643	8644	8613	8604	8605
Sample Location	TP-224B	TP-224C	TP-225A	TP-225B	TP-225B'	TP-225C	TP-226A	TP-226B
Sample Date	5/27/88	5/27/88	6/1/88	6/1/88	6/1/88	6/1/88	5/27/88	5/27/88
Percent Solids	54%	91%	95%	67%	83%	72%	95%	94%
units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg

antimony								
arsenic	5.2	0.87	0.63	0.46		0.45	0.68	0.74
beryllium	64			51	1.1	1.5		
cadmium								1.6
chromium	2100 J	3.3 J	3.5 J	2910 J	30 J	77 J	4.8 J	4.3 J
copper	2920			3390	49	84	17	5.7
lead	259 J	2.7 J	2.9	46	3.7	12	4.2 J	1.6 J
mercury				0.25				
nickel	1130			2020		25	6.6	
selenium								
thallium				0.93				
zinc	743 J	15 B	5 B	327	16 B	33	11 B	18 B

cyanide	NA	NA	NA		NA	NA	NA	
phenols	NA	NA	NA		NA	NA	NA	

Qualifier Codes:

B: This result is qualitatively invalid because the analyte was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

Blank spaces indicate none detected.

Table 4-8 (continued)
INORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8606	8607	8608	8640	8641	8614	8615	8616
Sample Location	TP-226C	TP-227A	TP-227B	TP-228A	TP-228B	TP-229A	TP-229B	TP-229C
Sample Date	5/27/88	5/27/88	5/27/88	6/1/88	6/1/88	5/31/88	5/31/88	5/31/88
Percent Solids	89%	92%	95%	97%	94%	97%	95%	88%
units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg

antimony								
arsenic	0.37	0.89	0.37	0.46	0.61	0.45	0.6	0.9
beryllium		1.2		0.68	0.77			
cadmium								
chromium	2.1 J	39 J	3.8 J	42 J	31 J	1.5 J	28 J	60 J
copper		44		38	17	4.4	7.5	7.3
lead	1.6 J	9.2 J	2.9 J	9.3	2.4	1.6 J	5.3 J	1.6 J
mercury								
nickel		16		9.3	6.4			
selenium								
thallium								
zinc	9.8 B	20 B	16 B	24	16 B	8.8 B	8.9B	6.3 B

cyanide	NA	NA		NA		NA		NA
phenols	NA	NA		NA		NA		NA

Qualifier Codes:

B: This result is qualitatively invalid because the analyte was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

Blank spaces indicate none detected.

Table 4-8 (continued)
INORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8618	8619	8620	8621	8622	8623	8466	8467
Sample Location	TP-230A	TP-230B	TP-230C	TP-231A	TP-231B	TP-231C	TP-232A	TP-232B
Sample Date	5/31/88	5/31/88	5/31/88	5/31/88	5/31/88	5/31/88	6/1/88	6/1/88
Percent Solids	95%	95%	95%	95%	95%	91%	92%	93%
units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg

antimony								
arsenic	0.37	0.95	0.81	3.6	0.66	0.82	0.75	0.58
beryllium			0.32		0.59	0.63		0.42
cadmium								
chromium		4.9 J	2.0 J	18 J	19 J	15 J	4.1 J	27 J
copper				12	19	25		27
lead	6.7 J		1.5 J	4.0 J	1.4 J	1.1 J	2.8	2.2
mercury								
nickel						6.9		16
selenium								
thallium								
zinc	4.8 B	14 B	6.5 B	9.1 B	20 B	14 B	4.3 B	37

cyanide	NA		NA	NA		NA	NA	
phenols	NA		NA	NA		NA	NA	

Qualifier Codes:

B: This result is qualitatively invalid because the analyte was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

Blank spaces indicate none detected.

Table 4-8 (continued)
INORGANIC DATA SUMMARY-TEST PIT SOIL SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T.R. No.	8468	8624	8625	8626	8629	8630	8631	8632	8639
Sample Location	TP-232C	TP-233A	TP-233B	TP-233C *	TP-233D *	TP-234A	TP-234B	TP-234B'	TP-234C
Sample Date	6/1/88	5/31/88	5/31/88	5/31/88	5/31/88	5/31/88	5/31/88	5/31/88	6/1/88
Percent Solids	92%	96%	95%	95%	95%	98%	97%	97%	97%
units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg

antimony									
arsenic	0.61 B		0.93	0.45	0.44	0.4	0.46	0.56	0.45
beryllium	0.76								
cadmium									
chromium	19 J	1.4 J	3.3 J	1.8 J				1.4 J	2.1 J
copper	7.8								
lead	1.9	.99 J	2.6	1	1.1	1.2	0.73	1.1	0.9
mercury									
nickel									
selenium									
thallium									
zinc	19 J	13 B	12 B	9.3 B	12 B	7 B	17 B	6.8 B	18

cyanide	NA	NA		NA	NA	NA		NA	NA
phenols	NA	NA		NA	NA	NA		NA	NA

Qualifier Codes:

B: This result is qualitatively invalid because the analyte was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

Blank spaces indicate none detected.

* FIELD NOTES AND TRAFFIC REPORTS IDENTIFIED THESE SAMPLES TO BE TP-233C AND TP 233D.
HOWEVER, THE SAMPLES SHOULD BE IDENTIFIED AS TP-233B' AND TP-233C, RESPECTIVELY.

Analysis for Priority Pollutant metals indicated that the high-metal sludges are characterized by percent-level total concentrations of copper, chromium, and nickel. The estimated concentration range for these metals is summarized below.

<u>ELEMENT</u>	<u>CONCENTRATION RANGE</u>
COPPER	766 - 16,300
CHROMIUM	174 - 11,300
NICKEL	198 - 11,100

All units are in mg/kg

The highest concentrations of these metals occurred at TP-220B'.

The metals arsenic, cadmium, beryllium, lead, mercury, thallium and zinc occurred as minor constituents in the high metal sludge at the following maximum concentrations:

<u>ELEMENT</u>	<u>MAXIMUM CONCENTRATION</u>	<u>LOCATION</u>
ARSENIC	22	TP-220B'
CADMIUM	27	TP-220B'
BERYLLIUM	361	TP-220B'
LEAD	389	TP-222B
MERCURY	1.7	TP-220B'
THALLIUM	2.1	TP-220B'
ZINC	1270	TP-223B

All units are in mg/kg

The metals antimony, selenium, and silver were not detected in the high-metal sludges.

The low-metal sludges contained the same relative distribution of estimated metals concentrations as did the high level sludges, except at much reduced concentrations. Copper, chromium, nickel and zinc represented the maximum concentrations of the metals, detected at 17, 12, 11, and 64 mg/kg respectively. The minor constituent metals arsenic, beryllium, and lead were detected at maximum estimated concentrations of 0.65, 0.76, and 4.8 mg/kg respectively. Antimony, cadmium, mercury, selenium, silver, and thallium, were not detected.

In test pits containing sludge material, cyanide was detected in two locations at low concentrations (0.41 and 0.68 mg/kg). Total phenols were not detected in any of the samples.

4.2.4 Buried Drum Area Soil

Two samples of visibly contaminated soils were collected in the vicinity of the buried drums. Refer to Table 4-5 for a summary of the organic data. Although ERM's limited exploratory excavation only uncovered empty drums, the soils near these drums contained the following organic contaminants:

<u>CONTAMINANT</u>	<u>CONCENTRATION</u>	
	<u>LOC. A</u>	<u>LOC. B</u>
<u>Volatile Priority Pollutants</u>		
Tetrachloroethene	0.55	270 J
Toluene	N.D.	0.02
Trichloroethene	0.011	0.02
1,1,2 Trichloroethane	0.002 J	N.D.

<u>Semi-volatile Priority Pollutants</u>	<u>LOC. A</u>	<u>LOC. B</u>
1,2-Dichlorobenzene	N.D.	44
chlordanes	0.19	0.470 N
4,4'-DDT	0.4	0.13 J
4,4'-DDE	N.D.	0.019 J
Dieldrin	0.160	0.230 N
heptachlor	0.058	0.010 J
Toxaphene	1.4	5.6 N
Phenol	N.D.	0.140 J
1,4-Dichlorobenzene	N.D.	0.300 J
1,2,4-Trichlorobenzene	N.D.	0.480
Naphthalene	N.D.	03.2
Pentachlorophenol	N.D.	0.04 J
Phenanthrene	N.D.	0.04 J
bis(2-Ethylhexyl)phthalate	0.052 J	0.100 J

Tentatively Identified Compounds

Dimethyl benzene isomer (TIC)	N.D.	40 J
unknown hydrocarbons (TIC)	29.7	644 J
alkyl substituted benzenes (TIC)	N.D.	992 J
total unknown (TIC)	N.D.	573 J
Unknown fatty acid (TIC)	N.D.	99 J

Note: All units in mg/kg

N.D. = not detected

N = results uncertain (see Appendix E-1)

J = estimated value

TIC = tentatively identified compound

Soil sample TP-234 was used in this report as a "background" sample for priority pollutant metals. A new background sample was collected (8 December) to provide background levels just for soil pH and common ions.

The soil samples from location A and B were also analyzed for acid residuals (common ions and soil pH) and metals. Soil pH, the most reliable indicator for residual acid in the soil, was 4.5 units in the new background sample. This pH is considered normal for the

pine forest region soils (Lakewood Series). The EPA-approved RI work plan did not specify the collection of soil pH data, so analysis of soil pH variability across the site cannot be made. However, it seems apparent that the samples from Locations A and B are not impacted by residual acids, based on the pH values obtained (4.3 and 7.1). Additionally, concentrations of two anions that would be typically associated with common forms of acid (nitrates and sulfates) were found to be near or below background levels. No other cations/anions were found at levels significantly above background.

Values for arsenic, copper, and chromium exceeded NJDEP cleanup guidance for the Location B sample. The arsenic value of 44 mg/kg at Location B was higher than any other value obtained from source materials or test pit soils. However, 44 mg/kg of arsenic is only two times higher than the NJDEP guidance of 20 mg/kg.

Although copper and chromium values for Location B are well above background, and would be considered mid-range to high for test pit soils, these values are fairly low when compared to values obtained from the other three source area samples. Values for all other metals are either below detection or are well below NJDEP guidance. As a result, ERM would not characterize the residual contamination found in these soils as providing a significant potential source of inorganic contaminants to the ground water.

The buried drum area is the only known source area that is contaminated with significant levels of volatile and semivolatile organic compounds. Based on current knowledge of the nature of the waste streams handled at the site, such high concentrations of chlorinated aliphatic and aromatic hydrocarbons, and pesticides are not expected.

4.3 Soil Sampling and Investigation

Thirty four test pits were installed across the site in order to sample and characterize the soil profile. Based upon the description of the physical characteristics of each pit they can be grouped into three categories. These categories include:

- test pits which contain sludge. These include TP-211, TP-215, TP-216, TP-220, TP-222, TP-223, TP-224, and TP-225. These pits are located around the immediate lagoon area.
- test pits without sludge, but with visual anomalies, which may include dark staining, purple sand, or hard pans. They include TP-201, TP-204, TP-207, TP-209, TP-217, TP-218, TP-221, TP-227, TP-229, TP-231, and TP-232. These pits are randomly distributed across the site; and
- test pits described as clean with no visual anomalies. They include TP-202, TP-203, TP-205, TP-206, TP-208, TP-210, TP-212, TP-213, TP-214, TP-219, TP-226, TP-228, TP-230, TP-233, and TP-234. These pits are also distributed across the site.

All analytical data can be found in tables located in Appendix E-2. The organic and inorganic analytical data for all test pit soil samples are summarized in Tables 4-7 and 4-8, respectively. Test pit locations are shown in Plate 2-B. The soil analysis results are discussed below.

4.3.1 Organic Compounds in Soil

Chemical analysis of the soil samples collected from each test pit indicates the general absence of Priority Pollutant organic compounds in the soil profile beneath the site. No Priority Pollutant organic compounds had been detected in the shallow or subsurface soil sampling efforts during the initial RI conducted by SMC. However, the supplemental investigation results indicate

the scattered presence of some such compounds, in the Tentatively Identified class. The results are summarized as follows. Low ug/kg concentrations of methylene chloride and chloroform, volatile organic compounds commonly recognized as laboratory contaminants, were detected at eight test pit locations. With the exception of sample TP-229B, both compounds were present at similar levels in the associated laboratory method and/or travel blanks. A sample from TP-229B exhibited the highest concentration of volatile organic compounds found in the soil, with methylene chloride reported at 110 ug/kg. This concentration is anomalous and does not appear in the ground water in that area. TP-229B is located in an area where there is evidence of the extensive "midnight dumping" of household refuse. Thus, some discarded household solvent may be responsible for this methylene chloride detection.

Samples from the remaining seven test pits (TP-203B, TP-204B, TP-213C, TP-215C, TP-216C, TP-217C, and TP-232B) were reported to contain only very low estimated concentrations of chloroform and methylene chloride, from 1 to 5 ug/kg. Although these data have been validated and "J" qualified, chloroform and methylene chloride at these levels are often found as laboratory contaminants, and are not likely related to site conditions.

Two tentatively identified volatile organic compounds (TICs) were detected in samples from two test pits at individual estimated concentrations of eight and eleven ug/kg. One of the TICs, a hexane isomer, may be related to the hexane used in field decontamination procedures.

Estimated concentrations of the Priority Pollutant semivolatile compound bis(2-ethylhexyl)phthalate was reported in samples from three locations, ranging from 60 to 130 ug/kg. Bis(2-ethylhexyl)phthalate is a common semivolatile compound associated with plastic materials, and is also a common laboratory contaminant.

Eleven classes of semivolatile TICs were detected at 24 soil sampling locations, with the highest estimated concentrations for Total Unknowns, in the range of 160 to 46,240 ug/kg at 16 locations. The second most prevalent identified class of compounds are Total Unknown Hydrocarbons, which occurred in an estimated concentration range of 350 to 3130 ug/kg at 16 locations. The remaining nine classes of compounds occurred in the estimated concentration range of 130 to 90,600 ug/kg.

There were no Priority Pollutant pesticide compounds detected in the soil at the site. However one location (TP-207A) did contain aroclor 1254 (PCB) at the detection limit of 190 ug/kg.

4.3.2 Inorganic Elements In Soil

Background concentrations of metals in site soils are represented by analytical results from TP-234. TP-234 was chosen as a background location due to its location away from presumed past site activities. It is recognized that this location may not always exhibit the lowest concentration of a particular element, as it is only one location, and is thus not representative of the range of naturally occurring background conditions. In order to illustrate the potential environmental significance of the site-related metals concentrations, ERM has compared the results of both phases of the Remedial Investigation to the New Jersey Department of Environmental Protection (NJDEP) soil cleanup guidelines (see figures 4-6, 4-7, 4-8, and 4-9).

The Priority Pollutant metals beryllium, copper, chromium, and nickel appear as the most significant soil contaminants. Although these metals were detected in nearly all of the 34 test pits at above background levels, except for beryllium there are few locations where the soil concentrations exceed the NJDEP guidelines. The background concentration for beryllium is below 0.31 mg/kg. It was detected in soils from 20 test pits at

concentrations ranging from 0.32 to 13.0 mg/kg. The NJDEP cleanup action guideline for beryllium is 1 mg/kg. Figure 4-6 shows that this value was exceeded at only 16 locations.

The background concentration for copper is below approximately 3 mg/kg. Copper was detected above this concentration in soils from 28 test pit soil samples at concentrations ranging from 3.7 J to 701 mg/kg. The NJDEP guidance level for copper in soil is 170 mg/kg. Figure 4-7 shows that this value was exceeded at only ten sampling locations.

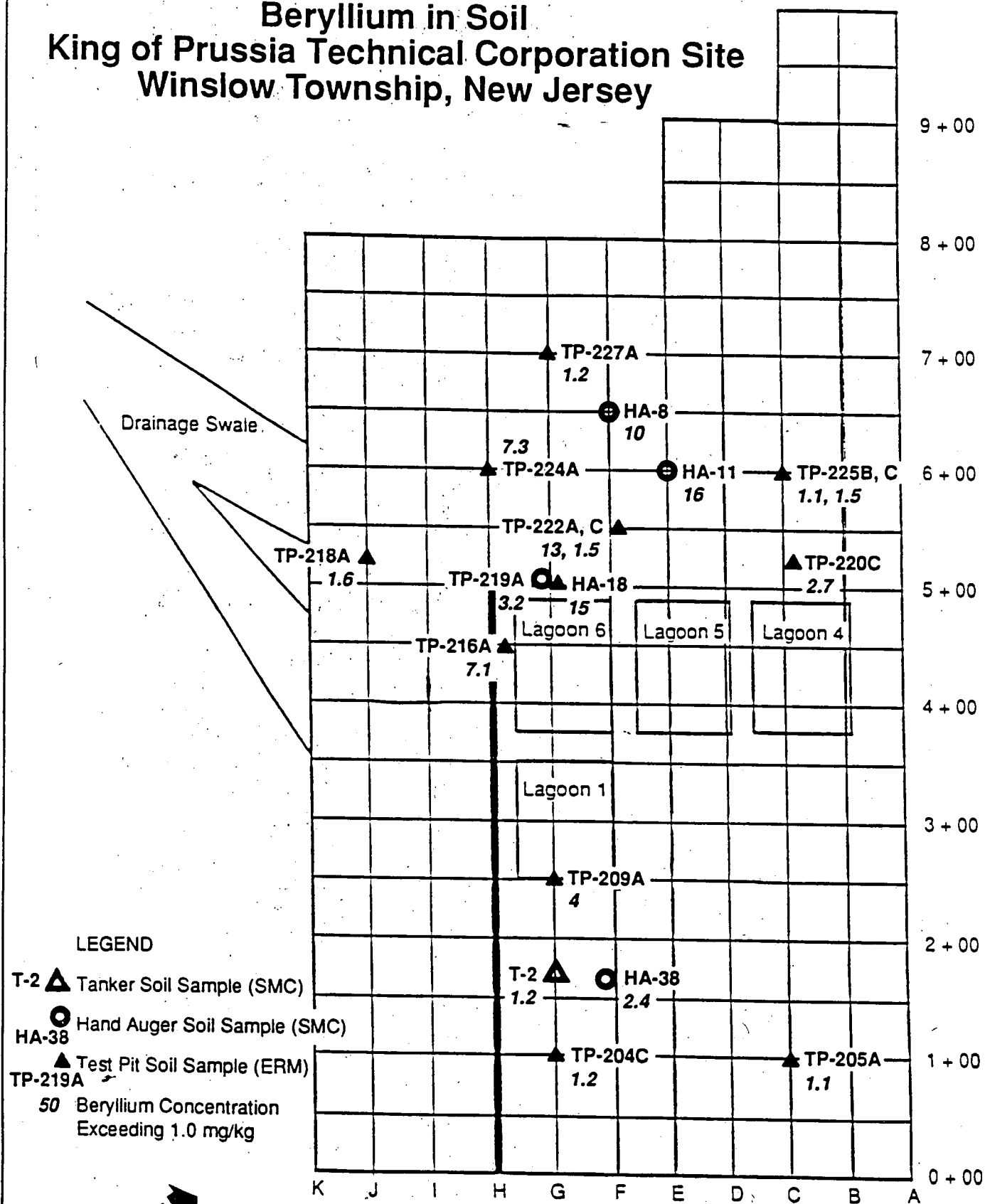
The background concentration for chromium is approximately 1.0 mg/kg. Chromium was detected above this concentration in soils from all 34 test pits, at concentrations ranging from 1.1 to 731 mg/kg. The NJDEP guidance value for chromium in soil is 100 mg/kg. Figure 4-8 shows that this value was exceeded at only 11 sampling locations.

The background concentration for nickel is approximately 5.4 mg/kg. Nickel was detected above this concentration in soils from 22 test pits at concentrations varying from 6.2 to 255 mg/kg. The NJDEP guidance value for nickel in soil is 100 mg/kg. Figure 4-9 shows that this value was exceeded at only seven sampling locations.

Soil sampling was also conducted during the first phase of the RI. Shallow 0-2 foot soil composite samples (HA-series) and 0-5 plus foot subsurface profile composite samples (DA-series) were collected. Where appropriate, the HA-series data for the four significant metal contaminants discussed above all presented in Figures 4-6 through 4-9.

The HA-series data was chosen for presentation and comparison with the ERM data since it was felt that the discrete soil horizons sampled in the test pits during the phase one RI were more comparable to a shallow two foot soil sampling horizon rather than

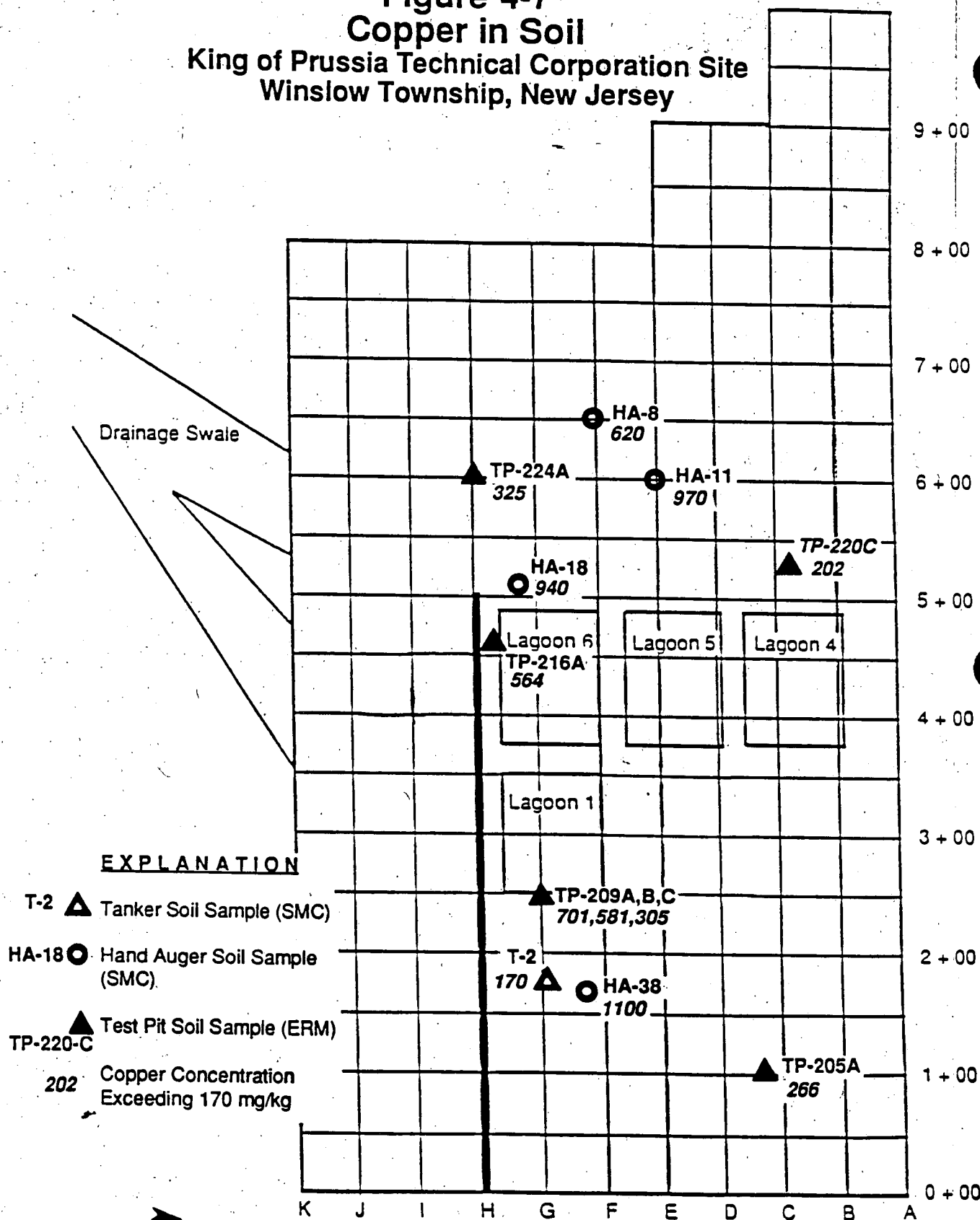
Figure 4-6
Beryllium in Soil
King of Prussia Technical Corporation Site
Winslow Township, New Jersey



Note: Not to Scale; All Locations Approximate
 Base Map: SMC Martin (1986) and EPA Aerial Photographs

W0# 7040215	Drawn by / Date: MEW 4.21.89	Checked by / Date: J. LaRegina 4.21.89	
	Revised by / Date:	Checked by / Date:	

Figure 4-7
Copper in Soil
King of Prussia Technical Corporation Site
Winslow Township, New Jersey



Note: Not to Scale; All Locations Approximate
 Base Map: SMC Martin (1986) and EPA Aerial Photographs

W0# 70402 15

Drawn by / Date: E.J.K 12/16/88

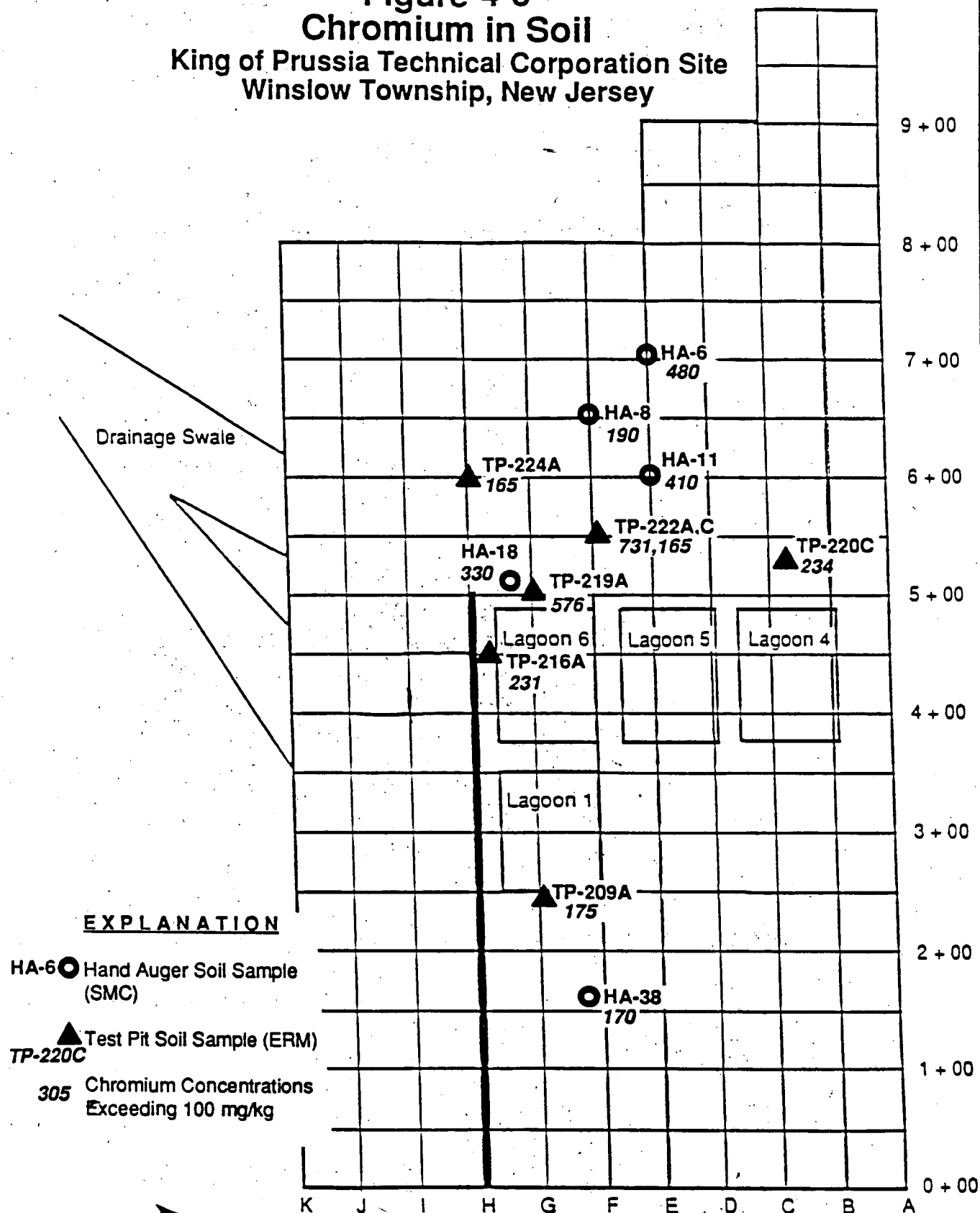
Checked by / Date: J.L.R. 12/16/88

Revised by / Date:

Checked by / Date:



Figure 4-8
Chromium in Soil
King of Prussia Technical Corporation Site
Winslow Township, New Jersey



Note: Not to Scale; All Locations Approximate
 Base Map: SMC Martin (1986) and EPA Aerial Photographs

W00 70402 15

Drawn by / Date: E.J.K 12/16/88

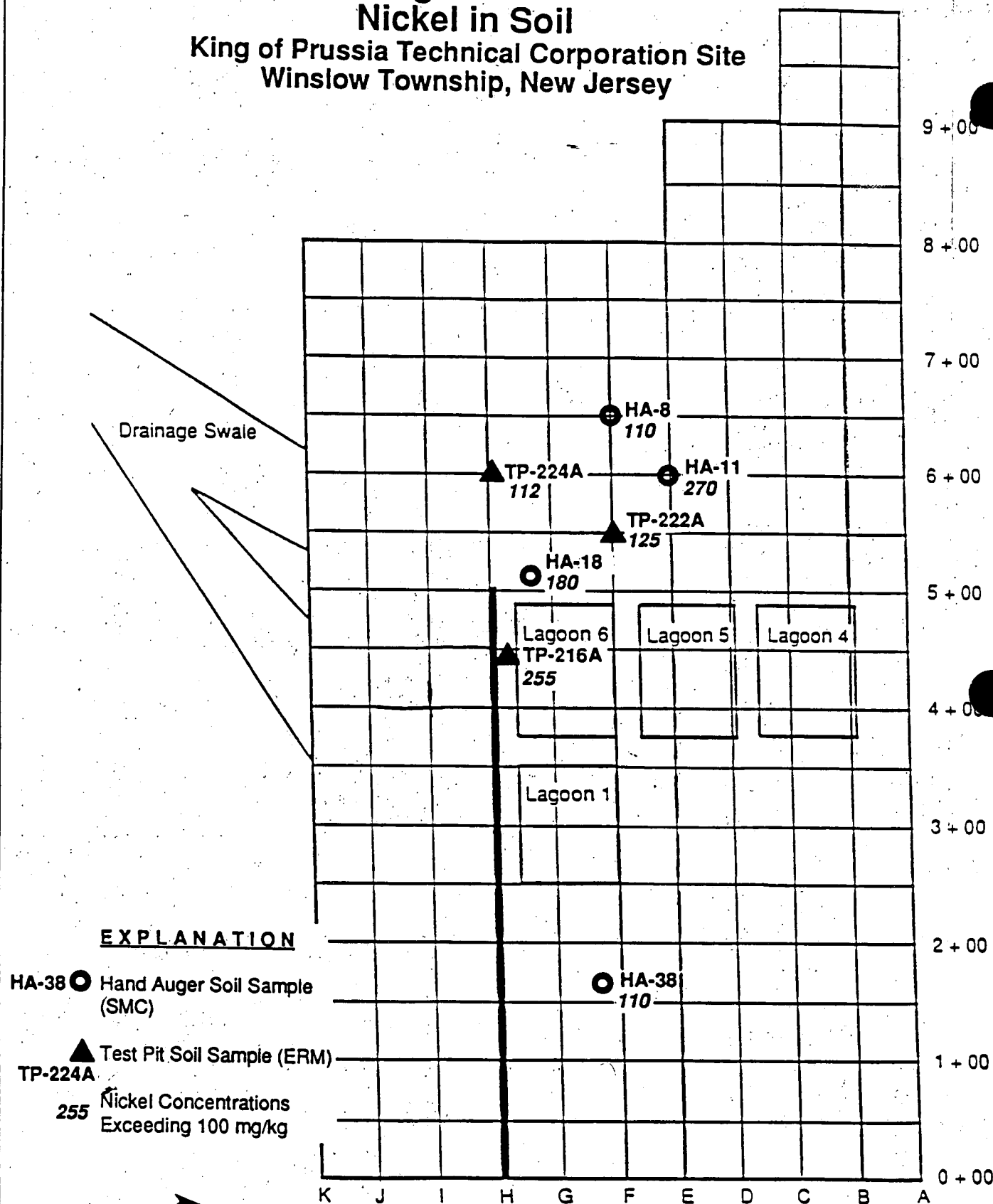
Checked by / Date: J.L.R. 12/16/88

Revised by / Date:

Checked by / Date:



Figure 4-9 Nickel in Soil King of Prussia Technical Corporation Site Winslow Township, New Jersey



Note: Not to Scale; All Locations Approximate
Base Map: SMC Martin (1986) and EPA Aerial Photographs

WO# 70402 15

Drawn by / Date: E.J.K 12/16/88

Checked by / Date: J.L.R. 12/16/88

Revised by / Date:

Checked by / Date:



a five foot plus subsurface composite sampling horizon as was collected by SMC.

The results of the ERM soil sampling event indicate that other Priority Pollutant metals are not significant contaminants in the soil at the site. Although present above background levels, none exceed NJDEP guidelines. A brief summary of their occurrence is given below.

Arsenic

The background concentration for arsenic is approximately 0.40 mg/kg. It was detected in a total of 20 test pits at concentrations ranging from 0.37 to an estimated 4.3 mg/kg, well under the NJDEP soil guidance value of 20 mg/kg.

Cadmium

The background concentration for cadmium is below 0.85 mg/kg. It was detected in a total of three horizons in two different test pits at concentrations of 1.6, 2.0 and 2.0 mg/kg. The NJDEP soil guideline value is 3 mg/kg.

Lead

The background concentration for lead is approximately 1.0 mg/kg. It was detected in all 34 test pits at concentrations ranging from 0.53 to 57 mg/kg, well below the NJDEP soil guideline value of 100 mg/kg.

Mercury

The background concentration for mercury is below 0.1 mg/kg. It was detected in only three test pits at concentrations ranging from 0.098 to 0.13 mg/kg, well under the NJDEP soil guideline of 1 mg/kg.

Zinc

The background concentration for zinc is somewhat difficult to determine since zinc was also present in the quality control blanks. However, based upon analytical results the background concentration appears to be approximately 8-10 mg/kg. Zinc was detected in a total of 19 test pits at concentrations ranging from 7.5 to 147 mg/kg, well under the NJDEP soil guideline of 350 mg/kg.

Other Priority Pollutant Metals

As determined during the second phase RI the Priority Pollutant metals antimony, silver and thallium were not present at concentrations significantly above their respective background concentrations of 5.5, 0.9, and 0.37 mg/kg. In addition, selenium was judged not present above the background concentration of 0.45 mg/kg due to its presence in quality control blanks at similar concentrations. NJDEP cleanup guidelines exist for antimony, silver, and thallium at 10 mg/kg, 5 mg/kg, and 5 mg/kg, respectively.

In addition to the four significant metal contaminants found in the soil during the phase one RI, silver and thallium were also detected in the HA-series samples above the NJDEP guidelines in several locations. These locations included HA-4, HA-5, HA-6, HA-11, HA-12, and HA-17.

4.3.3 Cyanide and Phenols

Cyanide and total phenols are not significant soil contaminants at the site. Both constituents were analyzed for in 29 test pit soil horizons. Cyanide was detected in only three test pit horizons in the range of 0.11 to 0.25 mg/kg. The remaining 26 sampling horizons contained cyanide at less than the detection limit of

0.10 mg/kg. Phenols were detected in only one location, TP-201A at 0.87 mg/kg. The remaining 28 test pit horizons contained phenols at less than the detection limit of 0.1 mg/kg.

4.4 Ground Water Sampling and Investigation

All analytical data for ground water can be found in tables located in Appendix F-4. The organic and inorganic analytical ground water data are summarized in Tables 4-9 and 4-10, respectively. Since ground water quality often changes significantly over time, the analysis of water quality conditions was performed using primarily the 1988 data obtained by ERM. Use of the SMC data was therefore limited to obtaining insights on the temporal variability of ground water quality.

4.4.1 Organic Compounds in Ground Water

Volatile Organic Compounds

Approximate concentrations of volatile organic vapors were detected from discrete interval split spoon samples within the saturated zone during well installations. Most sample results produced non-detectable levels of organic vapors (see Appendix B). With the exception of a few sample results from borings 12, 22, and 26, the remaining sample analyses produced OVA readings below 10 parts per million. The reasons for these low-level OVA results are not understood, but could be the result of naturally occurring organic vapors.

The high (120 and 310 ppm) OVA results in the 20-30 foot interval from boring 12 is interpreted as evidence of volatile organic contamination within a narrow vertical interval of the upper subzone aquifer. The moderate (21 and 48 ppm) levels of organic vapor detected in the 55-65 foot interval of boring 22 is not understood, given that volatile organic compounds were not detected in any water samples from the lower subzone aquifer. A

Table 4-9
ORGANIC DATA SUMMARY- GROUND WATER SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T. R. No.	11457	11451	11456	11450	11447	12782	11436	11446	11437	11440	10425
Sample Location	MW-1S	MW-2I	MW-3S	MW-4I	MW-5S	MW-6I	MW-7S	MW-8D	MW-9S	MW-10D	MW-11S
Sample Date	9/14/88	9/13/88	9/14/88	9/13/88	9/13/88	11/18/88	9/13/88	9/13/88	9/8/88	9/9/88	7/21/88
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organics			ND					ND		ND	ND
methylene chloride					2 J				2 J		
1,1-dichloroethene					64						
1,2-dichloroethene, (total)					12						
chloroform					1 J		1 J				
1,2-dichloroethane											
1,1,1-trichloroethane					570						
trichloroethene	26	2 J		2 J	940						
1,1,2-trichloroethane					2 J						
benzene					8	1 J					
tetrachloroethene		1 B			2500						
1,1,2,2-tetrachloroethane		2 B		1 B	2900						
toluene					190						
ethylbenzene					80	3 J					
Tentatively Identified											
Volatile Organic Compounds	ND	ND	ND	ND			ND		ND	ND	ND
dimethyl benzene isomers					440 J						
hexane isomer								11 J			
acetone											
alkane											
4-penten-2-ol											
trichloro-trifluoroethane						7.0 J					
total unknown alcohol											
total xylenes						4.0 J					
Semi-Volatile Organics		NA		NA		NA	NA	NA	NA	NA	
1-2-dichlorobenzene					9J						
2,4-dinitrophenol	4J										
bis(2-ethylhexyl)phthalate					1B						
Tentatively Identified											
Semivolatile Compounds		NA		NA		NA	NA	NA	NA	NA	
total unknowns	21J				101J						24J
unknown aromatic			34J								
Phosphoric acid, tributyl ester			23J		78J						
benzenemethane sulfonamide	6J				47J						
methoxy-methyl butanone isomer					6J						
N-methyl benzenamine isomer					16J						
total unknown hydrocarbons											
unknown carboxylate											
unknown siloxane											8J
N,N-dimethyl benzenamine											19J
total unknown hydrocarbon											
Pesticides/PCBs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND

Qualifier Codes:

B: This result is qualitatively invalid because the compound was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

ND: None detected.

Blank space indicate none detected.

Table 4-9 (continued)
ORGANIC DATA SUMMARY- GROUND WATER SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T. R. No.	11454	10426	11453	10423	11445	10419	10420	11455	11449	11448	10424
Sample Location	MW-12D	MW-13S	MW-14D	MW-15S	MW-16D	MW-17S	MW-18D	MW-19S	MW-20D	MW-21S	MW-22D
Sample Date	9/14/88	7/21/88	9/14/88	7/21/88	9/13/88	7/21/88	7/21/88	9/14/88	9/13/88	9/13/88	7/21/88
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organics											
methylene chloride		2 B	ND	ND	ND		ND	ND	ND		6 B
1,1-dichloroethene											
1,2-dichloroethene, (total)											
chloroform						2 J					
1,2-dichloroethane											
1,1,1-trichloroethane										2 J	
trichloroethene	3 J									170	
1,1,2-trichloroethane											
benzene											
tetrachloroethene										23	
1,1,2,2-tetrachloroethane										39	
toluene											
ethylbenzene											
Tentatively Identified											
Volatile Organic Compounds		ND	ND	ND	ND		ND	ND		ND	
dimethyl benzene isomers											
hexane isomer											6 J
acetone	37 J								130 J		
alkane									11 J		
4-penten-2-ol	7 J										
trichloro-trifluoroethane											
total unknown alcohol						11 J					
total xylenes											
Semi-Volatile Organics	NA		NA	ND	NA	ND		ND	NA	NA	
1,2-dichlorobenzene											
2,4-dinitrophenol											
bis(2-ethylhexyl)phthalate							3J				1J
Tentatively Identified											
Semivolatile Compounds	NA		NA	ND	NA			ND	NA	NA	ND
total unknowns		48J				60J					
unknown aromatic											
Phosphoric acid, tributyl ester											
benzenemethane sulfonamide											
methoxy-methyl butanone isomer											
N-methyl benzenamine isomer											
total unknown hydrocarbons		15J				18J					
unknown carboxylate		5J									
unknown siloxane											
N,N-dimethyl benzenamine											
total unknown hydrocarbon											
Pesticides/PCBs	NA	ND	NA	ND	NA	ND	ND	NA	NA	NA	ND

Qualifier Codes:

B: This result is qualitatively invalid because the compound was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

ND: None detected.

Blank spaces indicate none detected.

Table 4-9 (continued)
ORGANIC DATA SUMMARY- GROUND WATER SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T. R. No.	11442	11443	12345	10422	11441	11439	11434	11435	12343	12904
Sample Location	MW-23S	MW-24D	MW-25S	MW-26D	MW-27S	MW-28D	J & M	NJF&G	MW-25S'	MW-25S
Sample Date	9/9/88	9/9/88	10/7/88	7/21/88	9/9/88	9/9/88	9/8/88	9/8/88	10/6/88	11/18/88
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organics		ND		ND		ND	ND	ND		
methylene chloride									1.6B	1B
1,1-dichloroethene										
1,2-dichloroethene, (total)										
chloroform										
1,2-dichloroethane									0.36	
1,1,1-trichloroethane					2 J					
trichloroethene	1 B		1 J		230				1.5	1J
1,1,2-trichloroethane										
benzene										
tetrachloroethene					48				0.23	
1,1,2,2-tetrachloroethane					100					
toluene									1	
ethylbenzene										
Tentatively Identified										
Volatile Organic Compounds	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND
dimethyl benzene isomers										
hexane isomer										
acetone										
alkane										
4-penten-2-ol										
trichloro-trifluoroethane										
total unknown alcohol										
total xylenes										
Semi-Volatile Organics	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA
1,2-dichlorobenzene										
2,4-dinitrophenol										
bis(2-ethylhexyl)phthalate										
Tentatively Identified	NA	NA	NA							
Semivolatile Compounds	NA	NA	NA		NA	NA	NA	NA	NA	NA
total unknowns										
unknown aromatic										
Phosphoric acid, tributyl ester										
benzenemethane sulfonamide										
methoxy-methyl butanone isomer										
N-methyl benzenamine isomer										
total unknown hydrocarbons										
unknown carboxylate										
unknown siloxane										
N,N-dimethyl benzenamine										
total unknown hydrocarbon				34J						
Pesticides/PCBs	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA

Qualifier Codes:

B: This result is qualitatively invalid because the compound was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

ND: None detected.

spaces indicate none detected.

sample analyzed by method 601/602

Table 4-10
INORGANIC DATA SUMMARY-GROUND WATER SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T. R. No.	11457	11451	11456	11450	11447	12782	11436	11446	11437	11440	10425	11454
Sample Location	MW-1S	MW-2I	MW-3S	MW-4I	MW-5S	MW-6I	MW-7S	MW-8D	MW-9S	MW-10D	MW-11S	MW-12D
Sample Date	9/14/88	9/13/88	9/13/88	9/13/88	9/13/88	11/18/88	9/13/88	9/13/88	9/8/88	9/9/88	7/21/88	9/14/88
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Inorganics												
arsenic						2.2 B			0.9 B	1 B	2.7 B	1.3 B
beryllium	16	29	59	31	233						.97 B	1.3
cadmium					6.2							
chromium	87	20	237	26	1040				13		19	
copper	527	3070	3630	2830	12500			8.9	31		72 B	13 B
lead				10 B								3.2B
mercury		0.46				0.22 B						
nickel	142	783	1150	899	4670							
selenium							3 B		2 B			
zinc	90	232	782	627	2030	21 B	23	20 B	26	10	222	13

Qualifiers:

B - This result is qualitatively invalid due to the presence of the analyte in a method and/or travel blank at a similar concentration

J - This result should be considered a quantitative estimate.

Blank spaces indicate none detected.

Table 4-10 (continued)
INORGANIC DATA SUMMARY-GROUND WATER SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T. R. No.	10426	11453	10423	11445	10419	10420	11455	11449	11448	10424	11442
Sample Location	MW-13S	MW-14D	MW-15S	MW-16D	MW-17S	MW-18D	MW-19S	MW-20D	MW-21S	MW-22D	MW-23S
Sample Date	7/21/88	9/14/88	7/21/88	9/13/88	7/21/88	7/21/88	9/14/88	9/13/88	9/13/88	7/21/88	9/9/88
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L

Inorganics											
arsenic	6.1 B		1.5 B							3.0 B	1.5 B
beryllium	7.1	0.47	4.7 B		2.0 B		1.2		12		
cadmium							5.2 B				
chromium	23	77	20	10	8.3				74		
copper	524 J		263 J		21	14 B	413		790	27 B	12
lead		2.7 B					2.4 B		2.7 B		
mercury											
nickel	106		181				35		135	34	
selenium											2.9 B
zinc	79	22	188	7.1	31 B	10 B	26	22 B	120	67	40

Qualifiers:

B - This result is qualitatively invalid due to the presence of the analyte in a method and/or travel blank at a similar concentration

J - This result should be considered a quantitative estimate.

Blank spaces indicate none detected.

Table 4-10 (continued)
INORGANIC DATA SUMMARY-GROUND WATER SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T. R. No.	11443	12343	10422	11441	11439	11434	11435
Sample Location	MW-24D	MW-25S	MW-26D	MW-27S	MW-28D	J & M	NJF&G
Sample Date	9/9/88	10/6/88	7/21/88	9/9/88	9/9/88	9/8/88	9/8/88
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Inorganics							
arsenic	1.4 B		2.5 B		1.2 B		
beryllium	0.71	39 J		3.7			
cadmium		5.4					
chromium		340		13			
copper		2770	55 B	231		140	
lead							
mercury							
nickel		937		89			
selenium	2.5 B		2.3 B	2.6 B		2.8 B	2.9 B
zinc	15	397	89	99	13	25	26

Qualifiers:

B - This result is qualitatively invalid due to the presence of the analyte in a method and/or travel blank at a similar concentration

J - This result should be considered a quantitative estimate.

Blank spaces indicate none detected.

natural source for these unknown organic vapors cannot be ruled out.

Priority Pollutant volatile organic compounds were analyzed in samples from all monitoring wells in 1988. Quantifiable levels of these compounds were found in the samples from only four wells in the upper subzone aquifer (MW-1S, MW-5S, MW-21S, and MW-27S). The effect of the middle subzone confining unit's restriction of contaminant transport to the lower subzone aquifer is evident from the analyses of samples from the deep wells. Priority Pollutant volatile organic compounds were not detected at or above the quantification limit in any sample obtained from the middle subzone confining unit or the lower subzone aquifer.

The highest concentration of total volatile organic compounds was detected at MW-5S, with other significant concentrations detected only in wells along the swale (MW-21S and MW-27S), and near Lagoon 6 at MW-1S. In addition, the sample from downgradient well MW-25S contained an estimated trace (1 ug/l) of trichloroethene. Samples from the off-site Johnson Matthey and N.J. Fish and Game wells did not contain volatile organic compounds.

With the exception of relatively low concentrations of benzene (8 ug/l) and ethylbenzene (80 ug/l), and toluene (190 ug/l) in MW-5S, the volatile compounds detected in ground water were limited to six chlorinated aliphatic hydrocarbons. Tetrachloroethene, trichloroethene, and 1,1,2,2-tetrachloroethane were the principal compounds present. Total Priority Pollutant volatile organic concentrations in the four contaminated wells ranged from 26 ug/l at MW-1S to over 7,200 ug/l at MW-5S.

Eight tentatively identified volatile organic compounds or classes of compounds (TICs) were detected in samples from seven monitoring wells (MW-5S, MW-6I, MW-8D, MW-12D, MW-17S, MW-20D, and MW-22D), at individual estimated concentrations ranging from 4 to 440 ug/l. No single constituent was identified in samples from more than two

wells, thus minimizing the chance that any individual volatile TICs are significant ground water contaminants at the site.

Semivolatile Compounds

Priority Pollutant acid- and base/neutral- extractable organic compounds, cyanide, total phenol, pesticides, and PCBs were analyzed in samples taken from seven monitoring wells. No pesticides, PCBs, cyanide, or total phenol were detected in any of these samples. In addition semivolatile organic compounds (excluding pesticides and PCBs) were analyzed and not detected in samples from four additional monitoring wells (see Table 3-4). Priority Pollutant acid- and base/neutral- extractable organic compounds were found only at very low ug/l levels at five locations (MW-1S, MW-5S, MW-13S, MW-18D, and MW-22D). Semivolatile TICs were reported present at individual estimated concentrations ranging from 5 to 101 ug/l. As with the volatile TICs, none of the semivolatile TICs are interpreted as significant ground water contaminants at the site.

Comparison with SMC Data

A comparison was made of SMC's 1986 and ERM's 1988 analytical results for volatile organic compounds in samples from MW-1 through MW-7. These wells, although originally designated as shallow and deep, actually represent the upper and middle subzones across the site, as previously discussed. With the exception of well MW-5S, both sets of analyses correlated well with respect to the compounds identified and the concentrations detected. The following summarizes the analytical results from the upper subzone sample from MW-5S.

<u>Constituent</u>	SMC (1986) <u>Concentration</u> <u>in ug/l</u>	Ratio ERM/SMC <u>(rounded)</u>	ERM (1988) <u>Concentration</u> <u>in ug/l</u>
1,1,-Dichloroethene	26	2.50	64
1,2-trans-Dichloroethene	25	.50	12
1,1,1-Trichloroethane	280	2.00	570
Trichloroethene	360	2.60	940
1,1,2,2-Tetrachloroethane	930	3.10	2,900
Tetrachloroethene	1,500	1.70	2,500
Ethyl benzene	43	1.90	80
Benzene	N.D.	-	8
Toluene	N.D.	-	190

Notes: N.D. = Not detected

Virtually the same volatile constituents were identified in analyses from both years, at concentrations, on average in 1988, that are double those detected in 1986. Given the dry summer conditions of 1988 and the wet conditions present in March 1986, the 1986 results may reflect contaminant dilution from precipitation, or differences in sampling and/or analytical techniques.

Finally, three samples from MW-25S were analyzed for volatile organic compounds. These analyses are presented in Appendix E. Shortly after installation, a one-inch diameter polyethylene section of hose that was used to develop the well became lodged inside the well. Attempts to remove the hose failed, and as a result, ground water samples were obtained using a modified suction-lift procedure (Imbrigiotta and others, 1988). Personnel at the USEPA expressed concern regarding the potential loss of volatiles using this technique, so ERM recommended that volatiles be analyzed concurrently using USEPA's GC-MS Method (624) and their GC-PID/Hall Detector Method (601/602/603). The latter method produces an order-of-magnitude lower detection limit which

would compensate for the lack of sensitivity of the GC-MS Method to very low levels of volatiles which might result from the effects of negative pressure on the water column. The results of both analyses suggested that a non-quantifiable trace of trichloroethene was present in the well. By way of confirmation, a third sample was obtained using a custom 1/2-inch diameter teflon bailer which eliminated the theoretical effects of negative pressure on the sample. This third analysis confirmed the results obtained from the previous two analyses.

4.4.2 Inorganic Elements in Ground Water

Priority Pollutant metals were analyzed in samples from all monitoring wells in 1988. Five dissolved Priority Pollutant metals were detected in samples from many of the ground water monitoring wells. These metals are beryllium, chromium, copper, nickel, and zinc. The only other metals identified were cadmium which was detected in MW-5S and Mw-25S and mercury which was detected in MW-2i. With the exception of zinc, Priority Pollutant metals were not detected in upgradient well MW-7S during the 1988 sampling. This is consistent with background conditions found during the initial phase of the RI.

Overall, the 1986 analysis results obtained by SMC correlate well with the those obtained in 1988. The metals found in 1986 analyses are virtually the same as those identified in 1988. Unlike the concentration of volatiles in MW-5S which were higher in 1988, in general the concentrations of dissolved metals were higher in the 1986 samples. Section 4.6 discusses the implications of the isoconcentration contours with respect to contaminant sources and transport with the shallow subzone aquifer.

Some of the higher concentrations of copper and nickel observed in the ground water were detected at wells MW-2i and MW-4i, screened within the confining unit. However, of all the lower subzone

wells, only samples from MW-14D and MW-16D contained levels of a dissolved metal (chromium) significantly above background levels.

A summary discussion follows for select dissolved metal concentrations detected in the 1988 samples.

Beryllium

This metal is represented by the lowest and narrowest range of concentrations of the five potentially site-related metals found in the shallow ground water system. Concentrations ranged from less than detection limits to 233 ug/l, with the highest concentration occurring at MW-5S. Beryllium in the intermediate system ranged from less than detection limits to 31 ug/l. Beryllium was detected in samples from the deeper system at MW-12D (1.3 ug/l), MW-14D, (0.47 ug/l), and MW-24D (0.71 ug/l).

Chromium

Chromium ranged in concentration from less than the detection limit to 1040 ug/l in the shallow ground water system, the highest concentration occurring in MW-5S. Chromium in the intermediate system ranged from less than detection limits to 26 ug/l. It was detected in the deeper system at MW-14D and MW-16D at 77 and 10 ug/l, respectively.

Copper

This metal exhibited the highest and broadest range of concentrations of the dissolved metals found in ground water. Concentrations in the shallow ground water system ranged from below the detection limit to 12,500 ug/l. The highest concentrations in 1988 occurred at MW-5S and MW-3S, at 12,500 and 3,630 ug/l, respectively. Copper concentrations ranged from below detection limits to 3,070 ug/l in the three intermediate depth wells. The only reportable concentration for copper in the deeper

system was 8.9 ug/l at well MW-8D, which is just above the detection limit.

