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INSTALLATION RESTORATION PROGRAM
PHASE II
CONFIRMATION/QUANTIFICATION
STAGE 1.

AIR FORCE PLANT 38
PORTER, NEW YORK

Prepared by:

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April 1988

FINAL REPORT -RCRA SITES
(September 1986 to February 1988)

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Prepared for:

HEADQUARTERS AIR FORCE SYSTEMS COMMAND
(HQ ASFC/SGPB)
Andrews Air Force Base, DC 20334-5000

UNITED STATES AIR FORCE
Occupational and Environmental Health Laboratory
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Ecology and Environment, Inc., was retained by the USAFOEHL/TSS to provide technical and analytical services in support of the Air Force IRP. These services were supplied for the Phase II, Stage 1 investigation at Air Force Plant 38 (AFP 38), Porter, NY. The field investigation was conducted between 30 September 1986 and 8 October 1986, and involved work at seven sites. Two of the sites fell under RCRA jurisdiction and are described in a separate report. The investigation included record searches and sampling of surface and subsurface soils and surface water. Samples were analyzed for various parameters including metals, volatile organics, TOC, TOX, petroleum hydrocarbons, fluorides, nitrates, hydrazine, and isopropyl alcohol. Results of the investigation indicated that four of the five sites had only minor amounts of contamination present and have, therefore, been recommended for no follow-up action. The on-site fuel storage tanks and transformers were recommended for removal, according to applicable standards and regulations.

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FOR
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HEADQUARTERS AIR FORCE SYSTEMS COMMAND
(HQ AFSC/SGPB)
ANDREWS AIR FORCE BASE, DC 20334

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USAFOEHL TECHNICAL PROGRAM MANAGER
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TECHNICAL SERVICES DIVISION (TS)

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This report has been prepared for the United States Air Force by Ecology and Environment, Inc., for the purpose of aiding in the implementation of the Air Force Installation Restoration Program (AFIRP). It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United States Air Force, nor the Department of Defense.

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PREFACE

The purpose of the report is to document the Phase II, Stage 1, investigation of the United States Air Force (USAF) Installation Restoration Program (IRP) at Air Force Plant 38 (AFP 38), Porter, New York. This work was conducted by Ecology and Environment, Inc., (E & E) under Contract No. F33615-83-D-4003, Task Order 12.

Mr. Gerald Strobel is Program Manager for this Contract. The Task Order was managed by Mr. Hussein Aldis. Laboratory analyses were accomplished at E & E's Analytical Services Center in Buffalo, New York, under the supervision of Mr. Andrew Clifton and Ms. Cathy Syracuse.

This work was accomplished during the period from 30 September 1986 to 8 October 1986. Mr. James W. Better, USAF, Technical Services Division, USAF Occupational and Environmental Health Laboratory (USAF-OEHL/TS), was the Technical Program Manager.

Approved



Gerald Strobel
Program Manager

TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
	EXECUTIVE SUMMARY	1
1	INTRODUCTION	1-1
	1.1 LOCATION AND HISTORY OF OPERATIONS	1-2
	1.2 DESCRIPTION OF THE SITES	1-4
	1.3 TYPES OF CONTAMINANTS INVESTIGATED	1-7
	1.4 FIELD PERSONNEL	1-12
	1.5 SUBCONTRACTORS	1-12
2	ENVIRONMENTAL SETTING	2-1
	2.1 GEOGRAPHY	2-1
	2.1.1 Physiography	2-1
	2.1.2 Drainage	2-1
	2.1.3 Climate	2-3
	2.2 GEOLOGY AND HYDROGEOLOGY	2-4
	2.2.1 Geology	2-4
	2.2.2 Soils	2-4
	2.2.3 Hydrology	2-7
3	FIELD PROGRAM	3-1
	3.1 PROGRAM DEVELOPMENT	3-1
	3.2 FIELD INVESTIGATION	3-2
	3.2.1 Incinerator and Incinerator Pad	3-2
	3.2.2 Container Storage Pad and Surround- ing Soils	3-2
	3.2.3 Laboratory Program	3-4
	3.2.4 Variation from Description of Work	3-4

Table of Contents (Cont.)

<u>Section</u>		<u>Page</u>
4	RESULTS AND SIGNIFICANCE OF FINDINGS	4-1
4.1	RESULTS	4-1
4.1.1	Incinerator and Incinerator Pad	4-1
4.1.2	Container Storage Pad and Surrounding Soils	4-2
4.2	SIGNIFICANCE OF FINDINGS	4-5
4.2.1	Incinerator and Incinerator Pad	4-5
4.2.2	Container Storage Pad and Surrounding Soils	4-6
5	ALTERNATIVE MEASURES	5-1
5.1	Incinerator and Incinerator Pad	5-1
5.2	Container Storage Pad and Surrounding Soils	5-2
6	RECOMMENDATIONS	6-1
6.1	Incinerator and Incinerator Pad	6-1
6.2	Container Storage Pad and Surrounding Soils	6-1
 <u>Appendix</u>		
A	GLOSSARY OF TERMS	A-1
B	CONTRACT DESCRIPTION OF WORK	B-1
C	RAW FIELD DATA	C-1
D	CHAIN OF CUSTODY FORMS	D-1
E	REFERENCES	E-1
F	ANALYTICAL DATA	F-1
G	BIOGRAPHIES	G-1
H	TECHNICAL OPERATIONS PLAN AND SITE SAFETY PLAN	H-1

LIST OF ILLUSTRATIONS

<u>Figure</u>		<u>Page</u>
1	AFP 38 Sites of Potential Contamination (RCRA Sites) ..	2
1-1	Site Location Map	1-3
1-2	Property Ownership Map	1-5
1-3	AFP 38 Sites of Potential Contamination (RCRA Sites) ..	1-6
2-1	Block Diagram of Geology and Surface Drainage	2-2
2-2	General Site Stratigraphy	2-5
2-3	Soil Association Diagram	2-6

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1-1	Types of Sample Analyses Performed at AFP 38	1-8
1-2	Analytical Parameters and Detection Limits	1-10
3-1	Major Field Activities	3-3
4-1	Sample Analyses: Concentrations of Parameters that Exceeded Method Detection Limits - Incinerator and Incinerator Pad	4-3
4-2	Sample Analyses: Concentrations of Parameters that Exceeded Method Detection Limits - Container Storage Pad	4-4

EXECUTIVE SUMMARY

Ecology and Environment, Inc., (E & E) was retained by the United States Air Force Occupational and Environmental Health Laboratory/ Technical Services (USAFOEHL/TS) under Contract No. F33615-83-D-4003 to provide technical and analytical services in support of the Air Force Installation Restoration Program (IRP). This report concerns the Phase II, Stage 1, investigation of Air Force Plant 38, (AFP 38) Porter, New York.

The contract description of work (26 September 1986) listed a total of seven sites for which investigations were required to evaluate potential environmental contamination. Two of the sites fell under Resource Conservation and Recovery Act (RCRA) regulations and are discussed in this report. The two sites are: the Incinerator and Incinerator Pad; and the Container Storage Pad and Surrounding Soils. Site locations are shown on Figure 1. The remaining five sites are described in a separate report.

An incinerator was located north of the container storage facility on the east side of Marshall Street. The steel incinerator was set on a concrete pad, and was used to burn waste flammables consisting of monomethyl hydrazine (MMH) and unsymmetrical dimethyl hydrazine (UDMH) at a rate of approximately 10 gallons per hour. The incinerator was shut down and dismantled in August 1981. While in use, the incinerator was operated under a New York State Air 100 permit.

A container storage facility was operated from approximately November 1980 to September 1983. The container storage facility was

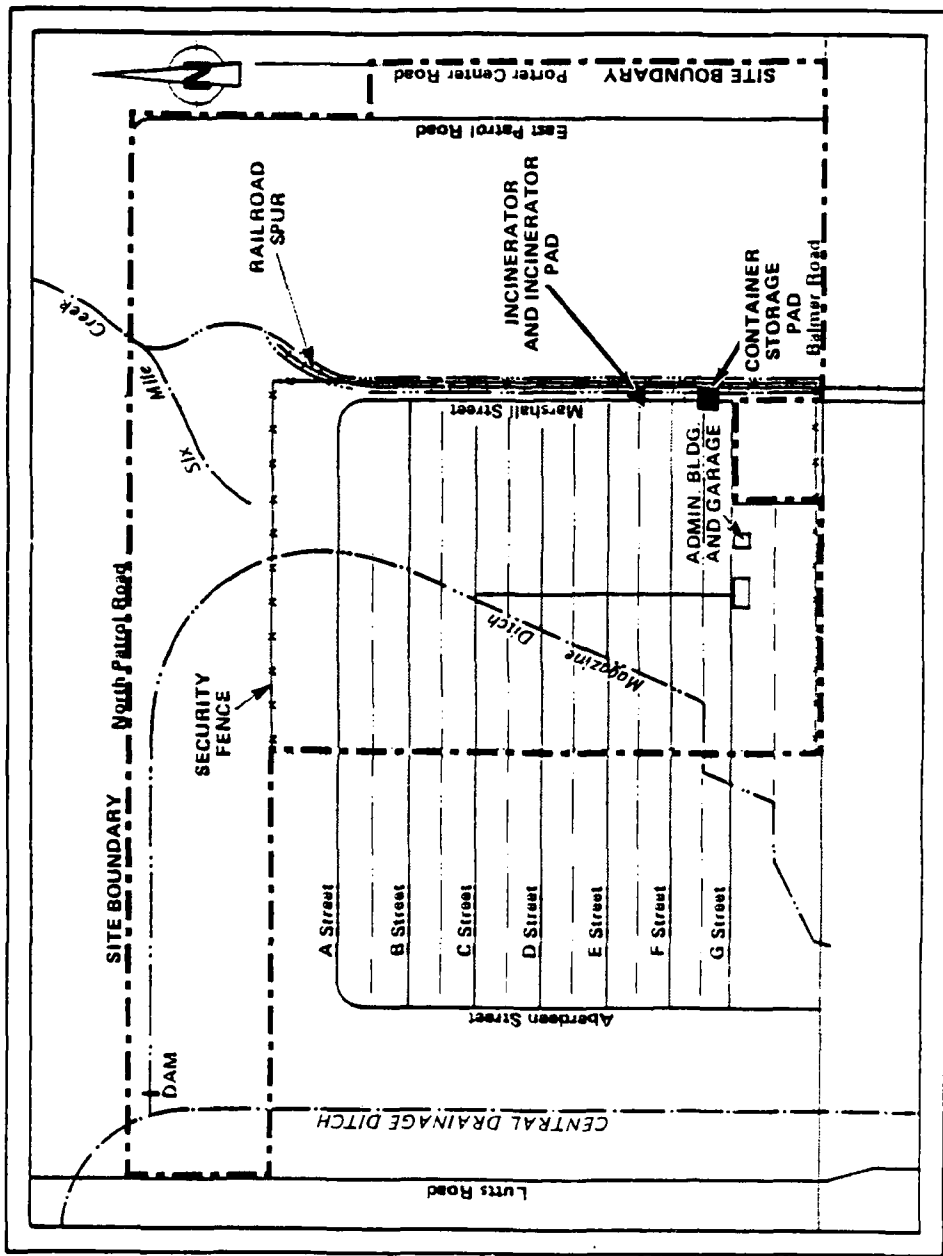


Figure 1 AFP 38 SITES OF POTENTIAL CONTAMINATION (RCRA SITES)

located on Marshall Street near "F" Street, along the east perimeter of the plant. The facility consisted of a concrete pad with a roof but no walls, surrounded by asphalt paving. The pad was approximately 20 feet by 25 feet in area, large enough to store up to 120 55-gallon drums, stacked one high. The pad slopes toward a drain in its center. The drain runs underground through a 6-inch diameter pipe and discharges into the western East Drainage Ditch.

Bell personnel indicated that stored wastes included spent solvents, Freon, isopropyl alcohol, methylene chloride, and methyl alcohol, as well as waste propellants such as hydrazine, monomethyl hydrazine, and unsymmetrical dimethyl hydrazine (Bottaro, Kramer, Willis). It was common practice to dilute the wastes accumulated at the container storage facility with 50% water.

Summary of Field Program

Fieldwork for the Phase II, Stage 1, investigation began on 30 September 1986 and was completed on 8 October 1986. The investigation at the Incinerator site consisted of drilling four borings around the concrete pad and collecting two samples from each borehole at one and five foot depths, making a total of eight soil samples. The samples were analyzed for volatile organic compounds, petroleum hydrocarbons, hydrazine, and isopropyl alcohol. Additionally, a scrape sample from the surface of the concrete pad was collected and analyzed for hydrazine and isopropyl alcohol.

The investigation at the Container Storage Pad also consisted of placing four borings around the pad and extracting eight soil samples. The samples were analyzed for petroleum hydrocarbons, total organic carbon (TOC), total organic halides (TOX), primary metals, and volatile organic compounds. A swab sample was collected from the concrete pad and analyzed for TOC, TOX, primary metals, and volatile organic compounds.

Findings

The following discussions summarize the findings at the two sites.

Incinerator and Incinerator Pad - The four soil samples collected from the 1-foot depth in each borehole showed elevated concentrations of

petroleum hydrocarbons, ranging from 10 to 160 mg/kg. Normal levels of petroleum hydrocarbons in soil are anything less than 50 ppm. One sample taken from a 5-foot depth showed a level of 5,500 mg/kg. Some small patches of sandy loam occur in thin layers over the relatively impervious glacial till. Contamination is not expected to be significant past this interface.

Biodegradation of the hydrocarbons found in the soil samples will occur naturally, since conditions at the site are conducive to this process (i.e., relatively shallow depths, good aeration, presence of vegetation to provide necessary nutrients). The impervious nature of the area soils and the absence of groundwater aquifers or groundwater use in the area indicate that the contamination found is not significant in terms of environmental or human health impacts.

Container Storage Pad - Elevated levels of petroleum hydrocarbons, TOC, and TOX were found in the 1-foot deep and 5-foot deep soil samples taken from the four borings placed around the pad. The levels of petroleum hydrocarbons ranged from 38 to 1,900 mg/kg in the 1-foot samples, and from 1,900 to 7,900 mg/kg at the 5-foot depths. Normal levels of petroleum hydrocarbons in soil are anything less than 50 ppm. Three of the four 5-foot samples also contained greater than 40,000 mg/kg of TOC. The contaminants found most likely resulted from the spilling of various petroleum hydrocarbons on the storage pad. These spills then migrated into the surrounding fill material, and because of the loose structure of the fill material, downward to the native soil layer. The native soils are relatively impermeable, so further migration was unlikely. No hydrocarbons were detected in the ditch which drains the Container Storage Pad area, indicating that the contamination has not spread laterally beyond the soils adjacent to the pad. Natural biodegradation of the hydrocarbons found is not likely to occur because of the very high levels present. Therefore, the most applicable course of action recommended is to remove the contaminated materials off-site.

1. INTRODUCTION

The Installation Restoration Program (IRP) was initiated by the Department of Defense (DOD) to investigate environmental contamination that may be present at DOD facilities as a result of past operations and waste disposal activities. Following passage of the Resource Conservation and Recovery Act (RCRA) of 1976 and the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) of 1980, DOD issued the Defense Environmental Quality Program Policy Memorandum (DEQPPM) 80-6 in June 1980. DEQPPM 80-6 mandated that hazardous waste disposal sites on DOD facilities be identified. The United States Air Force (USAF) implemented DEQPPM 80-6 in December 1980. DOD revised and expanded existing IRP directives through DEQPPM 81-5 in 1981, and the USAF implemented DEQPPM 81-5 in January 1982. The IRP has been developed as a four-phase program as follows:

Phase I - Records Search

Phase II - Confirmation and Quantification

Phase III - Technology Base Development

Phase IV - Corrective Action

This report documents work performed for the USAF at Air Force Plant 38 (AFP 38; the plant) in Porter, New York. The work was done as part of Phase II, Stage 1, of the IRP under Contract No. F33615-83-D-4003, Task Order 12.

A contract description of work (contract) was developed and issued on 18 August 1986. The field investigation was performed from 30 September 1986 through 8 October 1986. A presurvey report was prepared and submitted to USAFOEHL in January 1986. The report was the result of a presurvey meeting with representatives of the USAF, Bell Aerospace-Textron (Bell), a site inspection, and review of available reports, documents, and files on AFP 38 provided by USAF and Bell. The report identified five sites as potential contamination sources. These sites are described in a separate report and include:

- General Drainage Ditches;
- Salvage Yard and Container Storage Area Drainage Ditches;
- Burn Pits;
- Maintenance Building, Laboratory, and Flush Building Drainage Ditches; and
- Fuel Storage Tanks and Electrical Transformers.

Upon issuance of the contract, the USAF included two additional sites as part of the Phase II, Stage 1, investigation. These sites fell under the jurisdiction of RCRA regulations and are described in this report. The sites were:

- Incinerator and Incinerator Pad; and
- Container Storage Pad and Surrounding Soils.

Although not a defined RCRA site, the Acid Area was a unit which stored rocket propellants, including nitric acid. This area was located on the southwest corner of B Street and Marshall Street (Bottaro).

1.1 LOCATION AND HISTORY OF OPERATIONS

AFP 38 is situated in the Town of Porter, Niagara County, New York (see Figure 1-1). The latitude and longitude of the main gate is

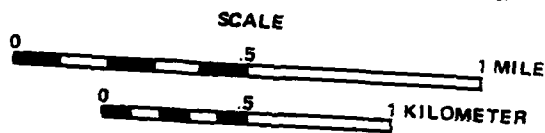
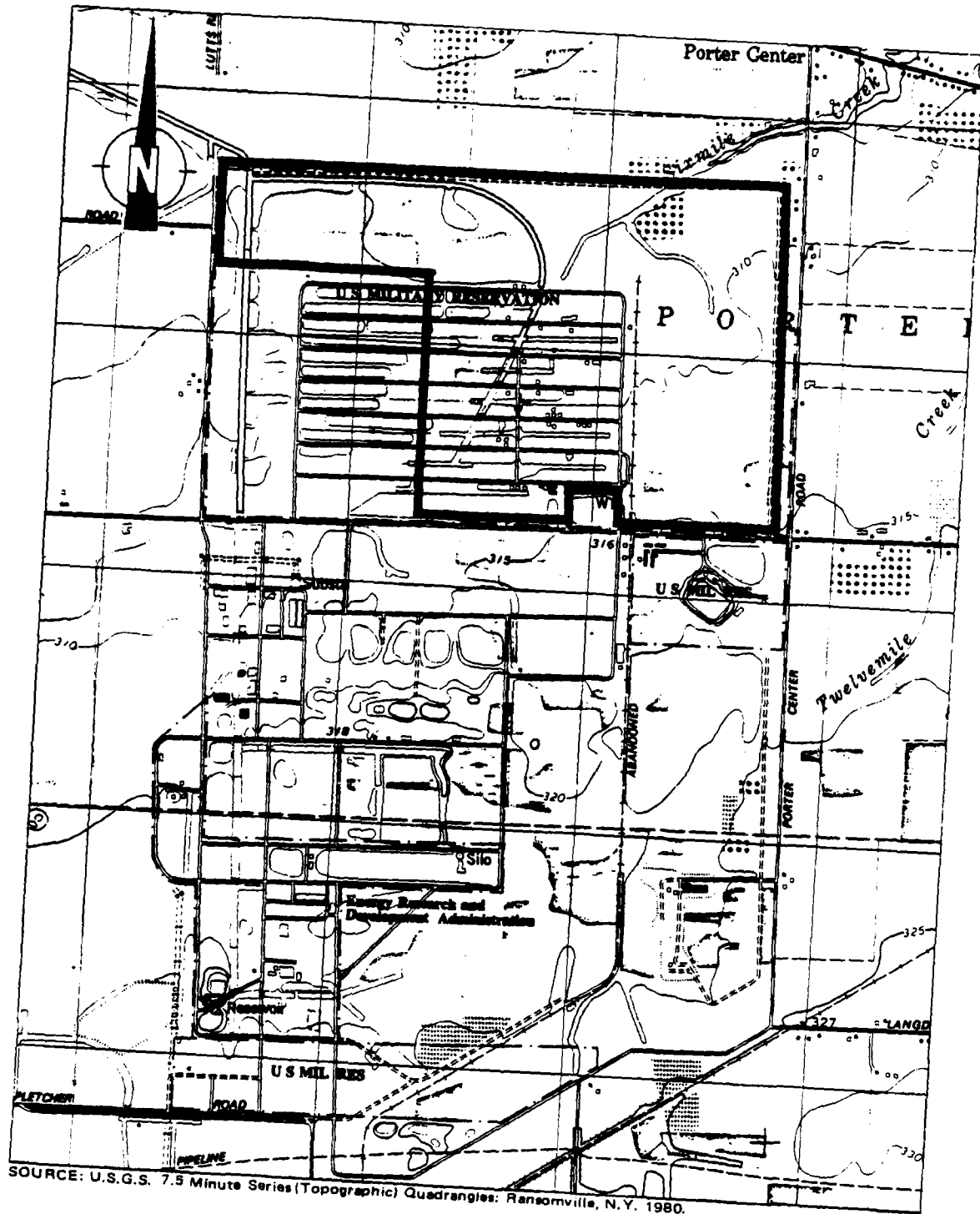


Figure 1-1 SITE LOCATION MAP

latitude 43°13'52" N, longitude 78°58'03" W. The USAF installation was originally bounded on the west by Lutts Road, on the south by Balmer Road, and on the east partly by Porter Center Road. The original installation was generally rectangular in shape, with dimensions of approximately 4,750 feet north to south and 7,800 feet east to west, encompassing an area of approximately 850 acres. The portion of the original installation that is still Air Force property comprises some 550 acres. An area of approximately 290 acres adjoining Lutts Road and Balmer Road on the west side of the site was transferred to the United States Army. Approximately 10 acres between the entrance road, "G" Street, and Marshall Street were sold to the Town of Porter (see Figure 1-2).

At the end of World War II, what is now AFP 38 became the Lake Ontario Ordnance Depot, a storage area for an ammunition manufacturing plant located south of Balmer Road. Ammunition storage bunkers were built, but never used. The Army Corps of Engineers built a series of drainage ditches which are still present. The Atomic Energy Commission (AEC) operated a facility located across Balmer Road from AFP 38 where radioactive wastes were stored. Runoff from the AEC area would have passed through the AFP 38 Magazine Ditch, which originates off AFP 38 property.

From the 1950s, AFP 38 was used by Bell (formerly Bell Aircraft Corporation) as a rocket, missile, and laser development site. During the mid-1950s, Bell dammed the Magazine Ditch in order to collect and neutralize any spills or discharges from the site. The facility was used by Bell at that time for loading Minuteman missiles. Five gallons of liquid fuel were used as propellents in each missile.

AFP 38 has been completely stripped of all useable equipment and the laboratory and storage bunkers have reportedly been cleared out (JRB 1984).

1.2 DESCRIPTION OF THE SITES

Two sites under the jurisdiction of RCRA regulations were investigated as part of the Phase II, Stage 1, work. Site locations are shown on Figure 1-3. A brief description of each of the sites follows.

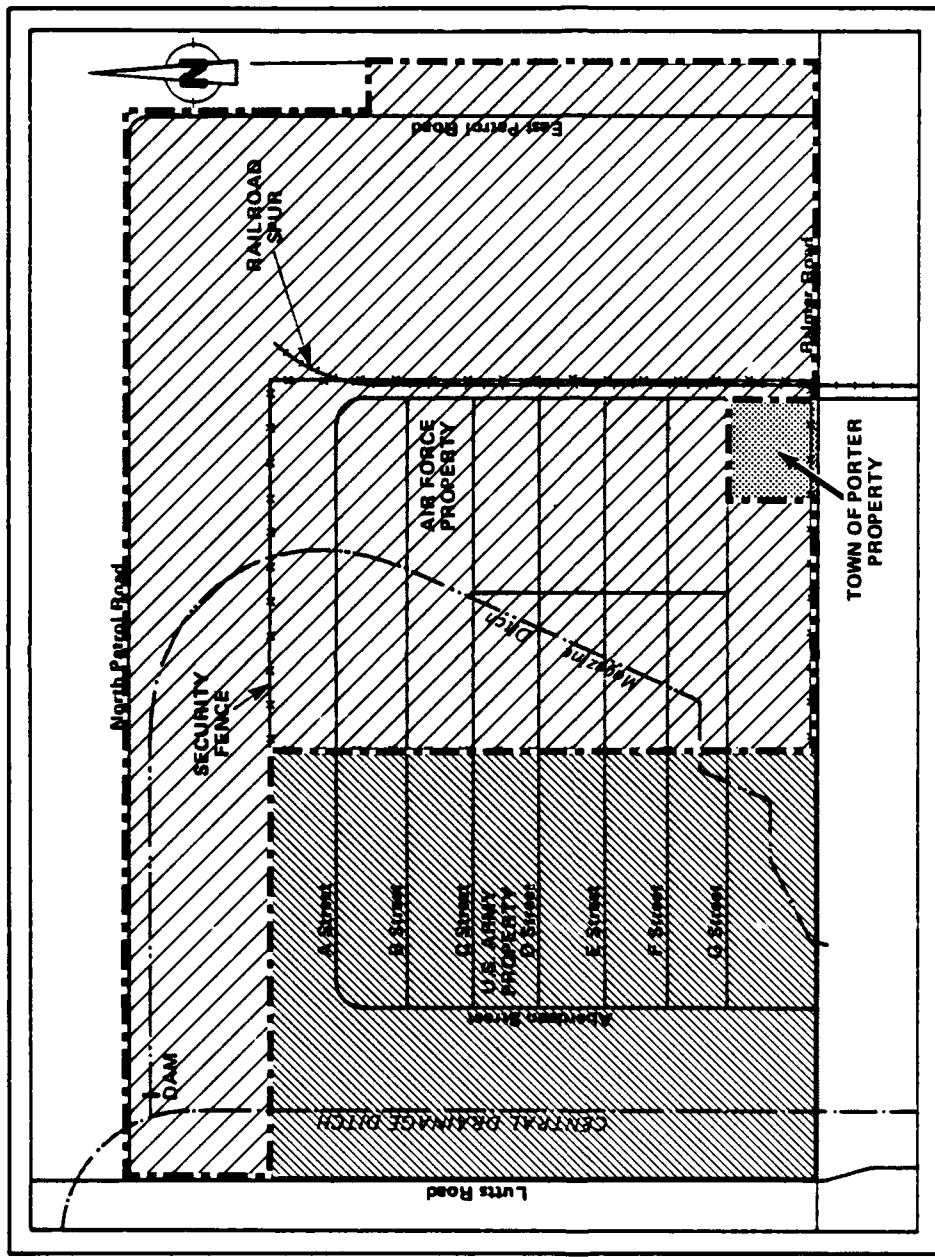


Figure 1-2 PROPERTY OWNERSHIP MAP

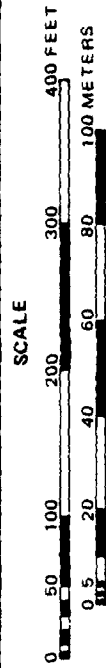
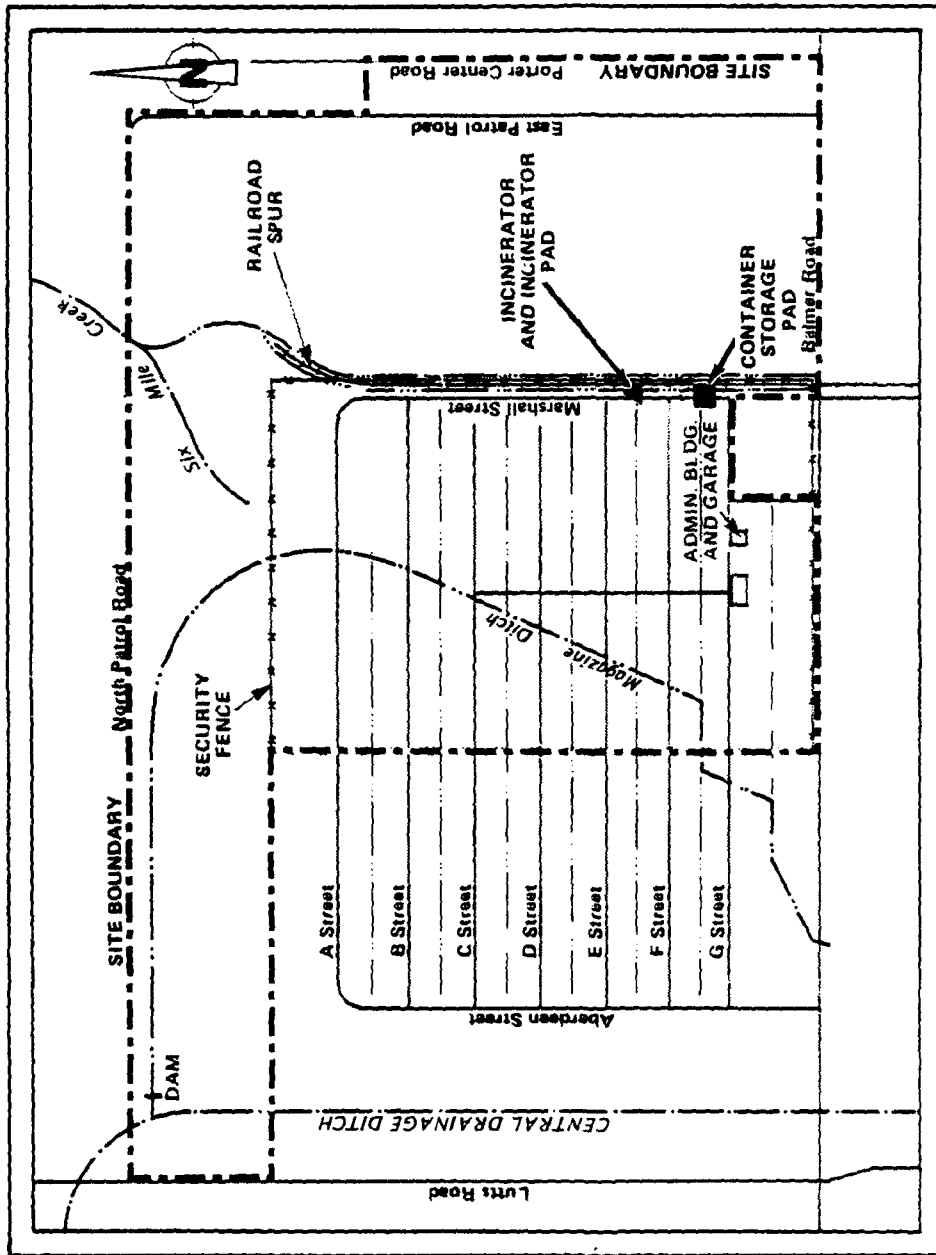


Figure 1-3 APP 38 SITES OF POTENTIAL CONTAMINATION (RCRA SITES)

Incinerator and Incinerator Pad

An incinerator was located north of the container storage facility on the east side of Marshall Street. The steel incinerator was set on a concrete pad, and was used to burn waste flammables consisting of monomethylhydrazine (MMH) and unsymmetrical dimethylhydrazine (UDMH) at a rate of approximately 10 gallons per hour. The incinerator was shut down and dismantled in August 1981. While in use, the incinerator was operated under a New York State Air 100 Permit (see Appendix E).

Container Storage Pad and Surrounding Soils

A container storage facility was operated from approximately November 1980 to September 1983. The container storage facility was located on Marshall Street near "F" Street, along the east perimeter of the plant. The facility consisted of a concrete pad with a roof but no walls, surrounded by asphalt paving. The pad was approximately 20 feet by 25 feet in areas, large enough to store up to 120 55-gallon drums, stacked one high. The pad slopes toward a drain in its center. The drain runs underground through a 6-inch diameter pipe and discharges into the western East Drainage Ditch.

Bell personnel indicated that stored wastes included spent solvents, Freon, isopropyl alcohol, methylene chloride, and methyl alcohol, as well as waste propellants such as hydrazine, monomethyl hydrazine, and unsymmetrical dimethyl hydrazine (Bell Aerospace 1967). It was common practice to dilute the wastes accumulated at the container storage facility with 50% water.

1.3 TYPES OF CONTAMINANTS INVESTIGATED

The investigation was designed to determine contaminant levels in subsurface soils and on the surface of concrete and metal structures. Table 1-1 shows the analyses performed for each environmental matrix at each site. Second column confirmations were run for GC analyses (EPA Methods 601/602 and 8010/8020) on a maximum of 50% of the samples exceeding the method detection limits. A brief discussion of the analytical parameters used is given below.

Table 1-1
 TYPES OF SAMPLE ANALYSES PERFORMED AT AFP 38

Site Name	Matrix	Volatile Organics	Petroleum Hydrocarbons	TOX	TOC	Hydrazine	Isopropyl Alcohol	Primary Metals*
Incinerator and Incinerator Pad	Soil Scrapings	X	X	--	--	X	X	--
	Soil Scrapings	--	--	--	--	X	X	--
Container Storage Pad and Surrounding Soils	Soil Scrapings	X	X	X	X	--	--	X
	Soil Scrapings	X	--	X	X	--	--	X

*Primary metals include: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver.

Volatile Organics

The test methods applied to soil and water samples determined the concentrations of halogenated and aromatic hydrocarbons. The analytical methods employed were EPA 601 and 602 for water samples, and EPA 8010 and 8020 for soil samples. A list of the compounds detected by these methods is presented in Table 1-2, along with their detection limits (DLs).

Petroleum Hydrocarbons

EPA Method 418.1 was used to analyze all samples for fuels. EPA Method 3550 was the extraction method for soil samples. This method is used to measure light fuels. The petroleum hydrocarbons testing method measures mineral oils. As with the oil and grease method, this method is subject to interferences from the extraction of other types of organic compounds and from loss by volatilization of very light molecular-weight components. The DLs were 100 microgram per liter (ug/L) in water and 10 micrograms per kilogram (mg/kg) in soil.

Total Organic Carbon (TOC)

TOC was measured using EPA Method 415. This method measures a broad spectrum of compounds and is non-specific. Comparison of the results with other analytical parameters can provide data on natural organics versus organic contamination. The DL is 5 mg/kg.

Total Organic Halides (TOX)

TOX was measured using EPA Method 9020. This method determines total organic halides (chloride, bromide, and iodide) in terms of chlorine. TOX determinations are non-specific in that they reflect the presence of volatile halocarbons and chlorinated pesticides. The results represent an accumulative concentration of the organic halides that were analyzed. There is no way of determining which of the specific compounds are actually being detected or their respective concentrations. Very high inorganic chloride concentrations can also produce a positive interference. The DL is 0.06 mg/kg in soil.

Primary Metals

Soil samples were analyzed for metals using an EP toxicity test. Water samples were analyzed for primary metals using EPA Method 200.7.

Table 1-2
ANALYTICAL PARAMETERS AND DETECTION LIMITS

Parameter	DL	
	Soil(mg/kg)	Water(ug/L)
<u>Purgeable Halogenated Hydrocarbons (Methods 601 and 8010)</u>		
Bromodichloromethane	1.0	0.10
Bromoform	1.0	0.20
Bromomethane	1.0	1.18
Carbon tetrachloride	1.0	0.12
Chlorobenzene	1.0	0.2
Chloroethane	1.0	0.52
2-Chloroethylvinyl ether	1.0	0.13
Chloroform	1.0	0.05
Chloromethane	1.0	0.08
Dibromochloromethane	1.0	0.09
1,2-Dichlorobenzene	1.0	0.4
1,3-Dichlorobenzene	1.0	0.4
1,4-Dichlorobenzene	1.0	0.3
Dichlorodifluoromethane	1.0	1.81
1,1-Dichloroethane	1.0	0.07
1,2-Dichloroethane	1.0	0.03
1,1-Dichloroethene	1.0	0.13
trans-1,2-Dichloroethene	1.0	0.10
1,2-Dichloropropane	1.0	0.04
cis-1,3-Dichloropropene	1.0	0.20
trans-1,3-Dichloropropene	1.0	0.34
Methylene chloride	1.0	0.25
1,1,2,2-Tetrachloroethane	1.0	0.03
Tetrachloroethene	1.0	0.03
1,1,1-Trichloroethane	1.0	0.03
1,1,2-Trichloroethane	1.0	0.02
Trichloroethene	1.0	0.12
Trichlorofluoromethane	1.0	2.0
Vinyl chloride	1.0	0.18
<u>Purgeable Aromatics (Methods 602 and 8020)</u>		
Benzene	1.0	0.2
Chlorobenzene	1.0	0.2
1,2-Dichlorobenzene	1.0	0.4
1,3-Dichlorobenzene	1.0	0.4
1,4-Dichlorobenzene	1.0	0.3
Ethylbenzene	1.0	0.2
Toluene	1.0	0.2
Xylenes (Total)	1.0	1.0

Table 1-2 (Cont.)

Parameter	DL	
	Soil(mg/kg)	Water(ug/L)
<u>PCB Compounds (Methods 608)†</u>		
PCB-1016	--	5.0
PCB-1221	--	5.0
PCB-1232	--	5.0
PCB-1242	--	5.0
PCB-1248	--	5.0
PCB-1254	--	5.0
PCB-1260	--	5.0
<u>Primary Metals (Method 200.7, 239.2, 279.2)</u>		
Antimony	--	150
Beryllium	--	10
Cadmium	--	10
Chromium	--	50
Copper	--	20
Lead	--	5
Nickel	--	100
Silver	--	40
Thallium	--	5
Zinc	--	50
<u>Other Parameters</u>		
EP Toxicity (SW 846-1310)	*	--
Arsenic (Method 206.2, 7061)	--	5
Mercury (Method 245.1)	--	0.2
Selenium (Method 270.2)	--	500
Fluorides (Method 340.2)	1	100
Nitrates (Method 352.1)	2.5	100
Hydrazine (ASTM D1385)	0.01	--
TOC (Method 415.1)	5.0	--
TOX (Method SW 846, 9020)	0.06	--
Isopropyl Alcohol (Flash point)	--	--
Petroleum Hydrocarbons (Method 418.1)	10	100

†As measured in oil, mg/kg.

*Key: Metal ug/L of leaching solution

As	500
Ba	5000
Cd	100
Cr	500
Pb	500
Hg	0.8
Se	500
Ag	500

Metals detected by these methods are listed in Table 1-2. In addition, both the soils and waters were tested for arsenic, mercury, and selenium using the methods specified in Table 1-2.

Isopropyl Alcohol

In order to test for residual isopropyl alcohol in soil samples, EPA Method 1010 was employed to determine the flash point of the sample.

Hydrazine

A spectrophotometric method using ASTM D1385 was employed to test for hydrazine in soil samples. Hydrazine is a volatile and unstable compound. Small spills of this material, therefore, are unlikely to persist in the environment for periods longer than 30 to 60 days. Residual hydrazine from a large spill could possibly be retained in the soil matrix; however, this is unlikely for long time periods.

1.4 FIELD PERSONNEL

The main field team consisted of three persons:

- Hussein Aldis - Project Manager, Chief Geologist
- Mark Hemann - Geologist, Health and Safety Officer
- Randy Holtz - Sampling Technician

1.5 SUBCONTRACTORS

E & E Drilling and Testing, Inc., of Buffalo, New York, provided drilling services. The drilling staff consisted of Greg Jones, Drilling Supervisor, and Randy Holtz.

INSTALLATION RESTORATION PROGRAM PHASE II
CONFIRMATION/QUANTIFICATION
STAGE 1

FINAL REPORT (RCRA SITES)
FOR
AIR FORCE PLANT 38
PORTER, NEW YORK

HEADQUARTERS AIR FORCE SYSTEMS COMMAND
(HQ AFSC/SGPB)
ANDREWS AIR FORCE BASE, DC 20334

April 1988

Prepared By:

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368 PLEASANTVIEW DRIVE, LANCASTER, NY 14086

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USAFOEHL TECHNICAL PROGRAM MANAGER
JAMES W. BETTER
TECHNICAL SERVICES DIVISION (TS)

UNITED STATES AIR FORCE OCCUPATIONAL AND ENVIRONMENTAL HEALTH
LABORATORY (USAFOEHL)
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This report has been prepared for the United States Air Force by Ecology and Environment, Inc., for the purpose of aiding in the implementation of the Air Force Installation Restoration Program (AFIRP). It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United States Air Force, nor the Department of Defense.

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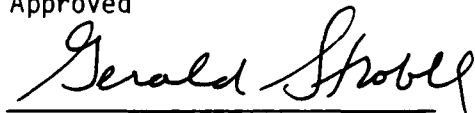
PREFACE

The purpose of the report is to document the Phase II, Stage 1, investigation of the United States Air Force (USAF) Installation Restoration Program (IRP) at Air Force Plant 38 (AFP 38), Porter, New York. This work was conducted by Ecology and Environment, Inc., (E & E) under Contract No. F33615-83-D-4003, Task Order 12.

Mr. Gerald Strobel is Program Manager for this Contract. The Task Order was managed by Mr. Hussein Aldis. Laboratory analyses were accomplished at E & E's Analytical Services Center in Buffalo, New York, under the supervision of Mr. Andrew Clifton and Ms. Cathy Syracuse.

This work was accomplished during the period from 30 September 1986 to 8 October 1986. Mr. James W. Better, USAF, Technical Services Division, USAF Occupational and Environmental Health Laboratory (USAF-OEHL/TS), was the Technical Program Manager.

Approved



Gerald Strobel
Program Manager

TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
	EXECUTIVE SUMMARY	1
1	INTRODUCTION	1-1
	1.1 LOCATION AND HISTORY OF OPERATIONS	1-2
	1.2 DESCRIPTION OF THE SITES	1-4
	1.3 TYPES OF CONTAMINANTS INVESTIGATED	1-7
	1.4 FIELD PERSONNEL	1-12
	1.5 SUBCONTRACTORS	1-12
2	ENVIRONMENTAL SETTING	2-1
	2.1 GEOGRAPHY	2-1
	2.1.1 Physiography	2-1
	2.1.2 Drainage	2-1
	2.1.3 Climate	2-3
	2.2 GEOLOGY AND HYDROGEOLOGY	2-4
	2.2.1 Geology	2-4
	2.2.2 Soils	2-4
	2.2.3 Hydrology	2-7
3	FIELD PROGRAM	3-1
	3.1 PROGRAM DEVELOPMENT	3-1
	3.2 FIELD INVESTIGATION	3-2
	3.2.1 Incinerator and Incinerator Pad	3-2
	3.2.2 Container Storage Pad and Surround- ing Soils	3-2
	3.2.3 Laboratory Program	3-4
	3.2.4 Variation from Description of Work	3-4

Table of Contents (Cont.)

<u>Section</u>		<u>Page</u>
4	RESULTS AND SIGNIFICANCE OF FINDINGS	4-1
4.1	RESULTS	4-1
4.1.1	Incinerator and Incinerator Pad	4-1
4.1.2	Container Storage Pad and Surrounding Soils	4-2
4.2	SIGNIFICANCE OF FINDINGS	4-5
4.2.1	Incinerator and Incinerator Pad	4-5
4.2.2	Container Storage Pad and Surrounding Soils	4-6
5	ALTERNATIVE MEASURES	5-1
5.1	Incinerator and Incinerator Pad	5-1
5.2	Container Storage Pad and Surrounding Soils	5-2
6	RECOMMENDATIONS	6-1
6.1	Incinerator and Incinerator Pad	6-1
6.2	Container Storage Pad and Surrounding Soils	6-1

Appendix

A	GLOSSARY OF TERMS	A-1
B	CONTRACT DESCRIPTION OF WORK	B-1
C	RAW FIELD DATA	C-1
D	CHAIN OF CUSTODY FORMS	D-1
E	REFERENCES	E-1
F	ANALYTICAL DATA	F-1
G	BIOGRAPHIES	G-1
H	TECHNICAL OPERATIONS PLAN AND SITE SAFETY PLAN	H-1

LIST OF ILLUSTRATIONS

<u>Figure</u>		<u>Page</u>
1	AFP 38 Sites of Potential Contamination (RCRA Sites) ..	2
1-1	Site Location Map	1-3
1-2	Property Ownership Map	1-5
1-3	AFP 38 Sites of Potential Contamination (RCRA Sites) ..	1-6
2-1	Block Diagram of Geology and Surface Drainage	2-2
2-2	General Site Stratigraphy	2-5
2-3	Soil Association Diagram	2-6

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1-1	Types of Sample Analyses Performed at AFP 38	1-8
1-2	Analytical Parameters and Detection Limits	1-10
3-1	Major Field Activities	3-3
4-1	Sample Analyses: Concentrations of Parameters that Exceeded Method Detection Limits - Incinerator and Incinerator Pad	4-3
4-2	Sample Analyses: Concentrations of Parameters that Exceeded Method Detection Limits - Container Storage Pad	4-4

2. ENVIRONMENTAL SETTING

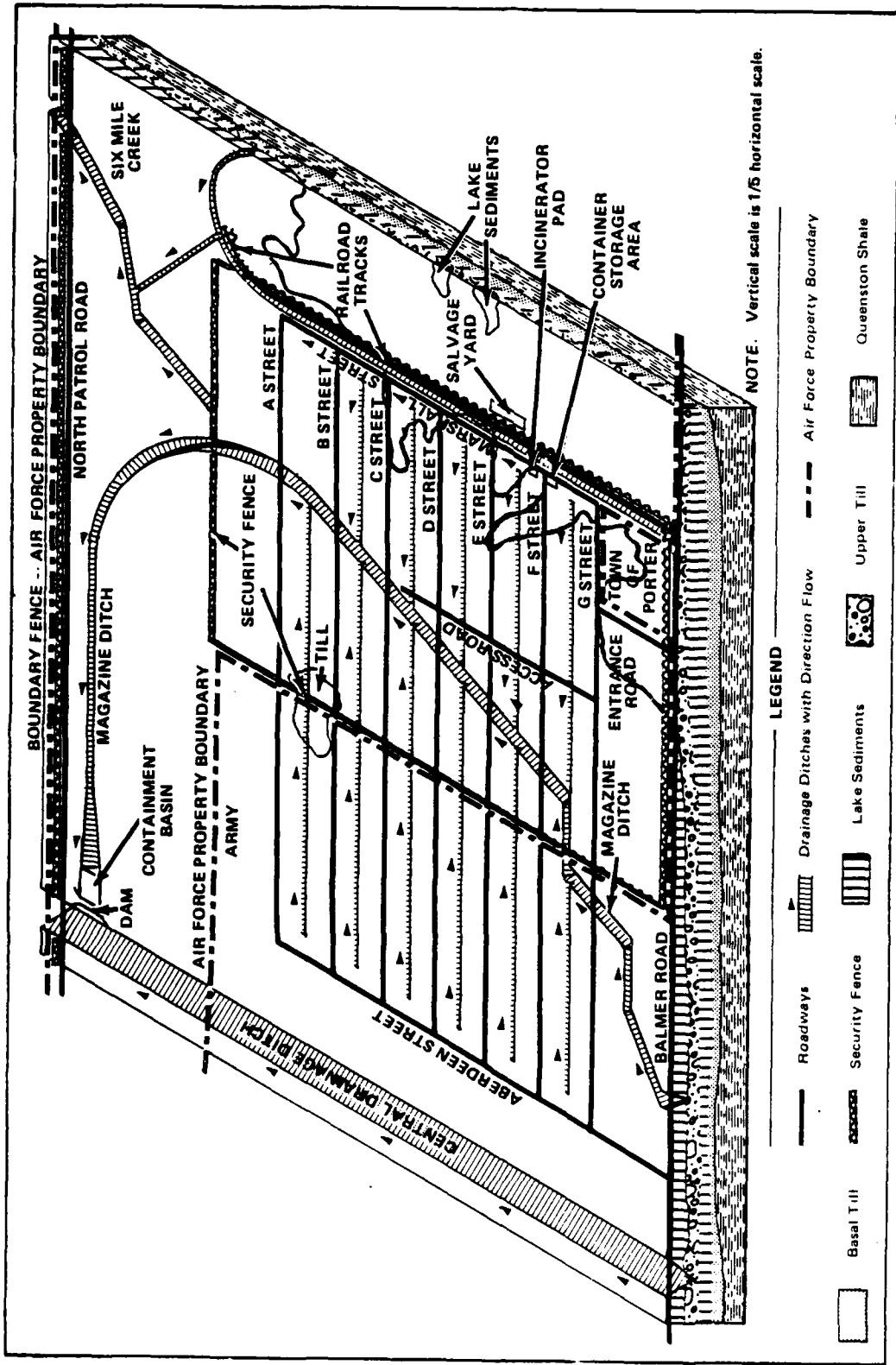
2.1 GEOGRAPHY

2.1.1 Physiography

AFP 38 is located in the physiographic region known as the Ontario Lowlands. The northern boundary of this region is Lake Ontario, and the Niagara Escarpment is the southern boundary. The terrain consists of slightly undulating hills near the escarpment and a flat glacial plain in the central and northern areas. To the west, the Niagara River bisects the plain from the mouth of the Niagara Gorge to Lake Ontario. A number of northward-flowing streams drain the area.

2.1.2 Drainage

AFP 38 is drained by a network of ditches which were dug by the Army Corps of Engineers (see Figure 2-1). Most on-site drainage is to the Magazine Ditch. Most off-site movement of the collected surface water occurs through the Magazine Ditch and the Central Drainage Ditch. Discharge at the dam totaled 103 million gallons in 1972, ranging from 465,000 gallons per day in January-March to 100,000 gallons per day in August and October. The dam discharges into Four Mile Creek. Some flow leaves the site via Six Mile Creek from the northeast corner of the site. The East Drainage Ditches, which discharge to the creek, collected drainage from along Marshall Street adjoining the Salvage Area, the Incinerator Pad, the Drum Storage Area, and the Acid Area (U.S. Department of Agriculture 1972). The Salvage Yard is drained by a ditch that runs from the yard to Six Mile Creek, east of



NOTE. Vertical scale is 1/5 horizontal scale.

Figure 2-1 BLOCK DIAGRAM OF GEOLOGY AND SURFACE DRAINAGE

and roughly parallel to the East Drainage Ditches. It is possible that the creek has been affected by site activities.

2.1.3 Climate

Niagara County has a humid, continental type of climate. The North American continent is the primary source for air masses and weather systems that affect the county. Air flow from the south or southwest brings moisture to the region from the Atlantic Ocean and Gulf of Mexico.

The county has pleasantly warm summers. The winters are fairly long and cold, and they have frequent spells of cloudy, unsettled weather. Temperatures range from an average maximum of 32°F in January to 82°F in July, with average minimum temperatures of 17°F in January and 60°F in July. Precipitation generally is evenly distributed during the year and there are no distinct seasonal differences in maximum precipitation. The average yearly total precipitation is approximately 32.6 inches.

Most atmospheric pressure systems affect Niagara County as they move across the continent or up the Atlantic Coast. The result is a variety of weather conditions. Temperatures and other atmospheric elements commonly undergo noticeable change within an interval of a few days.

The climate is greatly influenced by the close proximity of Lakes Ontario and Erie. In spring the cold lake waters function as a heat sink that retards the normal warming of the air temperature. The lakes tend to restrict the occurrence of extreme high temperatures in summer. Niagara County is therefore less subject to severe thunderstorms caused by strong summer heating than are other counties farther inland. In fall the lake waters are a source of heat that reduces cooling at night and increases the length of the frost-free growing season. Both Lake Ontario and, to a lesser extent, Lake Erie remain largely unfrozen in the winter, and this modifies the occurrence of extreme cold temperatures in comparison with more inland areas of similar elevation and latitude.

Nearness to the Great Lakes is an important factor in the amount of snow that falls in the county. Air flow from the southwest is heated and moistened as it moves across the open, relatively warm waters of Lake Erie. Moving inland, the air masses release moisture in the form of heavy snowfall. High winds often accompany the lake-effect snowstorms and hamper travel. These lake-effect storms are most common in November and December. The frequency and intensity of these storms decrease later in winter as more of the lake surface becomes covered with ice.

Because of the relatively small differences in elevation in the county, it is of minor influence on the climate. The climate is comparatively uniform, except as it may be affected by distance from the Great Lakes.

2.2 GEOLOGY AND HYDROGEOLOGY

2.2.1 Geology

Geologic formations at the surface within the region of the Ontario Lowlands were deposited during the Pleistocene Epoch. Four different ice advances with intervening periods of extensive erosion occurred during this time. Since the retreat of the last ice sheet, the landscape of the area has undergone very little change.

The entire site is underlain at shallow depths (50-80 feet) by Queenston Shale, which is several hundred feet thick beneath the site. A thin layer (approximately 10 feet) of glacial till overlies the shale, and interbedded layers of till and glacial lake clays, silts, and sand overlie the basal till across the site (Golder Associates 1987) (see Figures 2-1 and 2-2).

2.2.2 Soils

Soils in the area are predominantly silty loams with low permeabilities (U.S. Department of Agriculture 1972). Small patches of Claverack and Minoa sandy loam or loamy fine sand also occur. The soils at the site generally are composed of three associations: the Appleton-Hilton-Sun, Rhinebeck-Ovid-Madalin, and Canandaigua-Raynham-Rhinebeck (see Figure 2-3). The first of these soils associations is derived from calcareous glacial till, and the latter two from glacial lake sediments. Soils of the Rhinebeck-Ovid-Madalin Association cover the majority of the site and are poorly to very poorly drained.