Nickel

This metal also exhibited a broad range of concentrations in the shallow aquifer system, ranging from below detection limits to 4,670 ug/l. The highest concentrations occur at MW-5S and MW-3S, at 4,670 and 1,150 ug/l, respectively. Samples from the three intermediate depth wells exhibited levels of nickel ranging from below detection limits to 899 ug/l. Nickel was not detected at significant concentrations in the deeper ground water system.

Zinc

In the shallow ground water system, zinc ranged in concentration from 23 to 2,030 ug/l with the highest concentration occurring at MW-5S. Zinc ranged from 23 to 627 ug/l in the three intermediate zone wells. The concentrations of zinc found in the deep system were comparable to background concentrations with one exception (MW-26).

Other Metals

Finally, mercury was detected just above the minimum detection limit in one well (MW-2i), screened in the intermediate subzone. Cadmium was detected at wells MW-5S and MW-25S at 6.2 and 5.4 ug/l respectively.

4.5 Surface Water And Sediment Sampling

All analytical data from the surface water and sediment sampling can be found in tables located in Appendix F-3. The organic and inorganic analytical data from this sampling event are summarized in Tables 4-11 and 4-12, respectively. All surface water results represent analyses for total (non-filtered) constituents.

Table 4-11
ORGANIC DATA SUMMARY-SURFACE WATER AND SEDIMENT SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T. R. No.	8476	8462	8457	8479	8481	8488
Sample Location	SW-208	SW-205	SW-211	SD-211	SD-208	SD-205
Sample Date	5/27/88	5/27/88	5/27/88	5/27/88	5/27/88	5/27/88
Percent Moisture	.	.	.	30%	55%	48%
Units	ug/L	ug/L	ug/L	ug/Kg	ug/Kg	ug/Kg
Volatile Organics	ND	ND	ND	NA	NA	NA
Tentatively Identified						
Volatile Organic Compounds	ND	ND	ND	NA	NA	NA
Semi-Volatile Organics		ND	ND			
isophorone				65B	88B	75B
fluoranthene						69J
pyrene						82J
bis(2-ethylhexyl)phthalate	4J				100J	100J
chrysene						69J
benzo(k)fluoranthene						69J
Tentatively Identified						
Semivolatile Compounds	ND	ND	ND			
total unknowns				5500J	12000J	17000J
total unknowns hydrocarbons				17000J	65000J	6200J
Pesticides/PCBs	ND	ND	ND	ND	ND	ND

Qualifier Codes:

B: This result is qualitatively invalid because the compound was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

ND: None detected.

Blank spaces indicate none detected.

*: Analysis is meaningless for a water sample.

Table 4-12
INORGANIC DATA SUMMARY-SURFACE WATER AND SEDIMENT SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T. R. No.	8459	8460	8461	8462	8476	8477	8478	8457
Sample Location	SW-202	SW-203	SW-204	SW-205	SW-208	SW-209	SW-210	SW-211
Sample Date	5/27/88	5/27/88	5/27/88	5/27/88	5/27/88	5/27/88	5/27/88	5/27/88
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Inorganics								
antimony								
arsenic	3.1 B	2.7 B	2.0 B			1.7 B	2.3 B	2.6 B
beryllium	5.1 B	5.1 B	5.1 B	5.1 B				
cadmium								
chromium	332	307	174	137			11	
copper	943	789	396	445				
lead	8.2	5.6	3.4	4.9	2.8	3.8	5.1	3.2
mercury						0.32		
nickel	67	34	31	51			83	
selenium								
zinc	106	60	60	45	26 B	25 B	49	54
Cyanides	NA	NA	NA			NA	NA	
Phenols	NA	NA	NA	12		NA	NA	

Qualifier Codes

B: This result is qualitatively invalid because the analyte was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

ND: None detected.

Blank spaces indicate none detected.

Table 4-12 (continued)
INORGANIC DATA SUMMARY-SURFACE WATER AND SEDIMENT SAMPLES
KING OF PRUSSIA TECHNICAL CORPORATION
WINSLOW TOWNSHIP, NEW JERSEY

ERM T. R. No.	8485	8486	8487	8488	8481	8483	8496	8479	8482
Sample Location	SD-202	SD-203	SD-204	SD-205	SD-208	SD-209	SD-210	SD-211	SD-212
Sample Date	5/27/88	5/27/88	5/27/88	5/27/88	5/27/88	5/27/88	5/27/88	5/27/88	5/27/88
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Inorganics									
antimony		80 J		21 J					
arsenic	17 J	35 J	28 J	12 J					
beryllium	63	10 B	3.1	2.3 B		4.1 B			
cadmium					4.0	2.6		2.7	
chromium	8010	5870	3820	592	4.8 B	43	131	9.3	5.1 B
copper	9070	5000	6080	323		199	13	6.8	55
lead	87	271	181	105	11	49	3.9	3.2	36
mercury	2.6	9.9	6.1	0.41			0.52		
nickel	387	97	57			28			16
selenium	3.7 B	8 B	5.1 B		1.3 B	1.8 B			1.4 B
zinc	243	80	57	22	25	37	18	8.3 B	11 B
cyanide	NA	NA	NA	0.83		NA	NA		NA
phenol	NA	NA	NA			NA	NA		NA

Qualifier Codes

B: This result is qualitatively invalid because the analyte was also detected in a blank at a similar concentration.

J: This result should be considered a quantitative estimate.

NA: Not analyzed.

ND: None detected.

Blank spaces indicate none detected.

4.5.1 Organic Compounds in Surface Water and Sediment

Priority Pollutant organic compounds were analyzed in water samples from one location in the drainage swale (SW-205) and two locations in the Great Egg Harbor River (SW-208 and SW-211). No Priority Pollutant volatile compounds or TICs were identified in these samples. The Priority Pollutant compound bis(2-ethyl hexyl) phthalate was the only semivolatile compound detected in the Great Egg Harbor River. It was detected in both the surface water and sediment from the upstream location in the Great Egg Harbor River (SW/SD-208), at estimated low ug/kg concentrations. This compound was not detected in either matrix at any downstream river location or in the swale. No Priority Pollutant pesticides or PCBs were detected in any surface water and sediment samples from the river, or the swale.

Five Priority Pollutant semivolatile compounds were reported at less than detection limits in the swale sediment at location SD-205, but not in the overlying surface water sample. The semivolatile compounds present included bis(2-ethyl hexyl) phthalate and four polynuclear aromatic hydrocarbons. The former is a plasticizer and common laboratory cross-contaminant. The latter are characteristic of combustion products, and are commonly found in low levels in the environment due to such phenomena as wood fires and use of fossil fuels.

Other tentatively identified semivolatile compounds were reported in the sediments of the drainage swale and the Great Egg Harbor River. These compounds, classified as unknown compounds and hydrocarbons, were detected in the swale at location SD-205 near the Fire Road at a concentration of approximately 23,200 ug/kg. The highest concentration of unknown hydrocarbons (65,000 ug/kg) occurred in the river at location SD-208, which is upstream of the influence of the site. The downstream location sample (SD-211, at Piney Hollow Road) contained an estimated concentration of 17,500

ug/kg of unknown hydrocarbons. No semivolatile or volatile organic TICs were detected in the surface water at these locations. It is possible that naturally occurring organic substances (possibly components of humic or fulvic acids) comprise the unknown organic fraction.

4.5.2 Inorganic Elements in Surface Water and Sediment

None of the elements antimony, arsenic, beryllium, cadmium, selenium, silver, and thallium were detected in any of the surface water samples collected from the swale or the river. Chromium, copper, lead and zinc were detected in all of the water samples from the swale, with scattered detections of other metals. Concentrations of chromium, lead, and nickel were detected in the Great Egg Harbor River above background in the area between the swale/river confluence and the presumed area of ground water discharge from the site. In the river water these metals returned to background concentrations in the sample collected at Piney Hollow Road (SW-211).

High concentrations of chromium, copper, nickel, lead, and some beryllium were detected in the swale sediments, and lower concentrations of chromium, copper, nickel and lead in the river sediments, which exceeded upstream concentrations. In the swale sediments, chromium concentrations ranged from 592 to 8010 mg/kg, copper from 323 to 9070 mg/kg, nickel from less than 9.7 to 387 mg/kg, lead from 87 to 271 mg/kg, and beryllium from 31 to 63 mg/kg.

In the river sediments, concentrations of chromium ranged from 9.3 to 131 mg/kg below the swale/river confluence, copper from below background to 199 mg/kg, nickel from below background to 28 mg/kg, and lead from below background to 49 mg/kg. The higher concentrations were detected at location SW-209, except for chromium which was highest at location SW-210.

These results, and their implications for contaminant migration from the site, will be discussed further in Section 4.6.3.

4.6 Migration of Contaminants

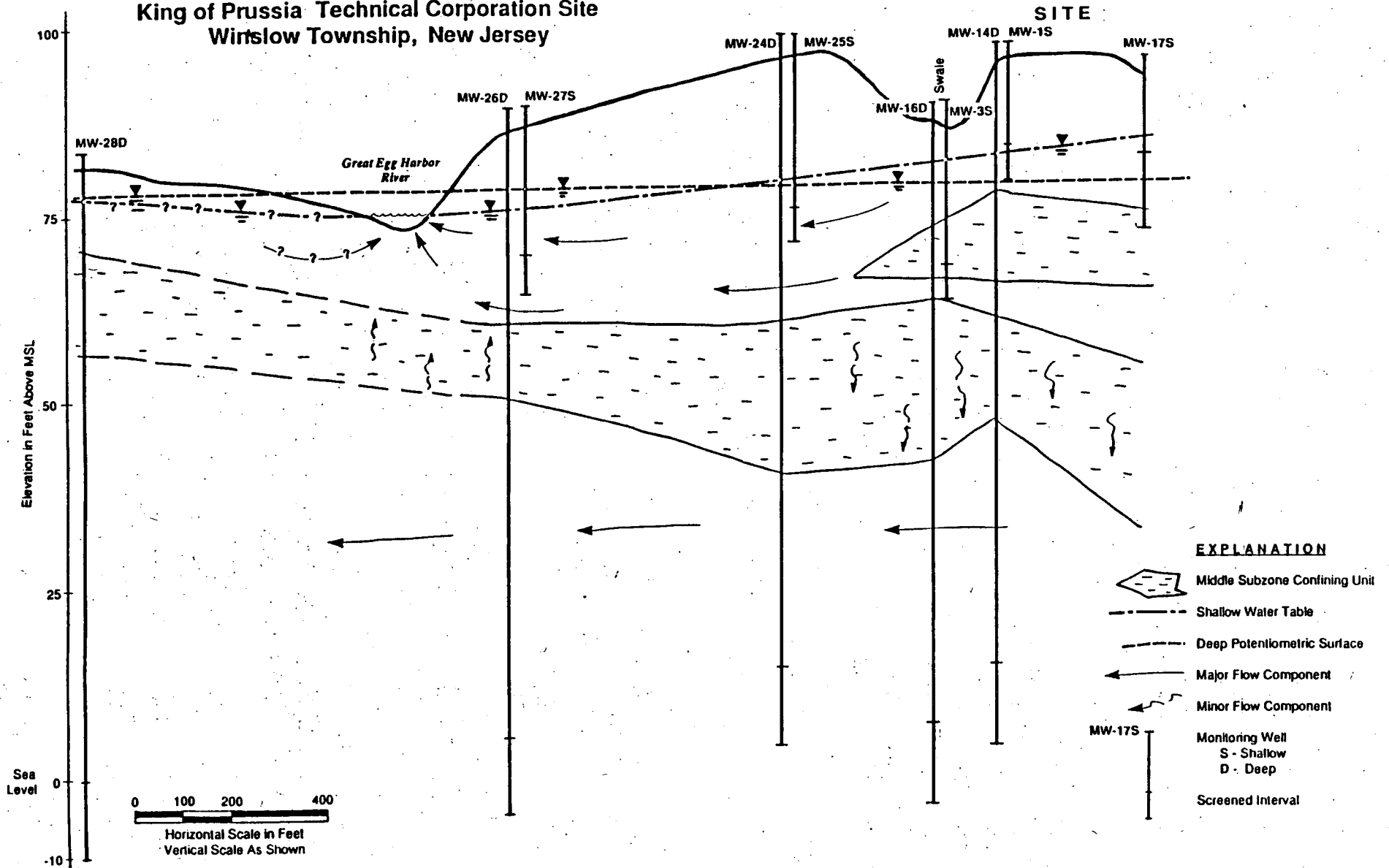
4.6.1 Vertical Migration

The data base described above indicates that contaminant migration has occurred in ground water at the site. However, the dynamics of ground water flow at the site largely limits the impact to the upper subzone aquifer. This is demonstrated by the low level of contaminants in the lower subzone aquifer (Refer to Section 4.4.2). Despite the fact that the middle subzone does allow some vertical contaminant migration, the middle subzone still functions as a confining unit. Figure 4-10 provides a conceptual model of "three dimensional" subsurface flow in cross sectional view.

The results of the aquifer testing indicated that the vertical hydraulic conductivity (K_v) of the middle subzone confining unit is approximately 2.7×10^{-7} cm/sec, which is indeed low enough to create confined conditions in the lower subzone aquifer. As a "check" on that number, ground water quality data can be used to provide a second estimate of K_v for the middle subzone unit. This is described as follows.

The copper concentration in well MW-2i was 3070 ug/l. This well is screened near the bottom of the middle subzone confining unit, indicating that contaminant migration has occurred into that unit under the influence of the high vertical hydraulic gradient between the upper and lower subzones. Apparently, very little cation exchange attenuation is occurring in the middle subzone. However, directly below in the lower subzone aquifer, the copper concentration was reported as < 5 ug/l. This implies that the lateral flow through the lower subzone aquifer is much greater than the vertical discharge into it from the middle subzone. In

Figure 4-10
Ground Water Flow Schematic
King of Prussia Technical Corporation Site
Wirtslow Township, New Jersey



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Revised by / Date:

Checked by / Date: J. LA REGINA

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fact, if the actual copper concentration were assumed to be 4 ug/l, the sample concentration of copper from the lower subzone was only 0.13 percent of that found in the middle subzone. This means that inflow to the lower subzone from the middle subzone (hereinafter Q_m) is less than 0.13 percent of lateral flow from upgradient in the lower subzone aquifer (hereinafter Q_1).

Darcy's Law can be used to estimate the K_v for the middle subzone. Darcy's Law states that:

$Q = KiA$, where:

Q = flow, in ft^3/day

K = hydraulic conductivity, in ft/day . $K_1 = 62$
 ft/day (Section 4.1.3)

i = hydraulic gradient, in ft/ft . $i_1 = .002$ as
 measured between wells MW-14D and MW-8D.

$i_v = .003$ ft/ft as measured between wells MW-2i
 and MW-14D.

A = cross sectional area of flow, in ft^2

From the above discussion, $Q_1 = K_1 i_1 A$; thus for a one ft^2 unit
 area: $Q_1 = 62 \text{ ft}/\text{day} \times .002 \text{ ft}/\text{ft} \times 1 \text{ ft}^2 = 0.12 \text{ ft}^3/\text{day}$, and:

$Q_v = .0013(Q_1) = 0.0002 \text{ ft}^3/\text{day}$, and:

$K_v = Q_v / i_v A$

$K_v = .0013(Q_1) / i_v A = (.0013) \times (0.12 \text{ ft}^3/\text{day}) / .003 \text{ ft}/\text{ft}$

$K_v = 0.05 \text{ ft}/\text{day} = 1.8 \times 10^{-5} \text{ cm}/\text{sec}$

This result should represent a maximum K_v , as it was assumed that copper was present at well MW-14D at just below the limit of detection. In actuality, the concentration may have been an unknown amount lower than that.

The above analysis reinforces that the middle subzone functions as a confining unit. From this analysis and the aquifer test

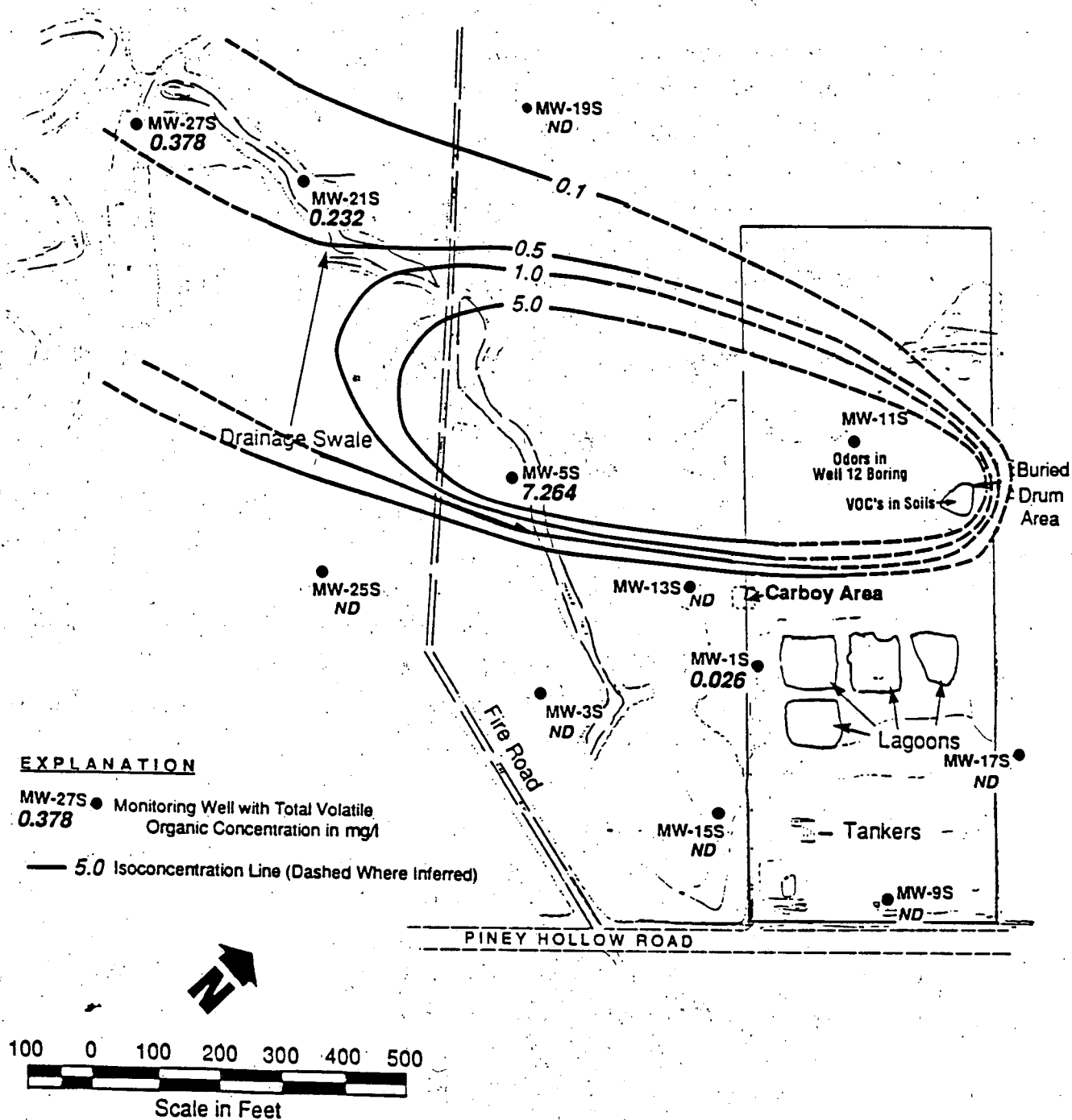
leakance results (Section 4.1.3), the K_v ranges between 2.7×10^{-7} and 1.8×10^{-5} cm/sec. Although this is a wide range, the contrast with the conductivity of the sand units-at-the site (approximately 2.9×10^{-2} cm/sec by aquifer test calculation) is a minimum of three orders of magnitude, and possibly four. This is sufficient contrast to produce confined conditions in the lower subzone aquifer, thus preventing impact on that unit from the contamination above.

4.6.2 Extent of Volatile Organic Compound Migration

Figure 4-11 shows an inferred isoconcentration map of volatile organic compounds (VOCs) in the upper subzone aquifer. Only well MW-5S contained any significant VOCs, with a total of over 7,000 ug/l. However, the results of other investigation components allow a probable migration configuration to be compiled. Specifically, the buried drum area soils contained several hundred mg/kg total volatiles, including tetrachloroethene, also found in ground water at well MW-5S. Well MW-11S, immediately downgradient of the buried drum area, contained no VOCs. However, during drilling of adjacent well MW-12D, strong odors and high OVA readings were encountered. Review of the well MW-12D boring log indicated the presence of a locally significant clay in the upper 20 feet of the stratigraphy. The odors were encountered in sands beneath this. Since well MW-11S was screened from about 3 to 13 feet in depth, the VOCs were not intercepted, as they migrate preferentially in the permeable sand zone below the clay.

Further examination of site boring logs did not indicate local lithologic changes which would channel the VOC migration in unexpected directions. Thus, the VOCs apparently have migrated along the flow gradient in the upper subzone aquifer, through the area of MW-5S, and on to discharge to the Great Egg Harbor River. The isoconcentration lines in Figure 4-10 have been inferred to reflect this conditions. Since the upper subzone ground water discharges to the River and the lower subzone aquifer has only

Figure 4-11
Total Volatiles in the Upper Subzone Aquifer
Isoconcentration Map
King of Prussia Technical Corporation Site
Winslow Township, New Jersey



trace levels of contamination, no underflow of contaminants beneath the river occurs. Thus, the river is likely the limit of the subsurface migration of VOCs, although this interpretation should be reinforced with the installation of a shallow piezometer along the west side of the river.

Despite the complete lack of volatile organic compounds in water samples obtained from the two referenced deep wells, elevated OVA readings were observed in geologic samples taken from the lower subzone aquifer at EB-17, MW-18D, and MW-20D. Since there is no evidence of OVA malfunction, ERM suspects that the OVA values are legitimate but the cause of these readings is not known. Based on the results obtained from validated quantitative analysis of aquifer water, however, ERM does not interpret the lower subzone aquifer to be contaminated with volatile organic compounds.

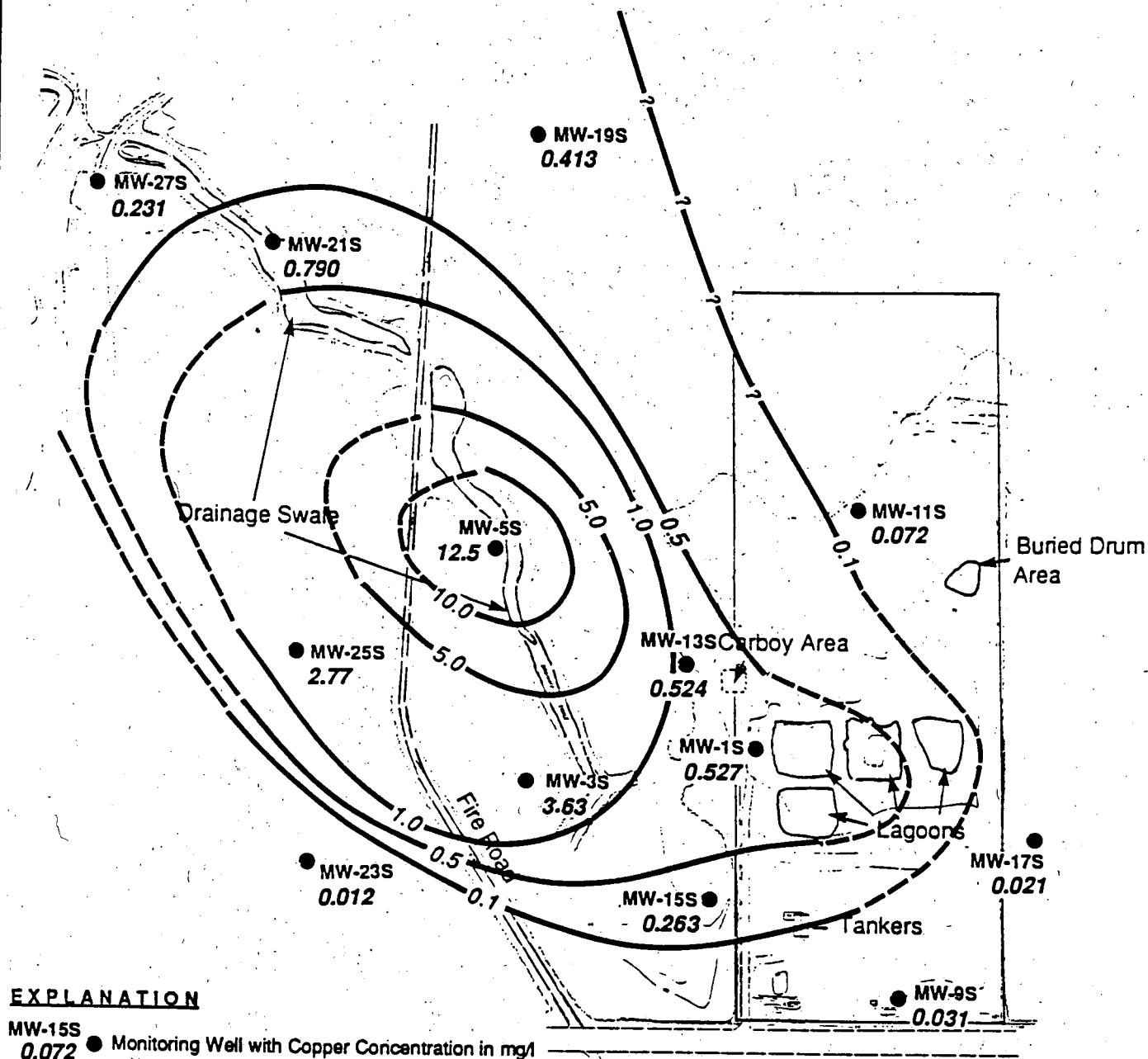
4.6.3 Extent of Metals Migration

Figures 4-12 and 4-13 illustrate the migration of two metals (copper and chromium) in the upper subzone ground water at the site. These figures show that at present, the lagoons and carboy area appear to contribute minor concentrations of copper and chromium to the ground water. However, the center of the contamination occurs at well MW-5S and to a lesser extent at well MW-3S. This suggests two possibilities:

- The lagoon materials and carboy contents have leached most of their metals, with the highest concentrations having migrated to downgradient areas; or
- An unknown source area exists in the vicinity of the most affected wells.