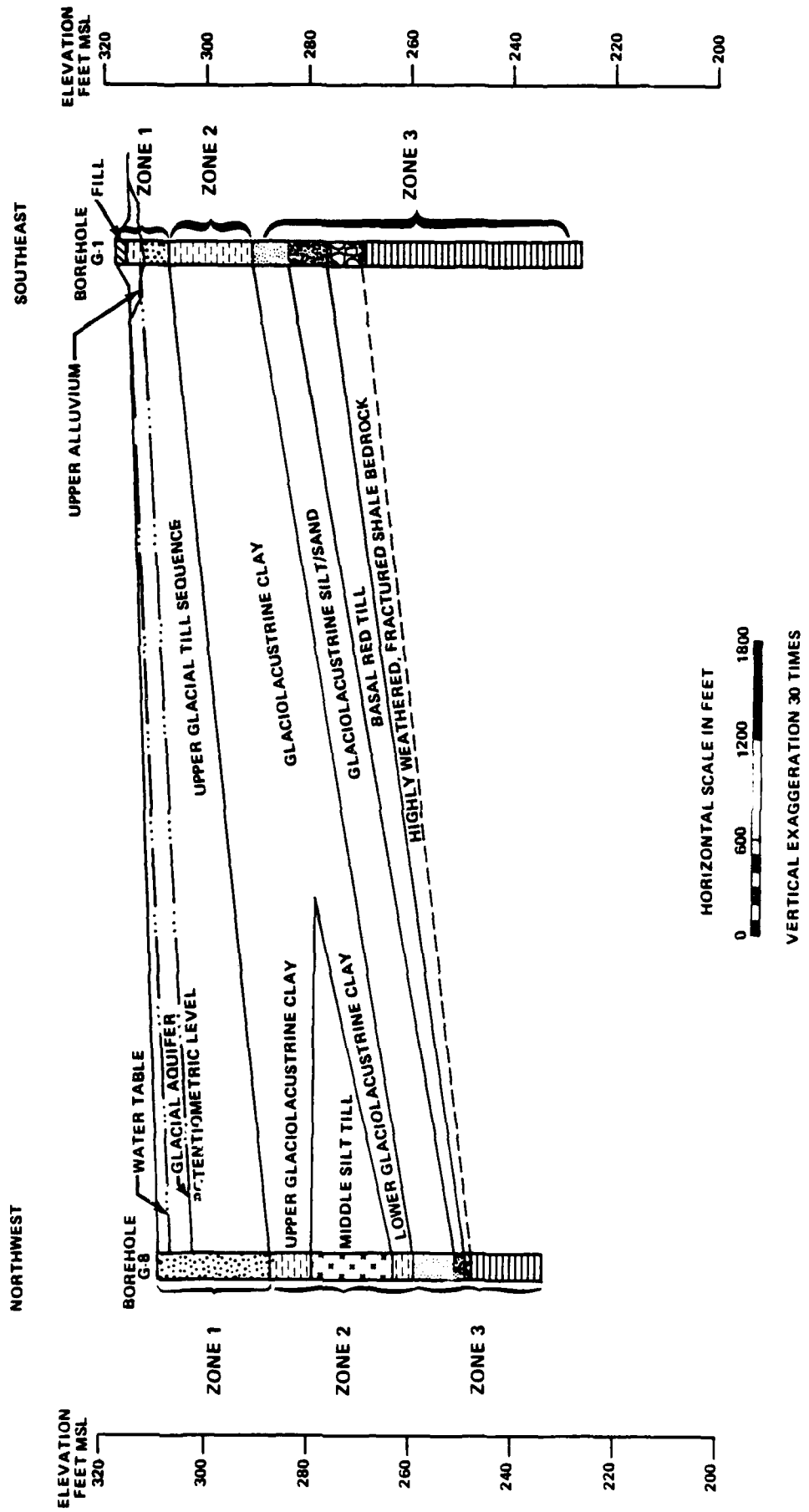
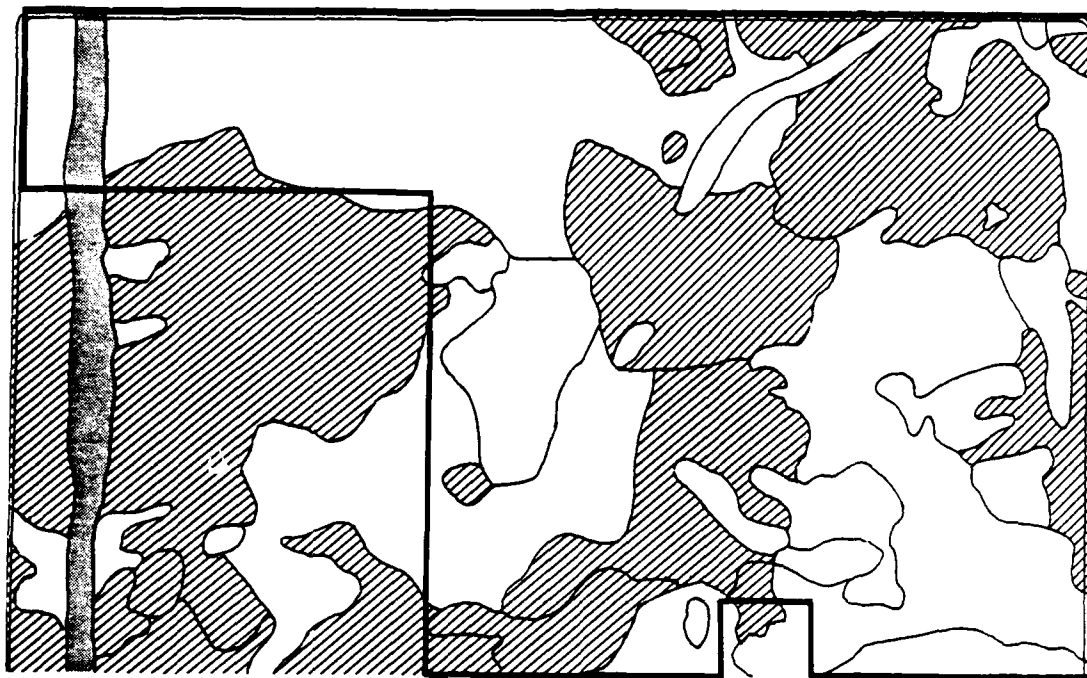



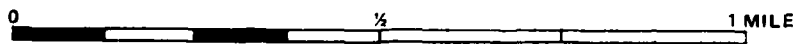


Figure 2-2 GENERAL SITE STRATIGRAPHY



SOURCE: U.S. Department of Agriculture, 1972.

- KEY:**
-  **SOILS FROM LAKE SEDIMENTS**
 - Canandaigua Series
 - Minoa Series
 - Niagara Series
 - Rhinebeck Series
 -  **ARTIFICIAL CUT AND FILL**
 -  **SOILS FROM TILL**
 - Appleton Series
 - Hilton Series
 - Madalin Series
 - Messena Series
 - Ontario Series
 - Sun Series



SCALE 1:15,840

Figure 2-3 SOIL ASSOCIATION DIAGRAM

2.2.3 Hydrology

AFP 38 is underlain by a combination of glacial tills and glacial lacustrine deposits resting on a great thickness of marine shale. Recent installation of monitoring wells on the Chemical Waste Management, Inc. (CWM), Model City facility immediately south of AFP 38 has shown more than one layer of till interbedded with lacustrine deposits. The water table occurs in low permeability silt and clay tills (1.6×10^{-4} cm/sec), above even lower permeability glaciolacustrine clay (6.4×10^{-5} cm/sec). This in turn rests either on further silt, till, and clay on top of a glaciolacustrine silt/sand aquifer or directly on the aquifer. The aquifer has moderate hydraulic conductivity (1.1×10^{-2} cm/sec) and hydraulic gradients of 0.0006 ft/ft to 0.01 ft/ft, with flow generally to the northwest at a rate of perhaps four feet per year. Within the water table, which is irregular because of mounding and other variations in topography, the rates of flow may be as little as 0.1 ft/year, again generally to the northwest. The water table is very shallow, ranging from zero to three or four feet, and is generally between two to four feet higher than the piezometric surface of the silt/sand aquifer, at between 30 to 55 feet below surface (deeper to the northwest). Vertical gradients are consequently of the order of 0.1 ft/ft to 0.02 ft/ft in general, ignoring very local mounding. Rates of vertical flow through the glaciolacustrine clays are probably on the order of two to three feet/year. Despite this, the low levels of chlorinated organics contamination found on the CWM site in the water table have not been detected in the deeper aquifer. A combination of adsorption and biodegradation apparently restricts the contamination to the shallow zone.

Because of the extensive system of surface ditches on AFP 38, lateral movement within the water table and discharge to surface water may well be the dominant mode of recharge movement. The deeper aquifer, if it extends under AFP 38, will also discharge upwards into the Central Drainage Ditch, where the surface water levels are well below the potentiometric surface in the glaciolacustrine silt/sand aquifer above the bedrock. This would explain the northwesterly flow in this aquifer under the CWM site (Golder 1987). The low permeability of the shale, till, and lacustrine deposits significantly reduces lateral or vertical water movement.

All local residences are on the municipal water supply. Town of Porter municipal water is supplied by the Niagara County Water District from the Niagara River. Area residences were probably formerly on shallow bedrock wells or large diameter shallow wells (Burmester 1985). The use of large diameter dug wells is indicative of a slow recharge rate, the large diameter bore acting as storage capacity to permit accumulation of water so that the well can be pumped in excess of its recharge rate for short periods. Such wells are essentially drawing on soil water and are extremely vulnerable to contamination from the surface. They are employed only where useable aquifers are not found within economic distance of the surface.

Johnston (1964) indicates that some drilled wells were installed into the "fractured zone in top one foot of shale." The report also indicates that "many wells were abandoned because of poor quality and inadequate yields," and that "wells in overlying glacial till and lake deposits yield little water and are adequate only where sand beds or a 'washed zone' at top of rock is penetrated."

3. FIELD PROGRAM

3.1 PROGRAM DEVELOPMENT

A field program for the Phase II, Stage 1, investigation was developed by E & E and presented in the Confirmation Study Installation Restoration Program (September 1986). The program was modified by the USAF and set forth in the Statement of Work for Order Number 12, Contract Number F33615-83-D-4003.

The field program was developed to accomplish three goals:

- Determine the presence or absence of contamination or contaminated materials within the area of investigation;
- Should contamination be found, determine the potential for migration of the contaminants through the various migration pathways; and
- Assess the potential environmental or health risks associated with the identified contaminants within the environmental setting of the plant.

The elements of the field program included: scrape and swab sampling of the Container Storage Pad and Incinerator and Incinerator Pad, and subsurface soil sampling.

3.2 FIELD INVESTIGATION

Schedule of Activities

Scheduling of field activities was designed to provide the most effective utilization of manpower and resources for the accomplishment of the program goals. Scheduled events were coordinated with USAF and plant personnel and one subcontractor to minimize delays and potential problems.

During this time, frequent contact was maintained with plant representatives. Table 3-1 provides the sequence of field activities.

Soil/Sediment Sampling

The location, color, and composition of all soil/sediment samples collected were recorded in the field logbook at the time of sampling. The sampling procedures were in accordance with protocols specified in the Technical Operations Plan (see Appendix H). All samples were monitored at the time of collection with an HNU photoionization detector.

Scrape Samples

One scrape sample was obtained from the surface of the Incinerator Pad (location 6b) by chiseling material from the concrete.

3.2.1 Incinerator and Incinerator Pad

A total of four 5-foot borings were drilled at a distance of approximately 2 feet from the edge of each of the four sides of the Incinerator Pad (location 6c). Soil samples were collected at the 1-foot and 5-foot depths of each boring. Duplicate soil samples were taken at a depth of 1 foot in the borings on the east and west sides of the pad.

3.2.2 Container Storage Pad and Surrounding Soils

The top surface of the Container Storage Pad (location 7a) was soaked and swabbed with deionized water, and swab water was collected for analysis. One-foot and 5-foot deep soil samples were collected 2 feet from the edge of each of the four sides of the Container

Table 3-1
MAJOR FIELD ACTIVITIES

Date	Activity
30 September 1986	Field effort coordination meeting; field effort mobilization and on-site coordination.
6 October 1986	Collection of scrape sample from Incinerator Pad and soil samples from borings near pad, and soil samples from borings near Container Storage Pad.
8 October 1986	Collection of swab sample from container storage pad; demobilization.

Source: E & E log books and sample documentation.

Storage Pad. At each sampling station, a 6-inch diameter auger was used to break through the cement surface which surrounds the pad.

3.2.3 Laboratory Program

All samples were split in the field and the split portions were submitted to USAFOEHL/SA, Brooks Air Force Base, Texas. Field collection, preservation, packaging, and shipping protocols were followed, as specified in the Technical Operations Plan (see Appendix H).

Copies of the chain-of-custody forms for the samples are provided in Appendix D. Information on detection limits and analytical methods used is given in Table 1-1. Additional information on sample holding times can be found with the analytical data in Appendix F. All samples were shipped to E & E's Analytical Services Center (ASC) the same day and to USAFOEHL/SA by Federal Express next-day delivery.

3.2.4 Variation From Description of Work

During the execution of the fieldwork, a change from the contract description of work was implemented due to field conditions and findings. The following change was made after discussion with and concurrence of OEHL:

- No scrape sample was obtained from inside the Incinerator, since the opening at the top of the Incinerator, which was approximately 1 foot in diameter, was too small to allow a sample to be collected.

4. RESULTS AND SIGNIFICANCE OF FINDINGS

Soil samples and scrape and swab samples were collected at the two sites and analyzed for various sets of parameters, including volatile halocarbons, volatile aromatics, petroleum hydrocarbons, primary metals, hydrazine, total organic carbon (TOC), total organic halides (TOX), isopropyl alcohol, and percent moisture. Results of the field and laboratory analyses are presented in Section 4.1. Their significance is discussed in Section 4.2.

4.1 RESULTS

The following subsections present site-specific discussions of the results of the investigation. Only concentrations of parameters that exceeded the method detection limits (see Table 1-1) are presented in the tables in this section. Laboratory reports containing all analytical data and quality assurance tests compiled during the investigation are presented in Appendix F. Accuracy and precision of results were generated in accordance with USEPA Quality Assurance/Quality Control (QA/QC) guidelines. In general, the guidelines require percent recovery to fall into the 80-120% range and relative percent difference (RPD) not to exceed 20%. All laboratory method blanks and the field blank collected on October 7, 1986, were found to exhibit no chemical contamination by the parameters analyzed.

4.1.1 Incinerator and Incinerator Pad

Eight soil samples plus one duplicate sample were acquired at the Incinerator Pad and submitted for analysis. Two samples were collected at 1- and 5-foot depths from each side of the pad. The primary

composition of these soil samples was silty clay. However, several samples contained significant amounts of sand and gravel (see Appendix C for boring logs). In addition, one scrape sample was obtained from the surface of the Incinerator Pad.

Analytical Results

All soil samples from the 1-foot depth from the Incinerator Pad showed concentrations above detection limits of petroleum hydrocarbons (see Table 4-1). The highest concentration (160 mg/kg) was in sample No. 0016, which was acquired from the west side of the pad adjacent to the road. Other 1-foot deep samples had hydrocarbon concentrations which ranged from 10 to 16 mg/kg. The only 5-foot deep soil sample (No. 0017) to yield an elevated concentration of petroleum hydrocarbons (5,500 mg/kg) was from the west side of the Incinerator Pad. Table 4-1 lists those samples which exceeded the detection limits. However, since no field blank samples were taken for analysis, no background information is available for comparison. From E & E's past laboratory experience, a normal soil sample may have a concentration of petroleum hydrocarbons of 50 ppm or less.

No other analyses showed concentrations above the detection limits.

4.1.2 Container Storage Pad and Surrounding Soils

Eight soil samples were collected from the Container Storage Pad and submitted for analysis. Each consisted of silty clay with small amounts of sand and gravel (see Appendix C for boring logs). The samples were obtained at 1- and 5-foot depths from each of the four sides of the pad. In addition, one swab sample was acquired from the surface of the pad.

Analytical Results

Table 4-2 shows the results of the analyses of seven soil samples, one duplicate soil sample, and one swab sample from the Container Storage Pad. Concentrations above the detection limits of petroleum hydrocarbons were found in soil samples from all four sides of the pad. The highest concentrations were found at 5-foot depths at the east (sample No. 0032), west (sample No. 0028), and north (sample

Table 4-1

SAMPLE ANALYSES: CONCENTRATIONS OF PARAMETERS
 THAT EXCEEDED METHOD DETECTION LIMITS -
 INCINERATOR AND INCINERATOR PAD

(mg/kg)

Sample Type	Soil	Soil	Soil	Soil	Soil	Soil*
E & E Lab No.	8651	8652	8653	8655	8657	8666
Sample No.	0016	0017	0018	0020	0022	0033
Site No.	6C	6C	6C	6C	6C	6C
Parameter						
Petroleum Hydrocarbons**	160	5,500	13	16	10	10

*Duplicate sample.

**Normal concentrations of petroleum hydrocarbons are ≤ 50 ppm.

Table 4-2

SAMPLE ANALYSES: CONCENTRATIONS OF PARAMETERS
THAT EXCEEDED METHOD DETECTION LIMITS -
CONTAINER STORAGE PAD

(mg/kg, unless otherwise noted)

Sample Type	Swab	Soil	Soil	Soil	Soil*	Soil	Soil	Soil	Soil	Soil
E & E Lab No.	8731	8659	8660	8661	8667	8662	8663	8664	8665	8665
Sample No.	0015	0025	0026	0027	0034	0028	0029	0030	0032	0032
Site No.	7a	7b	7b	7b	7b	7b	7b	7b	7b	7b

Parameter	ND	130	ND	38	120	2,400	1,900	1,900	7,900
Petroleum Hydrocarbons***	ND	130	ND	38	120	2,400	1,900	1,900	7,900
Total Organic Carbon	37.8 mg/L	15,000	12,000	2,560	8,560	>4%**	8,520	>4%	>4%
Total Organic Halides	0.010 mg/L	0.27	ND	0.22	ND	0.07	0.09	0.35	0.14
Lead	0.007 mg/L	ND	ND	ND	ND	ND	ND	ND	ND

*Duplicate sample.

**Concentrations exceeded the upper detection limit (40,000 mg/kg) of the TOC analyzer.

***Normal concentrations of petroleum hydrocarbons are <50 ppm.

No. 0030) sides of the pad. The concentrations were 7,900 mg/kg, 2,460 mg/kg, and 1,900 mg/kg, respectively. Other soil samples yielded elevated concentrations ranging from 38 mg/kg to 1,900 mg/kg. Table 4-2 lists those samples which exceeded the detection limits. However, since no field blank samples were taken for analysis, no background information is available for comparison. From E & E's past laboratory experience, a normal soil sample may have a concentration of petroleum hydrocarbons of 50 ppm or less. Elevated concentrations of total organic carbon (TOC) were found at all four soil collection sites. Sample Nos. 0028, 0030, and 0032 exceeded 40,000 mg/kg TOC, the upper detection limit of the TOC analyzer. Other samples ranged from 2,560 mg/kg TOC to 15,000 mg/kg TOC. TOX concentrations ranged from 0.07 mg/kg to 0.35 mg/kg in five of seven remaining soil samples. Swab sample No. 0015, taken from the surface of the container storage pad, showed TOC (37.8 mg/L), TOX (0.010 mg/L), and lead (0.007 mg/L).

4.2 SIGNIFICANCE OF FINDINGS

Based on the results presented in Section 4.1, preliminary statements can be made regarding the absence or presence of contamination at each of the sites investigated. A discussion of the extent of contamination and the potential for migration is provided where enough data exist. An evaluation of the contamination in terms of potential health and environmental hazards is also discussed where applicable.

4.2.1 Incinerator and Incinerator Pad

All four soil samples and one duplicate soil sample obtained at depths of 1 foot from the area surrounding the Incinerator Pad yielded concentrations of petroleum hydrocarbons above detection limits. The highest concentration (160 mg/kg) was from the west side of the pad. Only one soil sample obtained at a depth of 5 feet yielded an elevated petroleum hydrocarbon concentration (5,500 mg/kg). This sample was also from the west side of the Incinerator Pad. However, since it is common for soil to have concentrations of petroleum hydrocarbons as high as 50 ppm, only the samples from the west side of the Incinerator Pad, taken at depths of one and five feet, are of concern. The ubiquitous nature of petroleum hydrocarbons in 1-foot deep soil samples at the pad indicates that the presence of this contaminant

resulted from activities at the Incinerator Pad. However, with the exception of the 5-foot sample collected on the western side of the pad, there were no elevated levels of petroleum hydrocarbons at 5-foot deep sampling locations. This suggests that off-site contamination from the Incinerator Pad is not likely to be significant. The impervious nature of the soils and the lack of groundwater use in the area means that the contamination found is not significant in terms of environmental and health impacts since the rate of movement in this setting will be very low.

Biodegradation of the hydrocarbons will occur naturally. Conditions at the site are conducive to biological degradation, since the depths at which the contaminants were found are relatively shallow, allowing for adequate aeration of the affected soils. Also, the presence of vegetation will provide necessary nutrients. Many organic compounds are known to be degraded to CO₂ and water or merely transformed into other compounds which may be more or less toxic. Each compound will be degraded at a particular rate. This rate is dependent upon several factors, including:

- concentration (chemical and biological organisms),
- pH,
- temperature,
- nutrient concentration and availability (including oxygen and water),
- compound physiochemical properties, and
- other interfering substances or toxicants.

Some degradation rates of crude oil in soils are as follows:

- 8.3 kg oil/month/m³ (includes degradation and volatilization)(Kincannon 1972)
- 61.4%/3 months (Francke & Clarke 1974)
- 48.5-90%/year (Raymond et al. 1976)

4.2.2 Container Storage Pad and Surrounding Soils

Concentrations above detection limits of petroleum hydrocarbons were present in all but two soil samples collected from around the Container Storage Pad.

The highest concentrations, which ranged from 1,900 mg/kg to 7,900 mg/kg, were obtained from samples collected at 5-foot depths. Soil samples collected at 1-foot depths ranged from 38 to 1,900 mg/kg. TOC concentrations were also significantly higher from soil samples collected at 5-foot depths; i.e., three of four samples exceeded 40,000 mg/kg, the upper detection limit of the TOC analyzer. These contaminants probably resulted from spilling of petroleum hydrocarbons on the Container Storage Pad. The levels of petroleum hydrocarbons found were well above 500 ppm. The contaminants will not lend themselves well to natural biodegradation. In addition, the high concentrations of hydrocarbons are lethal to microbial populations, effectively stopping or greatly slowing the degradation process (Kincannon 1972; Francke & Clark 1974; Raymond et al. 1976).

The soil samples which were collected and analyzed were fill material composed of relatively loose gravels. This material allowed migration of contaminants from spills downward to the native soil layer. The relatively impervious soils at this interface and the lack of groundwater use in the area suggest that the contamination found is not significant in terms of human health. The fact that no hydrocarbons were detected in the ditch immediately below the site suggests that contamination would not have spread beyond the soils adjacent to the pad.

TOX concentrations above detection limits were present in three 1-foot deep soil samples, three 5-foot deep soil samples, and the swab sample on the surface of the pad. The presence of this contaminant probably resulted from various spills during the storage of solvents, degreasers, and paint removers at the pad. However, the TOX concentrations, which in all cases were relatively low (below 1 mg/kg), are not regarded as a threat to human health or the environment.

5. ALTERNATIVE MEASURES

The alternative measures that can be taken at each of the sites are discussed in this section. The "no action" alternative is considered for each site. Recommendations for the appropriate alternatives are presented in Section 6.

5.1 INCINERATOR AND INCINERATOR PAD

The subsurface soils in the area near the Incinerator Pad contained petroleum hydrocarbons. The levels found in the 1-foot deep samples were relatively low and will biodegrade naturally. The high level found in one 5-foot-deep sample is not likely to migrate due to the hydrogeologic setting. The alternatives applicable to this site are:

1. No action - this alternative would be applicable if it is determined that the levels of contaminants detected in the samples do not warrant further action.
2. Hydrogeologic assessment and additional sampling - install groundwater monitoring wells, additional soil borings and soil sampling, and additional hydrogeologic studies in order to better understand the specific characteristics of the site in relation to exact groundwater flow direction and rates, and also to better define the extent of contamination.

5.2 CONTAINER STORAGE PAD AND SURROUNDING SOILS

The subsurface soils in this area contained petroleum hydrocarbons, TOC, and minor levels of TOX. The swab sample from the surface of the concrete storage pad exhibited a minor amount of TOX. Alternatives applicable to this site include:

1. No action - this option would be applicable if it is determined that the levels of contaminants detected do not warrant further action. Some natural attenuation of the contamination will occur through biodegradation of the hydrocarbons. However, the time for degradation will be very slow, and complete degradation is not likely to occur.
2. Hydrogeologic assessment and additional sampling - install groundwater monitoring wells, additional soil borings and soil sampling, and additional hydrogeologic studies in order to better understand the specific characteristics of the site in relation to exact groundwater flow direction and rates, and also to better define the extent of contamination.
3. Excavate soils - the visibly contaminated soils may be excavated and then land-spread to facilitate the oxidation and biodegradation processes, followed by disposal in an off-site landfill. The excavated soils may also be directly disposed of in a secure landfill facility.

6. RECOMMENDATIONS

The recommendations presented in this section are based on the results of the Phase II, Stage 2, investigation. Each of the sites investigated has been listed by category (Category I, II, or III) based on requirements for work. Category I sites, where sufficient data exist to rule out public health or environmental hazards, require no further action. Category II sites require additional investigations to better quantify or assess the extent of contamination. Category III sites require remedial actions as part of Phase IV of the IRP. Such actions may include long-term monitoring (LTM).

The following subsections present site-specific recommendations for follow-up action at each of the sites. These recommendations were selected as the most appropriate from among the list of alternatives presented in Section 5.

6.1 INCINERATOR AND INCINERATOR PAD - CATEGORY II

Due to the elevated petroleum hydrocarbon levels and the lack of specific hydrogeologic data at the unit, additional boring and sampling are required. Groundwater flow velocity and directional data are needed to determine if any off-site migration of contaminants has or will occur in the groundwater.

6.2 CONTAINER STORAGE PAD AND SURROUNDING SOILS - CATEGORY III

The contaminated soils, as defined by visual means or by an organic vapor detecting instrument, should be excavated and removed off-site. Depending on a comparison of the associated costs, the

excavated materials may be sent directly to a secure landfill, or
landspread and treated to accelerate the biodegradation process.
These soils could then be disposed of in an non-hazardous waste land-
fill.

APPENDIX A

GLOSSARY OF TERMS

AAF: Army Air Field

ABG: Air Base Group

ACFT MAINT: Aircraft Maintenance.

AF: Air Force.

AFB: Air Force Base.

AFESC: Air Force Engineering and Services Center.

AFFF: Aqueous Film Forming Foam.

AFR: Air Force Regulation.

ALLUVIUM: Materials eroded, transported and deposited by streams.

ALLUVIAL FAN: A fan-shaped deposit formed by a stream either where it issues from a narrow mountain valley into a plain or broad valley, or where a tributary stream joins a main stream.

ANTICLINE: A fold in which layered strata are inclined down and away from the axes.

AQUAZENE: an algicide.

ARTESIAN: Groundwater contained under hydrostatic pressure.

AQUIFER: A geologic formation, group of formations, or part of a formation that is capable of yielding water to a well or spring.

AROMATIC: Description of organic chemical compounds in which the carbon atoms are arranged into a ring with special electron stability associated. Aromatic compounds are often more reactive than non-aromatics.

ATC: Air Training Command.

AVGAS: Aviation Gasoline.

BEE: Bioenvironmental Engineer.

BES: Bioenvironmental Engineering Services

BIOACCUMULATE: Tendency of elements or compounds to accumulate or build up in the tissues of living organisms when they are exposed to these elements in their environments, e.g., heavy metals.

BIODEGRADABLE: The characteristics of a substance to be broken down from complex to simple compounds by microorganisms.

BX: Base Exchange.

CAMS: Consolidated Aircraft Maintenance Squadron.

CE: Civil Engineering.

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act.

CES: Civil Engineering Squadron.

CIRCA: About; used to indicate an approximate date.

CLOSURE: The completion of a set of rigidly defined functions for a hazardous waste facility no longer in operation.

COD: Chemical Oxygen Demand, a measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water.

COE: Corps of Engineers.

CONFINED AQUIFER: An aquifer bounded above and below by impermeable strata or by geologic units of distinctly lower permeability than that of the aquifer itself.

CONFINING UNIT: A geologic unit with low permeability which restricts the movement of groundwater.

CONTAMINATION: The degradation of natural water quality to the extent that its usefulness is impaired; there is no implication of any specific limits since the degree of permissible contamination depends upon the intended end use or uses of the water.

Cr: Chemical symbol for chromium.

CS: Communications Squadron.

CSG: Combat Support Group.

DCM: Deputy Commander for Maintenance.

DCO: Deputy Commander for Operations.

DCRM: Deputy Commander for Resource Management.

DEQPPM: Defense Environmental Quality Program Policy Memorandum

DET: Detachment.

DIP: The angle at which a stratum is inclined from the horizontal.

DISPOSAL FACILITY: A facility or part of a facility at which hazardous waste is intentionally placed into or on land or water, and at which waste will remain after closure.

DISPOSAL OF HAZARDOUS WASTE: The discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste or any constituent thereof may enter the

environment or be emitted into the air or discharged into any waters, including groundwater.

DoD: Department of Defense.

DOT: Department of Transportation

DOWNGRAIENT: In the direction of decreasing hydraulic static head; the direction in which groundwater flows.

DPDO: Defense Property Disposal Office, previously included Redistribution and Marketing (R & M) and Salvage.

DUMP: An uncovered land disposal site where solid and/or liquid wastes are deposited with little or no regard for pollution control or aesthetics; dumps are susceptible to open burning and are exposed to the elements, disease vectors and scavengers.

E & E: Ecology and Environment, Inc.

EFFLUENT: A liquid waste discharge from a manufacturing or treatment process, in its natural state, or partially or completely treated, that discharges into the environment.

EOD: Explosive ordnance disposal.

EP: Extraction Procedure, the EPA's standard laboratory procedure for leachate generation.

EPA: U.S. Environmental Protection Agency.

EPHEMERAL AQUIFER: A water-bearing zone typically located near the surface which normally contains water seasonally.

EROSION: The wearing away of land surface by wind, water, or chemical processes.

ETHYLENE GLYCOL: A liquid used for de-icing aircraft; it bioaccumulates and can exhibit toxic properties.

FAA: Federal Aviation Administration.

FACILITY: Any land and appurtenances thereon and thereto used for the treatment, storage and/or disposal of hazardous wastes.

FAULT: A fracture in rock along which the adjacent rock surfaces are differentially displace.

FLOODPLAIN: The lowland and relatively flat areas adjoining inland and coastal areas of the mainland and off-shore islands, including, at a minimum, areas subject to a one percent or greater chance of flooding in any given year.

FLOW PATH: The direction or movement of groundwater as governed principally by the hydraulic gradient.

FPTA: Fire Protection Training Area.

FTW: Flying Training Wing.

FY: Fiscal Year.

GC/MS: Gas chromatograph/mass spectrophotometer, a laboratory procedure for identifying unknown organic compounds.

GROUNDWATER: Water beneath the land surface in the saturated zone that is under atmospheric or artesian pressure.

GROUNDWATER RESERVOIR: The earth materials and the interstitial open spaces that contain groundwater.

HALON: A fluorocarbon fire extinguishing compound.

HALOGEN: The class of chemical elements including fluorine, chlorine, bromine, and iodine.

HARDFILL: Disposal sites receiving construction debris, wood, miscellaneous spoil material.

HARM: Hazard Assessment Rating Methodology.

HAZARDOUS SUBSTANCE: Under CERCLA, the definition of hazardous substance includes:

1. All substances regulated under Paragraphs 311 and 307 of the Clean Water Act (except oil);
2. All substances regulated under Paragraph 3001 of the Solid Waste Disposal Act;
3. All substances regulated under Paragraph 112 of the Clean Air Act;
4. All substances which the Administrator of EPA has acted against under Paragraph 7 of the Toxic Substance Control Act;
5. Additional substances designated under Paragraph 102 of the Superfund bill.

HAZARDOUS WASTE: As defined in RCRA, a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

HAZARDOUS WASTE GENERATION: The act or process of producing a hazardous waste.

HEAVY METALS: Metallic elements, including the transition series, which include many elements required for plant and animal nutrition in trace concentrations but which become toxic at higher concentrations.

HNU Photoionizer - Field instrument used to determine the total concentration of organic and inorganic vapors and gases with an ionization potential of less than 11.7 ev. The instrument does not respond to methane or hydrogen cyanide.

HQ: Headquarters.

HWAP: Hazardous Waste Accumulation Point

HWMF: Hazardous Waste Management Facility.

HYDROCARBONS: Organic chemical compounds composed of hydrogen and carbon atoms chemically bonded. Hydrocarbons may be straight chain, cyclic, branched chain, aromatic, or polycyclic, depending upon arrangement of carbon atoms. Halogenated hydrocarbons are hydrocarbons in which one or more hydrogen atoms has been replaced by a halogen atom.

INCOMPATIBLE WASTE: A waste unsuitable for commingling with another waste or material because the commingling might result in generation of extreme heat or pressure, explosion or violent reaction, fire, formation of substances which are shock sensitive, friction sensitive, or otherwise have the potential for reacting violently, formation of toxic chemicals due to heat generation in such a manner that the likelihood of contamination of groundwater or escape of the substance into the environment is increased, any other reaction which might result in not meeting the air, human health, and environmental standards.

ICBM: Intercontinental Ballistic Missile

ILS: Instrument Landing System

INFILTRATION: The movement of water through the soil surface into the ground.

IRP: Installation Restoration Program.

ISOPACH: Graphic presentation of geologic data, including lines of equal unit thickness that may be based on confirmed (drill hole) data or indirect geophysical measurement.

ISOPROPYL ALCOHOL: Flammable liquid used for cleaning small parts.

JP-4: Jet Propulsion Fuel No. 4, military jet fuel.

LCF: Launch Control Facility.

LEACHATE: A solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water.

LEACHING: The process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water.

LENTICULAR: A bed or rock stratum or body that is lens-shaped.

LF: Launch Facility.

LINER: A continuous layer of natural or man-made materials beneath or on the sides of a surface impoundment, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents or leachate.

LITHOLOGY: The description of the physical character of a rock.

LOESS: An essentially unconsolidated unstratified calcareous silt; commonly homogeneous, permeable and buff to gray in color.

LYSIMETER: A vacuum operated sampling device used for extracting pore water samples at various depths within the unsaturated zone.

MAC: Military Airlift Command.

MEK: Methyl ethyl ketone.

MERCURY AMALGAM: A solid used in dental work; contains the toxic metal mercury.

METALS: See "Heavy Metals."

MGD: Million gallons per day.

MOA: Military Operating Area.

MIK: Methyl isobutyl ketone.

MOGAS: Motor gasoline.

MONITORING WELL: A well used to measure groundwater levels and to obtain samples.

MSL: Mean Sea Level.

MSS: Missile Security Squadron.

MWR: Morale Welfare and Recreation.

NCO: Non-commissioned Officer.

NCOIC: Non-commissioned Officer In-Charge.

NDI: Non-destructive inspection.

NET PRECIPITATION: The amount of annual precipitation minus annual evaporation.

NGVD: National Geodetic Vertical Datum of 1929.

NOAA: National Oceanic and Atmospheric Administration.

NPDES: National Pollutant Discharge Elimination System.

OEHL: Occupational and Environmental Health Laboratory.

OIC: Officer-In-Charge.

OMMS: Organization Missile Maintenance Squadron.

ORGANIC: Being, containing or relating to carbon compounds, especially in which hydrogen is attached to carbon.

Pb: Chemical symbol for lead.

PCB: Polychlorinated biphenyl; liquids used as a dielectrics in electrical equipment.

PERCOLATION: Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil.

PERMEABILITY: The capacity of a porous rock, soil or sediment for transmitting a fluid without damage to the structure of the medium.

PERSISTENCE: As applied to chemicals, those which are very stable and remain in the environment in their original form for an extended period of time.

PD-680: Cleaning solvent.

pH: Negative logarithm of hydrogen ion concentration.

PL: Public Law.

POL: Petroleum, oils and lubricants.

POLLUTANT: Any introduced gas, liquid or solid that makes a resource unfit for a specific purpose.

POLYCYCLIC COMPOUND: All compounds in which carbon atoms are arranged into two or more rings, usually aromatic in nature.

POTASSIUM HYDROXIDE: Corrosive material, usually liquid, used for cleaning purposes.

POTENTIOMETRIC SURFACE: The surface to which water in an aquifer would rise in tightly cased wells open only to the aquifer.

PPB: Parts per billion by weight.

PPM: Parts per million by weight.

PRAMITOL: Herbicide.

PRECIPITATION: Rainfall.

PURPLE K: A bicarbonate-based fire extinguishing agent.

QUATERNARY MATERIALS: The second period of the Cenozoic geologic era, following the Tertiary, and including the last 2-3 million years.

RCRA: Resource Conservation and Recovery Act.

RECEPTORS: The potential impact group or resource for a waste contamination source.

RECHARGE AREA: A surface area in which surface water or precipitation percolates through the unsaturated zone and eventually reaches the zone of saturation. Recharge areas may be natural or man-made.

RECHARGE: The addition of water to the groundwater system by natural or artificial processes.

SAC: Strategic Air Command.

SANITARY LANDFILL: A land disposal site using an engineered method of disposing solid wastes on land in a way that minimizes environmental hazards.

SATURATED ZONE: That part of the earth's crust in which all voids are filled with water.

SATAF: Site Activation Task Force.

SAX'S TOXICITY: A rating method for evaluating the toxicity of chemical materials.

SCS: U.S. Department of Agriculture Soil Conservation Service.

SEISMICITY: Pertaining to earthquakes or earth vibrations.

SMS: Strategic Missile Squadron.

SMW: Strategic Missile Wing.

SODIUM CHROMATE: Liquid used in refrigeration/air conditioning machines, contains toxic chromium.

SOLID WASTE: Any garbage, refuse, or sludge from a waste treatment plant, water supply treatment, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, or agricultural operations and from community activities, but does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges which are point source subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 USC 880); or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (68 USC 923).

SPG: Security Police Group.

SPILL: Any unplanned release or discharge of a hazardous waste onto or into the air, land, or water.

SPS: Security Police Squadron.

STORAGE OF HAZARDOUS WASTE: Containment, either on a temporary basis or for a longer period, in such a manner as not to constitute disposal of such hazardous waste.

STP: Sewage Treatment Plant.

SUPS: Supply Squadron.

SVS: Services Squadron.

TCE: Trichloroethylene.

TCHTW: Technical Training Wing.

TDS: Total Dissolved Solids, a water quality parameter.

TOC: Total Organic Carbon.

TOXICITY: The ability of a material to produce injury of disease upon exposure, ingestion, inhalation, or assimilation by a living organism.

TRANSMISSIVITY: The rate at which water is transmitted through a unit width of aquifer under a unit hydraulic gradient.

TREATMENT OF HAZARDOUS WASTE: Any method, technique, or process including neutralization designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize the waste or so as to render the waste nonhazardous.

TRNS: Transportation Squadron.

TSD: Treatment, storage or disposal.

TSDF: Treatment, storage or disposal facility.

TTG: Technical Training Group.

TVOR: Tactical Very-high-frequency Omnidirectional Range, a ground-based radio transmitter for aircraft navigation.

UPGRADIENT: In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of groundwater.

UREA: Solid, toxic in high doses, used as a combination ground de-icer and fertilizer.

USAF: United States Air Force.

USAFSS: United States Air Force Security Service.

USDA: United States Department of Agriculture.

USFWS: United States Fish and Wildlife Service.

USGS: United States Geological Survey.

WATER TABLE: Surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere.

WWTP: Wastewater Treatment Plant.

APPENDIX B

CONTRACT DESCRIPTION OF WORK

ORDER FOR SUPPLIES OR SERVICES

PAGE 1 OF 21

2. PROC INSTRUMENT ID NO. (PIIN) F33615-83-D-4003	3. CALL/ORDER NO. 0012	4. DATE OF ORDER* 86AUG18	5. REQUISITION/PURCHASE REQUEST PROJECT NO. FY7624-86-01818	6. CERTIFIED FOR NATIONAL DEFENSE UNDER DO-S1
---	----------------------------------	-------------------------------------	---	---

Mark all packages & papers with this number.

DOC REG 2/DMS REG 1 RATING

7. ISSUED BY DEPARTMENT OF THE AIR FORCE AIR FORCE SYSTEMS COMMAND AERONAUTICAL SYSTEMS DIV/PMRSC WRIGHT-PATTERSON AFB OH 45433-6503 CONTRACT NEGOTIATOR: CAPT GLENNITH C. JOHNSON PHONE: (513)-255-3042	8. ADMINISTERED BY DCASMA BUFFALO 1103 FEDERAL BLDG. 111 WEST HURON ST. BUFFALO NY 14202-2392
--	---

9. CONTRACTOR NAME AND ADDRESS ECOLOGY AND ENVIRONMENT, INC. 195 SUGG ROAD BUFFALO NY 14225	10. MAIL INVOICES TO
11. DISCOUNT FOR PROMPT PAYMENT	

**MAILING DATE
SEP 30 1986
DUPLICATE ORIGINAL**

12A. PURCHASE OFFICE POINT OF CONTACT LRX/L72/LRX	13. PAYMENT WILL BE MADE BY DCASR BOSTON 495 SUMMER ST. BOSTON MA 02210-2184
---	--

14. TYPE CONTRACTOR J	15. SECURITY A. CLASS J B. DATE OF DD 284
---------------------------------	--

16. CONTRACT ADMINISTRATION DATA A. FAST PAY 0 B. CONTRACT TYPE (1) KIND (2) TYPE Y C. ABSTRACT RECIP ADP POINT D. SPL CONT PROVISIONS E. CONT ADMIN FUNC LMT	17. (RESERVED)	18. SVC/AGENCY USE	19. SURV CRIT C	20. TOTAL AMOUNT NOT-TO-EXCEED 53,706.00
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21. APPROPRIATION AND ACCOUNTING DATA A. ACTY U B. ACRN AA C. APPROPRIATION 5763010 D. LIMIT SUBHEAD	E. SUPPLEMENTAL ACCOUNTING CLASSIFICATION 116 4720 140000 070000 0000 78011F 595600	F. SUPPLEMENTAL ACCOUNTING CLASSIFICATION	G. SUPPLEMENTAL ACCOUNTING CLASSIFICATION	H. SUPPLEMENTAL ACCOUNTING CLASSIFICATION	I. SUPPLEMENTAL ACCOUNTING CLASSIFICATION	J. SUPPLEMENTAL ACCOUNTING CLASSIFICATION
---	---	---	---	---	---	---

22A. DELIVERY <input checked="" type="checkbox"/> X	B. NON-ODD CONTRACT NO. This delivery order is subject to instructions contained on this side of form only and is issued in accordance with and subject to terms and conditions of above numbered contract, or Non-ODD Contract No.
--	--

23. UNITED STATES OF AMERICA HOWARD E. MARKS JR. BY: NAME OF CONTRACTING/ORDERING OFFICER AND DATE 9/26/86	24. TOTAL	25. DIFFERENCES
---	-----------	-----------------

15 (CHECKED, AND NO 15 IF THIS 15 IS CHECKED), special provisions _____ and delivery as indicated. This purchase is required under authority of 10 USC 2304(a)(6) or as specified in the schedule if within the U.S. or its possessions or Puerto Rico; if otherwise, under 2304(a)(6).

25. QUANTITY ORDERED HAS BEEN
 INSPECTED RECEIVED ACCEPTED, AND CONFORMS TO THE CONTRACT EXCEPT AS STATED

26. SHIP NO.	27. D.O. VOUCHER NO.	29. INITIALS
--------------	----------------------	--------------

30. PAYMENT <input type="checkbox"/> COMPLETE <input type="checkbox"/> PARTIAL <input type="checkbox"/> FINAL	31. PAID BY	32. Amount Verified Correct For
--	-------------	---------------------------------

33. CHECK NUMBER	34. BILL OF LADING NO.
------------------	------------------------

35. I CERTIFY THIS AMOUNT IS CORRECT AND PROPER FOR PAYMENT	SIGNATURE AND TITLE OF CERTIFYING OFFICER
---	---

36. RECEIVED AT	37. RECEIVED BY	38. DATE RECEIVED	39. TOTAL CONTAINERS	40. S/R ACCOUNT NUMBER	41. S/R VOUCHER NO.
-----------------	-----------------	-------------------	----------------------	------------------------	---------------------

AFSC FORM AUG 80 700

*When used as a formal contract this will be the effective date.

AFSC-Andrew AFB Ms 188

PREVIOUS EDITION IS OBSOLETE.

**PART I SECTION B OF THE SCHEDULE
SUPPLIES LINE ITEM DATA**

1. PROC INSTRUMENT ID NO. (PIIN) **F33615-83-D-4003**
 2. SPIIN **0012**
 3. PAGE **3** OF **21**

4. ITEM NO. 0004	5. QUANTITY* 1	6. PURCH UNIT LO	7. UNIT PRICE \$ N	8. TOTAL ITEM AMOUNT* \$ N	13. CIRR
9. SCTY10. ACRN CLAS U AA	11. NSM N	12. FSCM AND PART NUMBER		16. SVC/AGENCY USE	
14. SITE CODES A.PGA B.ACP C.FOB D D D		15. HOUN CHEM ANALYSIS AND DATA			
17. PR/MIPR DATA FY7624-86-01818-0004		18. AUTHORIZED RATE A.PROGRESS PAY B.RECOUP % %	19. CONTRACT PERCENT FEE %	20. SVC ID NO.	21. ITEM/PROJ MGR FY7624
22. 1ST DISCOUNT A. B.DAYS %	23. 2ND DISCOUNT A. B.DAYS %	24. 3RD DISCOUNT A. B.DAYS %	25. NET DAYS	26. QUANTITY VARIANCE A. OVER B. UNDER %	27. TYPE CONTRACT %
29. DESCRIPTIVE DATA					

PERFORM CHEMICAL TESTS IAW THE TASK DESCRIPTION OF THIS ORDER AND SECTION C, THE DESCRIPTION/SPECIFICATIONS OF THE BASIC CONTRACT. SUBMIT DATA IAW ATTACHMENT# 1, THE CONTRACT DATA REQUIREMENTS LIST OF THE BASIC CONTRACT, AS IMPLEMENTED BY PARAGRAPH VI OF THE TASK DESCRIPTION.

4. ITEM NO.	5. QUANTITY*	6. PURCH UNIT	7. UNIT PRICE	8. TOTAL ITEM AMOUNT*	13. CIRR
9. SCTY10. ACRN CLAS	11. NSM	12. FSCM AND PART NUMBER		16. SVC/AGENCY USE	
14. SITE CODES A.PGA B.ACP C.FOB		15. HOUN			
17. PR/MIPR DATA		18. AUTHORIZED RATE A.PROGRESS PAY B.RECOUP	19. CONTRACT PERCENT FEE	20. SVC ID NO.	21. ITEM/PROJ MGR
22. 1ST DISCOUNT A. B.DAYS	23. 2ND DISCOUNT A. B.DAYS	24. 3RD DISCOUNT A. B.DAYS	25. NET DAYS	26. QUANTITY VARIANCE A. OVER B. UNDER	27. TYPE CONTRACT
29. DESCRIPTIVE DATA					

*REPRESENTS NET AMOUNT OF INCREASE/DECREASE WHEN MODIFYING EXISTING ITEM NO.

N = NOT APPLICABLE
 U = UNDEFINIZED
 NSP = NOT SEPARATELY PRICED

E = ESTIMATED
 - (IN QTY AND \$) = DECREASE
 + OR - (IN ITEM NO.) = ADDITION OR DELETION
 CIRR: CONTROLLED ITEM RPT RGMT

SITE CODES:
 S = SOURCE
 D = DESTINATION
 O = INTERMEDIATE

INSTALLATION RESTORATION PROGRAM
PHASE II - CONFIRMATION/QUANTIFICATION (STAGE 1)
Air Force Plant 38
Town of Porter, New York

I. DESCRIPTION OF WORK

The overall objective of the Installation Restoration Program (IRP) Phase II investigation is to assess potential contamination at past hazardous waste disposal and spill sites on Air Force installations. A series of staged field investigations may be required to meet this objective.

The intention of this staged investigation is to undertake a field and laboratory study at Air Force Plant 38, Town of Porter NY: (1) to confirm the presence or absence of contamination within the specified areas of investigation; (2) if possible, to determine the extent and degree of contamination and the potential for migration of those contaminants in the various environmental media; (3) to identify public health and environmental hazards of migrating pollutants based on state or Federal standards for those contaminants; and (4) to delineate additional investigations required beyond this stage to reach the Phase II objectives.

The Phase I IRP Report (mailed under separate cover) incorporates the background and description of the sites/zones for this task. To accomplish this survey effort, the contractor shall take the following actions:

A. General Requirements

1. Conduct a literature search of local hydrogeologic conditions to complement the Phase I Report (mailed under separate cover). Use this data to determine optimum well depth and locations. Include the pertinent literature search information in an appendix of the Final Report. Develop the literature search data using the following guideline:

a. Topographic data

b. Geologic data

(1) Structure

(2) Stratigraphy

(3) Lithology

c. Hydrogeologic data

(1) Location of all existing and abandoned wells, including observation wells, and springs, natural ponds and seepages, that occur on or off the installation within a one-mile radius of sites to be investigated

(2) Groundwater table and piezometric contours

- (3) Depth to groundwater
- (4) Surface and groundwater quality
- (5) Recharge, discharge and contributing areas
- (6) Geologic setting, yield and hydrographs of springs and natural seepages

d. Data on all existing and abandoned wells, to include observation holes, on or off the installation and within a one-mile radius of sites to be investigated

- (1) Location, depth, diameter, types of wells, and logs
- (2) Static and pumping water levels, hydrographs, yield, and specific capacity
- (3) Present and projected groundwater development and use
- (4) Corrosion, incrustation, well interference, and similar operation and maintenance problems
- (5) Observation well networks
- (6) Existing water sampling sites

e. Aquifer data

- (1) Type, such as unconfined, artesian, or perched
- (2) Thickness, depths, and formational designation
- (3) Boundaries
- (4) Transmissivity, storativity, and permeability
- (5) Specific retention
- (6) Discharge and recharge
- (7) Ground and surface water relationships
- (8) Aquifer models

f. Climatic data

- (1) Precipitation (total and net)
- (2) Evapotranspiration

2. Determine the areal extent of the sites by reviewing historical and current panchromatic and infrared aerial photography.

B. Technical Operations Plan

Immediately after the Notice To Proceed (NTP) for the delivery order, develop a Technical Operations Plan (TOP) based on the technical requirements specified in this task description. (See Sequence No. 19 or 20, Item VI below). Follow the TOP format (mailed under separate cover). Provide the TOP to the USAFOEHL within two weeks of the NTP.

C. Health and Safety

Comply with USAF, OSHA, EPA, state and local health and safety regulations regarding the proposed work effort. Use EPA guidelines for designating the appropriate levels of protection needed at the study sites. Prepare a written Health and Safety Plan for the proposed work effort and coordinate it directly with applicable regulatory agencies prior to commencing field operations. Provide an information copy of the Health and Safety Plan to the USAFOEHL after coordination with regulatory agencies. The Health and Safety Plan is specified in Sequence No. 7, Item VI below.

D. Soils Work

1. Determine the exact location of all soil borings and sediment sampling locations during the planning/mobilization phase of the field investigation. Consult with Plant personnel to minimize disruption of Plant activities, to properly position sampling site locations, and to avoid underground utilities. Direct the sampling and maintain a detailed log of the conditions and materials penetrated during the course of the work.

2. Soil Borings

a. Conduct a maximum of 26 soil borings not to exceed a total of 80 linear feet. Accomplish the borings using hand or power auger techniques.

b. Scan all soil borings with a photoionization meter or equivalent organic vapor detector. Include monitoring results in the boring logs. If soils encountered during borehole drilling is suspected to be hazardous because of abnormal discoloration or air monitoring levels containerize the soil samples in new unused drums. Enter into the boring logs the depths from which suspected contaminated soils were collected for containerization. Collect a maximum of six composite samples one from each drum. Test each composited sample for EP Toxicity (metals). Use RCRA criteria to determine if soil cuttings must be classified as hazardous waste (40 CFR 261.24, RCRA).

c. During the soil boring operations, describe lithologies encountered and prepare stratigraphic logs. Place special emphasis on field identification of contaminated soils encountered.

d. Whenever possible, measure water levels in all boreholes after the water level has stabilized. Examine the water surface for the presence of hydrocarbons. Include this information in the boring logs.

e. Tremie-grout all boreholes to the surface with bentonite. It is especially important to insure that they be adequately resealed to preclude future migration of contaminants.

f. Permanently mark each location where soil borings are drilled. Record the location on a project map for each specific site or zone, whichever is applicable.

3. Well Cleanup

a. Remove all cuttings, soil borings and soil samples and clean the general area following the completion of each well.

b. Containerize and accumulate well cuttings and soil borings suspected of being contaminated according to paragraph I.D.2 of this order.

c. Label and transport these drummed wastes to a location designated by the Plant POC.

d. Transport the drummed wastes determined to be hazardous to a disposal site approved by appropriate state and federal regulatory agencies.

e. ASD/PMD is the generator of these hazardous wastes and will sign the manifest and track and report the disposal of these hazardous wastes.