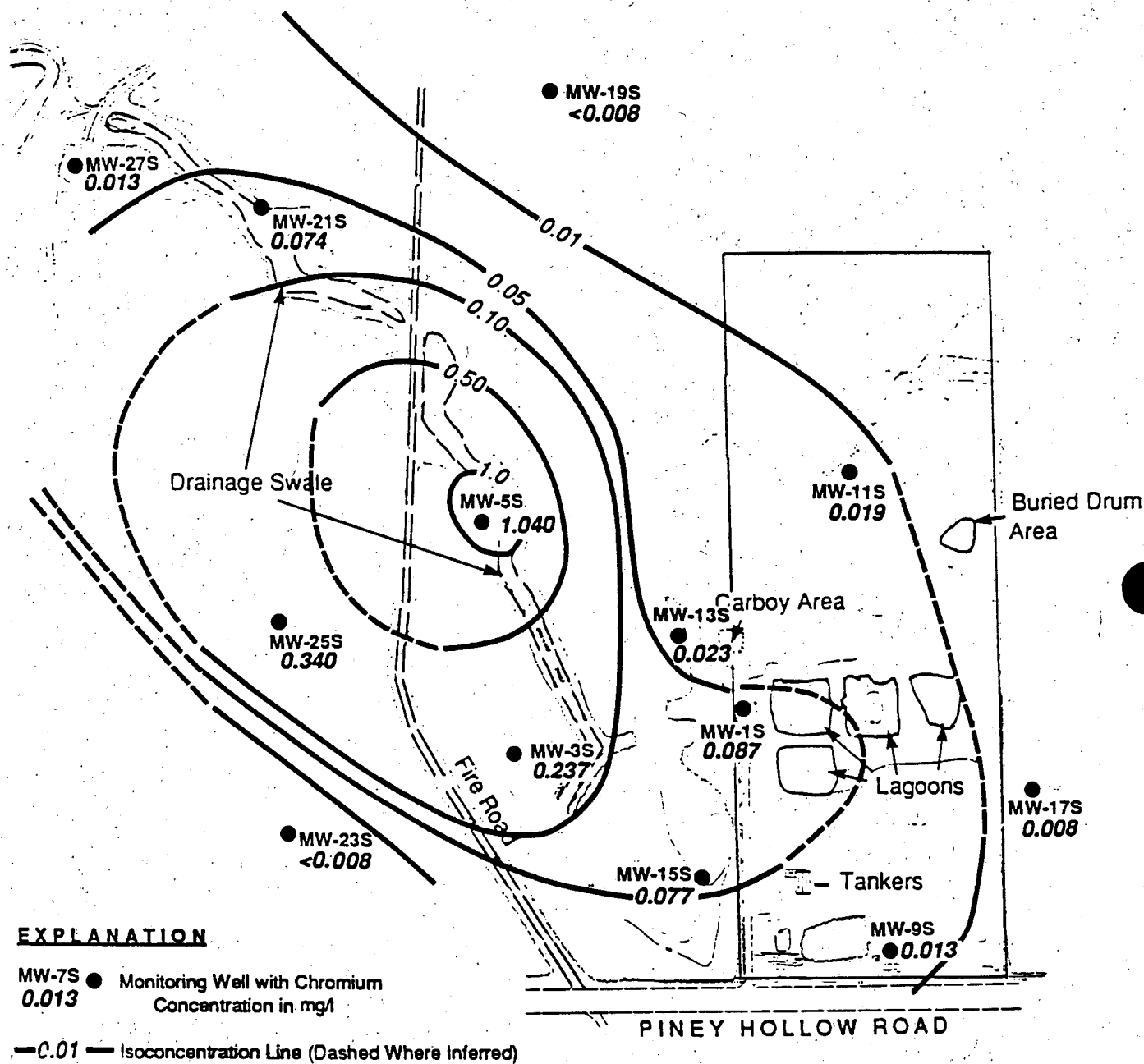
To evaluate these scenarios, ERM has examined conditions in the drainage swale, which is adjacent to wells MW-3S and MW-5S. Figure 4-14 shows that the copper and chromium concentrations in

Figure 4-12
Copper in the Upper Subzone Aquifer
Summer - Fall 1988
Isoconcentration Map
King of Prussia Technical Corporation Site
Winslow Township, New Jersey



100 0 100 200 300 400 500
 Scale in Feet

Figure 4-13
Chromium in the Upper Subzone Aquifer
Summer - Fall 1988
Isoconcentration Map
King of Prussia Technical Corporation Site
Winslow Township, New Jersey



100 0 100 200 300 400 500

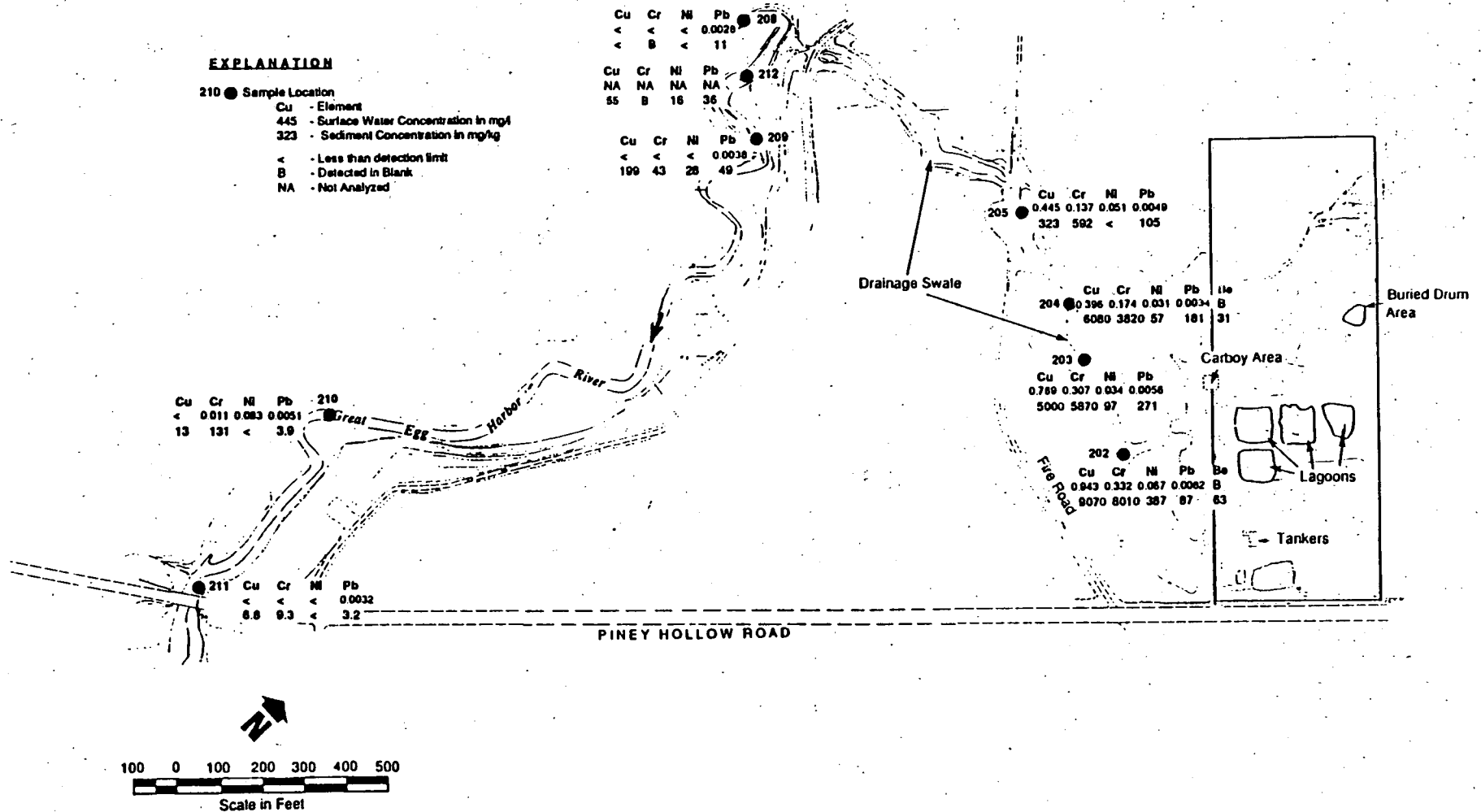
Scale in Feet

Figure 4-14 Summary of Surface Water/Sediment Sampling Results

King of Prussia Technical Corporation Site
Winslow Township, New Jersey

EXPLANATION

- 210 ● Sample Location
Cu - Element
445 - Surface Water Concentration in mg/l
323 - Sediment Concentration in mg/kg
< - Less than detection limit
B - Detected in Blank
NA - Not Analyzed



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Revised by / Date:

Checked by / Date: J. LA REGINA

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the swale sediments are in the thousands of mg/kg. These concentrations are generally higher than those in the lagoon sludges as analyzed during the SMC Martin investigation. Two possible scenarios could explain this:

- Ground water discharge to the swale during wet conditions could cause metals to adsorb onto organic material in the swale bottom; or
- Some metal-containing waste was discharged directly to the swale in sufficient quantity to create a ground water contamination source area.

Additional sampling and leaching tests of the swale sediments would be required to determine whether the swale sediments are a receptor of metals or a significant source. However, it is ERM's opinion that the preponderance of the data suggest that the swale sediments are a major source of the metals contamination in the ground water.

As shown in Figures 4-12 and 4-13, the metals in ground water migrate toward the Great Egg Harbor River. Like the VOCs, they discharge to the river, and no underflow occurs. The results of the inorganic surface water analyses are shown on Figure 4-14. Except for 11 ug/l of chromium, 83 ug/l of nickel at location SW-210, and slightly elevated zinc at SW-210 and SW-211, no metals were detected in the river water. Copper, chromium, lead, and nickel above background levels were detected in the river sediments where the ground water discharges to the river. The concentrations near the confluence of the swale with the river are lower than those downstream, where ground water discharges from the site. Therefore, the metals appear to be adsorbed onto the sediments from discharging ground water, and are not entering the river via erosion along the swale. This is consistent with the conclusion that swale runoff would not be able to occur past the Fire Road, which blocks the swale.

SECTION 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This section presents the conclusions of the Remedial Investigation at the King of Prussia Technical Corporation Site.

5.1.1 Source Area Characteristics

- The lagoon sludges, buried sludges in the soil profile, tanker residues, and carboy contents all contain chromium, copper and nickel, with some other minor metals present as well. The presence of these elements is consistent with the nature of the former waste processing operation as it is generally understood.
- With few exceptions, these waste materials do not contain significant quantities of semivolatile Priority Pollutant organic compounds. Sludges in TP-220, TP-222, TP-225 and the residue in Tanker two are the only source materials tested on site which contain detectable concentrations of semivolatile organic compounds.
- The soils in the buried drum area suggest that waste residues are present which contain significant concentrations of Priority Pollutant volatile organic compounds, pesticides, and unidentified hydrocarbons. The presence of these compounds is not consistent with the kinds of materials known to have been handled by the former waste processing operation. Arsenic, copper, and chromium were detected above NJDEP cleanup guidance levels in one of two samples collected from the buried drum area. No other metals or common ions were detected at concentrations significantly above NJDEP

Guidelines. The Buried Drum Area does not appear to be a major source for metals contamination or acid residuals.

5.1.2 Soil Conditions

- No Priority Pollutant organics were detected in the site soils at elevated levels.
- Most soil sampling locations contained indicator metals at levels above background, but below New Jersey guidance levels.
- Only limited areas of on-site soils contain concentrations of chromium, copper, nickel, and beryllium which exceed New Jersey guidance levels.
- The off-site swale sediments contained the highest levels of copper, chromium, lead and nickel of any soil materials analyzed.

5.1.3 Geology and Ground Water Flow

- Hydrogeologic conditions in the uppermost 150 feet of subsurface material are characterized by the presence of the upper, middle, and lower subzones of the Kirkwood-Cohansey Aquifer System.
- Lithologic, geophysical, and aquifer test data indicate that the upper and lower subzones are aquifers, and that the middle subzone functions as a confining unit.
- The confining unit separates shallow and deep groundwater flow systems, both of which flow from northeast to southwest across the site toward the Great Egg Harbor River.

- Potentiometric head measurements indicate that the shallow (upper subzone) ground water system discharges to the river, and that the deep (lower subzone) ground water system underflows the river, with a minor component discharging upward toward the river.

5.1.4 Ground Water Quality

- The upper subzone ground water system contains quantifiable levels of volatile organic compounds. The buried drum area appears to be the source of this contamination, which flows through sand interbeds toward the river, passing through the area of well MW-5S where concentrations of total VOAs are just over 7,000 ug/l.
- No significant concentrations of Priority Pollutant semivolatile organic compounds, pesticides, or PCBs are present in the upper subzone aquifer.
- Several dissolved priority pollutant metals are present in the upper subzone aquifer in excess of background concentrations. The lagoons and the carboy area appear to contribute concentrations generally near or below 500 ug/l of any given metal. The sediments in the swale appear to contribute the highest metal concentrations with, for example, concentrations of copper and chromium in the range of 1,000 to 1,250 ug/l in the ground water. This conclusion is tentative, and needs to be verified.
- With only minor exceptions, Priority Pollutant organic and inorganic compounds were not detected in the lower subzone aquifer. The results verify that the middle subzone sediments function as a confining unit which impedes the transport of contaminants to the lower subzone aquifer, to the extent that no significant impact occurs.

- Based upon the analysis of three samples obtained from MW-25S using two different sampling technologies, ERM concludes that a non-quantifiable trace of Trichloroethene is present in the well. No other volatile organic compounds could be found at or above one ug/l. Thus, this monitoring well is considered acceptable for the collection of samples to be analyzed for volatile organic compounds.

5.1.5 Surface Water Hydrology

- Runoff at the site is minimized by the low topography and the sandy nature of the soils. The off-site swale receives what runoff does occur.
- During periods of nominal precipitation, runoff in the swale is blocked by the first of two fire roads and is impounded.
- During extended periods of rainy weather, as characterized by the Spring of 1989, water in the swale can overtop the first fire road but is again blocked and impounded by the second fire road which appears to prevent direct discharge to the Great Egg Harbor River.
- It was observed on 16 May 1989, following a period of heavy rain, that approximately 3 feet of free board was present in the swale before the second fire road would be overtopped. Although the first fire road was topped marginally by standing water, there was no evidence of overland flow in the swale waters. Therefore, the potential for runoff to overtop the second fire road and discharge directly to the Great Egg Harbor River appears remote.

5.1.6 Surface Water and Sediment Quality

- No Priority Pollutant organic compounds were detected at elevated levels in the surface water and sediment in the Great Egg Harbor River, downstream of the KOP site.

- Site-related metals are present at concentrations elevated above background in the surface water and sediment, in the area of the river which receives ground water discharge from the KOP site. The data indicate that the source of these metals is the ground water discharge from the shallow subzone aquifer system.
- Site-related metals are present in the standing water and sediments in the swale. The concentrations in the swale upslope of the Fire Road exceed the New Jersey guidance levels for copper and chromium.

5.2 Recommendations

Based on the results of the Remedial Investigation, ERM has determined the need for a limited amount of additional data to verify the sources for the volatile organics in site ground water and the high concentration metals in ground water beneath the off-site swale. The evaluation and presentation of this data will be included as part of the Feasibility Study. Recommendations for additional data collection are as follows:

- A limited ground water investigation in the upper subzone aquifer should be performed between the drum burial area and well MW-5S to verify the source area for the volatile organic compounds in ground water, and to characterize the source area concentrations. This investigation should proceed in two steps; first, a ground water off-gassing survey should be conducted using field instrumentation, to verify the source area. Then, a shallow monitoring well should be installed at the source area to allow determination of the source area concentrations.
- A soil sampling/analysis program should be conducted in the off-site swale to determine the areal and vertical extent of

contamination in excess of New Jersey guidelines. Leaching analyses should be conducted to determine whether or not these soils are the source of ground water contamination.

- Limited sampling/analysis of the lagoon sludges should be conducted to determine their potential as continuing sources of ground water contamination. Leaching analyses should be included in this program.
- Assuming that the aforementioned recommendations for additional study are implemented, ERM recommends that the Feasibility Study and Endangerment Assessment proceed on the data obtained in the Remedial Investigation.

SELECTED REFERENCES

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FINAL

KOP 4.1001

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II

-----X
IN THE MATTER OF:

KING OF PRUSSIA TECHNICAL CORP. SITE
WINSLOW TOWNSHIP, N.J.

AGREEMENT AND
CONSENT ORDER

CABOT CORPORATION
CARPENTER TECHNOLOGY CORPORATION
JOHNSON MATTHEY INC.
RUETGERS-NEASE CHEMICAL COMPANY, INC.
LNP CORP.

Index No. II-CERCLA-40105

Respondents

Proceeding Under Section 106(a)
of the Comprehensive Environmental
Response, Compensation, and
Liability Act (42 U.S.C. §9606(a))
-----X

JURISDICTION

The following Agreement and Order on Consent (ORDER) is entered into with the Cabot Corporation, Carpenter Technology Corporation, Johnson Matthey, Inc., Ruetgers-Nease Chemical Company, Inc., and LNP Corp. (Respondents) pursuant to the authority vested in the President of the United States by Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §9606(a), which authority was delegated to the Administrator of the United States Environmental Protection Agency (EPA) by Executive Order 12316, August 20, 1981, 46 Fed. Reg. 42237, and redelegated to the Regional Administrator, Region II.

Pursuant to Section 106(a) of CERCLA, 42 U.S.C. §9606(a), the State of New Jersey has previously been notified of this ORDER.

PREAMBLE

The Regional Administrator, Cabot Corporation, Carpenter Technology Corporation, Johnson Matthey, Inc., Ruetgers-Nease Chemical Company, Inc., and LNP Corporation Corp., hereby

consent and agree to the ORDER set forth below, without trial or adjudication of any issues of fact or law, and without any admissions of fact, fault or liability by Respondents.

1. The King of Prussia Technical Corp. site is located on Piney Hollow Road in Winslow Township, Camden County, New Jersey.

2. The King of Prussia site is currently owned by Winslow Township. The site is a "facility" within the meaning of Section 101(9) of CERCLA, 42 U.S.C. §9601(9). None of the Respondents have ever owned or operated the King of Prussia site.

3. Respondents are persons as defined in Section 101(21) of CERCLA, 42 U.S.C. §9601(21). EPA also considers the Respondents responsible parties under Section 107(a)(3) of CERCLA, 42 U.S.C. §9607(a)(3).

4. On October 9, 1979 and April 23, 1980, representatives of EPA conducted sampling activities at and adjacent to the King of Prussia site. Analysis revealed the presence, in some samples, of the following substances, among others: toluene, xylene, lead, chromium, copper, zinc and beryllium. These substances, as found in these samples, are defined as hazardous under Section 101(14) of CERCLA, 42 U.S.C. §9601(14).

5. Analyses revealed that hazardous substances have been released into the groundwater and the surface waters of the Great Egg Harbor River.

6. The King of Prussia site is on the National Priorities List, promulgated pursuant to Section 105(8)(B) of CERCLA.

DETERMINATION

Based on information available to EPA, including but not limited to the facts recited above, the Regional Administrator hereby determines that the release and threatened release of hazardous substances from the facility may present an imminent and substantial endangerment to the public health and welfare and the environment. The Regional Administrator also has determined that, in order to protect public health and welfare and the environment, it is necessary that a remedial investigation and feasibility study take place to evaluate the nature and extent of releases of hazardous substances from the facility.

ORDER

Based on the foregoing, it is hereby ORDERED and AGREED that respondents shall undertake a Remedial Investigation and Feasibility Study (RI/FS) at the facility in accordance with the following schedule of compliance. This ORDER is entered without trial or adjudication of fact, fault or liability of the Respondents. Respondents do not admit or agree to the statements contained in the Preamble or Determination, and are not bound thereby, except only that Respondents do agree not to contest the authority or jurisdiction of EPA to issue this ORDER in any proceedings to enforce this ORDER.

I. Remedial Investigation

A. Respondents have submitted to EPA, and EPA has approved a detailed work plan and implementation schedule necessary to complete a remedial investigation of the site. The detailed work plan and implementation schedule, which is attached hereto as Appendix A, Section A, conforms to and is consistent with the National Oil and Hazardous Substances Contingency Plan (NCP), in particular, 40 C.F.R. 300.68(a)-(j). The remedial investigation is designed to fully define the nature and extent of contamination, if any, that constitutes the release and threatened release.

B. Within 180 days after the effective date of the Order, Respondents, through their consultant, shall complete the activities specified in Appendix A, Section A, and shall submit to EPA a report detailing the results of the remedial investigation.

C. Within 30 days of receipt of EPA comments on the remedial investigation report, Respondents shall modify the report as necessary to address such comments and submit the modified report to EPA. Respondents shall initiate such additional investigations as may be found necessary by EPA pursuant to the National Contingency Plan and applicable EPA guidance (or draft guidance), in accordance with a schedule to be proposed by Respondent and approved by EPA.

D. Within thirty days of receipt of EPA comments on the modified remedial investigation report, Respondents shall modify the report as necessary to address such comments and submit the report to EPA for approval.

E. Before EPA finalizes its comments under paragraphs I. C. and D. above, EPA will provide to the Respondents an opportunity to confer concerning such comments.

II. Feasibility Study

A. Respondents have also submitted to EPA, and EPA has approved, a detailed work plan and implementation schedule necessary to complete an engineering study of feasible alternatives with respect to conditions at the site, including the recommended remedial alternative (feasibility study). The detailed work plan, which is attached hereto as Appendix A, Section B, conforms to and is consistent with the requirements of the NCP, in particular, 40 C.F.R. §300.68(a)-(j).

B. Within 180 days of receipt by EPA of the final remedial investigations report, Respondents, through their consultant, shall complete the activities specified in Appendix A, Section B, and shall submit to EPA for review and approval a feasibility study report including the recommended remedial alternative. Within 30 days of receipt of EPA's comments on the feasibility report, Respondents shall modify that report as may be necessary to address such comments and submit the modified report to EPA.

III. Reporting, Quality Assurance and Sampling

A. All actions performed by Respondents' consultant pursuant to this ORDER shall be in compliance with all applicable laws and regulations, including but not limited to Section 300.68 of the National Contingency Plan, exclusive of the cost balancing provisions of 300.68(k), and in accordance with the Quality Control/Quality Assurance and Chain of Custody methodologies as set forth in Appendix A attached hereto.

B. Upon request by EPA, Respondents shall provide EPA with duplicate and/or split samples of any samples collected in furtherance of work performed in accordance with this ORDER.

C. All data and technical information not otherwise privileged or confidential, including raw sampling and monitoring data required pursuant to this ORDER, shall be made available to EPA within ten days of receipt by Respondents. No sampling and monitoring data or hydrological or geological data shall be considered confidential.

D. All documents delivered to EPA in the course of implementing this ORDER shall be available to the public unless identified as confidential by Respondents in conformance with 40 C.F.R., Part 2 and, in the case of New Jersey, applicable New Jersey law. Records so identified shall be treated as confidential in accordance with the applicable confidentiality regulations. No sampling and monitoring data or hydrological or geological information shall be considered confidential.

E. All correspondence, reports, work plans and other writings required under the terms of this ORDER to be submitted to EPA shall be sent by certified mail, return receipt requested, to the following address:

Chief, Site Investigation and Compliance Branch
Emergency and Remedial Response Division
U.S. Environmental Protection Agency
Room 402
26 Federal Plaza
New York, New York 10278
Attention: King of Prussia Project Officer

A copy of each such submittal shall be sent to the New Jersey Department of Environmental Protection (NJDEP) at the following addresses:

New Jersey Department of Environmental Protection
Office of Regulatory Services
CN 402
Labor & Industry Building
Trenton, New Jersey 08625
Attention: George Slosser, Esq.

and

New Jersey Department of Environmental Protection
Hazardous Site Mitigation Administration
CN 028
8 East Hanover Street
Trenton, New Jersey 08628
Attention: Chris Altomari

F. Copies of all notices and correspondence from EPA directed to the Facility Coordinator pursuant to paragraph IV. A., below, shall be sent separately to: ; such designated recipient may be changed upon notice to EPA by the Respondents.

G. Prior to performing any of the studies or actions required in Sections I through III above, Respondents shall provide to EPA, for its review, the names, titles and qualifications of all professionals engaged in the conduct of the specified activities.

IV. Facility Coordinator and On-Scene Coordinator

A. Respondents shall appoint a Facility Coordinator who shall be responsible for oversight of the implementation of this ORDER and the activities required herein. All written reports, written comments, and other correspondence dealing with technical and engineering matters directed to Respondents will be made to the Facility Coordinator.

B. EPA shall appoint an On-Scene Coordinator (OSC). The OSC will be EPA's designated representative at the site, and will have the right to move freely about the site at all times when work is being carried out pursuant to this ORDER.

C. Respondents and EPA have the right to appoint a new Facility Coordinator or On-Scene Coordinator at any time. Such change shall be accomplished by notifying the other party in writing at least five working days prior to the change. Both the Facility Coordinator and the On-Scene Coordinator shall be appointed within 15 days of the effective date of this ORDER.

V. General Provisions

A. EPA and Respondents recognize and agree that full and complete implementation of the work plan attached as Appendix A, including the schedule of work, is contingent upon the access to the King of Prussia Technical Corp. Site. Since Respondents are not the owners of the site, and do not have possession or control over it, EPA will exercise its authority to the extent necessary to secure sufficient access to the site for Respondents and Respondents' consultant.

B. Any delay of performance which is caused by circumstances beyond the control of Respondents and its consultant (force majeure) shall not be a breach or violation of this ORDER. Respondents and its consultant shall use best efforts to avoid or minimize any delay or prevention of performance of its obligations under this ORDER. The time for performance of any

activity delayed by circumstances beyond the control of Respondents will be extended by a period of time equal to that which can reasonably be attributed to such circumstances. Increased costs or expenses associated with the implementation of the activities called for in this ORDER shall not of itself be considered a circumstance beyond the control of Respondents. Respondents shall orally notify EPA's On-Scene Coordinator of such circumstances or of Respondents' belief that such circumstances may occur as soon as possible. In addition, written notification to those persons identified in paragraph III (E), above, shall be given as soon as possible but not later than 10 days after the date of oral notification. Such written notification shall be accompanied by all available documentation. Respondents shall explain why they believe the circumstances were beyond their control, the actions that are being taken to minimize the delay, and their estimate as to the length of time that the circumstances that constitute the force majeure will delay the affected activity.

C. EPA and the Respondents agree that each shall preserve, to the best of their abilities, during the pendency of this Consent Order and for a minimum of six (6) years after its effective date, all records and documents relating to the work under this Order, in their possession or in the possession of their divisions, employees, agents, or attorneys which relate in any way to the Site, despite any document retention policy to the contrary. Upon request by EPA, the Respondent shall make available to EPA such records or copies of any such records not privileged.

D. Any decisions of EPA under this ORDER, including approvals, disapprovals, and requests for modifications of reports, work plans, specifications, schedules, and other work outputs, will be made in consultation with DEP, and will be communicated in writing to Respondents by the Chief, Site Investigation and Compliance Branch, U.S. Environmental Protection Agency, 26 Federal Plaza, New York, New York 10278.

E. No informal advice, guidance, suggestions or comments by EPA or NJDEP shall be construed as relieving Respondents of their obligation to obtain such formal approvals as may be required herein.

F. Neither the United States Government nor any agency thereof shall be liable for any injuries or damages to persons or property resulting from acts or omissions of Respondents, its officers, directors, employees, agents, servants, receivers, trustees, successors, assignees, or of any persons, including but not limited to firms, corporations, subsidiaries, contractors or consultants carrying out activities on behalf of Respondents pursuant to this ORDER.

G. Neither the Respondents nor anyone acting for or on their behalf shall be liable for any injuries or damages to persons or property resulting from any acts or omissions of the United States Government, any agency thereof or of its employees, agents, servants, or representatives, including but not limited to persons, firms, corporations, subsidiaries, contractors or consultants carrying out activities on behalf of the Government pursuant to this ORDER.

H. Respondents have, and at their sole discretion may exercise, the right to retain or discharge any consultant for the purpose of performing any work pursuant to this ORDER.

I. This ORDER shall apply to and be binding upon Respondents and their agents, servants, receivers, trustees, successors, and assignees.

J. Nothing contained in this ORDER shall affect any right, claim, interest, or cause of action of any party hereto with respect to third parties.