E. Decontamination Procedures

1. Decontaminate all sampling equipment, including internal components, prior to use and between samples to avoid cross contamination. Wash equipment with a laboratory-grade detergent followed by drinking quality water, solvent (methanol), and distilled water rinses. Allow sufficient time for the solvent to evaporate and the equipment to dry completely before reuse.

2. Thoroughly clean and decontaminate the boring and sampling tools before initial use and after each sampling operation. As a minimum, steam clean each auger and sampling device after each use.

F. Field Sampling

1. Strictly comply with the sampling techniques, maximum holding times, and sample preservation as specified in the following references: Standard Methods for the Examination of Water and Wastewater, 16th Edition (1985), pages 37-44; ASTM, Section 11, Water and Environmental Technology; Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 2nd Edition (USEPA, 1984); Methods for Chemical Analysis of Waters and Wastes, EPA Manual 600/4-79-020, pages xiii to xix (1983); and the Handbook for Sampling and Sample Preservation of Water and Wastewater, EPA Document 600/4-82-029 (1982).

2. For surface water/sediment samples, collect one surface water sample and one sediment sample at each sample location specified. Collect samples so as not to cause cross-contamination; obtain downstream samples first, and obtain the water sample at each location before the sediment sample. Measure, on site, the pH, temperature, and specific conductance for all water samples. Permanently mark the location on a project map for each specific site or zone, whichever is applicable.

3. Split all water and soil samples. Analyze one set and immediately ship the other set (the same collection day) to:

USAFOEHL/SA
Bldg 140
Brooks AFB TX 78235-5501

For all split samples sent to the USAFOEHL, complete an AF Form 2752A "Environmental Sampling Data" and/or an AF Form 2752B "Environmental Sampling Data - Trace Organics", (working copies will be provided under separate cover) with the following information:

- a. Date and time collected
- b. Purpose of sample (analyte and sample group)
- c. Installation name (base)
- d. Sample number (on containers)
- e. Source/location and depth of sample
- f. Contract Task Numbers and Title of Project
- g. Method of collection (bailer, suction pump, air-lift pump, etc.)
- h. Volumes removed before sample taken (well samples only)
- i. Special Conditions (use of surrogate standard, etc.)
- j. Preservatives used
- k. Collector's name or initials

In addition, label each sample container with a permanent ink pen (laundry marker) to reflect the data in a, b, c, d, j and k above.

6. For every 10 field samples collected, take at least one additional sample (a field duplicate) for quality control purposes. Table 1 provides a 10% allowance for these additional analyses. Duplicates shall be indistinguishable from other analytical samples such that personnel performing the analyses are not able to determine which samples are duplicates.

7. For every 20 field water samples collected, prepare and submit for analysis one field blank for all parameters analyzed in water. A minimum of one field blank for each parameter is required. Allowances for these additional analyses are included in Table 1.

8. Maintain chain-of-custody records for all samples, field blanks, and quality control samples.

G. Chemical Analyses

1. Analyze water and soil samples collected as specified in Section H below, Specific Actions. The analytical parameters are summarized in Table 1 along with the required methods.

2. All analyses shall meet the required limits of detection for the applicable EPA method identified in Table 1.

3. For those methods which employ gas chromatography (GC) as the analytical technique (E601, E602, SW8010, SW8020) positive confirmation of identity is required for all analytes having concentrations higher than the Method Detection Limit (MDL). Conduct positive confirmation by second-column GC; however, gas chromatography/mass spectroscopy (GC/MS) can be used for positive confirmation if the quantity of each analyte to be confirmed is above the detection level of the GC/MS instrument. Analytes which cannot be confirmed will be reported as "Not Detected" in the body of the report, but results of all second-column GC or GC/MS confirmational analyses are to be included in the report appendix along with other raw analytical data. Base the quantification of confirmed analytes on the first-column analysis. The maximum number of second-column confirmational analyses shall not exceed fifty percent (50%) of the actual number of field samples (to include duplicates). The total number of samples for each GC method listed in Table 1 includes this allowance. If GC/MS, or a combination of second-column GC and GC/MS, is used, the total cost of all such analyses for a particular parameter shall not exceed the funding allowed for positive confirmation using only second-column GC.

4. All chemical/physical analyses shall conform to state and other applicable Federal and local regulatory agency legal requirements. If a regulatory agency specifies that a type of analysis be performed in a certified laboratory, assure compliance with the requirement and furnish documentation showing laboratory certification with the first analytical data supplied to the USAFOEHL/TS.

5. Archive all raw data, including QA/QC and standards data, for not less than five years after project completion. Supply these data to the USAFOEHL/TS upon request.

H. Specific Site Work

In addition to items delineated in I.A. through I.G. above, conduct the following specific actions at the sites listed below:

1. General Drainage Ditches

a. Collect water sample, either by hand or by use of a Wheaton sampler, and a sediment sample at a depth of 1 foot using a split spoon sampler at the following locations:

- (1) central drainage ditch downstream of the dam - Site 1(a);
- (2) central drainage ditch upstream of the intersection of magazine ditch and central ditch - Site 1(b);
- (3) magazine ditch upstream of the dam - Site 1(c);
- (4) magazine ditch upstream of the first intersection with any ditch on the plant - Site 1(d);
- (5) railroad ditch upstream close to Balmer Road - Site 1(e);
- (6) Six Mile Creek at the boundary of the plant - Site 1(f).

b. At each sampling location, the water depth, temperature, and pH will be measured and recorded. The water and sediment samples will be analyzed for the primary metals, petroleum hydrocarbons, volatile halocarbons, nitrates, fluorides and volatile hydrocarbons using the methods specified in Table 1.

2. Salvage Yard and Container Storage Area Drainage Ditches

a. Collect a soil/sediment sample using a split spoon sampler at a depth of 1 foot at the following locations:

- (1) In the drainage ditch downstream of the salvage yard - Site 2(a).
- (2) In the drainage ditch downstream of the discharge point of the pipe from the container storage area - Site 2(b).

b. The composition and color of the samples will be noted in the field logbook.

c. The composited soil/sediment samples taken at each location will be analyzed for the primary metals, volatile halocarbons and volatile aromatics using the methods specified in Table 1.

3. Burn Pits

a. Collect 4 soil samples at a depth of 1 foot from each of these locations using a split spoon sampler and composite the 4 samples taken at each site for analysis:

- (1) The "C" Street burn pit - Site 3(a).

(2) The salvage yard burn pit - Site 3(b).

b. The color and composition of each sample shall be noted in the field logbook. The composited samples at each location shall be analyzed for the primary metals, volatile halocarbons and volatile aromatics using the methods specified in Table 1.

4. Maintenance, Laboratory and Flush Building Drainage Ditches

a. Collect a water sample from the magazine ditch by submerging the sampler at a location below the point where the building drainage ditch discharges into the magazine ditch, Site 4(a). This sample will be analyzed for the primary metals, nitrate, fluoride, petroleum hydrocarbons, volatile halocarbons and volatile aromatics using the tests specified in Table 1.

b. Collect soil/sediment sample at a depth of 1 foot at the following locations using a split spoon sampler:

(1) drainage ditch adjacent to the buildings - Site 4(b).

(2) magazine ditch at a point below the discharge of the drainage ditch - Site 4(c).

c. The composition and color of each sample will be noted in field logbook. The soil/sediment samples will be analyzed for primary metals, petroleum hydrocarbons, volatile hydrocarbons and volatile aromatics using the methods specified in Table 1.

5. Fuel Storage Tanks and Electrical Transformers

Locate, inspect, and identify all fuel tanks, Site 5(a), and electrical transformers, Site 5(b). The identification shall provide the size, condition and percentage of each fuel storage tank that is underground. The identification shall include the location, size, and condition of each transformer. The inspection will note whether the transformers are properly labeled and whether there are oil stains under the transformer. A sample of oil will be taken from one transformer and the sample will be analyzed for PCBs using the test method specified in Table 1.

6. Incinerator and Incinerator Pad

a. Scrape the interior surface of the incinerator, Site 6(a), above the burning zone and analyze the sample for hydrazine and isopropyl alcohol.

b. Scrape the top surface of the incinerator pad, Site 6(b) and analyze the samples for hydrazine and isopropyl alcohol.

c. Using a six inch auger, drill a 5-foot deep soil boring at the center of each of the four sides of the incinerator pad, Site 6(c). Locate each soil boring 2-feet from the edge of the pad. Secure a soil sample at the

1-foot depth and at the 5-foot depth from the four borings using a split-spoon sampler. Analyze the eight soil samples for petroleum hydrocarbons, volatile halocarbons and volatile hydrocarbons, hydrazine and isopropyl alcohol using the test methods specified in Table 1.

7. Site 7. Container Storage Pad and Surrounding Soils.

a. Scrape the top surface of the container storage pad Site 7(a), and analyze the samples for Total Organic Carbons (TOC), Total Organic Halides (TOX), primary metals, volatile hydrocarbons and volatile halocarbons using the test methods specified in Table 1.

b. Using a six inch auger drill a 5-foot deep soil boring at the center of each of the four sides of the container storage pad Site 7(b). Locate each soil boring 2-feet from the edge of the pad. Secure a soil sample at the 1-foot depth and at the 5-foot depth from the four borings using a split-spoon sampler. Analyze the eight soil samples for petroleum hydrocarbons, Total Organic Carbons (TOC), Total Organic Halides (TOX), primary metals, volatile hydrocarbons and volatile halocarbons using the test methods specified in Table 1.

I. Data Review

1. Tabulate field and analytical laboratory results, including field and laboratory parameters and QA/QC data, as they become available and incorporate them into the next monthly R&D Status Report (Sequence No. 1, Item VI below) forwarded to the USAFOEHL. In addition to the results, report the following:

- a. the time and dates of sample collection, extraction (if applicable) and analysis;
- b. the method used and Method Detection Limits achieved;
- c. the chain-of-custody forms;
- d. a cross-reference of laboratory sample numbers and field sample numbers; and
- e. a cross-reference of field sample numbers to wells, boreholes, sites, etc.

2. Upon completion of all analyses, tabulate and incorporate all results into an Informal Technical Information Report (Sequence No. 3, Item VI below) and forward the report to USAFOEHL for review a minimum of two weeks prior to submission of the draft report. Provide as a minimum the information specified in I.I.1 above.

3. Immediately report to the USAFOEHL Program Manager or his supervisor via telephone, data/results generated during this investigation which indicate a potential health risk (for example, a contaminated drinking water aquifer). Follow the telephone notification with a written notice

within three days; attach a copy of the laboratory raw data (i.e., chromatogram).

J. Reporting

1. Prepare a draft report delineating all findings of this field investigation and forward it to the USAFOEHL (as specified in Sequence No. 4, Item VI below) for Air Force review and comment. Strictly adhere to the USAFOEHL report format (mailed under separate cover). The format is an integral part of this delivery order. Draft reports are considered "drafts" only in the sense that they have not been reviewed and approved by Air Force officials. In all other respects, "drafts" must be complete, in the proper format, and free of grammatical and typographical errors. Include as a minimum, discussion of the regional/site specific hydrogeology, well and boring logs, data from water level surveys, groundwater surface and gradient maps, water quality and soil analysis results, available geohydrologic cross sections, and laboratory and field QA/QC information. For state's requiring the field work or technical effort be supervised by a state registered geologist, engineering geologist or professional engineer, insert this information in the report to include registration numbers, certificates and seals (as appropriate).

2. Review the Results, Conclusions and Recommendations concerning the sites listed in this task which were investigated during a previous IRP Phase II staged work effort. Use this information and data from previous efforts to establish trends and develop conclusions and recommendations. Integrate all investigative work done at each site to date so the report reflects the total cumulative information for each site studied in this effort.

3. In the Results section, include water and soil analytical results and field quality control sample data. Report all internal laboratory quality control data (lab blanks, lab spikes and lab duplicates) and laboratory quality assurance information in an appendix of the report. Also provide second-column confirmation results and quantities, and include which columns were used, instrument operating conditions, and retention times. Summarize in the appendix the specific collection technique, analytical method (Standard Methods, EPA, etc.), holding time, and limit of detection for each analyte .

4. Make estimates of the magnitude, extent and direction which detected contaminants are moving. Identify potential environmental consequences of the discovered contaminants based upon state or Federal standards.

5. Plot and map all field data collected for each site according to surveyed positions.

6. In the Recommendation section, address each site and list them by category:

a. Category I consists of sites where no further action (including remedial action) is required. Data for these sites are considered sufficient to rule out unacceptable public health or environmental hazards.

b. Category II sites are those requiring an additional Phase II effort to determine the direction, magnitude, rate of movement and extent of detected contaminants. Identify potential environmental consequences of discovered contamination.

c. Category III sites are those that will require remedial action (ready for IRP Phase IV). In the recommendations for Category III sites, include any possible influence on sites in Categories I and/or II due to their connection with the same hydrological system. Clearly state any dependency between sites in different categories. Include a list of candidate remedial action alternatives, including Long Term Monitoring (LTM) as remedial action, and the corresponding rationale that should be considered in selecting the remedial action for a given site. List all alternatives that could potentially bring the site into compliance with environmental standards. For contaminants that do not have standards, EPA recommended safe levels for noncarcinogens (Health Advisory or Suggested-No-Adverse-Response Levels) and target levels for carcinogens (1×10^{-6} cancer risk level) may be used. Unless specifically requested, do not perform any cost analyses, or cost/benefit review for remedial action alternatives. However, in those situations where field survey data indicate immediate corrective action is necessary, present specific, detailed recommendations.

For each category above, summarize the results of field data, environmental or regulatory criteria, or other pertinent information supporting conclusions and recommendations. Reduce this summary information into a table (or tables) and insert it (them) into the text and the Executive Summary.

7. Provide cost estimates by line item for future efforts recommended for Category II sites and LTM Category III sites. Submit these estimates concurrently with the approved final technical report in a separate document. Only the cost requirements outlined in Sequence No. 2, Item VI, need be submitted.

a. For Category II sites, develop detailed site-specific estimates using prioritized costing format (i.e., cost of conducting the required work on: the highest priority site only; the first two highest priority sites only; the first three highest priority sites only; etc., until all required work is discretely costed) for the proposed work effort. The Air Force determines the priority of sites from contractor recommendations. Consider the type of contaminants, their magnitude, the direction and rate of their migration, and their subsequent potential for environmental and health consequences when developing recommendations for site prioritization.

b. For Category III sites slated for long term monitoring, develop site specific estimates which detail the costs associated with: (1) permanent installation of monitoring wells; (2) ground water sampling interface equipment, including permanent installation of pumps and sampling lines; and (3) four quarterly (1 year period) sample collections and laboratory chemical analyses of ground water, etc.

8. Provide an inventory of all on-base wells, to include production, irrigation, monitoring, etc. If the well has been abandoned, note the reason.

9. Reference in an appendix any local, state and/or Federal regulations which require specific well drilling techniques, materials, well development, plugging, and sampling methods as specified in this work effort.

K. Meetings

The contractor's project leader shall attend 3 meeting(s) to take place at a time to be specified by the USAFOEHL. Each meeting shall take place at Air Force Plant 38, Town of Porter, New York for a duration of one eight-hour day.

II. SITE LOCATION AND DATES:

Air Force Plant 38, Town of Porter New York
Date to be established

III. PLANT SUPPORT: (1) ASD/PMD will provide support to the Plant in accordance with the letter from ASD/PMD, Appendix 1.

IV. GOVERNMENT FURNISHED PROPERTY: None

V. GOVERNMENT POINTS OF CONTACT:

- | | |
|---|---|
| 1. USAFOEHL Technical Program Manager
James W. Better
USAFOEHL/TSS
Brooks AFB TX 78235-5501
(512) 536-2158
AUTOVON 240-2158/2159
1-800-821-4528 | 2. MAJCOM Monitor
Col Marlan J. Humerickhouse
HQ AFSC/SGPB
Andrews AFB DC 20334-5000 |
| 3. ASD Monitor
Lt Peter Reynolds
ASD/PMDA
Wright-Patterson AFB OH 45433-6503 | |

VI. In addition to sequence numbers 1, 5 and 11 listed in Attachment 1 to the contract, and which apply to all orders, the sequence numbers listed below are applicable to this order. Also shown are dates applicable to this order.

<u>Sequence No.</u>	<u>Para No.</u>	<u>Block 10</u>	<u>Block 11</u>	<u>Block 12</u>	<u>Block 13</u>	<u>Block 14</u>
19 (TOP)*	I.B.	OTIME	86 SEP 02	86 SEP 03	---	15
7 (Health & Safety)	I.C.	OTIME	86 SEP 02	86 SEP 03	---	3
3 (Prelim Data)	I.I.2	OTIME	**	**		3
4 (Tech. Rpt)	I.J.1.	ONE/R	87 JAN 30	87 FEB 27	87 DEC 31	***
2 (cost data)	I.J.7.	OTIME	87 FEB 27	87 DEC 31	---	****
14		MONTHLY	86 SEP 30	86 OCT 20	*****	3
15		MONTHLY	86 SEP 30	86 OCT 20	*****	3

*The Technical Operations Plans (TOP) required for this stage is due within two weeks of the Notice to Proceed.

**Upon completion of the total analytical effort and before submission of the first draft report.

***Two draft reports (25 copies of each) and one final report (50 copies plus the original camera ready copy) are required. Incorporate Air Force comments into the second draft and final reports as specified by the USAFOEHL. Supply the USAFOEHL with an advance copy of the first draft, second draft, and final reports for acceptance prior to distribution. Distribute the remaining 24 copies of each draft report and 49 copies of the final report as specified by the USAFOEHL.

****Submit cost estimates (five copies) in a separately bound document with the Final Report only. Provide estimates for only those sites recommended for additional Phase II work (Category II) and Phase IV, Long Term Monitoring, (Category III).

*****Submit monthly hereafter.

TABLE 1
ANALYTICAL PROGRAM - AIR FORCE PLANT 38
TOWN OF PORTER NY

Test Method	1a	1b	1c	1d	1e	1f	2a	2b	3a	3b	4a	4b	4c	5a	5b	6a	6b	6c	7a	7b	QA/QC	2nd Col	Total
Liquid Depth-In	1	1	1	1	1	1	1	1			1	1	1	1									42
Temperature of	1	1	1	1	1	1																	7
Specific Conductance	1	1	1	1	1	1					1	1											7
pH	1	1	1	1	1	1					1	1											7
Volatille Halocarbons																							
Water	1	1	1	1	1	1																	12
Soil/Sediment	1	1	1	1	1	1	1	1	1	1	1	1	1	1		8	1	8			3	2	63
																							459
Volatille Aromatics																							
Water	1	1	1	1	1	1																	12
Soil/Sediment	1	1	1	1	1	1	1	1	1	1	1	1	1	1		8	1	8			1	4	36
Petroleum Hydrocarbons																							
Water	1	1	1	1	1	1																	12
Soil/Sediment	1	1	1	1	1	1	1	1	1	1	1	1	1	1		8	1	8			1	4	36
Primary Metals																							
Water	1	1	1	1	1	1																	8
As	1	1	1	1	1	1																	8
Hg	1	1	1	1	1	1																	8
Se	1	1	1	1	1	1																	8
Soil/Sediment	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	8				3	3	30
Toxicity																							
PCBs																							
E608															1								2
Fluorides	1	1	1	1	1	1																	
(WATER SOIL/SED.)	1	1	1	1	1	1																	
% Nitrobenzene																							
				</																			

TABLE 1 Cont'd
ANALYTICAL PROGRAM - AIR FORCE PLANT 38
TOWN OF PORTER NY

Test Method	1a	1b	1c	1d	1e	1f	2a	2b	3a	3b	4a	4b	4c	5a	5b	6a	6b	6c	7a	7b	QA QC	2nd Col	Total
Nitrates WRITEL Soil/SED	1	1	1	1	1	1					1										1		8
Hydrazine Hach: A	1	1	1	1	1	1					-										1		7
ASTM MOIW 148-1																1	1	8			1		11
Total Organic Carbons E415.1																			1	8	1		10
Total Organic Halides SW5030 SW9020																			1	8	1		10
Isopropyl Alcohol Flash Point																1	1	8			1		11

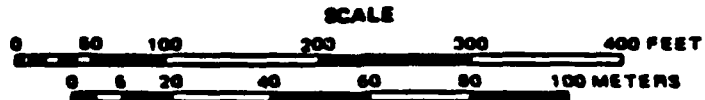
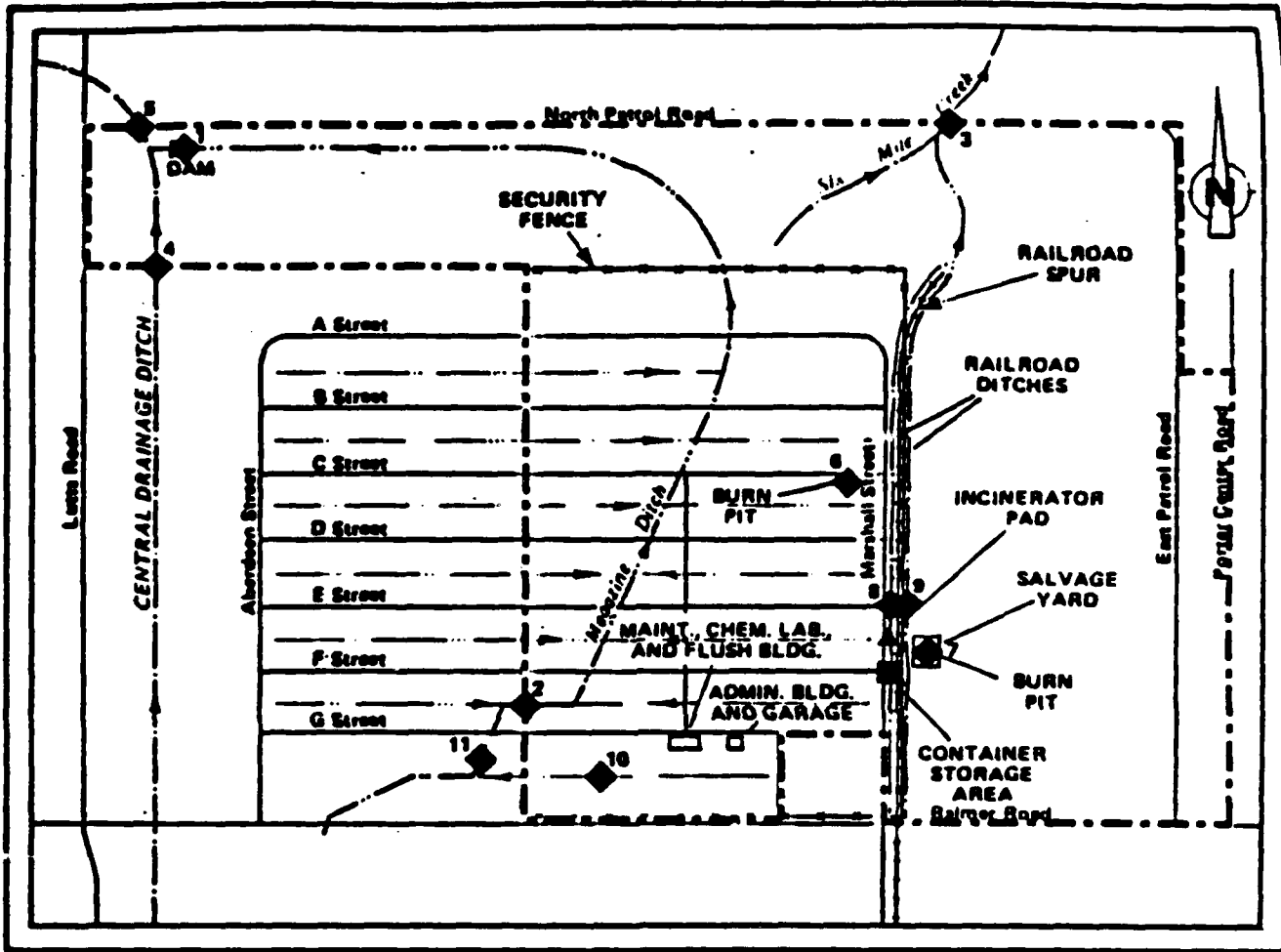


Figure 4-1 SAMPLING LOCATIONS



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AERONAUTICAL SYSTEMS DIVISION (AFSC)
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433-8503

fp3013-83-D-4003/0012

Page 20 of 21

ATTN OF: PMDA

SUBJECT: Plant Support, Installation Restoration Program (IRP)

TO: OEHL/TSS
Brooks AFB TX 78235-5000

1. The plant will provide the following support for services and materials for the IRP at Air Force Plant 38:
 - a. Personnel identification badges and vehicle passes and/or entry permits.
 - b. A staging area for storage of equipment and supplies.
 - c. A supply of potable water to be used in borehole flushing, equipment cleaning, etc.
 - d. An area where drilling equipment can be cleaned and decontaminated. Water and electrical hook-ups will be provided if possible.
 - e. Access to a telephone for use by the contractor. Contractor shall pay for any long distance telephone calls made by his personnel from this phone.
 - f. Provide engineering site plans, drawings, diagrams, aerial photographs, etc., to be used by the contractor to locate underground utilities affecting the sites to be investigated. The contractor shall return these data items to the plant upon completion of the field work.
2. Hazardous wastes generated by the investigation (drill cuttings, cleaning fluids) shall be properly stored at the site or in specified accumulation areas. Determination of the waste to be hazardous and disposal of any hazardous waste shall be done within ninety (90) days of generation (accumulation into barrels). Disposal of waste will be manifested by the Air Force and disposed of by the IRP contractor.
3. If you have any questions, contact Lt Peter Reynolds, AV 785-3076.

HAROLD H. HORN
Contracting Officer

B-21

BIRTHPLACE OF AVIATION

8 January 1987

Mr. Robert Marszalkowski
Ecology and Environment, Inc.
195 Dugy Road
P.O. Box D
Buffalo, New York 14225

Subject: Preliminary technical data Phase II Stage 1
IRP Air Force Plant 30: (T) Porter, Niagara
County, New York

1. Mr. Burris, DEHL consulting chemist
has reviewed the above noted data
and prepared comments for incorporation
in the draft report. These comments are attached.
2. Please incorporate these comments in
the report scheduled for delivery to
us by the end of January 1987.

James W. Better
JAMES W. BETTER
Technical Program Manager

8 Jan 87

REVIEW COMMENTS

Reference: R & D Status Report, dated 3 Dec 86, for Air Force Plant 38, Porter NY.

In general, Ecology & Environment did a nice job in reporting their analytical results. It was easy to check holding times and review the QA/QC data. I have just a few comments:

1. Sample Cross-reference U-4250: The field numbers listed do not correspond to those shown on the chain of custody form. It appears that E & E changed their field numbers after the samples were submitted. If so, they should explain why in a footnote.
2. U-4250: E & E did not submit a Sample Tracking Form for Holding Times for laboratory samples 8672 to 8678. They need to do so.
3. The E & E method 601 analyses excluded four chemical compounds: chlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, and 1,4-dichlorobenzene. These compounds were analyzed only under the method 602 protocol. There is apparently some misunderstanding with the laboratory about our requirements. We require the laboratory to analyze for all compounds listed by a method unless we specifically exclude some. Exclusions are made on a case-by-case basis. We want the chlorinated benzenes analyzed by both methods. This gives us a good quality control check on data. Also, method 602 can give false positives on the chlorinated benzenes when a sample contains high levels of petroleum hydrocarbons. The 601 method provides us with a means to eliminate these false positives. In the case of the analytical data in this report, false positives are not a problem since the chlorinated benzenes were non-detected in all samples. It is not necessary to resample. But all future E & E 601 analyses must include the chlorinated benzenes.
4. U-4236.1: The chain of custody form indicates that field samples GS-86-0001 and 0002 (lab numbers 8604 and 8605) should have been analyzed for fluoride. The laboratory did not do so, and I can understand why not. We normally do not analyze soil samples for fluoride. Was the analysis required by the SOW? or is the chain of custody form wrong?
5. U-4246.13: Analyses for Total Organic Carbon are reported as ">4%". This means that the values were greater than 40,000 mg/kg (ppm). We normally do not require this analysis to be run on soil samples, because all soil samples have some organic carbon. Did the contractor collect a background sample from some uncontaminated area so that a comparison could be made between these samples which appear to have high TOC and naturally occurring levels?

6. U-4246.11 to U-4246.13: Why did the laboratory report two different detection levels (0.05 and 0.01) for the hydrazine analyses? Also, what was the detection level for laboratory sample 8666 which shows a hydrazine concentration of 0.05 mg/kg? The detection level will be an important factor in determining how much significance should be placed in the 0.05 result.