K. No part of this ORDER shall constitute or be interpreted or construed as an admission by any of the Respondents of any liability under any federal, state, or local law or that the Respondents are in violation of any laws, rules or regulations. No part of this Order shall be admissible as evidence in any court or administrative proceeding, except as evidence for purposes of enforcement of this ORDER and for purposes of the recovery of costs incurred by the Government and for any other proceedings initiated by the Government in connection with the King of Prussia site which are related to the factual basis for issuance of this Order or as agreed to by the Respondents.

L. Respondents agree not to make any claims pursuant to Section 112 of CERCLA, 42 U.S.C. §9612, against the Hazardous Substance Trust Fund established by the Act for expenses relating to this Order.

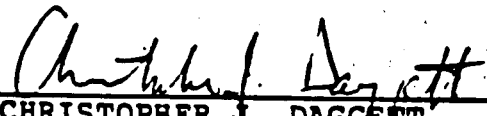
VI. Enforcement Actions and Effective Date

A. In the event that Respondents fail to adhere to any requirement of this ORDER; or, notwithstanding compliance with the terms of this ORDER, upon the occurrence or discovery of a situation as to which EPA would be empowered to take any further response action, including but limited to an immediate removal, planned removal and/or initial remedial action; or in the event of a release or threatened release not addressed by this ORDER; or upon the determination that action beyond the terms of this ORDER is necessary to abate an imminent and substantial endangerment to the public health or welfare or

the environment that may be posed by this facility; or upon the completion of the activities required by this ORDER; or under any other circumstances authorized by law, EPA may institute federally-funded response activities and subsequently pursue cost recovery actions available, and/or EPA may issue orders to Respondents pursuant to available statutory authority. In addition, EPA reserves its rights to recover under Section 107 of CERCLA all costs it has incurred in the oversight of the implementation of this Order. Nothing contained herein shall be deemed an admission by Respondents or a waiver of their legal rights (excepting the right to contest EPA's jurisdiction to issue this ORDER).

Dated and effective, this *April 17* day of 1985 with the agreement and consent of the parties.

U.S. ENVIRONMENTAL PROTECTION AGENCY


CHRISTOPHER J. DAGGETT
Regional Administrator
U.S. Environmental Protection Agency
Region II
26 Federal Plaza
New York, N.Y. 10278

LNP Corp.

Theodore G. Lieb

Name: Theodore G. Lieb
Title: Vice President & Director
Finance & Administration

3/27/85
Date

CABOT CORPORATION

L. S. O'Rourke
Name: L. S. O'ROURKE
Title: VICE PRESIDENT WSR

Mar 20 1985
Date

JOHNSON MATTHEY INC.

MB Stringfellow
Name: M. B. Stringfellow
Title: President

March 29, 1985
Date

CARPENTER TECHNOLOGY CORPORATION**Name: D. K. Rothermel****Title: Vice President****Date: March 13, 1985**

RUETGERS-NEASE CHEMICAL COMPANY, INC.

G. H. Wecker

Name:

Title: President

March 11 1985

Date

**KING OF PRUSSIA TECHNICAL CORPORATION
CAMDEN COUNTY
WINSLOW TOWNSHIP, NEW JERSEY
October 3, 1988
(Revised October 11, 1989)**

**Prepared by:
Division of Science and Research
New Jersey Department of Environmental Protection (NJDEP)**

**Prepared For:
Agency For Toxic Substances and Disease Registry (ATSDR)**

BACKGROUND

The King of Prussia Technical Corporation (KOP) site in Winslow Township, Camden County, New Jersey, is ranked 40th on the National Priorities List (NPL) of Superfund hazardous waste sites in New Jersey. The KOP site, comprising approximately 10.1 acres of generally barren sandy soil, is located northwest of Piney Hollow Road, midway between the Black Horse Pike and Folsom Road, within the 6,000 acre Winslow Wildlife Management Area. This area is located in extreme southern Winslow Township in Camden County immediately adjacent to Gloucester and Atlantic Counties, in a remote part of the New Jersey Pine Barrens. The Phase I draft report of the Remedial Investigation (RI) on the site was completed in July 1986.

The KOP site was purchased from Winslow Township in 1970 and was used by KOP from 1970 through 1973 when operations ceased. After the Township resumed ownership in 1976 for default in taxes, illicit dumping is suspected to have continued at this site, as a result of its proximity to the road and the lack of a fence (Personal communication, Environmental Resource Management). The site has recently been fenced. Winslow Township began construction of a police pistol range on the site in 1980; however, construction stopped when the Environmental Protection Agency (EPA) notified the township of the dangers involved with disturbing the site. In 1981, an Emergency Action Plan was prepared by the EPA. Four test wells were installed in 1975-1976 and subsequently sampled with additional samples taken in 1979 and 1980.

During its operational period, the KOP site was used as a waste treatment and disposal facility for hazardous industrial liquids. Located at the site are four large and two smaller

lagoons, two rusting and torn tankers, and possible drum burial sites with an indeterminate number of buried and deteriorating carboys and drums.

During heavy rains and/or periods of high groundwater table, water from the site drains off the site toward the southwest boundary in a swale to form a small periodic pond approximately 400 feet from the site, and then to the Great Egg Harbor River immediately to the west. (Remedial Investigation Report)

COMMUNITY CONCERNS

According to available documentation and USEPA, to date there have not been many health concerns expressed by the public concerning the King of Prussia site because of its remote, rural location. Issues associated with the site may be summarized as follows:

- * The severe contamination of ground water near the site.
- * The contamination of the Great Egg Harbor River located approximately 375 yards away.
- * The potential impact on the nearby New Jersey fish and wildlife area.
- * Accessibility of the site to hunters and recreational vehicles. (The accessibility of the site was reduced when the site was recently fenced.)

Other concerns expressed by the community were the perceived lack of a direct and accurate channel of communication with the agencies responsible for remediation of the site, the long time frame associated with remediation efforts, and the impact of the site on township real estate values.

ENVIRONMENTAL CONTAMINATION AND PHYSICAL HAZARDS

A. On-Site Contamination

Soil

Analysis of soil samples, collected during Phase I of the Remedial Investigation (RI), detected priority pollutant compounds in shallow soils, including heavy metals, volatile organic compounds (VOCs), and other organic contaminants. Soil

on the site consists of fine-grained, tan, silty sand, together with coarse gravel at some locations at the site. A variable, mostly thin layer of purple tinged/stained sand lies on or near the surface of the ground over large portions of the site. In some areas, ants bring this purple sand up to the soil surface, as they dig their ant holes. Tests have indicated that the purple substance is methylene blue.

There are quality assurance/quality control concerns, along with field operations concerns, with some of the soil sampling performed during Phase I of the RI. Additional sampling will occur during Phase II to correct this matter. The levels of compounds identified in soil samples and tanker samples are listed in Table 1. Phase II of RI will include additional soil sampling. Visible signs of ponding and stressed vegetation have been noted in the area of the swale. Analysis of sediments from the drainage swale revealed the presence of heavy metals that are being carried off-site by the swale (Table 2).

Lagoon

Lagoon 5 was the only lagoon with quantifiable base neutrals and pesticides. Lagoon 4 had sludge that had a TOX level of 120 ppm. Several unidentified organics were in the various lagoons. (Remedial Investigation Report) They are summarized as follows:

- Lagoon 1: One unidentified alkane
- Lagoon 4: Four unidentified alkanes
- Lagoon 6: Two unidentified alkanes
- Several unidentified phthalates

The concentration of other chemicals in the lagoons are presented in Table 3.

Magnetic Survey

Data from a magnetic survey, conducted by EPA's consultant, indicated that buried metallic debris may be present four twelve feet below the surface, in a number of areas. If buried metallic objects are present, they may be potential sources for contamination.

Surface Water

There is usually no standing surface water on the site, due to the high permeability of the sandy soil. During wet periods, however, a small pond forms immediately adjacent to the site along the swale that conducts runoff to the Great Egg

Harbor River, approximately 1,050 feet from the site boundary. Heavy metal concentrations detected in this surface water are listed in Table 4. Sampling, by EPA's consultant demonstrated that heavy metals are being transported by this swale and/or the groundwater beneath the swale toward the river. At the time the sampling occurred (March 1986), surface water quality in the Great Egg Harbor River had been altered only with respect to copper. Copper was not in the river above the KOP site. Below the site, copper is present in water at a concentration of 0.11 ppm which is less than the protection limit for human health (1.0 ppm), but slightly higher than the protection limit for freshwater aquatic biota (0.043 ppm). Further downstream dilution and adsorption in the sediment had reduced the concentration of copper by 50 percent, to approximately aquatic biota protection limits.

Groundwater

The nearest groundwater user is a residence about one mile northeast and upgradient of the site. An industrial property 2,000 feet south of the site contains a production well, for industrial use only, that was uncontaminated when last tested. The local groundwater flow direction and surface water drainage from the site are toward the southwest, in the direction of the Great Egg Harbor River. The regional groundwater flow direction however is to the southeast. There are no potable wells within 3 miles downgradient of the site. Neither of the nearby wells was tested during Phase I of the RI. Other homes in the Town of Folsom, about 2 miles southeast of the site, are on private wells and have not been affected by any off-site contamination from the KOP site.

EPA's consultant evaluated groundwater quality by comparing contaminant levels in the on-site and downgradient wells with the levels in the upgradient background well. Priority pollutants were not detected in the background well, except zinc which was present at 0.09 ppm. (The water quality criteria level for zinc is 5 ppm, and for protection of freshwater aquatic life the maximum allowable level is 0.57 ppm.) The concentrations of contaminants detected in the downgradient monitoring wells are presented in Table 5.

Air

No air sampling has been conducted at the KOP site to date. Further, insufficient data are available to identify possible receptors at risk. The relatively high concentrations of inorganic constituents in surface and subsurface soil

samples collected during the RI suggest inhalation may be an exposure pathway.

B. Off-Site Contamination

A large groundwater plume and sediments being carried by surface water are the major pathways of off-site migration. The plume has moved off-site in a generally southwesterly direction toward the river. The surface water and sediments, in runoff from the site, contain inorganic priority pollutant metals and organics. A small seasonal pond sometimes forms off-site prior to emptying into the Great Egg Harbor River to the west. Estimates of the depth of the conductive plume range from 35 to 80 feet beneath the ground surface. Visibly stressed vegetation indicates run-off to be an environmental pathway of concern.

QUALITY ASSURANCE/QUALITY CONTROL

The reports and other material reviewed for this document indicated that all laboratory chemical analyses were conducted by S-R Analytical, Inc., Cherry Hill, New Jersey; that chain-of-custody procedures were followed for the samples obtained during the field investigation; and that methods utilized for the chemical analyses of priority pollutants were in accordance with EPA accepted methodologies. However, several areas of concern and deficiencies were noted, such as: chemicals (vinyl chloride) being referred to in some reports but not others; many chemicals primarily organic, were detected in the analysis blanks (any chemical that was detected in the analysis blanks were deleted from further consideration in this report); samples were taken that were neither analyzed nor reported; and some data sheets were reduced to a small size that precludes reading. However, the data contained in these reports is of sufficient quality and accuracy for use in Phase I of RI/FS, and in a qualitative preliminary health assessment. Discrepancies and concerns noted need to be addressed in later phases of the RI/FS.

SITE VISIT AND PHYSICAL HAZARDS

The KOP site (10.1 acres) was visited on September 8, 1988, by Department of Environmental Protection staff. The site is surrounded by a new (installation completed late in July 1988) 8 foot tall cyclone fence, with three gates secured with padlocks. At the front gate is a "NO TRESPASSING" sign

Several areas on-site may present physical hazards. These include the unstable ground area surrounding the carboy partial burial area and other areas where buried drums are known/suspected. In these areas there is evidence of ground subsidence possibly due to containers collapsing beneath the ground surface.

POTENTIAL ENVIRONMENTAL AND HUMAN EXPOSURE PATHWAYS

A. Environmental Pathways

On-Site

In Phase I of the RI/FS soils, groundwater, and surface water were identified as the primary media in which the contamination has been detected. Results of soil sampling during Phase I of the RI/FS identified the potential for surface and groundwater contamination. Sampling of this will be part of the continued investigation in Phase II activities. Preliminary investigation of surface water samples and sediments from the drainage swale indicated the presence of a number of heavy metals above acceptable limits (see Tables 2 and 3).

Off-Site

The contaminants listed in Tables 2 and 3 are migrating off-site, leaching into the soils, water table, and Cohansey Aquifer below and adjacent to this site (Remedial Investigation Report). Analysis of drainage water and sediments from the swale indicates that heavy metals are present in levels exceeding New Jersey Drinking Water Guidance criteria and New Jersey Soil Cleanup Objectives. The heavy metal-polluted water is emptying into the small transient pond and later into the river. The soil in this region is sandy and has an above average percolation rate. Therefore, this polluted surface water is a conduit for moving contaminated water to the Great Egg Harbor River, to groundwater, and ultimately to the Cohansey Aquifer which underlies the site and supplies much of southern New Jersey. Copper is the only identifiable contaminant from this site presently degrading the water quality of the River.

B. Human Exposure Pathways

Exposure pathways of concern at this site include: inhalation, dermal absorption, ingestion, and ingestion of contaminated aquatic biota. The utilization of contaminated

groundwater appears to be the most significant human exposure pathway. This site is within the 6,000 acre Winslow Wildlife Management Area which is used for recreation and hunting. Probable uses by residents and visitors to the wildlife area and the Great Egg Harbor River include hiking, camping, birding, picnicking, fishing, hunting, and possibly wading. Private wells service the drinking water needs of residents that live in the area of the site. City drinking water is not available.

Human exposure to contaminated surface soils may occur via ingestion or dermal contact. Since access to the site is now restricted by a fence, exposure of on-site receptors is limited to those personnel involved with the remediation of this site. However, since a significant component of the contamination has been eroded off-site by run-off, and contaminant migration via runoff, people who are outside the restricted access area may be exposed to contamination. A significant degree of disturbance in the surface or subsurface soils in the contaminated areas off-site has the potential to increase the human and environmental exposures.

Surface contamination in the wooded area is limited to the drainage swale. The risk to human or wildlife exposed to contamination is minimal because of the relatively low concentrations in the area and the short duration of any such exposure. The concentrations of contaminants in the river will be low, due to the effects of dilution.

DEMOGRAPHICS

The area of the site does not have a large permanent population base. The area is primarily rural, and KOP is surrounded by the 6,000 acre Winslow Wildlife Management Area. The estimated population in a three mile radius area is estimated to be at least 150 people.

Additional demographic information is needed, including the identification of potable wells near the site, and within a 2-3 mile radius of the site, and a characterization of the population close to the site (i.e., identification of sensitive populations).

EVALUATION AND DISCUSSION

Phase I studies were designed primarily to determine the nature of the contaminants, not the extent of the contamination

at the site. Future studies will concentrate on the more quantitative aspects required before effective remediation procedures can be recommended.

It should be noted that some of the samples taken in the Phase I portion of work were not properly collected. Phase II sampling was designed to correct for this deficit. Hence, Phase II results may reveal contamination that was not indicated in the Phase I portion of this work.

On-site contamination consists principally of heavy metals with highest concentrations being found for chromium, copper, nickel, and zinc. Probable sources of contamination are a drum burial area, a carboy area, soils northwest of several lagoons, four confirmed lagoons, surface soils near rusted tankers, and soils located in the eastern corner of the site.

Soil and tanker samples exceeded New Jersey Soil Cleanup Objectives for beryllium, cadmium, chromium, copper, mercury, nickel, silver, volatile organics, and oil and grease. Lagoon soil samples exceeded New Jersey Soil Cleanup Objectives for arsenic, beryllium, cadmium, copper, lead, nickel, and zinc. Groundwater monitoring wells exceeded New Jersey Drinking Water Guidance criteria for chromium, copper, mercury, iron, 1,1-dichloroethene, trans-1,2-dichloroethene, 1,1,1-trichloroethane, trichloroethene, tetrachloroethene, and bis (2-ethylhexyl) phthalate. Drainage swale surface water exceeded New Jersey Drinking Water Guidance criteria for chromium, iron, and lead. Drainage swale sediments exceeded New Jersey Soil Cleanup Objectives for beryllium, chromium, copper, and selenium. No standards are available for some of the contaminants at this site. These are indicated by blanks on the respective tables.

Additional contamination may occur in buried drums that are suspected to exist on the site at depths between 4 and 12 feet. Preliminary information indicates soils in the area of the carboys contain at least nickel, zinc, chromium, lead, and cadmium.

Surface runoff transports contaminants via erosion and sedimentation. Groundwater flows southwest from the site to the Great Egg Harbor River. Although the contaminant plume requires better characterization, the plume may have reached the river and might be approximately 1,000 feet wide.

No known domestic groundwater users are known to have been affected by the groundwater contaminants. When the peak concentrations in the groundwater plume reach the river, water quality will be degraded. However, the effects on human health

and aquatic biota may be minimal as a result of downstream dilution.

CONCLUSIONS AND RECOMMENDATIONS

Discrepancies and areas of concern expressed in this report regarding QA/QC issues, including illegible data and report sheets, and samples taken but not reported, need to be addressed and/or clarified.

Lagoons 2 and 3, previously identified on aerial photographs, are not shown on the current mapping of this site, nor discussed in the available reports. The location and characterization of the materials associated with these lagoon locations should be further investigated, and these findings should be incorporated into future phases of this project. In addition, materials buried in drum and carboy areas need to be better characterized, and air sampling for mercury and VOC levels needs to be conducted.

Warning signs need to be posted at off-site locations where soil is heavily contaminated with heavy metals to minimize inadvertent exposure of casual users in these areas.

Within approximately one mile upgradient and across Piney Hollow Road there is a single family residence assumed to be on a private well. In this same general area several real estate signs are posted, indicating that further development of this area is imminent. Results of the analyses of all private wells in the surrounding area and test wells located in areas where private development is likely to occur in the near future, need to be included in Phase II of the RI/FS. A land use policy that is consistent with these findings and is protective of human health concerns should be developed or modified for the surrounding area.

Should contaminant levels in the river increase to levels that may be hazardous to human health, signs should be erected warning against ingestion of all aquatic species.

A sizable percentage of the contaminated materials may have escaped into the air, groundwater, and subsurface soils. Future cleanup phases should be expedited to minimize continued migration of contaminated material into the environment.

This health assessment focuses on public health issues. Environmental issues and natural resources damage issues, which may play a key role in the remediation of the site, are not

focused upon in the assessment. The emphasis of the health assessment on public health is not intended to diminish the importance to remediation based upon environmental damage.

There are potential exposure pathways that have not yet been adequately characterized or addressed. In particular, the locations of potable wells need to be identified and wells that could be impacted by the site need to be sampled. More information is needed before a decision can be made on whether a feasibility health study is warranted. When this information becomes available, the health assessment will be revised if necessary, and a decision on whether to conduct a feasibility health study will be made.

REFERENCES

ATSDR Site Summary, King of Prussia, CERCLIS No. 7-19-88.

Field Investigations of Uncontrolled Hazardous Waste Sites, Task Report to the Environmental Protection Agency Contract No. 68-01- 6056, Mitre Model Scoring of King of Prussia, New Jersey, TDD No. HQ-8109-01. Ecology and Environment, Inc., October 1981.

King of Prussia, Comments to Draft Remedial Investigation Report.

King of Prussia Hazardous Waste Site visit by NJDEP personnel on September 8, 1988.

New Jersey Safe Drinking Water Act, N.J.A.C. 7:10- 1.1 through 7.3, November 1985.

New Jersey Department of Environmental Protection (NJDEP), Summary of Approaches to Soil Cleanup Levels, 1987.

New Jersey Drinking Water Quality Institute: Maximum Contaminant Level Recommendations for Hazardous Contaminants in Drinking Water, NJDEP, 1987.

New Jersey Department of Environmental Protection: Division of Water Resources Division Order No. 64, Groundwater Cleanup Criteria, September 1986.

REM III Program, Remedial Planning Activities At Selected Uncontrolled Hazardous Substance Disposal Sites Within EPA Regions I-IV., King of Prussia, Region II, New Jersey., Supplemental Work Plan for Remedial Investigation Field Activities, King of Prussia Site, Camden County, New Jersey, Prepared by: NUS Corporation, Pittsburgh, PA., Approved by: EBASCO Services Incorporated, Lynhurst, NJ., EPA Work Assignment Number 108-2615 under EPA Contract Number 68-01-7250, July, 1987.

Draft Remedial Investigation Report for the King of Prussia Technical Corporation Site in Winslow Township, Camden County, New Jersey, Volume One: Narrative Report, Volume Two: Appendices, Prepared for: U.S. Environmental Protection Agency, Region II, New York, Prepared by: SMC Martin Inc., Valley Forge, PA., Reference 8925- 040-80040, July 1986.

Case Manager, 1988. Personal communication. NJDEP (New Jersey Department of Environmental Protection), Division of Hazardous Site Mitigation, Technical Coordinator for King of Prussia Technical Corporation, Inc. site.

Table 1. Soil and Tanker Samples

Contaminant	Concentration (PPM)	New Jersey Soil Cleanup Objectives (1) (PPM)
Beryllium	1.0 - 16	1
Chromium	5.0 - 570	100
Copper	5.9 - 1,100	170
Mercury	0.24 - 100	1
Nickel	6.6 - 470	100
Silver	18	5
Thallium	10 - 24	
Organic Carbon	190 - 3,500	
Organic Halogens	150 - 1,600	
Oil and Grease	50 - 3,000	100
Total Volatile Organic Compounds	4	1
Lagoon 5 Sludge alpha BHC (Lindane)	(PPB) 3,000	

 (1) New Jersey Department of Environmental Protection (NJDEP), Summary of Approaches to Soil Cleanup Levels, 1987. Numbers indicate NJDEP Cleanup Objective in parts per million. PPM = parts per million = milligrams per kilogram. PPB = parts per billion.

Table 2. Metals Detected in Drainage Swale Sediment

Contaminant	Maximum Concentration (PPM)	New Jersey Soil Cleanup Objectives (1) (PPM)
Beryllium	8.3	1
Chromium	430	100
Copper	760	170
Selenium	5.4	4

 -- PPM = parts per million.

(1) New Jersey Department of Environmental Protection (NJDEP), Summary of Approaches to Soil Cleanup Levels, 1987. Numbers indicate NJDEP Cleanup Objective in parts per million (PPM = milligrams per kilogram).

Table 3. Metals and Selected Parameters from Lagoon Soil Samples

Contaminant	Maximum Concentration (PPM)	New Jersey Soil Cleanup Objectives (1) (PPM)
Arsenic	300	20
Beryllium	100	1
Cadmium	18	3
Chromium	5,000	100
Copper	3,700	170
Lead	290	250
Nickel	1,400	470
Thallium	45	
Zinc	1,600	350
Organic Carbon	2.900	
Organic Halogens	120	
Oil and Grease	1,200	100

 (1) New Jersey Department of Environmental Protection (NJDEP), Summary of Approaches to Soil Cleanup Levels, 1987. Numbers indicate NJDEP Cleanup Objective in parts per million.

Table 4. Metals Detected in Drainage Swale (Surface Water)

Contaminant	Maximum Concentration (PPM)	New Jersey Drinking Water Guidance (1) (PPM)
Chromium	0.20	0.05
Iron	1.1	0.3

 --- PPM = parts per million.

(1) New Jersey Safe Drinking Water Act, N.J.A.C. 7:10 - 1.1 through 7.3.

Table 5. Contaminants in the Groundwater Monitoring Wells

Contaminant	Maximum Concentration (PPM)	New Jersey Drinking Water Guidance (1) (PPM)
Metals:		
Beryllium	0.12	
Chromium	0.55	0.05
Copper	14.00	1.0
Mercury	0.003	0.002
Iron	36.00	0.3
Volatile Organics:		
	(PPB)	(PPB)
1,1-Dichloroethene	26	1 (2)
Trans-1,2-Dichloroethene	25	10 (2)
1,1,1-Trichloroethane	280	26 (2)
Trichloroethene	360	1 (2)
1,1,2,2-Tetrachloroethane	930	
Tetrachloroethene	1500	1 (2)
Base Neutrals:		
Bis (2-Ethylhexyl) Phthalate	25	

 --- PPM = parts per million = milligrams per liter.

(1) New Jersey Safe Drinking Water Act, N.J.A.C. 7:10 - 1.1 through 7.3.

(2) New Jersey Drinking Water Quality Institute: Maximum Contaminant Level Recommendations for Hazardous Contaminants in Drinking Water. 1987. As part of New Jersey Safe Drinking Water Act N.J.A.C. 7:10 - 1.1 through 7.3.

TAT-02-F-04760

COMMUNITY RELATIONS PLAN
KING OF PRUSSIA LANDFILL SITE
WINSLOW TOWNSHIP, CAMDEN COUNTY, NEW JERSEY

Issued: April 5, 1989

Prepared By:
Technical Assistance Team
Weston/SPER Division
Edison, New Jersey 08837

Prepared For:
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Emergency and Remedial Response Division
Removal Action Branch, U.S. EPA
Edison, New Jersey 08837

COMMUNITY RELATIONS PLAN
KING OF PRUSSIA LANDFILL SITE
WINSLOW TOWNSHIP, NEW JERSEY

I. SITE BACKGROUND

A. Site Description

The King of Prussia Landfill is an abandoned hazardous waste management facility located along Piney Hollow Road, Winslow Township, Camden County, New Jersey. The property is bounded on three sides by a State Wildlife Management Area and the fourth side borders on Piney Hollow Road. Along the southern perimeter of the site is an intermittent wetland which feeds directly into the Great Egg Harbor River less than a quarter of a mile away (Figure 1). The site is in a rural/remote area. The nearest residence is within a quarter mile of the site. Several gravel operations, a chemical manufacturer, an asphalt plant and the municipal landfill are all within a quarter mile of the site.

The King of Prussia property consists of a cleared ten acre area which is devoid of vegetation except for grasses, scrub brush, and an occasional pine tree. Within these ten acres are the following points of special concern: six lagoons, two deteriorated tank trailers, several areas of soil discolored by an undetermined purple substance, partially buried carboys and drums, one exposed drum of unknown content and a large area of stressed vegetation on the southern perimeter (Figure 2).

Prior to fencing the ten acre site by the PRPs, the site lacked any form of security. A deer blind and numerous tire tracks throughout the site clearly indicated that the site was subject to trespassing by hunters and operators of off-road vehicles. There is clear evidence that illegal dumping has occurred.

B. Brief History

Based upon information previously gathered by the EPA and the NJDEP, a brief history of the activities at the site follows:

At an unspecified date prior to 1975, the Evor-Phillips Leasing Company and Interchemical Corporation began operating the King of Prussia site as a liquid chemical waste treatment/disposal facility. During this time the facility was used primarily by five companies that now make up the current group of PRPs. An undetermined amount of illicit dumping of chemical materials is believed to have continued long after the facility was abandoned in 1975.

C. Quantity and Types of Substances Present

The King of Prussia Site has numerous containers of varying types and sizes, which have deteriorated, releasing their contents onto the ground. Included in this list of deteriorated containers are the following:

- 1) Six lagoons: four backfilled, two open

Three lagoons are 70 feet long, 50 feet wide and 15 feet deep (working capacity 350,000 gallons each). The larger lagoons are 100 feet long, 80 feet wide and 15 feet deep (working capacity of 800,000 gallons). At a working capacity of 90% the plant storage capability was 3.5 million gallons.

Grossly deteriorated liners are visible in the open lagoons. No liquid retention capabilities are possible.

- 2) Partially buried drums and carboys

There are two areas where the burial of drums and carboys is clearly evident. The number of drums is estimated at twenty and the number of carboys at ten. Excavation is necessary to obtain a count.