Judith F. Burris

JUDITH F. BURRIS
Consulting Chemist

APPENDIX C

RAW FIELD DATA

Sample #	Site #	Sample Location	Color	Composition	Collection date	Comment
0002	39	"C" Street Bumpit	light brown	silty clay	10/3/86	None
0002	36	Salvage Yard Bumpit	light brown	silty clay	10/3/86	Composite sample
0003	2a	Drainage ditch downstream of Salvage Yard	light brown	silty clay w/ pebbles	10/3/86	Composite sample
0004	2b	Drainage ditch downstream of the Container Storage Area	light brown red	silty clay	10/3/86	None
~~~~~						
0006	4b	Maintenance Laboratory and Flush Building Drainage Ditches	brown	silty clay	10/3/86	None
0007	6c	West Side of Incinerator Pad	brown	Sand and gravel fill	10/6/86	1' deep
0008	6c	West Side of Incinerator Pad	brown	Sand and gravel fill	10/6/86	5' deep
0009	6c	East Side of Incinerator Pad	light brown	silty clay	10/6/86	1' deep
0019	6c	East Side of Incinerator Pad	light brown	silty clay	10/6/86	5' deep
0020	6c	North Side of Incinerator Pad	dark brown	silty clay w/ gravel	10/6/86	1' deep
0021	6c	North Side Incinerator Pad	light brown	silty clay w/ pebbles	10/6/86	5' deep
0022	6c	South Side Incinerator Pad	light brown	silty clay w/ pebbles	10/6/86	1' deep
0023	6c	South Side Incinerator Pad	reddish brown	Clayey silt w/ sand + pebbles	10/6/86	5' deep

Table 3-2 - Textural Description of Soil Samples

Sample #	Site #	Sample Location	Color	Composition	Collection date	Comments
0025	7B	Storage Pad South side of Container	dark grey	Clayey silt	10/6/86	<del>1' depth</del>
0026	7B	Storage Pad South side of Container	reddish brown	Loam	10/5/86	5' depth
0027	7B	Storage Pad West side of Container	grey and brown	Clayey silt	10/6/86	<del>1' depth</del>
0028	7B	Storage Pad West side of Container	light brown	silt	10/6/86	5' depth
0029	7B	Storage Pad North side of Container	brown and grey	silty clay	10/6/86	<del>1' depth</del>
0030	7B	Storage Pad North side of Container	brown	till	10/6/86	<del>1' depth</del>
0031	7B	Storage Pad East side of Container	Door Recovery	Door Recovery	10/6/86	<del>1' depth</del>
0032	7B	Storage Pad East side of Container	No recovery	No recovery	10/6/86	<del>1' depth</del>
0037	1c	Storage Pad North side of Container	grey	Sand fill	10/6/86	<del>1' depth</del>
0038	1d	Storage Pad North side of Container	Door Recovery	Door Recovery	10/6/86	<del>1' depth</del>
0039	1(f)	Storage Pad Boundary of Plant	grey brown	Sandy clay w/ pebbles	10/7/86	None
0040	1c	Storage Pad Magazine ditch upstream of Dam	brown	silty clay	10/7/86	None
0041	1a	Storage Pad Central drainage ditch downstream of Dam	light brown	silty clay	10/7/86	None
0042	1b	Storage Pad Central drainage ditch upstream of magazine ditch and central ditch intersection	dark grey	sandy clay	10/7/86	None

Table 3-2 - Textural Description of Soil Samples

* Check w/ Lab  
* May have sample

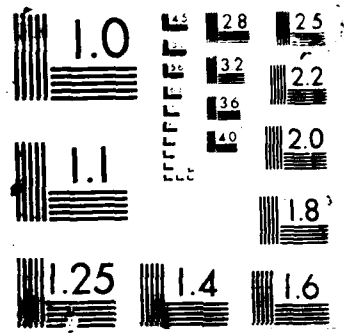
Get this! 1X  
Not listed in notes

What?

Sample #	Site #	Sample Location	Color	Composition	Collection Date	Comments
<del>0043</del>	4C	Magazine Ditch below discharge point of drainage ditch	red brown	clayey sand	11/7/86	none
<del>0035</del>	1e	Railroad ditch upstream	gray	sandy clay	10/7/86	Soil duplicate for sample 0037
<del>0033</del>	6C	close to Balmer Road	brown	1/4 pebbles		
<del>0031</del>		East side of Invention Pad	light brown	Silty clay	10/6/86	Soil duplicate for sample 0018
<del>0029</del>						
<del>0027</del>						
<del>0025</del>						
<del>0023</del>						
<del>0021</del>						
<del>0019</del>						
<del>0017</del>						
<del>0015</del>						
<del>0013</del>						
<del>0011</del>						
<del>0009</del>						
<del>0007</del>						
<del>0005</del>						
<del>0003</del>						
<del>0001</del>						

Table 3-2 - Textural Description of Soil Samples













# Incinerator Pad.

Boring #	Depth	Description
16	0-6"	Asphalt
	6"-2.5'	Fill: Crushed limestone, medium to large size, ^{with} small amount of coarse grain sand.
	2.5-5'	Sandy Clay - Clay, reddish brown, semi moist, pliable; sand, coarse grain.
18	0-2'	Sandy Clay - Clay, grayish black, moist, pliable, small amount of pebbles; sand, coarse grain.
	2-5'	Clay - reddish brown, semi moist, cohesive, very little sand.
	5'	gravel and water encountered
20	0-2.5'	Sandy Clay - Clay, dark grayish black, moist, pliable, small amount of sand and pebbles.
	2.5-5'	Clay - reddish brown, mottled with tanish gray, semi moist, pliable.
22	0-2.5'	same as boring # 20
	2.5-5'	same as boring # 20 with water at 5'

# Container Storage Area

Boring #	Depth	Description
25	0-2"	Asphalt
	2"-8"	Fill: crushed limestone, medium to large in size with small amount of coarse grain sand
	8"-4'	Sandy clay - clay, grayish black, semi moist, plastic; sand, coarse grain, grayish black.
	4'-5'	Clay - tannish brown, wet, plastic.
27	0-2"	Asphalt
	2"-6"	Fill: crushed limestone, medium to large in size.
	6"-3'	Sandy clay - clay - grayish black, moist, plastic. sand, coarse grain. water at 1'
	3'-5'	Clay - mottled - gray - tannish brown mixture, moist, cohesive
29	0-2"	} same as boring # 27
	2"-6"	
	6"-3'	
	3'-5'	
31	0-2"	} same as boring # 27
	2"-6"	
	6"-3'	
	3'-5'	

APPENDIX D

CHAIN OF CUSTODY FORMS







APPENDIX E

REFERENCES



## REFERENCES

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BELL AEROSPACE-TEXTRON PERSONNEL

<u>Name</u>	<u>Function for Contract</u>	<u>Address</u>
Andrew Bottaro	Former Chief Engineer at Site	Bell Aerospace-Textron P.O. Box 1, Mail Zone T.43 Buffalo, New York 14240-0001
Earl Kramer	Manager, Safety and Environmental	Bell Aerospace-Textron P.O. Box 1, Mail Zone T.43 Buffalo, New York 14240-0001
Clyde A. Willis	Plant Engineer	



KEYED 4/30/86

SEARCH NO: 9-X-0389  
PLAN DATE: 01/07/86

# ANNUAL INSPECTION

N.Y.S. DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
DIVISION OF AIR  
SOURCE NOT IN OPERATION  
INCINERATOR UNIT  
ACTION DUE NOTICE

293489 0374 00001 N R  
LOCATION FAC EP

CONFIDENTIAL STATUS  
APPLICATION STATUS  
DATE OF LAST CHARGING  
(13) PRIOR CO ISSUE DATE  
(14) PRIOR CO EXPIRATION DATE

CONFIDENTIAL STATUS  
APPLICATION STATUS  
DATE OF LAST CHARGING  
(13) PRIOR CO ISSUE DATE  
(14) PRIOR CO EXPIRATION DATE

FACILITY  
(6) BELL AEROSPACE CO  
(7) BALMER RD ADJ TO MARSHALL ST  
(8) PORTER (9)  
(10) REP: CLYDE WILLIS

OWNER  
(1) BELL AEROSPACE CO  
(2) PO BX 1  
(3) BUFFALO (4) NY  
(5) 14240

FACILITY EHS-CLASS / PGM-CODE: A2 POINT EHS-CLASS / PGM-CODE:

(41) UTH-E: 180.0 KM. (42) STACK HEIGHT: 21 FT. (43) EXIT VELOCITY: 16.00 FT/SEC  
(46) UTH-H: 794.2 KM. (47) INT ABV STRUC: 21 FT. (49) ICO FEE: 3721 (45) AGENCY-CODE-1:  
(51) GRND ELEV: 316 FT. (52) STK DIAM: 26 IN. (53) EXIT TEMP: 700 DEGR F (54) ICO CONDITIONS: 1 3 (50) AGENCY-CODE-2:  
(55) TYPE: 001 SINGLE CHAMBER (56) MFG: PRENCO MFG CO SE 3 20 (57) ENCOMP-ID: (58) FURN FEED: 09 OTHER  
(60) BLDG: AF PLANT 38 (61) FLOOR NAME: GRADE (59) SOURCE CODE: 8190 OTHER INCINERATOR  
(73) REFUSE TYPE: 9 (74) % TYPE 5: 99.99 % (75) CAPACITY: 140 LBS/HR (76) HOURS/DAY: 24.0 (77) % OP BY SEASON: 10 35 45 10  
(78) RADIOACTIVE: NO (79) % TYPE 6: % (80) INT CHARGED: 140 LBS/HR (81) DAYS/YEAR: 12 (62) RULE 1: 219.00 (63) RULE 2:  
(91) TYPE: 001 PRIMARY CHAMBER BURNER (92) MFG: PRENCO 10-018 (93) NO. OF UNITS: 1 (94) TEMP. ACTUATED: NO  
(103) TYPE: 099 NONE (95) FUEL TYPE: 60 MANUFACTURED GAS (96) RATED BURHER CAPACITY: 2500000.0 BTU/HR

AIR CONTAMINANTS PARTICULATES	CAS NUMBER (115) H7075-00-0 (116)	E M I S S I O N S UNIT (117) 01 (118) 09 (119)	% CONTROL EFFICIENCY (120) .001 (120)	HRLY ACTUAL LBS/HOUR (121)	ANNUAL EMISSIONS (LBS/YEAR)	
					ACTUAL	PERMISSIBLE
				.001 (122)	0 (123)	.001 (124)

(165) CONDITION 1. NCHD MUST BE NOTIFIED PRIOR TO NEXT START UP

(15) PRIOR COMMENTS (16) BY INGRASCI (17) DATE 02/06/84  
 (18) CURRENT COMMENTS (19) BY SALIMBENE (20) DATE 04/16/86  
 1. *1. 2. 3. 4. 5.*  
 2. *2. 3. 4. 5.*  
 3. *3. 4. 5.*  
 4. *4. 5.*  
 5. *5.*

(21) INSPECTION STATUS 8 #  
 (22) DATE OF NEXT ACTION / /



APPENDIX F  
ANALYTICAL DATA

Table F-1  
SAMPLE IDENTIFICATION CROSS REFERENCE

Site Number	Lab Number	Field Number	Description	Page
<u>Incinerator and Incinerator Pad</u>				
6(b)	8650	0013	Scrape sample, incinerator pad	F-3
6(c)	8651	0016	West boring, 0.5-1.5 ft.	F-3
6(c)	8652	0017	West boring, 4.5-5.5 ft.	F-3
6(c)	8653	0018	East boring, 0.5-1.5 ft.	F-3
6(c)	8654	0019	East boring, 4.5-5.5 ft.	F-3
6(c)	8655	0020	North boring, 0.5-1.5 ft.	F-3
6(c)	8656	0021	North boring, 4.5-5.5 ft.	F-3
6(c)	8657	0022	South boring, 0.5-1.5 ft.	F-3
6(c)	8658	0023	South boring, 4.5-5.5 ft.	F-3
6(c)	8666	0033	Duplicate sample, east boring, 0.5-1.5 ft.	F-4
<u>Container Storage Pad and Surrounding Soils</u>				
7(b)	8659	0025	South boring, 0.5-1.5 ft.	F-3
7(b)	8660	0026	South boring, 4.5-5.5 ft.	F-3
7(b)	8661	0027	West boring, 0.5-1.5 ft.	F-3
7(b)	8662	0028	West boring, 4.5-5.5 ft.	F-4
7(b)	8663	0029	North boring, 0.5-1.5 ft.	F-4
7(b)	8664	0030	North boring, 4.5-5.5 ft.	F-4
7(b)	8665	0032	East boring, 4.5-5.5 ft.	F-4
7(a)	8731	0015	Swab sample, container storage pad	F-27
7(b)	8667	0034	Duplicate, west boring, 0.5-1.5 ft.	F-4



**ecology and environment, inc.**  
**QUALITY ASSURANCE PROTOCOL REVIEW**

Job No.: 1-4240

Date: 11/3/86

Report Title: _____

Client: Section 9F13

Laboratory Data Review	Supervisor	Date
Metals	<i>[Signature]</i>	11-5-86
Gen. Chem.	<i>[Signature]</i>	11-18-86
GC	<i>[Signature]</i>	11-18-86
GC/MS	_____	_____
Micro, Asbestos	_____	_____
Other	_____	_____

Report Written by: *[Signature]* _____ 11/3/86

1st Draft Reviewed by: *[Signature]* _____ 11/17/86

2nd Draft Reviewed by: (If needed) _____

Final Review by Author: _____

ASC Manager: *[Signature]* _____ 11/21/86

QA Officer: *[Signature]* _____ 11/20/86

Corp. Project Manager: *[Signature]* _____ 11/20/86

All QA Protocol Review Forms Signed and in File (to be signed by report writer)

Copies of Report Sent to: *[Signature]* _____ 11/21/86

Invoices Sent to Accounting: *[Signature]* _____ 11/21/86

Comments/Notes: _____  
 _____  
 _____

Copy Distribution: White - Report to Project File; Canary - Project Manager; 407064  
 Pink - Project File.

SAMPLE IDENTIFICATION  
CROSS-REFERENCE

U-4246

Laboratory Number 86-	Field Number	Field Location
8650	0013	AP38-S0-006-GD-86-0013
8651	0016	AP38-S0-006-GS-86-0016
8652	0017	AP38-S0-006-GS-86-0017
8653	0018	AP38-S0-006-GS-86-0018
8654	0019	AP38-S0-006-GS-86-0019
8655	0020	AP38-S0-006-GS-86-0020
8656	0021	AP38-S0-006-GS-86-0021
8657	0022	AP38-S0-006-GS-86-0022
8658	0023	AP38-S0-006-GS-86-0023
8659	0025	AP38-S0-007-GS-86-0025
8660	0026	AP38-S0-007-GS-86-0026
8661	0027	AP38-S0-007-GS-86-0027

SAMPLE IDENTIFICATION  
CROSS-REFERENCE

U-4246.1

Laboratory Number 86-	Field Number	Field Location
8662	0028	AP38-S0-007-GS-86-0028
8663	0029	AP38-S0-007-GS-86-0029
8664	0030	AP38-S0-007-GS-86-0030
8665	0032	AP38-S0-007-GS-86-0032
8666	0033	AP38-S0-006-GS-86-0033
8667	0034	AP38-S0-007-GS-86-0034

SAMPLE TRACKING OF ANALYSES  
REQUIRING HOLDING TIMES

U-4246.2

Job	Sample Number	Sample Date	VOA(14)		FLUORIDE (28)		NITRATES (14)		PET HC (28)		TOC (28)	
			Dead	Anal	Dead	Anal	Dead	Anal	Dead	Anal	Dead	Anal
U-4246	8650	10/6	--	--	--	--	--	--	--	--	--	--
	8651	10/6	10/20	10/8	--	--	--	--	11/3	10/13	--	--
	8652	10/6	10/20	10/8	--	--	--	--	11/3	10/13	--	--
	8653	10/6	10/20	10/8	--	--	--	--	11/3	10/13	--	--
	8654	10/6	10/20	10/8	--	--	--	--	11/3	10/13	--	--
	8655	10/6	10/20	10/8	--	--	--	--	11/3	10/13	--	--
	8656	10/6	10/20	10/8	--	--	--	--	11/3	10/13	--	--
	8657	10/6	10/20	10/8	--	--	--	--	11/3	10/13	--	--
	8658	10/6	10/20	10/8	--	--	--	--	11/3	10/13	--	--
	8659	10/6	10/20	10/8	--	--	--	--	11/3	10/13	11/3	10/23
	8660	10/6	10/20	10/8	--	--	--	--	11/3	10/13	11/3	10/23
	8661	10/6	10/20	10/8	--	--	--	--	11/3	10/13	11/3	10/23
	8662	10/6	10/20	10/8	--	--	--	--	11/3	10/13	11/3	10/23
	8663	10/6	10/20	10/8	--	--	--	--	11/3	10/13	11/3	10/23
	8664	10/6	10/20	10/8	--	--	--	--	11/3	10/13	11/3	10/23
	8665	10/6	10/20	10/8	--	--	--	--	11/3	10/13	11/3	10/23
	8666	10/6	10/20	10/9	--	--	--	--	11/3	10/13	--	--
8667	10/6	10/20	10/9	--	--	--	--	11/3	10/13	11/3	10/23	

VOA Confirmation Date	
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

DEAD: Date sample holding time expires.  
 EXTR: Date sample was extracted.  
 ANAL: Date sample was analyzed.

ECOLOGY AND ENVIRONMENT'S, INC.  
ANALYTICAL SERVICES CENTER

RESULTS OF SOIL ANALYSIS FOR PRIORITY POLLUTANT  
PURGEABLE AROMATIC COMPOUNDS BY GC

(all results in mg/kg as received)

U-4246.3

Compound	E & E Lab. No. 86-	Blank	Blank	8651	8652	8653
	Sample Identity	10/8/86	10/9/86	0016	0017	0018
chlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0
1,2-dichlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0
1,3-dichlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0
1,4-dichlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0
benzene		<1.0	<1.0	<1.0	<1.0	<1.0
total xylenes		<1.0	<1.0	<1.0	<1.0	<1.0
toluene		<1.0	<1.0	<1.0	<1.0	<1.0
ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0

ECOLOGY AND ENVIRONMENT'S, INC.  
ANALYTICAL SERVICES CENTER

RESULTS OF SOIL ANALYSIS FOR PRIORITY POLLUTANT  
PURGEABLE AROMATIC COMPOUNDS BY GC

(all results in mg/kg as received)

U-4246.4

Compound	E & E Lab. No. 86-	8654	8655	8656	8657	8658
	Sample Identity	0019	0020	0021	0022	0023
chlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0
1,2-dichlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0
1,3-dichlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0
1,4-dichlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0
benzene		<1.0	<1.0	<1.0	<1.0	<1.0
total xylenes		<1.0	<1.0	<1.0	<1.0	<1.0
toluene		<1.0	<1.0	<1.0	<1.0	<1.0
ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0

ECOLOGY AND ENVIRONMENT'S, INC.  
ANALYTICAL SERVICES CENTER

RESULTS OF SOIL ANALYSIS FOR PRIORITY POLLUTANT  
PURGEABLE AROMATIC COMPOUNDS BY GC

(all results in mg/kg as received)

U-4246.5

Compound	E & E Lab. No. 86-	8659	8660	8661	8662	8663
	Sample Identity	0025	0026	0027	0028	0029
chlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0
1,2-dichlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0
1,3-dichlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0
1,4-dichlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0
benzene		<1.0	<1.0	<1.0	<1.0	<1.0
total xylenes		<1.0	<1.0	<1.0	<1.0	<1.0
toluene		<1.0	<1.0	<1.0	<1.0	<1.0
ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0

ECOLOGY AND ENVIRONMENT'S, INC.  
ANALYTICAL SERVICES CENTER

RESULTS OF SOIL ANALYSIS FOR PRIORITY POLLUTANT  
PURGEABLE AROMATIC COMPOUNDS BY GC

(all results in mg/kg as received)

U-4246.6

Compound	E & E Lab. No. 86-	8664	8665	8666	8667	
	Sample Identity	0030	0032	0033	0034	
chlorobenzene		<1.0	<1.0	<1.0	<1.0	
1,2-dichlorobenzene		<1.0	<1.0	<1.0	<1.0	
1,3-dichlorobenzene		<1.0	<1.0	<1.0	<1.0	
1,4-dichlorobenzene		<1.0	<1.0	<1.0	<1.0	
benzene		<1.0	<1.0	<1.0	<1.0	
total xylenes		<1.0	<1.0	<1.0	<1.0	
toluene		<1.0	<1.0	<1.0	<1.0	
ethylbenzene		<1.0	<1.0	<1.0	<1.0	



ECOLOGY AND ENVIRONMENT'S, INC.  
ANALYTICAL SERVICES CENTER

RESULTS OF SOIL ANALYSIS FOR  
PURGEABLE HALOCARBON COMPOUNDS BY GC  
(all results in mg/kg as received)

U-4246.7

Compound	E & E Lab. No. 86-	Blank	Blank	8651	8652	8653	8654
	Sample Identity	10/8/86	10/9/86	0016	0017	0018	0019
carbon tetrachloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-tetrachloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
chloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-chloroethylvinyl ether		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
chloroform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
methylene chloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
chloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
bromomethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
bromoform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
bromodichloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
fluorotrichloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
dichlorodifluoromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
chlorodibromomethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
tetrachloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
vinyl chloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

ECOLOGY AND ENVIRONMENT'S, INC.  
ANALYTICAL SERVICES CENTER

RESULTS OF SOIL ANALYSIS FOR  
PURGEABLE HALOCARBON COMPOUNDS BY GC  
(all results in mg/kg as received)

U-4246.8

Compound	E & E Lab. No. 86-	8655	8656	8657	8658	8659	8660
	Sample Identity	0020	0021	0022	0023	0025	0026
carbon tetrachloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-tetrachloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
chloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-chloroethylvinyl ether		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
chloroform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
methylene chloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
chloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
bromomethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
bromoform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
bromodichloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
fluorotrichloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
dichlorodifluoromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
chlorodibromomethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
tetrachloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
vinyl chloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

ECOLOGY AND ENVIRONMENT'S, INC.  
ANALYTICAL SERVICES CENTER

RESULTS OF SOIL ANALYSIS FOR  
PURGEABLE HALOCARBON COMPOUNDS BY GC  
(all results in mg/kg as received)

U-4246.9

Compound	E & E Lab. No. 86-	8661	8662	8663	8664	8665	8666
	Sample Identity	0027	0028	0029	0030	0032	0033
carbon tetrachloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-tetrachloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
chloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-chloroethylvinyl ether		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
chloroform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
methylene chloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
chloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
bromomethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
bromoform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
bromodichloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
fluorotrichloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
dichlorodifluoromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
chlorodibromomethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
tetrachloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
vinyl chloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

ECOLOGY AND ENVIRONMENT'S, INC.  
ANALYTICAL SERVICES CENTER

RESULTS OF SOIL ANALYSIS FOR  
PURGEABLE HALOCARBON COMPOUNDS BY GC  
(all results in mg/kg as received)

U-4246.10

	E & E Lab. No. 86-	8667					
Compound	Sample Identity	0034					
carbon tetrachloride		<1.0					
1,2-dichloroethane		<1.0					
1,1,1-trichloroethane		<1.0					
1,1-dichloroethane		<1.0					
1,1,2-trichloroethane		<1.0					
1,1,2,2-tetrachloroethane		<1.0					
chloroethane		<1.0					
2-chloroethylvinyl ether		<1.0					
chloroform		<1.0					
1,1-dichloroethene		<1.0					
trans-1,2-dichloroethene		<1.0					
1,2-dichloropropane		<1.0					
trans-1,3-dichloropropene		<1.0					
cis-1,3-dichloropropene		<1.0					
methylene chloride		<1.0					
chloromethane		<1.0					
bromomethane		<1.0					
bromoform		<1.0					
bromodichloromethane		<1.0					
fluorotrichloromethane		<1.0					
dichlorodifluoromethane		<1.0					
chlorodibromomethane		<1.0					
tetrachloroethene		<1.0					
trichloroethene		<1.0					
vinyl chloride		<1.0					



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**LABORATORY REPORT**

FOR

PORTER AIR FORCE BASE

U-4246.11

Job No.:	U-4246		RE:	DF-3000		
Sample Date:	10/6/86		P.O. No.:			
Date Received:	10/6/86		Sampled By:	E & E, Inc.		
Sample Type:	Soil		Delivered By:	E & E, Inc.		
E & E Lab. No. 86-	8650	8651*	8652*	8653	8654	8655
Customer No.	0013	0016	0017	0018	0019	0020
Sample Identity						
	Results in: mg/kg as received unless noted					
Ignitability, °F	No flash at 140	No flash at 140	No flash at 140	No flash at 140	No flash at 140.	No flash at 140
Hydrazine	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
Petroleum Hydrocarbons	NR	160	5500	13	<10	16
Solids, %	NR	97	97	77	78	81

NR: Not requested

*Rocky sample

Analytical References:

"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, Second Edition, U.S. EPA, 1982 and "American Society for Testing and Materials", 1985.

Supervising Analyst: John H. Kelly 1/10/85

Date: January 11, 1988



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International Specialists in the Environment

**LABORATORY REPORT**

FOR

PORTER AIR FORCE BASE

U-4246.12

Job No.:		U-4246		RE:		DF-3000	
Sample Date:		10/6/86		P.O. No.:			
Date Received:		10/6/86		Sampled By:		E & E, Inc.	
Sample Type:		Soil		Delivered By:		E & E, Inc.	
E & E Lab. No. 86-	8656	8657*	8658	8659	8660	8661	
Customer No.	0021	0022	0023	0025	0026	0027	
Sample Identity							
Results In: mg/kg as received unless noted							
Ignitability, °F	No flash at 140	No flash at 140	No flash at 140	NR	NR	NR	
Hydrazine	<0.01	<0.05	<0.01	NR	NR	NR	
Petroleum Hydrocarbons	<10	10	<10	130	<10	38	
Total Organic Carbon	NR	NR	NR	15,000	12,000	2560	
Total Organic Halides	NR	NR	NR	0.27	<0.06	0.22	
Solids, %	87	79	89	87	86	83	

NR: Not requested

*Rocky sample

Analytical References:

"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, Second Edition, U.S. EPA, 1982 and "American Society for Testing and Materials", 1985.

Supervising Analyst: John Haber / kgj

Date: January 11, 1987



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**LABORATORY REPORT**

FOR

PORTER AIR FORCE BASE

U-4246.13

Job No.:		U-4246		RE:		DF-3000	
Sample Date:		10/6/86		P.O. No.:			
Date Received:		10/6/86		Sampled By: E & E, Inc.			
Sample Type:		Soil		Delivered By: E & E, Inc.			
E & E Lab. No. 86-	8662	8663	8664	8665	8666	8667	
Customer No.	0028	0029	0030	0032	0033	0034	
Sample Identity							
Results In: mg/kg as received unless noted							
Ignitability, °F	NR	NR	NR	NR	No flash at 140	NR	
Hydrazine	NR	NR	NR	NR	0.05	NR	
Petroleum Hydrocarbons	2400	1900	1900	7900	10	120	
Total Organic Carbon	>4%	8520	>4%	>4%	NR	8560	
Total Organic Halides	0.07	0.09	0.35	0.14	NR	<0.06	
Solids, %	87	85	86	96	77	85	

NR: Not requested

Analytical References:

"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, Second Edition, U.S. EPA, 1982 and "American Society for Testing and Materials", 1985.

Supervising Analyst: Jerry Hahn / KAS  
Date: January 11, 1987



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**LABORATORY REPORT**

FOR

PORTER AIR FORCE BASE

U-4246.14

Job No.:	U-4246	RE:	DF-3000
Sample Date:	10/6/86	P.O. No.:	
Date Received:	10/6/86	Sampled By:	E & E, Inc.
Sample Type:	Soil	Delivered By:	E & E, Inc.

**RESULTS OF CHEMICAL ANALYSIS OF EXTRACTS FROM EP TOXICITY TESTS**

	mg/L						Maximum Allowable Concentration (mg/L)
	E & E Lab. No. 86-	8659	8660	8661	8662	8663	
Customer No.	0025	0026	0027	0028	0029	0030	
Sample Identity							
Arsenic	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5.0
Barium	<5	<5	<5	<5	<5	<5	100.0
Cadmium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.0
Chromium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5.0
Lead	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5.0
Mercury	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	0.2
Selenium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.0
Silver	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5.0
Endrin	NR	NR	NR	NR	NR	NR	0.02
Lindane	NR	NR	NR	NR	NR	NR	0.4
Methoxychlor	NR	NR	NR	NR	NR	NR	10.0
Toxaphene	NR	NR	NR	NR	NR	NR	0.5
2,4-D	NR	NR	NR	NR	NR	NR	10.0
2,4,5-TP (Silvex)	NR	NR	NR	NR	NR	NR	1.0

NR: Not requested.

Analytical References:

"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, Second Edition, U.S. EPA, 1982.

Supervising Analyst: Jay Hobbs 11/85

Date: November 18, 1984





**ecology and environment, inc.**

International Specialists in the Environment

**LABORATORY REPORT**

FOR

PORTER AIR FORCE BASE

U-4246.15

Job No.: U-4246	RE: DF-3000
Sample Date: 10/6/86	P.O. No.:
Date Received: 10/6/86	Sampled By: E & E, Inc.
Sample Type: Soil	Delivered By: E & E, Inc.

RESULTS OF CHEMICAL ANALYSIS OF EXTRACTS FROM EP TOXICITY TESTS

	mg/L				Maximum Allowable Concentration (mg/L)