- 3) Two badly deteriorated tank trailers

The trailers are positioned side by side and are the predominant visible aspects of the site. A total of approximately 10 cubic yards of an inert solid remains inside the tankers.

- 4) One full drum of unknown contents

This drum is fully exposed and is lying in lagoon #2.

In addition to the containers listed, there exists several areas where soil contamination/discoloration is clearly visible and of undetermined depth.

Analytical results for samples taken of the groundwater, lagoon sediment, surface runoff, the carboys and the purple discolored soil all verify varying degrees of contamination.

The following is a partial list of the hazardous substances identified by studies conducted prior to 1988.

<u>Contaminant</u>	<u>Concentration</u>	<u>Sample Statutory Source Media Under CERCLA</u>	
1,2,4 Trichlorobenzene	120 ug/kg	L.S.	2
Hexachloroethane	740,000 ug/kg	L.S.	2,4
Chromium	5,600 ug/l	M.W.	2
Copper	3,900 ug/l	M.W.	2
Cadmium	600 ug/l	M.W.	2
Arsenic	1,000 ug/l	M.W.	2,3
Beryllium	2,200 ug/l	M.W.	2,3,4
Mercury	1.44 ug/l	M.W.	2,3,4
Lead	600 ug/l	M.W.	2
Vinyl chloride	29 ug/l	CBY.	2,3,4
Phenol	1,700 ug/l	CBY.	1,2,4

The following is a list of the hazardous substances identified by sampling conducted in 1988.

Bis (2-ethylhexyl) phthlate	1,200 ug/kg	L.S.	2,4
Hexachlorobenzene	1,300 ug/kg	L.S.	2,4
Arsenic	330,000 ug/kg	L.S.	2,3
Beryllium	120 ug/l	M.W.	2,3,4
Mercury	3 ug/l	M.W.	2,3,4
Chromium	1,400,000 ug/l	CBY.	2
Copper	2,400,000 ug/l	CBY.	2
Cadmium	21,000 ug/l	CBY.	2
Lead	61,000 ug/l	CBY.	2
Vinyl chloride	29 ug/l	CBY.	2,3,4
Phenol	1,700 ug/l	CBY.	1,2,4
Trichloroethene	360 ug/l	M.W.	1,2,4

1. 311(b)(4) of the Clean Water Act
2. 307(a) of the Clean Water Act
3. 112 of the Clean Air Act
4. RCRA Section 3001

Media Symbols: M.W. = monitoring well
CBY. = carboy
L.S. = lagoon sediment

Current data (1988) from the PRP surficial sampling of the carboy area during the recent RI/FS has identified the presence of the following: Copper (1550 mg/Kg), chromium (185 mg/Kg), Lead (15 mg/Kg), and Zinc (517 mg/kg).

D. National Priorities List

This site is on the National Priorities List.

II. THREAT

A. Threat of Public Exposure

The King of Prussia facility is a high risk site. The property, prior to fencing by the PRPs, lacked any form of security. Its remote location made it an obvious choice for hunters and off-road vehicle users as evidenced by the presence of a deerblind and numerous motorcycle tracks.

Since the King of Prussia facility ceased operations in 1975, there have been alleged instances of youths contracting rashes of unknown origin after riding their dirt bikes at the site. As of May 11, 1988, the Winslow Township Police were unable to deny or confirm such allegations.

The high levels of toxic compounds known to exist in the upper portion of the soil present an unacceptable health risk to the targeted population. Many of the compounds found thus far are known to be carcinogenic, teratogenic and mutagenic. The potential for exposure to the known and unknown compounds on site warrants the continued restriction of unauthorized persons from the site.

Aside from the threat of direct contact with the hazardous and toxic compounds on site, the threat of inhalation is also a major concern. The sandy and wind swept nature of the site makes the likelihood of inhaling airborne particles highly possible.

B. Threat to the Environment

All analyses conducted thus far indicate that contamination of the site is pervasive. Almost the entire southern perimeter of the site consists of stressed and dead vegetation. Surface water contamination was identified during a study conducted by EPA during October of 1979. Analytical results of runoff water from a ditch revealed a significant amount of contaminants including the following: Mercury (1.44 ppb), Arsenic (10 ppb), Chromium (340 ppb), Beryllium (5 ppb), Cadmium (4 ppb), Copper (950 ppb), Nickel (190 ppb), Phenol (0.23 ppb), Bis 2-Ethylhexyl Phthalate (9.1 ppb) and Di-N-Butyl Phthalate (0.81 ppb).

The sandy soil conditions of southern New Jersey have a high percolation rate, which decreases the potential for off-site surface migration but does not totally eliminate the possibility for migration to the wetlands and the Great Egg Harbor River which is one quarter of a mile from the southern boundary of the site.

The high percolation rate greatly increases the potential to contaminate the subsurface soils and the underlying Cohansey aquifer. The analytical results of the groundwater samples taken during October of 1979, verify that such contamination has occurred.

The analytical results of the major contaminants from monitoring well #1, located between the lagoons and the carboy disposal and stressed vegetation areas, are as follows:

Chloroform (0.34 ppb), Vinyl Chloride (7.3 ppb), Arsenic (7.2 ppb), Chromium (10 ppb), Copper (95 ppb), Bis 2-Ethylhexyl Phthalate (3.5 ppb) and Di-N-Butyl Phthalate (0.49 ppb).

The most recent round of surficial sampling, performed during June of 1988, revealed that organic and inorganic contaminants are present in the first three inches of soil throughout much of the site. Soil depths below three inches were not investigated. Contamination of the upper layers of soil was found to be consistent with results previously found in samples taken of surficial runoff and groundwater. Contamination of this particular substrate is cause for concern because the contaminants can migrate into the ground and surface water through the actions of wind, rain and human activities.

Aerial photography of 1975 indicates that two horizontal chemical storage tanks and two tank trailers were located on or adjacent to the carboy disposal area. Grounds stains are evident in the vicinity of the lagoons. Spillage or runoff from any or all of the above due to site topography would flow in the direction of the carboy disposal area. Since the lagoons are upstream of the carboy area, a leak in a lagoon liner could also contribute to contamination of the carboy area. Site runoff flows into a small unnamed tributary which then flows two thousand feet due west into the Great Egg Harbor River.

C. Evidence of Extent of Release

The analytical data and on-site observations performed thus far are indicative of the off-site release of contaminants. The available information indicates that a release of contaminants has been occurring for a number of years and unless mitigation means are implemented will continue for many years.

Contaminated soils and groundwater (documented by laboratory analysis) and a large area of stressed vegetation located off-site are strong indicators that contaminants are

migrating off-site via the air, surface water and groundwater.

D. Previous Actions to Abate Threat

On April 17, 1985, the EPA and the PRPs (Cabot Corp., Carpenter Technology Corp., Johnson Matthey Inc., Ruetgers-Nease Chemical Co., LNP Corp.) entered into an agreement through a Consent Order whereby the PRPs would undertake a Remedial Investigation and Feasibility Study (RI/FS).

The NJRAB has indicated that the PRPs have twice covered the carboy area with soil. This action has proven ineffective. The stained soil is repeatedly exposed when the added soil is eroded by wind and rain.

The PRPs in 1988 installed a perimeter fence during the RI/FS activity, decreasing the possibility for intimate contact.

E. Current Actions to Abate Threat

EPA, NJDEP, and the Winslow Township Police currently observe the hazardous waste site on a regular basis.

III. ENFORCEMENT

During 1976-1977, after the facility's closure in 1975, the NJDEP conducted several on-site inspections but no enforcement action was taken. The NJDEP maintained the lead on all enforcement matters until an unspecified date during 1979, at which time the site was referred to EPA for the purpose of addressing site security and mitigation efforts.

On October 9, 1979, EPA conducted a site investigation which included the sampling of monitoring wells, lagoon sediment, liquid runoff and soil.

To date, no reliable information is available that details the installation of the monitoring wells. Indications are that the wells were installed sometime prior to the issuance of a site report by Geharty and Miller during 1975-1976. Analytical results showed that the shallow groundwater was severely contaminated.

As a result of the EPA's efforts, a Consent Order was signed on April 17, 1985, in which the PRPs agreed to conduct a RI/FS at the site. In July, 1986, the PRPs submitted a Draft Remedial Investigation report. Upon review of the report, the NJDEP and the EPA determined that the details did not fully address the extent of contamination at the site and, therefore, requested the PRPs to conduct a Phase

II RI. On May 16, 1988, the PRPs' consultant, Environmental Resources Management of Exton, Pa., mobilized at the site to begin supplemental field activities that were completed in September, 1988.

The site was referred to the Response and Prevention Branch and a preliminary assessment was performed on May 11, 1988. Before an Action Memorandum that requested funding to install a fence, post hazard warning signs and cover the stained soil in the carbor area could be approved, the PRPs installed the perimeter fence.

A review of existing files indicates that Interchemical Corporation with the Evor-Phillips Leasing Corporation operated the facility. In addition, Valley Forge Engineering of Pennsylvania or its principles may have been involved in the operation. Since the PRPs have refused to remediate the carboy area the current action includes removal of the carboys and the adjacent highly contaminated soil to eliminate further contamination.

IV. PROPOSED PROJECT

A. Objective of the Project's Initial Action

The main objective of the project's initial action is to eliminate the threat of direct contact with the hazardous materials which exist on the surface and to a depth of three inches, disposing of surface hazardous materials and encapsulating selected areas of contamination where removal is unfeasible.

B. Objective of the Project's Secondary Action

The secondary objective of the removal action is to sample, stage, and dispose of surface and partially buried containers and other non-indigenous materials. Additionally, selected areas of soil will be excavated where sufficient contamination exists.

C. Objective of the Project's Final Action

The final objective will address subsurface soils, groundwater contamination, and other removal actions not included in this report.

V. COMMUNITY INFORMATION

A. Community Profile

Winslow Township is located in the southeastern section of Camden County which borders Gloucester and Atlantic

Counties. The township has an area of 57.78 square miles, and a population of 20,034 according to 1980 census data. Winslow Township has developed into approximately ten smaller communities which range from rural to suburban. Eighty percent of the Township is situated within the Pinelands National Reserve. This area is conservation land, in which development is regulated by the State. The suburban sections of the township are developing rapidly as many Philadelphia and Atlantic City commuters are moving to the area.

Winslow Township is governed by a mayor and eight township committee members. Township elections are held every three years.

B. Community Involvement

Within the last two years there has been an increased level of activities regarding environmental issues in Winslow Township. The first Township Environmental Commission was recently established and members were appointed in January 1987. A local environmental organization called Residents for Environmental Protection and Preservation (R.E.P.P.) was established in late 1987. R.E.P.P. has been active in trying to deny a local company a permit to rebuild a chemical storage warehouse which burned down recently.

Neither R.E.P.P. nor the Township Environmental Commission have been involved with the King of Prussia Landfill. The only focused community involvement has been from the Township Committee, which has been the primary local point of contact for EPA at the site.

VI. COMMUNITY CONCERNS

This community concerns section is based on interviews conducted with local officials, community leaders, and residents of Winslow Township during June of 1988. While concerns about general environmental issues in Winslow Township have risen over the last year, the level of concern about the King of Prussia landfill site has remained at a low level. Residents are more concerned about other environmental issues in their area, rather than the King of Prussia Landfill site which is located in a remote part of the Township. One public official commented that if more people lived near the site that it would receive more attention from residents.

1. Length of Time of Site Mitigation

Several public officials and community leaders expressed concerns about the length of time involved in mitigating contamination at the King of Prussia Landfill site. One community leader

requested that EPA address the length of time involved in site mitigation.

2. Exposure to Contaminants and Potential Health Effects

Several local officials, community leaders, and residents expressed concerns about the possibility of adverse health effects to people who have entered the site. Most of the people interviewed expressed concerns about the potential health effects to area children who allegedly use the site to ride their off-road vehicles. One local official said that hunters use the site to hunt deer. This official was also concerned that residents who had cut down trees from the site for firewood might be exposed to contaminants from burning the wood in their fireplaces.

3. Extent of Contamination

Several local officials and community leaders expressed concerns about the extent of contamination. Local officials and community leaders said that they believe that excavation and water uses by area resource extraction facilities could extend the migration of contaminants from the site and potentially lead to drinking water contamination. Community leaders are also concerned about the potential of the contamination from the site entering the Great Egg Harbor river. They believe that contamination could jeopardize the river's status as part of a Congressional Scenic and Wild River Study that began in 1986.

4. Extent of Cleanup

Community leaders said that they are concerned about the extent and degree of cleanup. Another community leader said that Winslow Township residents want to learn about the cleanup process involved at the site.

5. Information on Site Activities

Several public officials and community leaders said that the best way to inform Winslow Township residents about site activities is through the local media. One community leader said that EPA should directly distribute reports and information about site activities to the local officials and local organizations. This community leader said that R.E.P.P. would like to publish information supplied by EPA in its newsletter. The same community leader said that a location should be established in the Township at which this information would be made available to the public. This community leader said that some R.E.P.P. members are familiar with environmental issues and would be able to understand technical information about the site.

VII. OBJECTIVES OF THE COMMUNITY RELATIONS PLAN AT THE KING OF PRUSSIA LANDFILL SITE 6.1011

The objectives of EPA's community relations plan for the King of Prussia landfill site are specifically designed to meet the needs and concerns of public officials, community leaders, and residents expressed during community interviews. The primary objective of EPA's community relations plan will be to provide information about the progress of the cleanup and the safety measures taken at the site to reduce health risks.

PROVIDE STATUS UPDATES OF EPA CLEANUP ACTIVITIES.

EPA will provide local officials, community leaders, and residents with frequent, accurate, and easily understandable status updates of cleanup activities. Status updates of EPA's cleanup activities will communicate to local officials, community leaders, and residents a clear picture of progress being made at the site. Providing community members with periodic updates of site. Providing community members with periodic updates of sampling results, and explaining the significance of any newly discovered contaminant levels, will help to communicate to them that EPA is actively seeking to precisely define the nature and extent of contamination.

PREPARE AND DISTRIBUTE UPDATES ON SITE ACTIVITIES

Purpose: To inform residents about site safety activities.

Technique: Cleanup efforts and safety measures taken by EPA at King of Prussia site will be prepared and distributed by EPA and provided to local officials and community leaders. A special effort should be made to distribute updates to state elected officials and to R.E.P.P. since organization wants to publish information about the site in the newsletter.

PROVIDE ADEQUATE WARNING OF DANGERS ASSOCIATED WITH ENTERING THE SITE

Purpose: To warn the community and keep trespassers off the site.

Technique: The PRPs in 1988 installed a perimeter fence and large visible warning signs on the fence are placed. The signs clearly indicate the dangers associated with entering the site. EPA, NJDEP and the Winslow Township Police currently observe the hazardous waste site on a regular basis.

PREPARE AND DISTRIBUTE PRESS RELEASES ON SITE ACTIVITIES

Purpose: To inform residents about the Superfund cleanup process, site activities, and safety measures implemented during the cleanup.

Technique: Press release will be prepared and distributed to local media that describe the Superfund cleanup process, and EPA's site activities and safety measures.

PROVIDE UPDATES ON SAMPLING RESULTS

Purpose: To inform community leaders about sampling results of groundwater and surface water that could potentially effect the status of the Great Egg Harbor River as part of the Congressional Scenic and Wild River Study.

Technique: EPA should provide technical reports and information directly to local officials and community leaders. In addition, EPA should maintain phone contact to be able to quickly inform local officials and community leaders about sampling results throughout and cleanup process.

ESTABLISH AND MAINTAIN AN INFORMATION REPOSITORY

Purpose: To ensure all technical documents, the final community relations plan, and other site related information is available to interested parties.

Technique: A suggested location for an information repository is the Winslow Township Municipal Building.

SPONSOR A PUBLIC MEETING

Purpose: To provide information about site activities and respond to questions. A public meeting is not a formal hearing at which testimony is received. It is a meeting at which EPA and the community can exchange information.

Technique: EPA should sponsor a public meeting in Winslow Township in coordination with local officials and community leaders. A press release should be prepared to inform the community about the meeting purpose, location, time, and date.

APPENDIX A

SUGGESTED LOCATIONS FOR AN INFORMATION
REPOSITORY AND PUBLIC MEETINGSA. Information Repository

Camden County Library
Winslow Township Branch
Route 73
Braddock, New Jersey 08037

(609) 567-9770

Hours of Operation

Monday and Wednesday 10:00 a.m. - 8:00 p.m.

Tuesday, Thursday, and Friday 10:00 a.m. - 5:00 p.m.

Saturday 10:00 a.m. - 2:00 p.m.

Contact: Art Wolk, Reference Librarian

B. Public Meeting Location

Winslow Township Municipal Building
Route 73
Braddock, New Jersey 08037

(609) 567-0700

Hours of Operation

Monday - Friday 8:30 a.m. - 4:30 p.m.

Contact: Ron Nunnemkamp, Township Clerk

Capacity: 200

C. State Elected Officials

State Senator Daniel J. Dalton (609) 227-1407
 Box 100, RD 2
 Greentree Road
 Turnersville, NJ 08012

State Assemblyman Anthony Marsella (609) 589-2333
 Box 427 RD 3
 Ganttown Road
 Ganttown Professional Plaza
 Sewel, NJ 08080

State Assemblyman Dennis Riley (609) 228-8080
 Academy Hall 27 South
 Black Horse Pike
 Blackwood, NJ 08012

D. State Officials

*Catherine Timpy (609) 894-9342
 Environmental Specialist
 New Jersey Pinelands Commission
 P.O. Box 7
 New Lisbon, NJ 08064

E. Winslow Township Officials

*Norman Tomasello, Mayor
 F. William Auwarter, Committee Member
 Russell Bates, Committee Member
 John Gargano, Committee Member
 Sue Ann Metzner, Committee Member
 Jeannine LaRue, Committee Member
 *Lawrence Mauriello, Committee Member
 James Powell, Committee Member
 N. Lee Tomasello, Committee Member

*Ron Nunnenkamp, Township Clerk
 *Dr. George Leon, Environmental Commission Chairperson
 *Ed McGlinchey, Superintendent, Department of Public Works
 *June Fletcher, Environmental Commission Member

Winslow Township Municipal Building (609) 567-0700
 Route 73
 Braddock, NJ 08037

F. Winslow Township Community Organizations

*Macy Wright, President (through June 1988) (609) 767-4273
Residents for Environmental
Protection and Preservation (R.E.P.P.)

*Indicates persons interviewed in preparation of this plan.

G. Newspapers

Courier Post (609) 663-6000
301 Cuthbert Road
Cherry Hill, NJ 08002

Philadelphia Inquirer (609) 779-3840
53 Haddonfield Road
Cherry Hill, NJ 08002
Attention: Andy Wallace

E. Television Stations

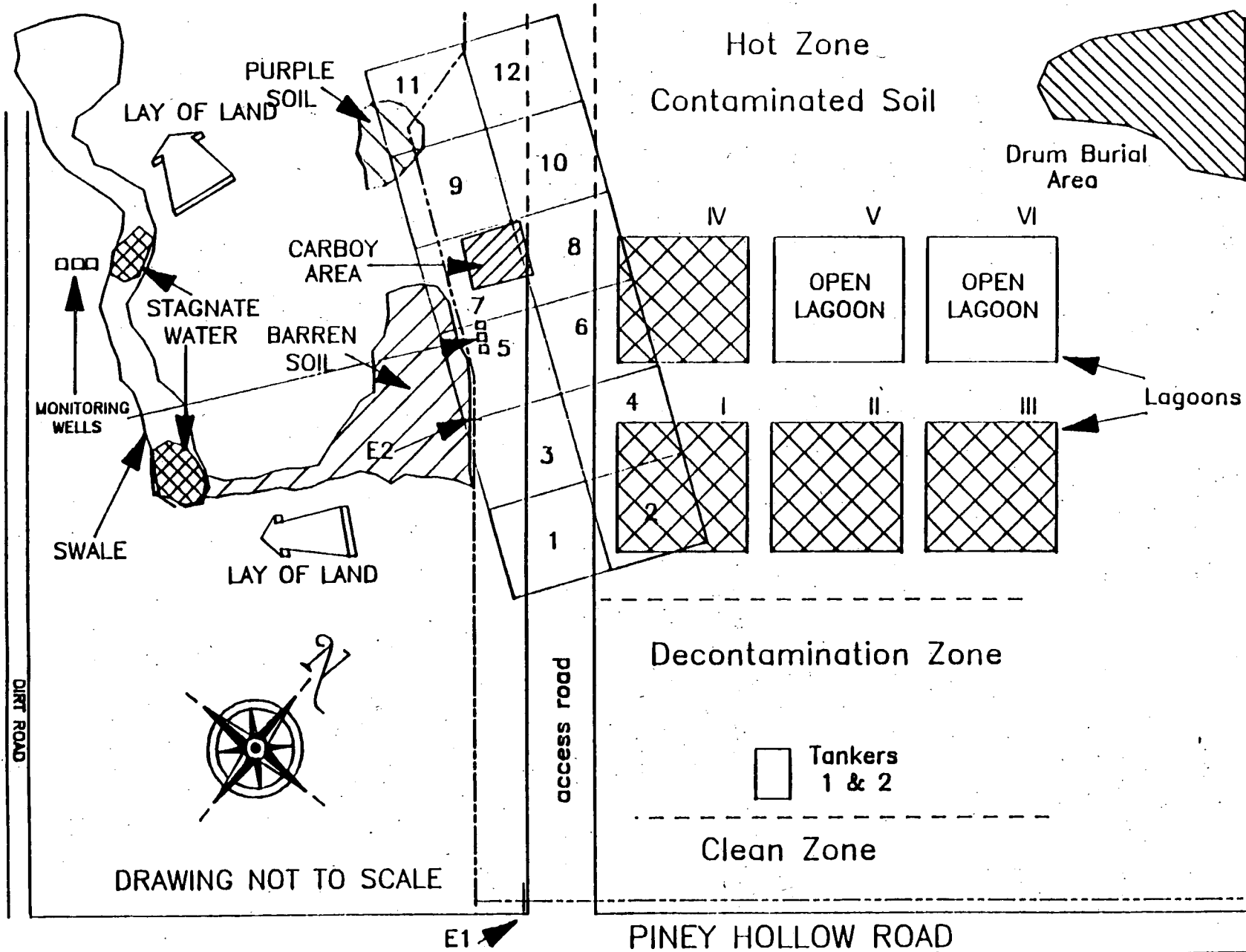
WCAU-TV (609) 866-0553
Plaza Office Center
Route 73
Mount Laurel, NJ 08054

WPVI-TV (609) 966-6666
4100 City Line Avenue
Philadelphia, PA 19131

F. Radio Stations

WDBK-FM (609) 227-7200
Camden County College
Little Gloucester Road
P.O. Box 200
Blackwood, NJ 08012

WSSJ-AM (609) 365-5600
Mutual Broadcasting System
6N Market Street
Camden, NJ 08101



SPILL PREVENTION &
EMERGENCY RESPONSE DIVISION

In Association with ICF Technology Inc., C.C. Johnson & Associates, Inc., Resource Applications, Inc., GeoSource Consultants, Inc., and Environmental Toxicology International, Inc.

EPA PM
E. Dominach

TAT PM
D. Graham

King of Prussia
Site

Figure

KOP 6-6016



United States
Environmental Protection Agency
Region 2: New Jersey, New York
Puerto Rico, Virgin Islands
26 Federal Plaza, NY, NY 10278

FACTS

SUPERFUND UPDATE

June 1988

KING OF PRUSSIA TECHNICAL CORPORATION DISPOSAL SITE
Winslow Township, New Jersey

This update reviews the activities of the U. S. Environmental Protection Agency (EPA) at the King of Prussia Technical Corporation Disposal Superfund Site (KOP) since August 1987. Information on site background and current and future activities is provided.

SITE BACKGROUND

The King of Prussia Technical Corporation Disposal Site is located on Piney Hollow Road in Winslow Township, Camden County, New Jersey. The site is approximately 10 acres and is located 800 to 1000 feet northeast of the Great Egg Harbor River. There are no private residences in the immediate surroundings of the site.

Between 1970 and 1973 the site was used as an industrial waste treatment station. The facility processed liquid industrial wastes, principally through a series of lagoons. In 1973, KOP sold the facility to the Evor Phillips Leasing Company, and in 1976, Winslow Township foreclosed on the property for failure of the company to pay taxes. Winslow Township currently owns the property.

Based on chemical analyses of groundwater and soil samples obtained and conducted by EPA at various times between 1975 and 1980, EPA determined that a Remedial Investigation/Feasibility Study (RI/FS) was necessary. Consequently, KOP was placed on the National Priorities List of hazardous waste sites.

In April 1985, EPA entered into an Agreement and Consent Order with five Potentially Responsible Parties (PRPs) to conduct the RI/FS. The purpose of the RI/FS is to determine the nature and extent of contamination at the site and to identify and evaluate clean up alternatives.

FIELD ACTIVITIES

The RI for this site will be done in two phases. Phase I focused on defining and characterizing the nature of contamination on and near the KOP site. Field work for Phase I began in November 1985 and was completed in June 1986.

Field work consisted of surface and subsurface soils investigations, including the collection and analysis of samples from 76 locations. Seven wells were drilled and the groundwater from these wells was sampled. In addition, surface water and sediment sampling occurred at 6 locations in

the Great Egg Harbor River. Analysis of the results of the sampling revealed heavy metals contamination throughout the site as well as the presence of small amounts of volatile chemicals in the groundwater on the site.

Phase II of the RI will focus on determining the amount and extent of contamination on and near the site. Field work for Phase II began in May 1988 and is scheduled to be completed in late summer of this year. Current field activities include soil sampling, additional surface water and sediment sampling from the Great Egg Harbor River, and the placement of additional wells throughout the site, including one on the side of the Great Egg Harbor River opposite the site. In addition, all of the previously installed wells and the new ones (a total of 28 wells) will be sampled during this phase. EPA estimates that the RI will be completed in December 1988.

FUTURE ACTIVITIES

Once the RI has been completed and reviewed by EPA, the data gathered from the RI will be used to develop the FS. The FS will address remedial response objectives and identify and evaluate viable clean up alternatives. EPA estimates that the FS will be completed in the summer of 1989.

In addition, an EPA contractor will be preparing an Endangerment/Risk Assessment Report. This report will identify the contaminants of concern to determine and evaluate pathways by which the public and the environment may be exposed, and will estimate the short and long-term effects of such exposures. The Endangerment/Risk Assessment Report is scheduled for completion in December 1988.

FURTHER INFORMATION

Copies of technical and community relations documents regarding the King of Prussia Technical Corporation Disposal Superfund Site will be available for review in the near future at the following locations:

Winslow Township Municipal Hall
Route 73
Braddock, New Jersey 08073
(609) 567-0700

Camden County Library
Echelon Urban Center
Laurel Road
Voorhees, New Jersey 08043
(609) 772-1636

Residents and other interested parties with questions or comments concerning the King of Prussia Technical Corporation Disposal Superfund Site may contact Marilyn Haye, EPA Enforcement Project Officer or Isabel Funcia, EPA Superfund Community Relations Specialist, at

EPA Region II
26 Federal Plaza
New York, NY 10278

King of Prussia Technical Corporation Disposal Site

Winslow Township, New Jersey

EPA Region 2

September 1989

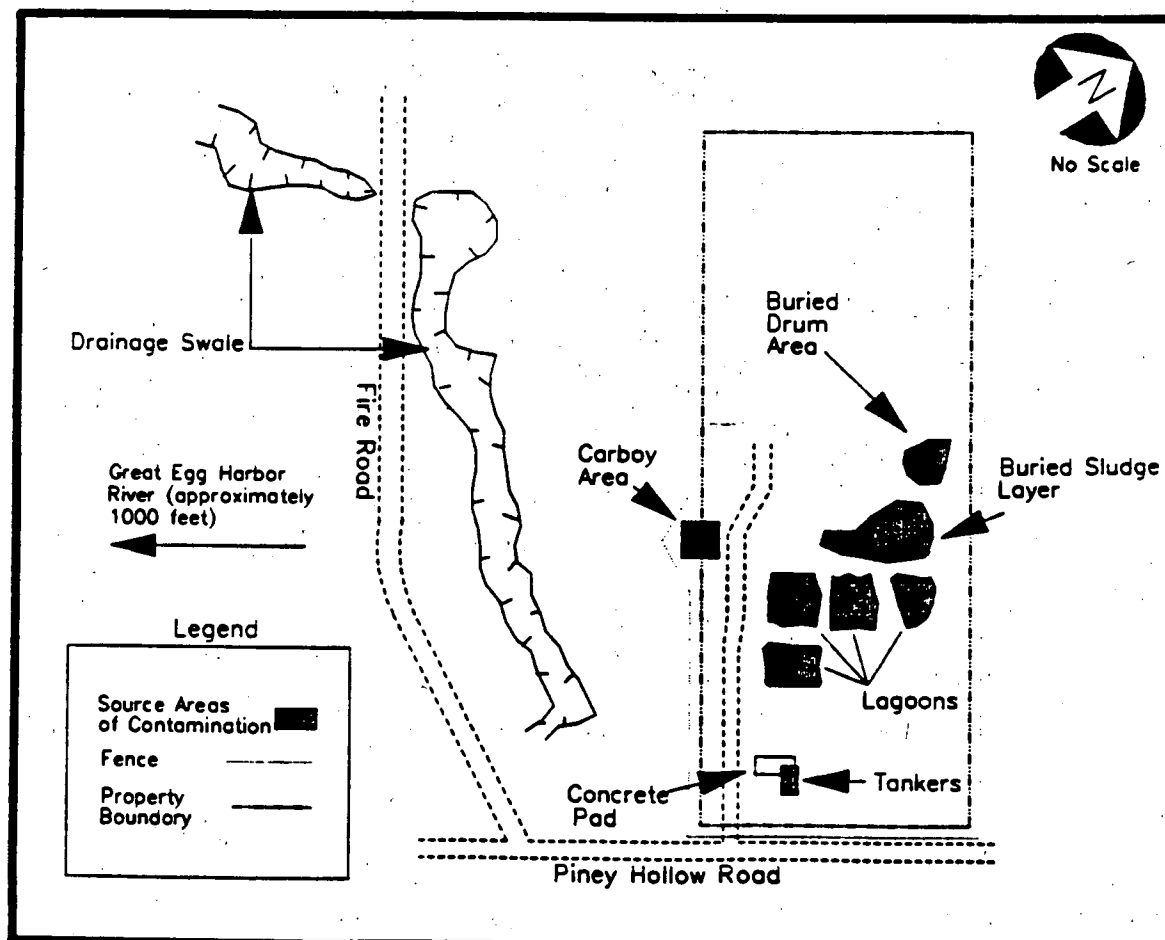
EPA Announces Completion of the Remedial Investigation and Endangerment Assessment

INTRODUCTION

This Superfund Update Provides the latest information on activities being conducted by the U.S. Environmental Protection Agency (EPA) at the King of Prussia Technical Corporation Superfund (KOP) site. A two phased Remedial Investigation (RI) and an Endangerment Assessment (EA) have been completed for the KOP site.

The RI and EA reports, along with public comments, will be used to conduct a Feasibility Study and to select a long term remedy for cleanup of the site. This update focuses on the RI and EA reports and provides information on site background, and current and future activities being conducted.

Site Map



SITE BACKGROUND

The KOP site is located in Winslow Township, Camden County, New Jersey. The 10.1 acre site is situated on Piney Hollow Road, and is approximately 800 to 1000 feet northeast of the Great Egg Harbor River. The site is located in a rural area of the New Jersey Pine Barrens, with no private residences in the vicinity.

The King of Prussia Technical Corporation purchased the KOP site from Winslow Township in 1970 for use as a waste processing facility. The facility utilized a series of lagoons to process an estimated six million gallons of liquid industrial wastes. Sometime between 1973 and 1975, operations at the facility ceased, and the site was abandoned. In 1976, Winslow Township foreclosed on the property for failure of the company to pay taxes, and the township resumed ownership of the property.

EPA began its investigation of the KOP site in 1975, and installed four groundwater monitoring wells in 1976. Subsequent sampling and investigative work conducted by EPA through 1980 resulted in EPA's proposal to place the KOP site on the National Priorities List (NPL) of hazardous waste sites. The site was formally listed on the NPL in September of 1983.

In April of 1985, EPA entered into an Agreement and Consent Order with five Potentially Responsible Parties (PRPs) to conduct a Remedial Investigation and Feasibility Study (RI/FS) at the site. An RI/FS is a two-part study of a hazardous waste site that supports the selection of a cleanup remedy for the site. The RI determines the nature and extent of contamination at the site, and the FS identifies and evaluates alternatives for addressing site contamination.

Physical evidence of the previous waste processing activities at the site still remains. Past records show that there were six lagoons on-site. The visible remains of three lagoons

are evident at a slightly elevated setting near the center of the property. A fourth lagoon appears as a slightly depressed area and the other two lagoons are no longer readily evident.

Between Piney Hollow Road and the lagoon area are the rusted remains of two thirty-foot long tank trailers, and a twenty by ten foot concrete pad. The remains of plastic carboys (5-10 gallon containers) have been uncovered in a disposal area on the southwestern boundary of the site. Towards the northern portion of the site is an area of drum disposal.

The site property was fenced in the summer of 1988 to protect public health, by restricting access.

REMEDIAL INVESTIGATION SUMMARY

The RI for the KOP site has been conducted in two phases. Both phases focused on characterizing the suspected contaminant source areas and their impacts on soil, groundwater, surface water and river bed sediments. Phase I of the RI was completed in July 1987. In March 1988, EPA requested the initiation of Phase II to provide additional information on the source areas. The Final RI Report was approved by EPA in August 1989.

The main objectives of the RI were as follows:

- To characterize the site geology and hydrogeology.
- To define possible sources of contamination, to determine potential or existing pathways of contamination migration, and to determine the nature and extent of the site contaminants in the soils, surface water, and groundwater.

RESULTS OF THE RI REPORT

The remedial investigations examined five hazardous waste source areas listed below:

- Wastewater treatment lagoons.
- Drum burial area in the northwest section of the site.
- Carboys containing liquid waste buried along fence line.
- Two corroded 30-foot long tank trailers located near the site entrance.
- Subsurface sludge band northwest of the wastewater treatment lagoons.

The major findings of the RI are summarized below:

- Hydrogeologic investigations conclude that upper, middle and lower subzones exist within the upper part of the Kirkwood-Cohansey aquifer system which underlies the KOP site. Tests indicate that the upper and lower subzones function as aquifers, while the middle subzone functions as a confining unit.
- Groundwater within the upper and lower subzones flows in a southwest direction. The upper subzone aquifer appears to discharge into the Great Egg Harbor River.
- The lagoon sludges, buried sludge band, tanker residue and carboy contents contain chromium, copper, nickel, and zinc as well as other metals. These sources are believed to have contributed to metals contamination in the upper subzone aquifer.
- The soils in the buried drum area suggest that waste residues are present which contain significant concentrations of volatile organic compounds.

Pesticides and unidentified hydrocarbons were also detected. The buried drum area, however, does not appear to be a major source of metal contamination.

- Only limited areas of on-site soils, exclusive of the source areas, contain concentrations of metals in excess of New Jersey Soil Action Levels.
- Metals including chromium, copper, nickel and lead were detected at high concentrations in offsite drainage swale sediments. The concentrations in the swale upslope of the Fire Road exceed the New Jersey Action Levels for several metals.
- Onsite and offsite wells installed in the upper subzone aquifer indicate that aquifer is contaminated with metals including chromium, copper and nickel in excess of acceptable Federal and State levels established under the Safe Drinking Water Act. Generally the lower subzone aquifer does not contain metals in excess of these Federal and State Levels.
- The upper subzone aquifer contains quantifiable levels of volatile organic compounds. The buried drum area appears to be the source of this contamination.
- Site-related metals are present at concentrations elevated above background in the surface water and sediment, in the area of the Great Egg Harbor River which receives ground water discharge from the KOP site. The data indicates that the source of these metals is the ground water discharge from the shallow subzone aquifer system.
- No organic compounds were detected at elevated levels in the surface water and sediments in the Great Egg Harbor River.

ENDANGERMENT ASSESSMENT

An Endangerment Assessment (EA) was prepared for the KOP site by EPA. The EA consists of Public Health Risk Assessment and an Environmental Risk Assessment.

The EA report identifies contaminants of concern, determines and evaluates pathways by which the public and environment may be exposed, and estimates the short and long term effects of such exposures.

PUBLIC HEALTH RISK ASSESSMENT

The public health risk assessment addresses potential impacts to human health associated with the KOP site in the absence of remedial (corrective) actions. It is a conservative analysis intended to indicate the potential for adverse impacts to occur.

Data collected during the RI was used in the EA to estimate the exposure to indicator chemicals. Indicator chemicals are principal contaminants of concern that have been detected in environmental media, that are considered to be related to past activities and are likely to contribute to risk. The exposure pathways were defined using conservative assumptions that tend to overestimate exposure. Thus, final estimates of exposure should be near to or higher than (often much higher than) the upper end of the range of actual exposures. For this reason, the risk estimates are unlikely to underestimate the actual risk, and may considerably overestimate risk.

For risk assessment purposes, individual pollutants were separated into two categories of chemical toxicity depending on whether they cause carcinogenic or noncarcinogenic effects. In the case of chemicals exhibiting carcinogenic effects, a risk level representing a probability of one excess cancer case in one million individuals (1×10^{-6}) is often used as a benchmark by EPA. In the case of chemicals exhibiting noncarcinogenic effects, risks are characterized by means of a hazard index. In

general, a hazard index below 1 is not likely to be associated with any appreciable health risk.

EXPOSURE PATHWAYS

Each exposure pathway describes a specific mechanism by which a population or an individual is exposed to contaminants originating from a site.

Specific pathway exposures are not necessarily cumulative because they may represent exposures of different receptor populations.

The public health risks associated with exposure to indicator chemicals were estimated based on the following exposure pathways:

- Potential exposure to future residents via ingestion of contaminated ground water (drinking water) from the shallow or deep aquifer.
- Potential risk to future residents who may be exposed to contaminated swale sediments and surface soils via dermal contact, and/or ingestion, or inhalation of airborne particulates.
- Potential exposure to site contaminants via recreational activities such as hiking, swimming, and fishing.
- Potential exposure to workers during future remedial activities and/or possible excavations conducted on the site and adjoining area.

The following major conclusions regarding the public health risk assessment were reached:

- Contaminant levels in the upper subzone aquifer underlying and downgradient southwest of the site exceed available Federal and State Safe Drinking Water Act (SDWA) standards. These contaminant levels indicate a potential for adverse health effects associated with long term exposure to the groundwater as a source of drinking water.

- Contaminant levels in the lower subzone aquifer are minimal and adverse non-carcinogenic affects are not anticipated. It should be noted that there are currently no local users of groundwater from either aquifer as a source of drinking water.
- Dermal contact and ingestion of surface water and sediments from the Great Egg Harbor River would not result in adverse health effects; however ingestion of fish by a child under maximum exposure is potentially of concern.
- Dermal contact with and accidental ingestion of surface water and sediments from the drainage swale is not of concern for the recreational user. However, future residential use of the site could result in adverse health affects.
- The potential for adverse health affects from inhalation of dust particles from the KOP site is minimal.
- Direct contact or ingestion of onsite contaminated soils by a person crossing the site does not appear to be an exposure pathway of consequence. However, future residential use of the site could result in adverse health affects.

ENVIRONMENTAL RISK ASSESSMENT

The environmental risk assessment of the EA describes the environmental damage suspected to have occurred as a result of the site-related contaminants and discusses the risks to aquatic and terrestrial life as a result of exposure to contaminants in the environmental media.

The major results of the Environmental Assessment are stated below:

TERRESTRIAL EFFECTS

- Photographs taken before and after site utilization demonstrate stressed

vegetation in the southwest portion of the site. It appears that the damage to the vegetation is site related.

- There is little data to evaluate the effects of site-related contaminants on terrestrial fauna; however, given the relatively high concentration of indicator compounds in onsite soils and drainage swale sediments and their bioaccumulative characteristics adverse health effects cannot be ruled out.

AQUATIC EFFECTS

- Comparison of metal concentrations in the Great Egg Harbor River to available Ambient Water Quality Criteria suggest a minimal potential for adverse health effects on aquatic receptors although definitive conclusions cannot be made.

FUTURE ACTIVITIES

FEASIBILITY STUDY

EPA anticipates that the Feasibility Study (FS) will be completed late in the fall of 1989. The purpose of this FS is to develop and evaluate available methods to clean up contamination detected at the site. The following nine requirements must be addressed:

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT. This requirement addresses how the preferred method of cleanup eliminates, reduces, or controls existing and potential risks to human health and the environment through treatment, engineering controls, and/or institutional controls.

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS). This requirement addresses how the chosen cleanup remedy complies with other federal and state regulatory guidelines.

LONG-TERM EFFECTIVENESS AND PERMANENCE This requirement addresses the adequacy of remedies used to manage untreated waste and residuals from treatment; the extent of remaining risk in terms of untreated wastes and treatment residuals; and the long-term reliability of the implemented remedy.

REDUCTION OF TOXICITY, MOBILITY, AND VOLUME (TMV) This requirement includes several criteria designed to reduce the toxicity, mobility, and volume of the contaminants.

SHORT-TERM EFFECTIVENESS This requirement addresses the potential impact on the community, workers, and the environment. Short-term effectiveness addresses the effectiveness and reliability of mitigative measures, and the time until protection is achieved.

IMPLEMENTABILITY This requirement deals with the ease with which the chosen remedy can be implemented. The criteria include:

TECHNICAL FEASIBILITY (e.g. the difficulties and unknowns associated with the technology; the reliability of technology)

ADMINISTRATIVE FEASIBILITY (e.g. the ability and time required to obtain the required approvals and permits; the steps required to coordinate with other government agencies and the associated time requirements)

AVAILABILITY OF SERVICES AND MATERIALS (e.g. the capacity to treat, store, or dispose of contaminants; the existence and availability of service or materials vendors and operators)

COST This requirement addresses the cost involved in implementing the remedial action and includes the following: capital costs; operation and maintenance costs; and present worth costs.

STATE ACCEPTANCE This requirement deals with state acceptance of the chosen remedy.

COMMUNITY ACCEPTANCE This requirement addresses local support for the chosen remedy.

CARBOY REMOVAL

The EPA will begin removal of buried carboys, carboy liquids and related contaminated soil at the KOP site. EPA anticipates this removal action will begin in September 1989 and is expected to take approximately six to eight weeks to complete.

FURTHER INFORMATION

EPA representatives will continue to keep community members informed of activities concerning the KOP site, and will continue to meet with the Winslow Township Environmental Commission to discuss site developments.

For additional information concerning EPA activities at the KOP site, please contact the EPA Enforcement Project Manager, James Hahnenberg at (212) 264-5387 or the EPA Community Relations Coordinator, Lillian Johnson at (212) 264-7054.

Copies of site related documents are available for review at the following information repositories:

Winslow Township Municipal Hall
Route 73
Braddock, New Jersey 08073
(609) 567-0700

Camden County Library
Echelon Urdan Center
Laurel Road
Voorhees, New Jersey 08043
(609) 772-1636

King of Prussia Technical Corporation Site

Winslow Township, New Jersey



Region 2

July 1990

PROPOSED REMEDIAL ACTION PLAN

PURPOSE OF THE PROPOSED PLAN

This document describes the preferred alternatives for remediation of contaminated ground water, sludges and soils at the King of Prussia (KOP) Superfund site in Winslow Township, Camden County, New Jersey. It also describes the preferred remedial alternatives for the drainage swale adjacent to the site.

The plan was developed by the U.S. Environmental Protection Agency (EPA) in conjunction with the New Jersey Department of Environmental Protection (NJDEP). The plan also outlines all of the remedial alternatives which were evaluated and the rationale that EPA used to make the preliminary selection. The preferred remedial alternatives are primarily based on four key documents:

- the Remedial Investigation (RI) report which characterizes the nature and extent of the contamination present,
- the Endangerment Assessment (EA) which addresses potential impacts to human health and the environment,
- the Feasibility Study (FS) report which describes how the various remedial alternatives were developed and evaluated, and
- a Supplemental Feasibility Study (SFS), a companion document to the FS, which describes additional remedial alternatives to those presented in the FS.

The proposed plan is being distributed, along

with the RI, EA, Draft Final FS and SFS reports, to solicit public comment regarding the most acceptable methods to remediate the contaminated sludges, soils, sediments and ground water at the King of Prussia site. Detailed information on all of the material included in the proposed plan may be found in these reports. The documents listed above have been placed at the following information repositories:

- Winslow Township Municipal Hall
Route 73
Braddock, New Jersey 08073
(609) 567-0700
- Camden County Library
Echelon Urban Center
Laurel Road
Voorhees, New Jersey 08043
(609) 772-1636

Additional documentation regarding the remedy selection is available in the administrative record for the site. The administrative record is being established at the Camden County Library, Echelon Urban Center, Laurel Road, Voorhees, New Jersey 08043.

COMMUNITY ROLE IN SELECTION PROCESS

EPA relies on public comment and discussion to ensure that the problem being addressed and the remedial alternatives being evaluated for each Superfund site are fully understood, and that the needs of the local community have been considered. To this end, this Proposed Remedial

Action Plan (PRAP) is being distributed to the public. EPA is providing a 30-day public comment period to give the local community an opportunity to have input into this selection process. During this period EPA staff will visit the community to discuss the PRAP, RI, FS and SFS, and to answer questions. The Agency will hold a public meeting on Wednesday, August 1, 1990 at 7:00 p.m. in the Winslow Township Municipal Hall on Route 73 in Braddock, New Jersey.

Written and verbal comments on the PRAP and the RI, FS and SFS reports will be welcomed through August 15, 1990 and will be documented by EPA in the subsequent Record of Decision (ROD), the formal document that describes the selected remedy.

All written comments should be addressed to:

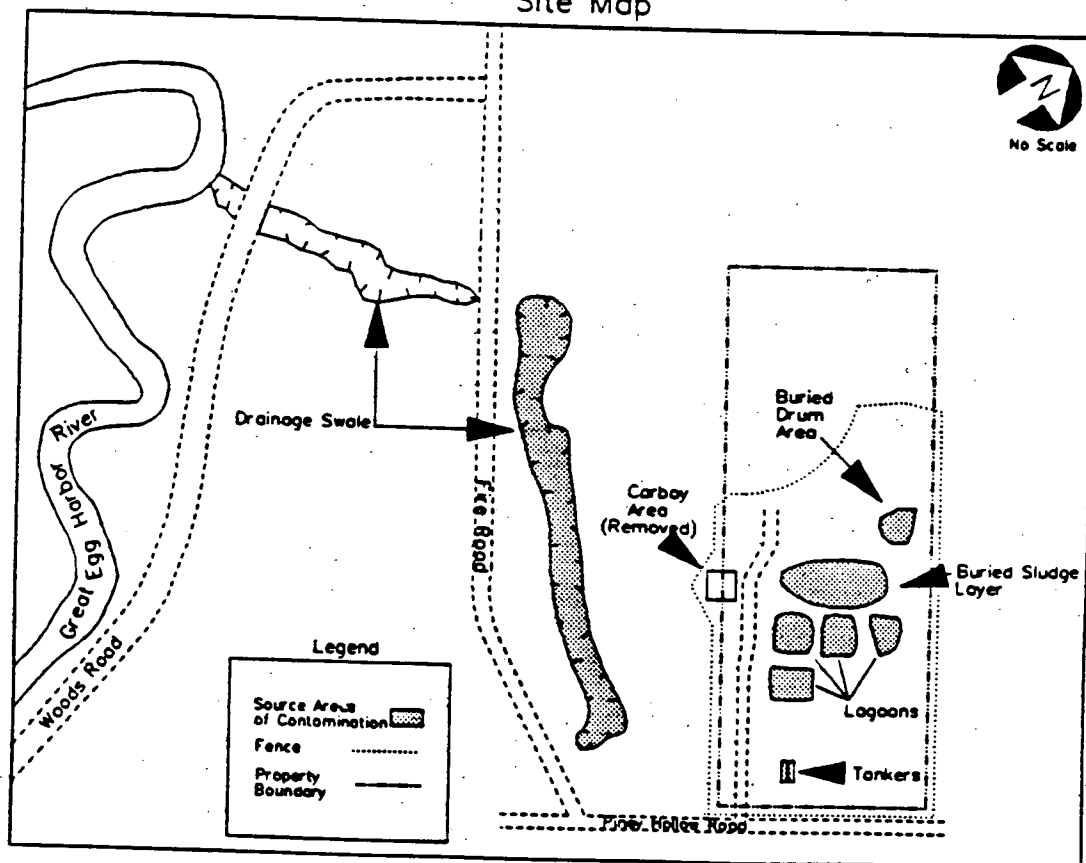
James Hahnenberg
Project Manager
U.S. Environmental Protection Agency
Room 720
26 Federal Plaza
New York, NY 10278

It is important to note that while the option described herein is EPA's preferred alternative for this site, the final decision will be made only after consideration of all comments received during the public comment period on any of the remedial alternatives addressed in the PRAP, the FS and SFS.

SITE BACKGROUND

The site, approximately ten acres in size, is in a rural area within the Pinelands National Reserve. It is also adjacent to the State of New Jersey's Winslow Wildlife Refuge. The nearest residence is a single family home approximately one mile northeast (upgradient) of the site. The Great Egg Harbor River, located approximately 1000 feet southwest and downgradient of the site, is used for recreational purposes and has been proposed as a Nationally designated Wild and Scenic River. A swale, which drains most of the site runoff, lies between the site and the river. Stressed vegetation and trees have been observed in the upper swale area and is believed to be caused by metals-contaminated runoff from the site. (See Site Map below.)

Site Map



The King of Prussia Technical Corporation purchased the site from Winslow Township in 1970 to process and recycle hazardous waste. Six lagoons were used to process liquid industrial waste with the intention to convert these wastes to useful chemicals and construction materials. Sometime between 1973 and 1975 operations ceased and the site was abandoned. In 1976, Winslow Township foreclosed on the property and resumed ownership because the company failed to pay taxes.

Records indicate that six lagoons were originally utilized for industrial waste processing. Three of the lagoons are still evident, and a fourth may be identified by a slight depression. These lagoons are located in a slightly elevated area near the center of the property (refer to Site Map).

Two rusting and torn tankers are lying on a concrete pad between Piney Hollow Road and the lagoons on the southeast part of the site. Toward the back of the site is an area with an undetermined number of buried drums and containers. The site has sandy soil and is mostly barren of vegetation.

The site property was fenced in July 1988 to restrict access and to prevent the public from coming into direct contact with the contaminants. The fence was also installed to prevent illegal dumping.

Buried plastic containers (carboys) and surrounding soils with visible contamination, located inside the fence west of the lagoons, were excavated and containerized by EPA in September 1989. Final removal and off-site disposal of these materials is anticipated to occur during the fall of 1990.

Currently, EPA is evaluating the removal of buried drums and aboveground tankers.

In April 1985, EPA entered into an Administrative Order on Consent with five Potentially Responsible Parties (PRPs) to conduct the RI and FS activities. In 1988 and 1989, EPA identified additional PRPs bringing the total number of PRPs to fourteen. EPA's search for additional PRPs is continuing.

REMEDIAL INVESTIGATION SUMMARY

The RI for the KOP site was conducted in two phases, with the final report approved in August 1989. The first phase was completed in July 1987, at which time EPA determined that sufficient data and information had not been obtained to characterize site-related contamination adequately. In March 1988, EPA requested that the PRPs initiate a second phase of the investigation to provide additional information on contaminant source areas and more complete definition of aquifer contamination. On September 19, 1989, EPA representatives met with local citizens and interested parties to present the findings of the RI.

The objectives of the RI were to: characterize the nature and extent of contamination associated with the site, identify off-site contamination and its impact on the environment and public health, and determine the need for remedial measures to mitigate the impact of the site on the public health and the environment. These objectives were met by examining all available information regarding the site and by performing field investigations to gather additional data.

The following tasks were accomplished during the RI:

- Pre-existing geological, geophysical, hydrological and chemical information were reviewed and evaluated.
- Two hundred and ten test pits and boreholes were drilled/dug to sample soils, sediments and sludges to determine the types and concentrations of contamination.
- Twenty-seven monitoring wells and one observation well were installed to define the site geology and to determine the types and concentrations of contaminants in the groundwater.
- Conductivity, magnetometer and resistivity surveys were conducted to determine the location of areas with

potential contamination.

- Surface-water and stream-bottom sediments were sampled at fourteen locations to characterize contamination in the Great Egg Harbor River.
- The contents of tankers, a buried drum and carboys were sampled and analyzed.

The findings of the RI report are as follows:

- Lagoon sludges and soils adjacent to the lagoons indicated high concentrations of chromium, copper, nickel and zinc as well as other metals. These are contaminant source areas for metals contamination detected in the upper aquifer.
- Silty sediments in the portion of the swale upslope from the fire road also showed high concentrations of chromium, copper, nickel and zinc as well as other metals. This is believed to be a source of metals contamination in the upper aquifer.
- Carboys and tankers contents were found to have high levels of chromium, copper, nickel and zinc as well as other metals.
- A sample analysis from a buried drum located in the rear (northwest) of the site indicated high concentrations of volatile and semi-volatile organic compounds above cleanup levels. Limited sampling indicates soils in this area has significant concentrations of volatile organic compounds. This area is believed to be the source for organic contamination of the groundwater.
- Two aquifers within the Kirkwood-Cohansey Aquifer System were identified at the KOP site. The upper aquifer begins 15 feet below the surface and extends to approximately 35 feet. A second aquifer extends downward from 50 feet below the surface to an undetermined depth. A 10 to 30-foot semi-confining layer composed primarily

of silt and clay separates the two aquifers.

- The highest levels of groundwater contamination have been identified in the upper aquifer. Metals, including chromium, copper and nickel, were identified at concentrations in excess of acceptable Federal and State levels established under the Safe Drinking Water Act. The upper aquifer also contained volatile organic compounds. Some metals contamination has been identified in the lower aquifer.
- Groundwater contamination has migrated toward the Great Egg Harbor River, with contaminants in the upper aquifer discharging to the river. The highest contaminant concentrations have not reached the river and are approximately 500 feet east of the river. The deeper aquifer is not believed to discharge a significant volume of water to the Great Egg Harbor River.
- The Great Egg Harbor River has low levels of metals contamination in both the sediments and the surface waters. The upper aquifer is believed to be the source of these metals into the river. No organic compounds were detected above background levels in surface water or in river sediments.

SUMMARY OF SITE RISKS

An Endangerment Assessment (EA) was conducted by EPA to determine risks presented by hazardous substances at the site. Indicator chemicals from each media were selected to ensure that representative contaminants from all exposure routes at the site would be evaluated.

The following exposure routes were assessed: 1) breathing dust contaminated from site soils and swale sediments; 2) ingestion of site soils, sludges and swale sediments; 3) skin contact with contaminants in the groundwater, site soils and sludges, and swale sediments; 4) drinking the groundwater at the site; 5) inhalation of

contaminants volatilizing from groundwater during showering; and 6) eating fish from the Great Egg Harbor River. These analyses indicate that the greatest risks to human health at the site are from ingesting site soils, sludges and swale sediments, and from drinking the groundwater.

Human health risks from soil ingestion are calculated to have a Hazard Index of 3.7. A Hazard Index greater than 1 is considered to exceed the maximum recommended exposure. The soil remediation proposed in this plan will reduce human health risk to a Hazard Index of less than 1.

The cancer risk from drinking contaminated ground water is 2.4×10^{-2} although presently there are no users of the groundwater in the proximity of the site. The proposed remedial activities will reduce contaminant concentration to Maximum Contaminant Levels (MCLs) which are drinking water standards.

The RI indicates metals contamination may present a threat to stream biota due to metals contamination in the sediments and possible bioaccumulative effects. Additional data on contaminant concentrations and biologic effects are necessary.

SCOPE AND ROLE OF PROPOSED RESPONSE ACTION AND SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED

Due to the wide variety of contaminants and multiple migration routes presented at the KOP site, EPA has divided the site into the five components listed below to effectuate a more protective remedial action. The alternatives considered for each of these components are based on those evaluated in the FS, which was initiated during the spring of 1989, and the SFS conducted by EPA during the spring of 1990.

Component 1:

Metals-contaminated soils adjacent to lagoons, sludges in lagoons, and sediments in the swale.

Component 2:

Buried drums and soils contaminated with volatile organic compounds located toward the rear (northwest) of the site.

Component 3:

Tankers and contents located near the front (southeast) of the site. Soils under and adjacent to the tankers will be addressed as part of Component 1.

Component 4:

Organic and metals-contaminated ground water.

Component 5:

Surface waters and sediments of the Great Egg Harbor River.

Preferred Alternatives

After careful consideration of all reasonable alternatives, EPA proposes utilizing the following alternatives for the remedial action for the KOP site:

COMPONENT 1- METALS-CONTAMINATED SOILS, SEDIMENTS AND SLUDGES

ALTERNATIVE S-4: COMPLETE EXCAVATION; CONTAMINANT EXTRACTION; REPLACEMENT ON SITE

This consists of excavation of metals-contaminated soils that do not meet the cleanup objectives in the area adjacent to the lagoons, sediments in the swale and sludges in the lagoons. Extraction of metals contaminants will continue until the cleanup objectives are met. This alternative will reduce human health risks to a protective Hazard Index of less than 1. After excavation, these materials would be consolidated and contaminant extraction would be performed in a multi-stage batch process. The treated soils, sediments, and sludges would then be redeposited in their original locations after meeting cleanup objectives.

COMPONENT 2- BURIED DRUMS AND SOILS CONTAMINATED WITH VOLATILE ORGANIC COMPOUNDS

ALTERNATIVE DR-2: DRUM REMOVAL AND OFF-SITE DISPOSAL; SAMPLING AND ANALYSIS OF SOILS

This consists of removal and off-site disposal of the buried drums and visibly contaminated soils followed by sampling and post-removal analysis of nearby soils to define types and concentrations of residual contaminants. This will provide a complete characterization of soils contamination and volumes that may require further remediation. If further remediation is warranted, a focused feasibility study will be conducted to evaluate remedial alternatives.

COMPONENT 3- TANKERS AND CONTENTS

ALTERNATIVE TK-2: TANKER REMOVAL AND OFF-SITE DISPOSAL

This involves removing the tankers and their contents for off-site disposal.

COMPONENT 4- GROUND WATER

ALTERNATIVE GW-3: GROUND WATER PUMPING, TREATMENT AND REINJECTION

This involves pumping the contaminated ground water from the upper aquifer and treating to MCLs. Treated ground water would be reinjected into the aquifer. This process will continue until MCLs are achieved in the aquifer. The treatment system will also prevent contaminants in the upper aquifer from discharging into the river. Additional monitoring wells will be required to provide data to define more completely the vertical extent of contamination. The pumping, treatment and reinjection design may need to be modified if data indicate contamination in the deeper aquifer.

COMPONENT 5- SURFACE WATER AND SEDIMENTS OF THE GREAT EGG HARBOR RIVER

Additional sampling of the Great Egg Harbor River's surface waters and sediments will be conducted to define contamination more completely, assess biological impacts and to monitor future contaminants concentrations in the river. This information will be used to determine if remediation of the Great Egg Harbor River waters and/or sediments will be necessary. Costs and detailed discussion are presented in the ground-water alternatives in the FS and SFS.

Rationale for Selection

The nine criteria used to evaluate all remedial alternatives fall into four categories: environmental/public health, compliance with required cleanup standards, technical performance and cost. In addition, the selected remedy should result in permanent solutions and should use treatment to the maximum extent practicable. The criteria are summarized below:

- Overall protection of human health and the environment addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls or institutional controls.
- Compliance with ARARs addresses whether or not a remedy will meet all the Applicable or Relevant and Appropriate Requirements (ARARs) of federal and state environmental statutes and/or provides a basis for a waiver.
- Long-term effectiveness refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.
- Reduction of toxicity, mobility or volume is the anticipated performance of the

remedy in terms of reducing the toxicity, mobility or volume of the contaminants of concern in the environment.

- Short-term effectiveness and permanence addresses the period of time needed to achieve protection, and any adverse impacts to human health or the environment that may be posed during the construction and implementation period until cleanup goals are achieved.
- Implementability refers to the technical and administrative feasibility of implementing a remedy, including availability of materials and services required to implement a particular option.
- Cost includes estimated capital and operation and maintenance costs of the remedy, and the net present worth cost.
- State Acceptance indicates whether, based on its review of the RI and FS and the Proposed Remedial Action Plan (PRAP), the state concurs with the preferred alternative.
- Community Acceptance will be assessed in the ROD following a review of the public comments received on the RI, FS and SFS reports and the PRAP.

EPA in consultations with NJDEP, is required to select the remedial alternatives which offer the best balance among the nine criteria. The manner in which the preferred alternatives meets the criteria are presented briefly below. Community comments and acceptance are being solicited at this time.

COMPONENT 1- METALS-CONTAMINATED SOILS, SEDIMENTS AND SLUDGES

ALTERNATIVE S-4: COMPLETE EXCAVATION; CONTAMINANT EXTRACTION; REPLACEMENT ON-SITE

Excavation of metals-contaminated soils, sediments and sludges and extraction of metals contaminants would be effective and permanent

in removing risks to recreational users and any future inhabitants of the site. This soil alternative permanently removes contamination, completely restores the site and allows for future unrestricted use. Toxicity, mobility and the volume of contaminants would be reduced once cleanup goals are met. Human health risks would be reduced to a Hazard Index of less than 1.

Competing alternatives such as stabilization/solidification or containment are less attractive because they do not remove contaminants and would limit future use of the site. In addition, other alternatives such as excavation and disposal may not be implementable due to the uncertainties of available off-site hazardous landfill sites, and costliness. Moreover, excavation and disposal would not meet the statutory preference for a remedy that involves treatment as a principal element.

COMPONENT 2- BURIED DRUMS AND SOILS CONTAMINATED WITH VOLATILE ORGANIC COMPOUNDS

ALTERNATIVE DR-2: DRUM REMOVAL AND OFF-SITE DISPOSAL

Removal and off-site disposal of drums would be effective and permanent in removing risks to recreational users and any inhabitants of the site. It would also eliminate the major source of organic contaminants migrating to the aquifer.

Additional characterization of soils contamination will provide the basis to determine if additional action is required.

The No Action Alternative would offer no reduction in toxicity, mobility or volume of contaminants in the drums. Deterioration of the drums could result in increased levels of contamination being released to soils and the ground water.

COMPONENT 3- TANKERS AND CONTENTS

ALTERNATIVE TK-2: TANKER REMOVAL AND OFF-SITE DISPOSAL

Removal of tankers and their contents would be effective and permanent in removing risks to any recreational users and any inhabitants of the site.

The No Action Alternative would offer no reduction in toxicity, mobility or volume of contaminants in the tankers. Deterioration of the tankers could result in increased levels of contamination being released to soils and the ground water.

COMPONENT 4- GROUND WATER

ALTERNATIVE GW-3: GROUND WATER PUMPING, TREATMENT AND REINJECTION

The pumping of contaminated ground water, from the upper aquifer until required cleanup levels are met, and the treatment of the ground water to drinking water standards (MCLs), followed by reinjection to the upper aquifer will be protective of human health and the environment. Long-term effectiveness and permanence would be achieved once the ground-water cleanup level is reached. Toxicity, mobility and volume of the ground-water contaminants would be reduced, and discharge of ground-water contaminants to the Great Egg Harbor River would be eliminated. The ground water would be returned for use as a potable water source.

This remedy is highly implementable because reliable and commercially operations are available for pumping and treatment. The cost for this alternative is reasonable relative to the protectiveness of this remedy.

Competing alternatives such as No Action or Limited Action are less attractive because contaminants will not be removed and will continue to discharge to the Great Egg Harbor River. Furthermore, alternatives such as pumping, treatment and discharge to the river may not be implementable due to regulatory restrictions (e.g., pumping, treatment and discharge to the river).

COMPONENT 5- SURFACE WATER AND SEDIMENTS OF THE GREAT EGG HARBOR RIVER

Additional sampling and analysis of surface waters and sediments of the Great Egg Harbor River will allow a determination on whether further remediation of the river system may be necessary to protect the public health and environment. The monitoring program is included in the groundwater alternatives in the FS and SFS.

SUMMARY

The preferred alternatives represent the best balance among the criteria used to evaluate remedial actions. Based on the information available at this time, EPA believes that the preferred alternatives would be more protective than competing alternatives, attain ARARs, be cost effective and would use permanent and complete treatment technologies to the maximum extent practicable.

Selected Alternatives and Costs are summarized on the following page:

SPECIAL EPA INSERT

SUMMARY OF ALTERNATIVES EVALUATED

INTRODUCTION

The Superfund law requires each site remedy selected to be protective of human health and the environment, and in accord with statutory requirements. Permanent solutions to contamination problems are to be achieved wherever possible. The following provides a description of all remedial alternatives evaluated for the King of Prussia Technical Corporation Site. The numbers assigned to the alternatives correspond to those used in the FS and SFS reports.

COMPONENT 1- METALS CONTAMINATED SOILS, SEDIMENTS AND SLUDGES

The objective of Remedial Component 1 is to achieve removal of contaminants from site soils, lagoon sludges and swale sediments that do not meet the cleanup standards developed during the FS. These standards were developed based on risk to public health. Although these standards are not considered ARARs, cleanup to these levels will ensure that the contaminants do not continue to migrate into the ground water and risks to recreational users or inhabitants at the site are reduced to an acceptable level.

ALTERNATIVE S-1: NO ACTION

Construction Cost: 0
Annual Operation and Maintenance (O&M) Costs: \$7,000
Present Worth: \$79,000
Months to Implement: 2

The No Action alternative for metals-contaminated soils, sludges and sediments provides a baseline against which other alternatives may be compared. No remedial activities would be performed but long-term ground-water monitoring would be conducted. Potential health risks would not be reduced as

there would be no reduction in toxicity, mobility or volume of metals contaminants in the soils, sediments and sludges.

ALTERNATIVE S-2: LIMITED ACTION

Construction Cost: \$43,000
Annual O&M Costs: \$9,000
Present Worth: \$144,000
Months to Implement: 6

The Limited Action alternative for metals-contaminated soils consists of site and deed restrictions, additional fencing around the swale and long-term ground-water monitoring. Potential public health risks would be somewhat reduced by limiting access to contaminated soils, sediments and sludges. However, there would be no reduction in toxicity, mobility or volume of metals contaminants in the soils, sediments and sludges. Contaminants from these materials would also continue to migrate to the ground water and eventually discharge to the Great Egg Harbor River. This would pose minor risks to current recreational users and higher risks to future users when higher concentrations of contaminants are anticipated to reach the river.

ALTERNATIVE S-3: LIMITED EXCAVATION OF SEDIMENTS AND SOILS; CONSOLIDATION; CAPPING

Construction Cost: \$1,550,000
Annual O&M Costs: \$17,000
Present Worth: \$1,740,000
Months to Implement: 12

This alternative consists of excavation and consolidation of 1,000 cubic yards of swale sediments and 350 cubic yards of site soils outside of the area to be capped. These materials would be consolidated in the lagoons and adjacent area followed by installation of a multi-layer cap covering 2.6 acres. Long term

ground-water monitoring would also be conducted to determine contaminant degradation and/or migration. Potential health risks would be reduced by eliminating direct contact with these materials, but there would be no reduction in toxicity or volume of metals contaminants in the soils, sediments and sludges. Migration of contaminants from these materials to the ground water would be reduced but not eliminated.

**ALTERNATIVE S-4: COMPLETE
EXCAVATION OF SOILS, SEDIMENTS AND
SLUDGES; CONTAMINANT EXTRACTION;
REDEPOSITION ON SITE**

Construction Cost: \$8,050,000*
Annual O&M Cost: 0
Present Worth: \$8,050,000*
Months to Implement: 18

This consists of excavating and treating 20,150 cubic yards of contaminated soils, sediments and sludges in a multi-stage soil washing/extraction process which reduces the concentration of contaminants so that they are no longer hazardous. Treated materials would be redeposited to their approximate former locations. Contaminants would be removed from treated materials and the site would be restored for unrestricted use.

* Note: Costs presented here were developed in the SFS; EPA believes these costs to be a more realistic estimate than costs presented for this alternative in the FS.

**ALTERNATIVE S-5: IN SITU
STABILIZATION/SOLIDIFICATION;
CAPPING**

Construction Cost: \$3,182,000*
Annual O&M Costs: \$10,000
Present Worth: \$3,336,000*
Months to Implement: 18

This alternative consists of excavation and consolidation of 1,000 cubic yards of swale sediments and 350 cubic yards of site soils outside of the area to be treated and capped.

The area of consolidation, stabilization and capping includes a 2.6-acre area of the lagoons and adjacent area toward the rear of the site. After consolidation, in situ stabilization would be performed using a system of injection and mixing augers and a multi-layer cap constructed. Mobility of contaminants would be reduced; treated materials could then be rendered "non-characteristic." Long-term ground water monitoring would be required and site access restricted.

* Note: Costs presented here were developed in the SFS; EPA believes these costs to be a more realistic estimate than costs presented for this alternative in the FS.

**ALTERNATIVE S-5a: COMPLETE
EXCAVATION OF SOILS, SEDIMENTS AND
SLUDGES; STABILIZATION/
SOLIDIFICATION; CAPPING**

Construction Cost: \$5,402,000
Annual O&M Costs: \$10,000
Present Worth: \$5,555,000
Months to Implement: 18

This alternative is similar to S-5, except all contaminated soils, sediments and sludges would be excavated and stabilized above ground. After excavation and consolidation, these materials would be mixed with cementing and stabilizing agents to create a structurally strong and inert matrix. A multi-layer cap would then be constructed on a 2.6-acre area over the lagoons and adjacent area. Long-term monitoring would be required and site access restricted.

Note: This alternative is presented in the SFS.

**ALTERNATIVE S-6: COMPLETE
REMOVAL; OFF-SITE DISPOSAL**

Construction Cost: \$11,500,000
Annual O&M Costs: 0
Present Worth: \$11,500,000
Months to Implement: 12

This alternative consists of the removal and off-site disposal at a permitted facility of 20,150 cubic yards of untreated contaminated soils,

sludges and sediments. All soils, sludges and sediments above action levels would be removed from the site, replaced with clean fill and revegetated.

COMPONENT 2- BURIED DRUMS AND SOILS CONTAMINATED WITH VOLATILE ORGANIC COMPOUNDS

The objective of Remedial Component 2 is to achieve removal of drums and contaminated adjacent soil.

ALTERNATIVE DR-1: NO ACTION

Construction Cost: \$0
Annual O&M Costs: \$7,000
Present Worth: \$79,000
Months to Implement: 2

The No Action alternative for organically contaminated soils in the buried drum area provides a baseline against which other alternatives may be compared. The number and condition of buried drums would remain undetermined and contaminants would continue to migrate into the ground water.

Note: This Alternative is identical to Alternative BD-1 presented in the FS.

ALTERNATIVE DR-2: DRUM REMOVAL AND OFF-SITE DISPOSAL; SAMPLING AND ANALYSIS OF SOILS

Construction Cost: \$386,000
Annual O&M Costs: \$0
Present Worth: \$386,000
Months to Implement: 12

This consists of drum removal and off-site disposal followed by sampling and analysis of nearby soils. The volume of materials that would require off-site treatment and disposal is estimated to be approximately 250 cubic yards. Followup soil sampling and analysis will define contaminant types, concentrations and soil volumes that may require remediation. If further remediation of soils in the area of buried drums

is necessary, a focused Feasibility Study will be conducted to evaluate remedial alternatives. This Feasibility Study may include treatability testing as there would be a preference for treatment in remediating the organically contaminated soils.

Note: This alternative is presented in the SFS.

COMPONENT 3- TANKERS AND CONTENTS

The objective of Remedial Component 3 is to achieve removal of tankers and contents. Contaminated soils under and adjacent to the tankers would be addressed as part of Component 1.

ALTERNATIVE TK-1: NO ACTION

Construction Cost: \$0
Annual O&M Costs: \$0
Present Worth: \$0
Months to Implement: 0

This alternative does not require any remedial activity.

ALTERNATIVE TK-2: TANKER REMOVAL AND OFF-SITE DISPOSAL

Construction Cost: \$22,000
Annual O&M Costs: \$0
Present Worth: \$22,000
Months to Implement: 2

This consists of removing the tankers and contents and their disposal at an off-site facility. This would permanently reduce mobility, toxicity and volume of tanker wastes at the site. This would eliminate risks posed by this source area.

COMPONENT 4- GROUND WATER

Ground water extraction scenarios were designed for aquifer restoration and to prevent migration of contaminated ground water to the Great Egg Harbor River.

ALTERNATIVE GW-1: NO ACTION

Construction Cost: \$0
 Annual O&M Costs: \$11,000
 Present Worth: \$122,000
 Months to Implement: 2

The No Action alternative provides a baseline against which to compare other alternatives. This alternative includes sampling existing monitoring wells installed during the remedial investigations to conduct long-term monitoring of ground water contaminants. The Great Egg Harbor River would also be sampled to determine current and future levels of contamination in the river.

ALTERNATIVE GW-2: LIMITED ACTION

Construction Cost: \$0
 Annual O&M Costs: \$11,000
 Present Worth: \$122,000
 Months to Implement: 6

This alternative is the same as GW-1 with the addition of institutional controls such as deed and/or zoning restrictions to prevent use of contaminated ground water at the site.

ALTERNATIVE GW-3*: GROUND WATER PUMPING, TREATMENT AND REINJECTION WITHIN THE PLUME

Construction Cost: \$2,043,000
 Annual O&M Costs: \$285,000
 Present Worth: \$6,431,000
 Months to Implement: 360

This alternative involves pumping ground water at 240 gallons per minute from extraction wells southwest and downgradient from the site to capture the contaminant plume. This will capture contaminated ground water currently discharging to the Great Egg Harbor River. Extraction would be followed by treating the ground water to drinking water standards. Treated water would be reinjected to the aquifer at 240 gallons per minute until contaminants in the aquifer fall below ARARs.

* Note: Alternative GW-3 discussed above is a

modification of the design presented in the FS; additional information can be found in the SFS.

ALTERNATIVE GW-4*: GROUND WATER PUMPING, TREATMENT AND DISCHARGE TO THE GREAT EGG HARBOR RIVER

Construction Cost: \$2,766,000
 Annual O&M Costs: \$406,000
 Present Worth: \$9,016,000
 Months to Implement: 360

This alternative involves pumping ground water at 460 gallons per minute from extraction wells southwest and downgradient from the site. This will capture contaminated ground water currently discharging to the Great Egg Harbor River. Extraction would be followed by treating the ground water to drinking water standards and then discharging to the Great Egg Harbor River until contaminants in the aquifer fall below ARARs. This would require a waiver of Pinelands regulations that restrict surface water discharge.

* Note: Alternative GW-4 discussed above is a modification of the design presented in the FS; additional information can be found in the SFS.

COMPONENT 5- SURFACE WATERS AND SEDIMENTS OF THE GREAT EGG HARBOR RIVER

Sampling and analysis of the Great Egg Harbor River's surface waters and sediments will further characterize contaminants concentrations and distribution in the river. This will include biological sampling to evaluate organisms responses to changes in the river environment related to contamination. A determination will then be made if remediation of the Great Egg Harbor River waters and/or sediments will be necessary. Costs and detailed discussion of this alternative are included as part of the Component 4 cost and discussion of ground-water alternatives in the FS and SFS.

TABLE 1
SELECTED ALTERNATIVES AND COSTS

<u>Component</u>	<u>Alternative</u>	<u>Present Worth*</u>
1- Metals Contamination of Soils, Sediments & Sludges	S-4: Excavation/Extraction and Redeposit	\$ 8,050,000
2- Buried Drums and Soils Contaminated and Volatile Organic Compounds	DR-2: Drum Removal & Off Site Disposal/Soil Sampling and Analysis	386,000
3- Tankers & Contents	TK-2: Tanker Removal and Off Site Disposal (Including Tanker Contents)	22,000
4- Contaminated Ground Water	GW-3: Pumping, Treatment and ReInjection into the Aquifer	6,431,000
5- Great Egg Harbor River	Additional Sampling: Included in GW-3	_____
	ESTIMATED TOTAL COST	\$14,889,000

*Present Worth is the amount of money needed to invest now at a discount rate of 5% interest in order to have the appropriate funds available at the time the remedial action is implemented.

KING OF PRUSSIA TECHNICAL CORPORATION SITE

SUMMARY OF REMEDIAL ALTERNATIVES

<u>REMEDIAL ALTERNATIVE</u>	<u>PRESENT WORTH COST (\$1,000)</u>	<u>DURATION OF REMEDIAL ACTION (YEARS)</u>	<u>COMMENTS</u>
*COMPONENT ONE (METALS-CONTAMINATED SOILS, SEDIMENTS AND SLUDGES)			
S-1: No Action	79	0.2	Inadequate to protect human health and the environment.
S-2: Limited Action (Fencing and Institutional Controls)	144	1	Inadequate to protect human health and the environment.
S-3: Limited Excavation/ Consolidation/ Capping	1,740	1	Limited protectiveness; not permanent; contaminants remain on-site.
S-4: Complete Excavation/ Extraction/ Redeposit Soils On-Site	8,050	2	Protective; permanent; contaminated soil cleaned; contaminants disposed off-site; complete restoration of site.
S-5: In-Situ Stabilization & Solidification/ Capping	3,336	2	Protective; contaminants immobilized but remain on-site; completeness uncertain; no reduction in toxicity or volume; site topography affected; contaminants would be rendered "non-characteristic."

KING OF PRUSSIA TECHNICAL CORPORATION SITE
SUMMARY OF REMEDIAL ALTERNATIVES

<u>REMEDIAL ALTERNATIVE</u>	<u>PRESENT WORTH COST (\$1,000)</u>	<u>DURATION OF REMEDIAL ACTION (YEARS)</u>	<u>COMMENTS</u>
S-5a*: Complete Excavation/ Stabilization & Solidifi- cation/ Capping	5,402	2	Protective; contaminants immobilized but remain on-site; no reduction in toxicity or volume; site topography affected; contaminants would be rendered "non- characteristic."
S-6: Complete Removal/Off- Site Disposal	11,500	1	Protective; permanent; contaminants disposed off-site; complete restoration of site; high relative cost.
*COMPONENT TWO (BURIED DRUMS AND CONTAMINATED SOILS)			
DR-1#: No Action	79	0.2	Inadequate to protect human health and the environment.
DR-2*: Drum Removal & Disposal/ Soil Sampling & Analysis	386	1	Protective; soils sampling results will determine if further remediation is required.
*COMPONENT THREE (TANKERS)			
TK-1: No Action	0	0.0	Inadequate to protect human health and the environment.

KING OF PRUSSIA TECHNICAL CORPORATION SITE
SUMMARY OF REMEDIAL ALTERNATIVES

<u>REMEDIAL ALTERNATIVE</u>	<u>PRESENT WORTH COST (\$1,000)</u>	<u>DURATION OF REMEDIAL ACTION (YEARS)</u>	<u>COMMENTS</u>
TK-2: Tanker Removal & Disposal	22	0.2	Protective; permanent; contaminants disposed off-site; low cost.
*COMPONENT FOUR (GROUND WATER)			
GW-1: No Action	122	0.2	Inadequate to protect human health and the environment; monitoring of the Great Egg Harbor River (GEHR).
GW-2: Limited Action (Institu- tional Controls)	122	1	Inadequate to protect human health and the environment; monitoring of the GEHR.
GW-3*: Downgrad- ient Capture/ Treatment/ Reinjection	6,431	30	Treatment reduces toxicity; eliminates contaminant discharge to the GEHR; monitoring of the GEHR.
GW4*: Downgrad- ient Capture/ Treatment	9,016	30	Treatment reduces toxicity; eliminates contaminant discharge to the GEHR; waiver of surface water discharge restrictions required; includes monitoring of GEHR.

**KING OF PRUSSIA TECHNICAL CORPORATION SITE
SUMMARY OF REMEDIAL ALTERNATIVES**

<u>REMEDIAL ALTERNATIVE</u>	<u>PRESENT WORTH COST (\$1,000)</u>	<u>DURATION OF REMEDIAL ACTION (YEARS)</u>	<u>COMMENTS</u>
COMPONENT FIVE (GREAT EGG HARBOR RIVER)			
All Groundwater Alternatives	@	30	Sampling of the GEHR surface waters and sediments to provide additional characterization of contamination; further remediation will be considered.

Notes

- Presented in the SFS.
- # Identical to Alternative BD-1 presented in the FS.
- @ Costs included with GW alternatives.

PREFERRED ALTERNATIVES ARE IN BOLD

United States
Environmental Protection Agency

Region 2
26 Federal Plaza
New York, NY 10278

Official Business
Penalty for Private Use
\$300



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
EDISON, NEW JERSEY 08837

KOP7.1001

EPA REGIONAL GUIDANCE DOCUMENTS

The following documents are available for public review at U.S. EPA Region II Headquarters, Raritan Depot, Woodbridge Avenue, Edison, New Jersey, during regular business hours. Contact Douglas Kodama at (908)906-6905 for more information.

- Glossary of EPA Acronyms
- Superfund Removal Procedures--Revision #3. OSWER Directive 9360.0-03B, February 1988.
- Hazardous Waste Operations and Emergency Response. Notice of Proposed Rulemaking and Public Hearings. 29 CFR Part 1910, Monday, August 10, 1987.
- Redelelegation of Authority under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). OSWER Directive 9012.10, May 25, 1988.
- Removal Cost Management Manual. Office of Solid Waste and Emergency Response (OSWER) Directive 9360.0-02B, April 1988.
- Field Standard Operating Procedures (FSOP)
 - #4 Site Entry
 - #6 Work Zones
 - #8 Air Surveillance
 - #9 Site Safety Plan
- Standard Operating Safety Guidelines--U.S. EPA Office of Emergency and Remedial Response, July 5, 1988.
- CERCLA
- SARA
- National Oil and Hazardous Substances Pollution Contingency Plan (NCP)