E & E Lab. No. 86-	8665	8667	Blank		
Customer No.	0032	0034			
Sample Identity					
Arsenic	<0.5	<0.5	<0.5		5.0
Barium	<5	<5	<5		100.0
Cadmium	<0.1	<0.1	<0.1		1.0
Chromium	<0.5	<0.5	<0.5		5.0
Lead	<0.5	<0.5	<0.5		5.0
Mercury	<0.0008	<0.0008	<0.0008		0.2
Selenium	<0.5	<0.5	<0.5		1.0
Silver	<0.5	<0.5	<0.5		5.0
Endrin	NR	NR	NR		0.02
Lindane	NR	NR	NR		0.4
Methoxychlor	NR	NR	NR		10.0
Toxaphene	NR	NR	NR		0.5
2,4-D	NR	NR	NR		10.0
2,4,5-TP (Silvex)	NR	NR	NR		1.0

NR: Not requested.

Analytical References:

"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, Second Edition, U.S. EPA, 1982.

Supervising Analyst: Sam Hahn / KB  
 Date: November 18, 1986

QUALITY CONTROL FOR PRECISION  
RESULTS OF ANALYSIS OF REPLICATE  
ANALYSES OF SOIL SAMPLES

U-4246.16

Parameter	E & E Laboratory No. 86- 8659	(mg/kg)		Relative Percent Difference (RPD)
		Original Analysis	Replicate Analysis	
chlorobenzene		<1.0	<1.0	--
1,2-dichlorobenzene		<1.0	<1.0	--
1,3-dichlorobenzene		<1.0	<1.0	--
1,4-dichlorobenzene		<1.0	<1.0	--
benzene		<1.0	<1.0	--
total xylenes		<1.0	<1.0	--
toluene		<1.0	<1.0	--
ethyl benzene		<1.0	<1.0	--

QUALITY CONTROL FOR PRECISION  
 RESULTS OF ANALYSIS OF REPLICATE  
 ANALYSES OF SOIL SAMPLES

U-4246.17

Parameter	E & E Laboratory No. 86- 8664	(mg/kg)		Relative Percent Difference (RPD)
		Original Analysis	Replicate Analysis	
chlorobenzene		<1.0	<1.0	--
1,2-dichlorobenzene		<1.0	<1.0	--
1,3-dichlorobenzene		<1.0	<1.0	--
1,4-dichlorobenzene		<1.0	<1.0	--
benzene		<1.0	<1.0	--
total xylenes		<1.0	<1.0	--
toluene		<1.0	<1.0	--
ethyl benzene		<1.0	<1.0	--

QUALITY CONTROL FOR PRECISION  
 RESULTS OF ANALYSIS OF REPLICATE  
 ANALYSES OF SOIL SAMPLES

U-4246.18

Compound	E & E Laboratory No. 86-	(mg/kg)		Relative Percent Difference (RPD)
		Original Analysis	Replicate Analysis	
carbon tetrachloride	8659	<1.0	<1.0	--
1,2-dichloroethane	8659	<1.0	<1.0	--
1,1,1-trichloroethane	8659	<1.0	<1.0	--
1,1-dichloroethane	8659	<1.0	<1.0	--
1,1,2-trichloroethane	8659	<1.0	<1.0	--
1,1,2,2-tetrachloroethane	8659	<1.0	<1.0	--
chloroethane	8659	<1.0	<1.0	--
2-chloroethylvinyl ether	8659	<1.0	<1.0	--
chloroform	8659	<1.0	<1.0	--
1,1-dichloroethene	8659	<1.0	<1.0	--
trans-1,2-dichloroethene	8659	<1.0	<1.0	--
1,2-dichloropropane	8659	<1.0	<1.0	--
trans-1,3-dichloropropene	8659	<1.0	<1.0	--
cis-1,3-dichloropropene	8659	<1.0	<1.0	--
methylene chloride	8659	<1.0	<1.0	--
chloromethane	8659	<1.0	<1.0	--
bromomethane	8659	<1.0	<1.0	--
bromoform	8659	<1.0	<1.0	--
bromodichloromethane	8659	<1.0	<1.0	--
fluorotrichloromethane	8659	<1.0	<1.0	--
dichlorodifluoromethane	8659	<1.0	<1.0	--
chlorodibromomethane	8659	<1.0	<1.0	--
tetrachloroethene	8659	<1.0	<1.0	--
trichloroethene	8659	<1.0	<1.0	--
vinyl chloride	8659	<1.0	<1.0	--

QUALITY CONTROL FOR PRECISION  
RESULTS OF ANALYSIS OF REPLICATE  
ANALYSES OF SOIL SAMPLES

U-4246.19

Compound	E & E Laboratory No. 86-	(mg/kg)		Relative Percent Difference (RPD)
		Original Analysis	Replicate Analysis	
carbon tetrachloride	8664	<1.0	<1.0	--
1,2-dichloroethane	8664	<1.0	<1.0	--
1,1,1-trichloroethane	8664	<1.0	<1.0	--
1,1-dichloroethane	8664	<1.0	<1.0	--
1,1,2-trichloroethane	8664	<1.0	<1.0	--
1,1,2,2-tetrachloroethane	8664	<1.0	<1.0	--
chloroethane	8664	<1.0	<1.0	--
2-chloroethylvinyl ether	8664	<1.0	<1.0	--
chloroform	8664	<1.0	<1.0	--
1,1-dichloroethene	8664	<1.0	<1.0	--
trans-1,2-dichloroethene	8664	<1.0	<1.0	--
1,2-dichloropropane	8664	<1.0	<1.0	--
trans-1,3-dichloropropene	8664	<1.0	<1.0	--
cis-1,3-dichloropropene	8664	<1.0	<1.0	--
methylene chloride	8664	<1.0	<1.0	--
chloromethane	8664	<1.0	<1.0	--
bromomethane	8664	<1.0	<1.0	--
bromoform	8664	<1.0	<1.0	--
bromodichloromethane	8664	<1.0	<1.0	--
fluorotrichloromethane	8664	<1.0	<1.0	--
dichlorodifluoromethane	8664	<1.0	<1.0	--
chlorodibromomethane	8664	<1.0	<1.0	--
tetrachloroethene	8664	<1.0	<1.0	--
trichloroethene	8664	<1.0	<1.0	--
vinyl chloride	8664	<1.0	<1.0	--

QUALITY CONTROL FOR PRECISION  
 RESULTS OF ANALYSIS OF REPLICATE  
 ANALYSES OF EP TOXICITY EXTRACTS

U-4246.20

Parameter	E & E Laboratory No. 86-	(mg/L)		Relative Percent Difference (RPD)
		Original Analysis	Replicate Analysis	
Arsenic	8667	<0.5	<0.5	--
Barium	8667	<5	<5	--
Cadmium	8667	<0.1	<0.1	--
Chromium	8667	<0.5	<0.5	--
Lead	8667	<0.5	<0.5	--
Mercury	8667	<0.0008	<0.0008	--
Selenium	8667	<0.5	<0.5	--
Silver	8667	<0.5	<0.5	--

QUALITY CONTROL FOR PRECISION  
 RESULTS OF ANALYSIS OF REPLICATE  
 ANALYSES OF SOIL SAMPLES

U-4246.21

Parameter	E & E Laboratory No. 86-	(mg/kg)		Relative Percent Difference (RPD)
		Original Analysis	Replicate Analysis	
Total Organic Carbon	8663	8520	8040	5.8
Flashpoint, °F	8666	no flash at 140	no flash at 140	--
Solids, %	8667	85	85	0
	8655	81	80	1.2

QUALITY CONTROL FOR ACCURACY: PERCENT RECOVERY  
FOR SPIKED SOIL SAMPLES

U-4246.22

Parameter	E & E Laboratory No. 86-	Original Value	Amount Added	Amount Determined	Percent Recovery
		(mg/kg)			
Hydrazine	8656	<0.01	0.12	0.13	108
	8658	<0.01	0.12	0.14	117
Petroleum Hydrocarbons	8660	<10	820	810	98.9
	8653	13	790	760	94.6
Total Organic Halides	8662	0.07	1.22	1.04	79.5



**ecology and environment, inc.**  
**QUALITY ASSURANCE PROTOCOL REVIEW**

Job No.: 11-4205 Date: 10/13/86  
 Report Title: _____  
 Client: Porter AFB

Laboratory Data Review	Supervisor	Date
Metals	<u>B.H. K. Walsh</u>	<u>11-17-86</u>
Gen. Chem.	<u>A. P. ...</u>	<u>11-17-86</u>
GC	<u>(X) ...</u>	<u>1-13-86</u>
GC/MS		
Micro, Asbestos		
Other		

	Signature	Date
Report Written by:	<u>draft</u> <u>KS</u>	<u>10/13/86</u>
1st Draft Reviewed by:	<u>KS</u>	<u>11/10/86</u>
2nd Draft Reviewed by: (If needed)	<u>KS</u>	<u>11/12/86</u>
	<u>KS</u>	<u>11/12/86</u>
Final Review by Author:	<u>KS</u>	<u>11/12/86</u>
ASC Manager:	<u>[Signature]</u>	<u>11-18-86</u>
QA Officer:	<u>SM</u>	<u>11-18-86</u>
Corp. Project Manager: <u>H. H. ...</u> (Internal Job)	<u>[Signature]</u>	<u>11-18-86</u>
All QA Protocol Review Forms Signed and in File (to be signed by report writer)		
<input checked="" type="checkbox"/> Copies of Report Sent to: <u>H. H. ...</u>	<u>TBB</u>	<u>11/18/86</u>
<input type="checkbox"/> Invoices Sent to Accounting	<u>TBB</u>	<u>11/18/86</u>
Comments/Notes: <u>Check for ...</u>		

Copy Distribution: White - Report to Project File; Canary - Project Manager; 407064  
 Pink - Project File.

SAMPLE IDENTIFICATION  
CROSS-REFERENCE

U-4265

Laboratory Number 86-	Field Number	Field Location
8730	0005	AP38-NS-004-GN-86-0005
8731	0015	AP38-NO-007-CD-86-0015

SAMPLE TRACKING OF ANALYSES  
REQUIRING HOLDING TIMES

U-4265.1

Job	Sample Number	Sample Date	VOA(14)		Fluoride (28)		Nitrates (14)		Pet HC(28)		TOC (28)							
			Dead	Anal	Dead	Anal	Dead	Anal	Dead	Anal	Dead	Anal						
U-4265	8730	10/8	10/22	10/10	11/6	11/3	10/22	*	11/6	10/20	--	--						
	8731	10/8	10/22	10/10	--	--	--	--	--	--	11/6	10/21						
*Holding time missed - new sample being taken.																		
<table style="margin-left: auto; margin-right: auto;"> <tr> <td colspan="2" style="text-align: center;">VOA Confirmation Date</td> </tr> <tr> <td style="width: 50%;">8730</td> <td style="width: 50%;">10/14</td> </tr> <tr> <td>8731</td> <td>10/14</td> </tr> </table>													VOA Confirmation Date		8730	10/14	8731	10/14
VOA Confirmation Date																		
8730	10/14																	
8731	10/14																	

DEAD: Date sample holding time expires.  
EXTR: Date sample was extracted.  
ANAL: Date sample was analyzed.

ECOLOGY AND ENVIRONMENT'S, INC.  
ANALYTICAL SERVICES CENTER

RESULTS OF WATER ANALYSIS FOR PRIORITY POLLUTANT  
PURGEABLE AROMATIC COMPOUNDS BY GC

(all results in ug/L)

U-4265.2

Compound	E & E Lab. No. 86-	8730	8731	Blank		
	Sample Identity	0005	0015	10/10/86		
chlorobenzene		<0.20	<0.20	<0.20		
1,2-dichlorobenzene		<0.40	<0.40	<0.40		
1,3-dichlorobenzene		<0.40	<0.40	<0.40		
1,4-dichlorobenzene		<0.30	<0.30	<0.30		
benzene		<0.20	<0.20	<0.20		
total xylenes		<1.0	<1.0	<1.0		
toluene		<0.20	<0.20	<0.20		
ethylbenzene		<0.20	<0.20	<0.20		

ECOLOGY AND ENVIRONMENT'S, INC.  
ANALYTICAL SERVICES CENTER

RESULTS OF WATER ANALYSIS FOR  
PURGEABLE HALOCARBON COMPOUNDS BY GC  
(all results in ug/L)

U-4265.3

Compound	E & E Lab. No. 86-	Blank	8730	8731		
	Sample Identity	10/10/86	0005	0015		
carbon tetrachloride		<0.12	<0.12	<0.12		
1,2-dichloroethane		<0.03	<0.03	<0.03		
1,1,1-trichloroethane		<0.03	<0.03	<0.03		
1,1-dichloroethane		<0.07	<0.07	<0.07		
1,1,2-trichloroethane		<0.02	<0.02	<0.02		
1,1,2,2-tetrachloroethane		<0.03	<0.03	<0.03		
chloroethane		<0.52	<0.52	<0.52		
2-chloroethylvinyl ether		<0.13	<0.13	<0.13		
chloroform		<0.05	<0.05	<0.05		
1,1-dichloroethene		<0.13	<0.13	<0.13		
trans-1,2-dichloroethene		<0.10	<0.10	<0.10		
1,2-dichloropropane		<0.04	<0.04	<0.04		
trans-1,3-dichloropropene		<0.34	<0.34	<0.34		
cis-1,3-dichloropropene		<0.20	<0.20	<0.20		
methylene chloride		<0.25	<0.25	<0.25		
chloromethane		<0.08	<0.08	<0.08		
bromomethane		<1.18	<1.18	<1.18		
bromoform		<0.20	<0.20	<0.20		
bromodichloromethane		<0.10	<0.10	<0.10		
fluorotrichloromethane		<2.0	<2.0	<2.0		
dichlorodifluoromethane		<1.81	<1.81	<1.81		
chlorodibromomethane		<0.09	<0.09	<0.09		
tetrachloroethene		<0.03	<0.03	<0.03		
trichloroethene		<0.12	<0.12	<0.12		
vinyl chloride		<0.18	<0.18	<0.18		



**ecology and environment, inc.**

International Specialists in the Environment

**LABORATORY REPORT**

FOR

PORTER AIR FORCE BASE

U-4265.4

Job No.:	U-4265		RE:	DF-3000		
Sample Date:	10/8/86		P.O. No.:			
Date Received:	10/8/86		Sampled By:	E & E, Inc.		
Sample Type:	Water		Delivered By:	E & E, Inc.		
E & E Lab. No. 86-	8730	8731	Blank			
Customer No.	0005	0015				
Sample Identity						
Results in: mg/L unless noted						
Petroleum Hydrocarbon	<1	NR	NA			
Fluoride	0.46	NR	<0.1			
Total Organic Carbon	NR	37.8	NA			
Total Organic Halides	NR	0.010	NA			
Antimony	<0.15	<0.15	<0.15			
Beryllium	<0.01	<0.01	<0.01			
Cadmium	<0.01	<0.01	<0.01			
Chromium	<0.05	<0.05	<0.05			
Copper	<0.02	<0.02	<0.02			
Lead	0.141	0.007	<0.005			
Nickel	<0.1	<0.1	<0.1			
Mercury	<0.0002	<0.0002	NA			
Selenium	<0.025†	<0.005	<0.005			
Silver	<0.04	<0.04	<0.04			
Thallium	<0.005	<0.005	<0.005			
Zinc	<0.05	<0.05	<0.05			
Arsenic	<0.005	0.016	<0.005			

NA: Not applicable.

NR: Not requested.

†Elevated detection limit due to matrix interferences.

Analytical References:

"Methods for the Chemical Analysis of Water and Wastes," EPA-600/4-79-020, March 1983.

Supervising Analyst: Myra Roberts

Date: 10/16/86

QUALITY CONTROL FOR ACCURACY: PERCENT RECOVERY  
FOR SPIKED WATER SAMPLES

U-4265.5

Compound	E & E Laboratory No. 86- 8731	Original Value	Amount Added	Amount Determined	Percent Recovery
		(ug/L)			
1,2-dichlorobenzene		<0.40	10.0	10.5	105
1,3-dichlorobenzene		<0.40	10.0	10.4	104
1,4-dichlorobenzene		<0.30	10.0	10.4	104
toluene		<0.20	10.0	10.6	106
ethyl benzene		<0.20	10.0	9.9	99

QUALITY CONTROL FOR ACCURACY: PERCENT RECOVERY  
FOR SPIKED WATER SAMPLES

U-4265.6

Compound	E & E Laboratory No. 86-	Original Value	Amount Added	Amount Determined	Percent Recovery
		(ug/L)			
carbon tetrachloride	8730	<0.12	10.0	8.50	85.0
1,2-dichloroethane	8730	<0.03	10.0	8.86	88.6
1,1,1-trichloroethane	8730	<0.03	10.0	9.48	94.8
1,1-dichloroethane	8730	<0.07	10.0	8.64	86.4
chloroethane	8730	<0.52	10.0	9.36	93.6
chloroform	8730	<0.05	10.0	8.53	85.3
trans-1,2-dichloroethene	8730	<0.10	10.0	8.32	83.2
methylene chloride	8730	<0.25	10.0	11.2	112
chloromethane	8730	<0.08	10.0	8.89	88.9
bromomethane	8730	<1.18	10.0	10.7	107
bromoform	8730	<0.20	10.0	12.9	129
bromodichloromethane	8730	<0.10	10.0	8.68	86.8
trichloroethene	8730	<0.12	10.0	8.59	85.9



QUALITY CONTROL FOR PRECISION  
 RESULTS OF ANALYSIS OF REPLICATE  
 ANALYSES OF WATER SAMPLES

U-4265.7

Parameter	E & E Laboratory No. 86-	(mg/L)		Relative Percent Difference (RPD)
		Original Analysis	Replicate Analysis	
Total Organic Halides	8731	0.010	0.015	40
Fluoride	8730	0.46	0.46	0
Total Organic Carbon	8566*	18.1	15.1	18.1

*This represents 10% QC. This is not one of your samples but was analyzed in the same batch as your samples.

QUALITY CONTROL FOR ACCURACY: PERCENT RECOVERY  
FOR SPIKED WATER SAMPLES

U-4265.8

Parameter	E & E Laboratory No. 86-	Original Value	Amount Added	Amount Determined	Percent Recovery
		(mg/L)			
Petroleum Hydrocarbon	DI Water	--	8.3	6.7	80.7

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CHROMATOGRAPHIC CONDITIONS

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Operator _____ Date _____  
Job Number _____ Sample Identification _____  
Solvent NA Analytical Method LPA 601  
Instrument Varian 6000 #4

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COLUMN

Type Stainless Steel  
Length 8'  
Diameter 1/8"  
Liquid Phase (% wt.) 1% SP1000  
Support Carbopack B  
Mesh 60/86

CARRIER GAS

Nitrogen  
Rotameter NA  
Inlet Pressure, psig 60  
Flow Rate, mL/min. 40

HALL DETECTOR

Mode Halogen  
Solvent 1-Propanol  
Solvent flow, mL/min. 0.5  
Reactor tube temperature, °C 250  
Reactor Gas Hydrogen  
Reactor gas flow, mL/min. 50

CHART SPEED, cm/min. 0.5

DETECTOR Hall Electrolytic Conductivity

Range 10  
Attenuation 256

TEMPERATURE, °C

Detector 950  
Injection Port 220

Column

Initial 45/3 min.  
Program 8/min.  
Final 220

PURGE AND TRAP

Purge time 12 min. Temp. 30  
Purge flow 40ml/min.  
Desorb time 4 min. Temp. 180  
Bake time 15 min. Temp. 200

238082

CHLOROMET  
BROMOMET  
HClO/F2CL2  
CLORGET

2 354

3 864

4 801

5 947

6 926

8 070

NECL2

CL2F/110C

11 121 770

1,10CA  
11,20CE  
CHCL3  
1,20CAHE

11 255

11 704

13 153

13 958

111TCANE  
CLL4  
CL2BR

15 224

15 451

16 113

DCR/DCE  
TCE  
TCR/DCP/C

17 554

19 001

19 028

CHBR2CL

20 276

CHBR3

21 088

22 624

CL4ENE/AN  
FINAL 220

24 256

CLBZ

26 764

28 599

29 392

29 311

CHART SPEED 0.5 CM/MIN  
ATTEN: 8 ZERO: 5% 5 MIN/TICK

CHLOROMET  
BROMOMET  
HClO/F2CL2  
CLORGET

2 354

3 864

4 801

5 947

6 926

8 070

NECL2

CL2F/110C

11 121 770

1,10CA  
11,20CE  
CHCL3  
1,20CAHE

11 255

11 704

13 153

13 958

111TCANE  
CLL4  
CL2BR

15 224

15 451

16 113

DCR/DCE  
TCE  
TCR/DCP/C

17 554

19 001

19 028

CHBR2CL

20 276

CHBR3

21 088

22 624

CL4ENE/AN

24 256

F-37

CLBZ

26 764

28 899  
28 892  
29 911

5 Only *DL*

CHANNEL: SA - 1 TITLE: RUN# |

21:02 9 OCT 86

SAMPLE: 1-158-82

METHOD: HALLSA

CALCULATION: ES - CALIB

PEAK NO	PEAK NAME	RESULT FACTOR	TIME (MIN)	TIME OFFSET	AREA COUNTS	SEP CODE	W1/2 (SEC)
1	CHLOROMET	1.219533U	2.354	0.004	409993	0V	13.44
2	BROMOMET	2.443578U	3.864	-0.026	204618	0V	23.75
3	VIC/F2CL2	1.999036U	4.801	0.031	500241	0V	20.50
4	CLOROET	0.675169U	5.947	0.017	740555	0V	19.06
5			6.926		106170	0V	? 54.75
6	MECL2	0.569627U	8.070	0.050	879311	0V	14.00
7	CL2F/110C	1.860545U	10.770	0.020	537477	0V	15.13
8			11.141		677120	0V	? 10.00
9	1,10CA	0.476060U	11.989	0.029	1050298	0V	15.56
10	1,20CE	0.545172U	12.704	0.024	917142	0V	17.25
11	CHCL3	0.272299U	13.153	0.013	1836218	0V	13.13
12	1,20CANE	0.295121U	13.958	-0.002	1688497	0V	21.19
13	111TCANE	0.541596U	15.272	-0.008	923198	0V	? 16.63
14	CCL4	0.373533U	15.651	0.001	1338571	0V	? 25.00
15	CL2BR	0.297335U	16.113	-0.007	1691605	0V	? 31.00
16	DCA	0.391859U	17.554	-0.025	1275969	0V	? 21.56
17	DCE	0.503218U	17.755	-0.025	993606	0V	? 20.39
18	TCE	0.191858U	18.251	-0.019	2749394	0V	10.69
19	TCA/DCP/C	0.348200U	19.028	-0.032	4307957	0V	21.63
20	CHBR2CL	0.305157U	20.275	-0.004	1639503	0V	40.39
21	CHBR3	1.577770U	21.688	-0.102	316903	0V	? 11.01
22	CL4ENE/AN	0.322284U	23.969	-0.021	3100859	0V	19.21
23			24.295		2193076	0V	? 13.13
24	CLBZ	0.599390U	26.764	-0.015	835576	0V	22.01

TOTALS: -0.099 30894758

DETECTED PKS: 28 REJECTED PKS: 4

AMT STD: 1.00000

NOISE: 11.4 OFFSET: 170

NOTES:

NOTEBOOK:233-162 ANALYST:PETE MITCHELL  
 SECURE AREA:E JOB#:U-4251 PORTER H2O RCD 10-7  
 INST:VARIAN 6000#4 HALL 100X ATTN:8  
 COLUMN:8'SS 1/8"OD CARBOPACK B  
 LIQUID PHASE:1%SP-1000  
 CARRIER GAS N2@40ML/MIN  
 DET:950C INJ:220C  
 OVEN TEMP.45C/3MIN 8C/MIN TO 220/6MIN  
 SML P&T

POST RUN:

SAVE FILE: RAW

HAC0083

RECALCULATE ON FILE: HAC0083

CHANNEL: 5A - 1 TITLE: RUN# {

21:02 9 OCT 86

SAMPLE: 1-158-82

METHOD: HALLSA

CALCULATION: ES - ANALYS

PEAK NO	PEAK NAME	RESULT	TIME (MIN)	TIME OFFSET	AREA COUNTS	SEP CODE	W1/2 (SEC)
1	CHLOROMET	50.0000	2.354	0.004	403993	UV	13.44
2	BROMOMET	51.529	3.864	0.004	210876	UV	23.76
3	VIC/F2CL2	100.0000	4.801	0.001	500241	UV	20.50
4	CLOROET	50.0000	5.947	0.007	740555	UV	19.00
5		0.0000	6.926		106170	UV	2 54.75
6	MECL2	50.5736	8.070	0.000	899399	UV	14.00
7	CL2F/110C	100.0000	10.770	0.000	537477	UV	15.13
8		0.0000	11.141		677120	UV	2 19.00
9	1,1DCA	50.0000	11.989	0.009	1050299	UV	15.55
10	T1,2DCE	50.0000	12.704	0.004	917142	UV	17.25
11	CHCL3	50.0000	13.153	0.003	1936210	UV	19.13
12	1,2DCANE	50.0000	13.958	0.008	1689497	UV	21.19
13	111TCANE	50.0000	15.272	0.002	923198	UV	2 16.60
14	CCL4	50.0000	15.651	0.001	1338571	UV	2 25.00
15	CL2BR	50.0000	16.113	0.003	1681605	UV	2 31.00
16	DCA	50.0000	17.554	0.004	1275969	UV	2 21.55
17	DCE	50.0000	17.755	0.005	993606	UV	2 29.30
18	TCE	50.0000	18.251	0.001	2749394	UV	19.60
19	TCA/DCP/C	150.0000	19.028	0.000	4307067	UV	11.50
20	CHBR2CL	50.0000	20.276	0.006	1639503	UV	19.33
21	CHBR3	50.0000	21.688	0.008	316903	UV	2 41.00
22	CL4ENE/AN	100.0000	23.969	0.009	3102658	UV	19.29
23		0.0000	24.295		2183076	UV	2 19.19
24	CLBZ	50.0000	26.764	0.004	935576	UV	22.81

TOTALS: 1302.102 0.091 30911104

DETECTED PKS: 28 REJECTED PKS: 4

DIVISOR: 1.00000 MULTIPLIER: 1.00000

NOISE: 11.4 OFFSET: 170

NOTES:

NOTEBOOK:233-162 ANALYST:PETE MITCHELL  
SECURE AREA:E JOB#:U-4251 PORTER H2O RCD 10-7  
INST:VARIAN 6000#4 HALL 100X ATTN:8  
COLUMN:8'SS 1/8"OD CARBOPACK B  
LIQUID PHASE:1%SP-1000  
CARRIER GAS N2040ML/MIN  
DET:950C INJ:220C  
OVEN TEMP.45C/3MIN 90/MIN TO 220/6MIN  
SML P&T

ecology and environment, inc.  
ANALYTICAL SERVICES CENTER  
CHROMATOGRAPHIC CONDITIONS

Operator _____ Date _____  
Job Number _____ Sample Identification _____  
Solvent NA Analytical Method EPA601/SW8010  
Instrument Varian 3700

COLUMN

Type Stainless Steel  
Length 6'  
Diameter 1/8" OD  
Liquid Phase (% wt.) N-Octane  
Support Porasil-C  
Mesh 80/100

CARRIER GAS Nitrogen  
Rotameter NA  
Inlet Pressure, psig 60  
Flow Rate, mL/min. 40

HALL DETECTOR

Mode Halogen  
Solvent 1-Propanol  
Solvent flow, mL/min. 0.5  
Reactor tube temperature, °C 950  
Reactor gas Hydrogen  
Reactor gas flow, mL/min. 50

CHART SPEED, cm/min. 0.5

DETECTOR Hall Electrolytic Conductivity

Range 10  
Attenuation 256

TEMPERATURE, °C

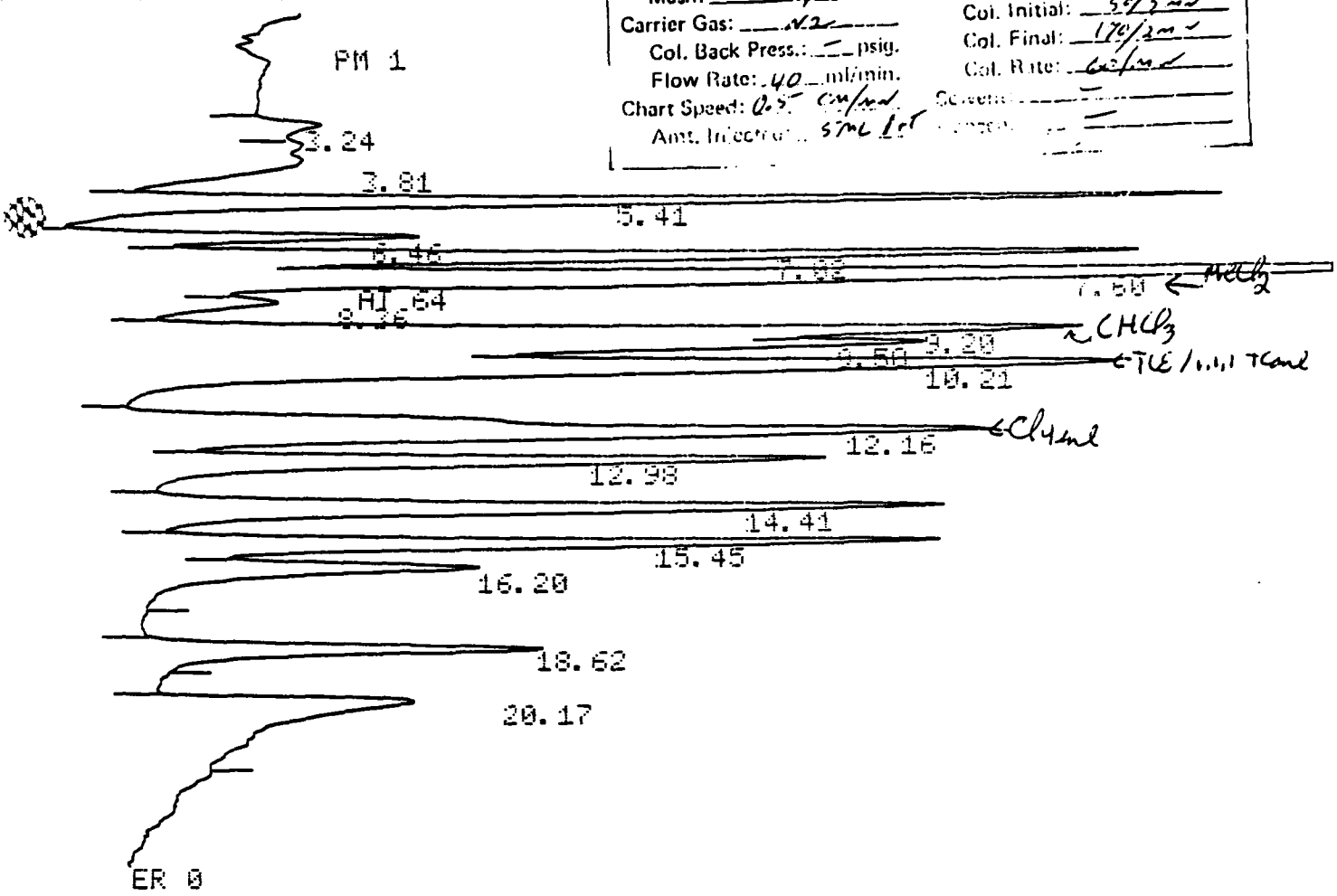
Detector 950  
Injection Port 220  
Column  
Initial 50 3 min.  
Program 6/min.  
Final 170

PURGE AND TRAP

Purge time 11 min. Temp. 30  
Purge flow 40 ml/min.  
Desorb time 4 min. Temp. 180  
Bake time 15 min. Temp. 220

258082

Mesh: 60/80 Det.: 750 Inj.: 20  
 Carrier Gas: N₂ Col. Initial: 50/3 ml  
 Col. Back Press.: — psig. Col. Final: 170/2 ml  
 Flow Rate: 40 ml/min. Col. Rate: 60/2 ml  
 Chart Speed: 0.5 cm/rev. Screens: —  
 Amt. Injected: 5 ml Solvent: —



158-82 00:29:13 CH= "A" PS= 1.

FILE 1. METHOD 0. RUN 1 INDEX 1  
 ANALYST: P. BRUTSCHER

PEAK#	AREA%	RT	AREA	BC
1	0.478	3.24	108439	02
2	1.724	3.81	390649	02
3	4.308	5.41	976332	08
4	0.949	6.46	215178	06
5	4.517	7.02	1023850	02
6	8.782	7.6	1990450	02
7	1.878	8.26	425584	02
8	9.107	8.2	2064000	02
9	7.323	9.58	1659705	02
10	12.991	10.21	2944321	02
11	12.238	12.16	2773785	02
12	6.996	12.98	1585654	02
13	8.435	14.41	1911713	02
14	7.234	15.45	1629513	02
15	4.112	16.2	931989	03
16	3.56	18.62	886754	01
17	5.369	20.17	1216759	01
TOTAL	100.		22664675	

881 882 886  
 FI= 1. FF= 1. MH= 0 F-41

800



ecology and environment, inc.  
ANALYTICAL SERVICES CENTER  
CHROMATOGRAPHIC CONDITIONS

Operator _____ Date _____  
Job Number _____ Sample Identification _____  
Solvent NA Analytical Method LPA 602  
Instrument Varian 6000 #3

COLUMN

Type Stainless Steel  
Length 6'  
Diameter 1/8"  
Liquid Phase (% wt.) 5% SP1200 1.75%  
Bentone-34  
Support Supelcoport  
Mesh 100/120

CARRIER GAS Nitrogen  
Rotameter NA  
Inlet Pressure, psig 60  
Flow Rate, mL/min. 40

CHART SPEED, cm/min. 0.5

DETECTOR Photometric Ionization (Iracor)  
Range -12  
10  
Attenuation 128

TEMPERATURE, °C

Detector 300  
Injection Port 220

Column

Initial 50 2 min.  
Program 6/min.  
Final 90

PURGE AND TRAP

Purge time 12 min. Temp. 50  
Purge flow 40ml/min.  
Desorb time 4 min. Temp. 180  
Bake time 15 min. Temp. 200

258082

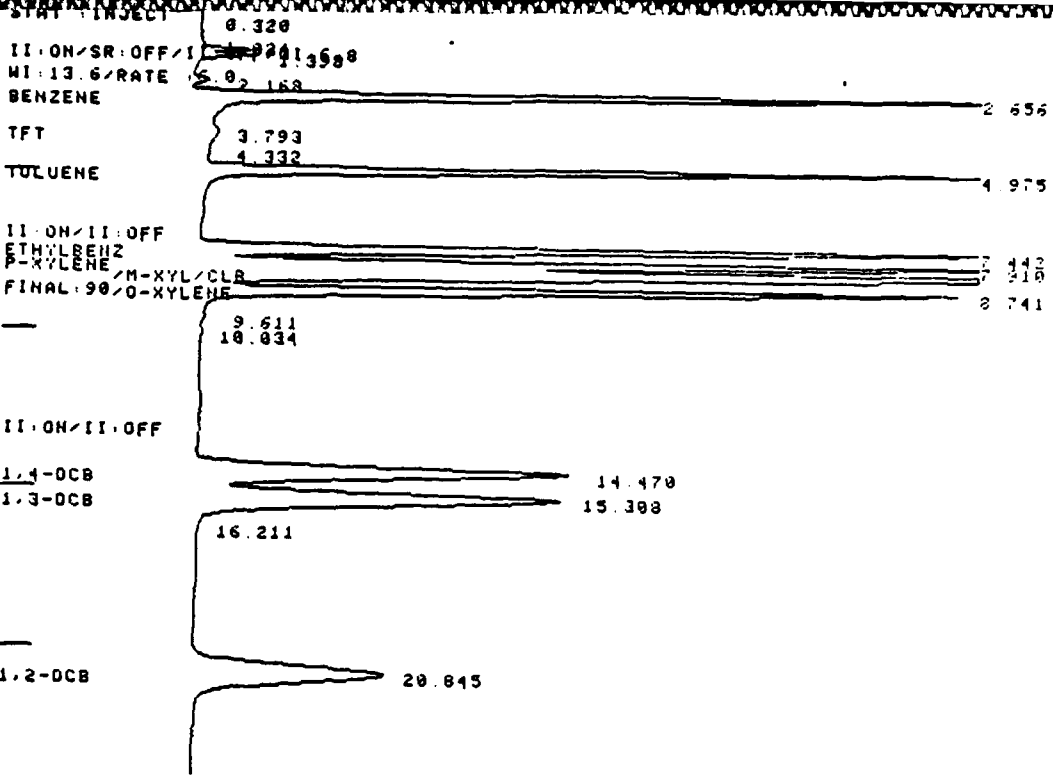
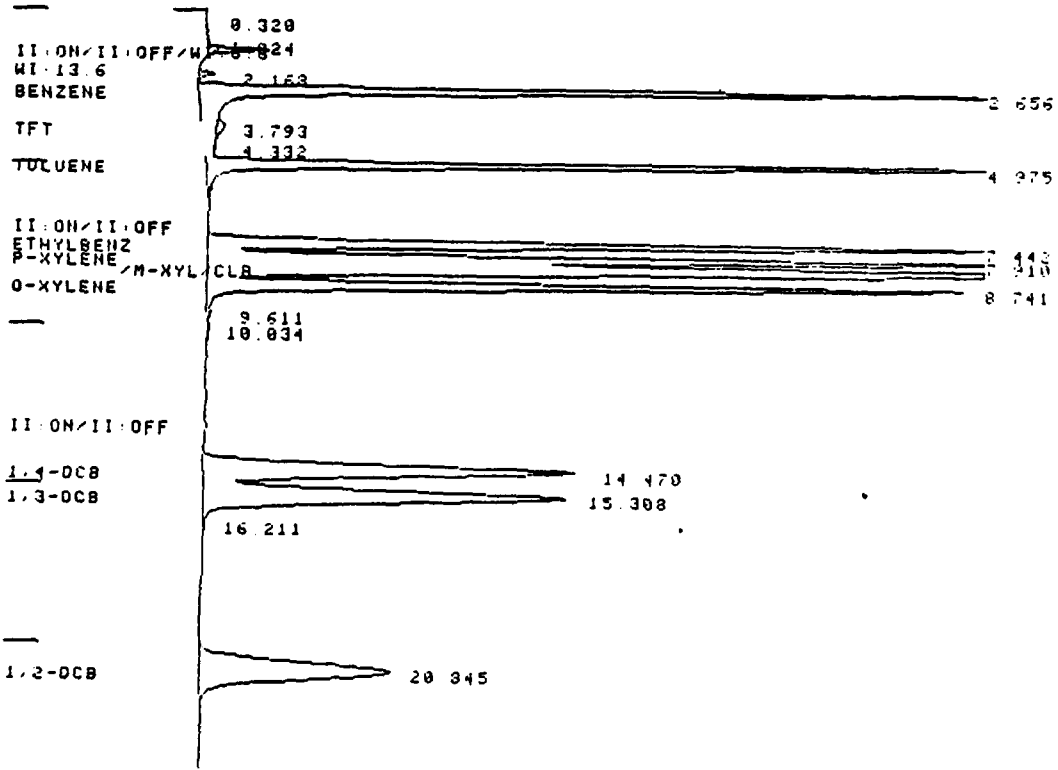


CHART SPEED 0.5 CM/MIN  
 ATTEN: 32 ZERO: 10% 5 MIN/TICK



CHANNEL: 3A - 1 TITLE: RUN# /

18:01 9 OCT 86

SAMPLE: DFT58-82 5049 METHOD: PURARO

F-43

CALCULATION: EM - CALIB

CHANNEL: 3A - 1 TITLE: RUN# /

18:01 9 OCT 86

SAMPLE: 2-158-82 *501g* METHOD: PURARO

CALCULATION: ES - CALIB

PEAK NO	PEAK NAME	RESULT FACTOR	TIME (MIN)	TIME OFFSET	AREA COUNTS	SEP CODE	W1/2 (SEC)
1			1.398		14252	VB	6.13
2			2.168		6831	BV	9.50
3	BENZENE	1.347934U	2.656	0.006	370938	VV	8.06
4	<del>IFT</del>	<del>75.63162U</del>	3.793	0.053	6611	T	7 42.38
5	TOLUENE	1.357736U	4.975	0.025	368260	VB	9.50
6	ETHYLBENZ	1.510031U	7.442	0.012	331119	BV	10.00
7	P-XYLENE	1.408971U	7.910	0.010	354869	VV	10.00
8	M-XYL/CLB	1.185052U	8.209	0.029	843845	VV	9.75
9	O-XYLENE	1.495909U	8.741	0.011	334245	VV	10.13
10	1,4-DCB	1.585817U	14.470	0.000	315295	BV	7 21.06
11	1,3-DCB	1.453125U	15.308	0.008	344086	VV	7 23.06
12	1,2-DCB	1.907261U	20.845	0.005	262156	BB	7 34.00

TOTALS: 0.159 3552507

DETECTED PKS: 25 REJECTED PKS: 13

AMT STD: 1.00000

NOISE: 25.1 OFFSET: 43

ERRORS:

HB, HF, VB ON TANGENT

NOTES:

NOTEBOOK: 232-99 ANALYST: PETE MITCHELL  
 SECURE AREA: E JOB#U-4251 PORTER H20 10-7  
 INST: VARIAN 6000 #3 PID 10-12 ATTN: 32  
 COLUMN: 6' SS 1/8" OD 100/120 SUPELCOPORT  
 PHASE: 5% SP1200/1.75% BENTONE-34  
 CARRIER GAS: N2 @ 40 ML/MIN.  
 DET: 300 C INJ: 220 C  
 INIT 50C HOLD 2MIN TO 90C 6MIN

POST RUN:

SAVE FILE: RAW BENZ041

RECALCULATE ON FILE: BENZ041

CHANNEL: 3A - 1 TITLE: RUN# /

18:01 9 OCT 86

SAMPLE: 2-158-82 METHOD: PURARO F-44 CALCULATION: ES - ANALYS

PEAK NO	PEAK NAME	RESULT FACTOR	TIME (MIN)	TIME OFFSET	AREA COUNTS	SEP CODE	W1/2 (SEC)
---------	-----------	---------------	------------	-------------	-------------	----------	------------

PHASE:5% SP1200/1.75% BENTONE-34  
CARRIER GAS: N2 @ 40 ML/MIN.  
DET: 300 C INJ:220 C  
INIT 50C HOLD 2MIN TO 90C 6MIN

POST RUN:  
SAVE FILE: RAW BENZ041

RECALCULATE ON FILE: BENZ041

CHANNEL: 3A - 1 TITLE: RUN# / 18:01 9 OCT 66

SAMPLE: 2-158-82 METHOD: PURARO CALCULATION: ES - ANALYS

PEAK NO	PEAK NAME	RESULT <i>ug/kg my</i>	TIME (MIN)	TIME OFFSET	AREA COUNTS	SEP CODE	W1/2 (SEC)
1		0.0000	1.398		14252	VB	6.13
2		0.0000	2.168		6831	BV	9.50
3	BENZENE	50.0000	2.656	0.006	370938	VV	8.06
4		0.0000	3.793		6611	1	? 42.38
5	TOLUENE	50.0000	4.975	0.005	368260	VB	9.50
6	ETHYLBENZ	50.0000	7.442	0.002	331119	BV	10.00
7	P-XYLENE	50.0000	7.910	0.000	354869	VV	10.00
8	M-XYL/CLB	100.0000	8.209	0.009	843845	VV	9.75
9	O-XYLENE	50.0000	8.741	0.001	334245	VV	10.13
10	1,4-DCB	50.0000	14.470	0.000	315295	BV	? 21.06
11	1,3-DCB	50.0000	15.308	0.008	344086	VV	? 23.06
12	1,2-DCB	50.0000	20.845	0.005	262156	BB	? 34.00

TOTALS: 500.0000 0.036 3552507

DETECTED PKS: 25 REJECTED PKS: 13

DIVISOR: 1.00000 MULTIPLIER: 1.00000

NOISE: 25.1 OFFSET: 43

ERRORS:

HB, HF, VB ON TANGENT

NOTES:

NOTEBOOK:232-99 ANALYST:PETE MITCHELL  
SECURE AREA:E JOB#U-4251 PORTER H2O 10-7  
INST:VARIAN 6000 #3 PID 10-12 ATTN:32  
COLUMN:6' SS 1/8" OD 100/120 SUPELCOPORT  
PHASE:5% SP1200/1.75% BENTONE-34  
CARRIER GAS: N2 @ 40 ML/MIN.  
DET: 300 C INJ:220 C  
INIT 50C HOLD 2MIN TO 90C 6MIN

CHAPT SPEED 0.5 CM/MIN  
ATTENT 32 ZERO: 10% 5 MIN/TICK F-45

Ecology and Environment, Inc.

CHROMATOGRAPHIC CONDITIONS

Operator _____ Date _____  
Job Number _____ Sample Identification _____  
Solvent _____ Analytical Method EPA-602  
Instrument Varian 6000 #1

COLUMN

Type Stainless Steel  
Length 8 ft.  
Diameter 1/8 inch  
Liquid Phase (% wt.) % SP1000  
Support Carbopack B  
Mesh 60/80

CARRIER GAS Nitrogen

Rotameter NA  
Inlet Pressure, psig 60  
Flow Rate, ml/min. 40

FID GAS

Hydrogen, ml/min. 30  
Air, ml/min. 300

CHART SPEED, cm/min. 0.5

DETECTOR PID  
Range 10  
Attenuation 8

TEMPERATURE, °C

Detector 300  
Injection Port 220

Column

Initial 45 3 minutes  
Program 10/min.  
Final 220

PURGE AND TRAP

Purge time 11 min. Temp. 30°C  
Purge flow 40 ml/min.  
Desorb time 4 min. Temp. 180°C  
Bake time 15 min. Temp. 200 °C

II-ON/SR-OFF/II-OFF

BENZENE  
WI-16.0

TOLUENE  
CLBZ  
FINAL: 240  
ETBZ

M XYL  
O. PXYL

1,3DCB  
1.2  
WI-32.0

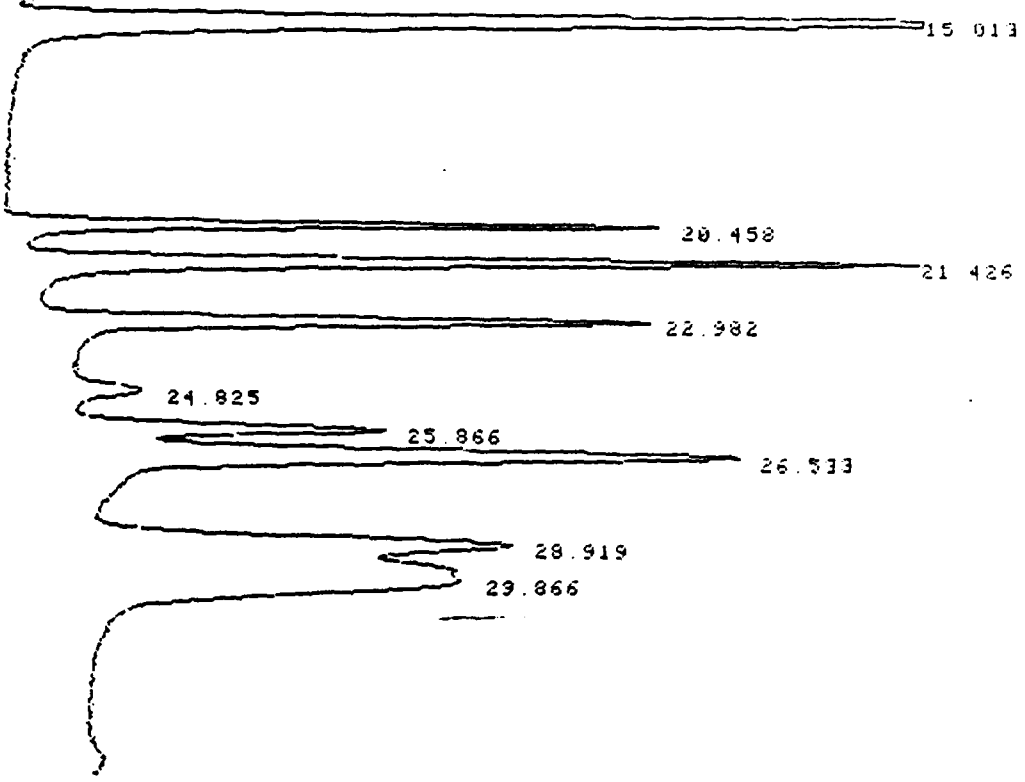
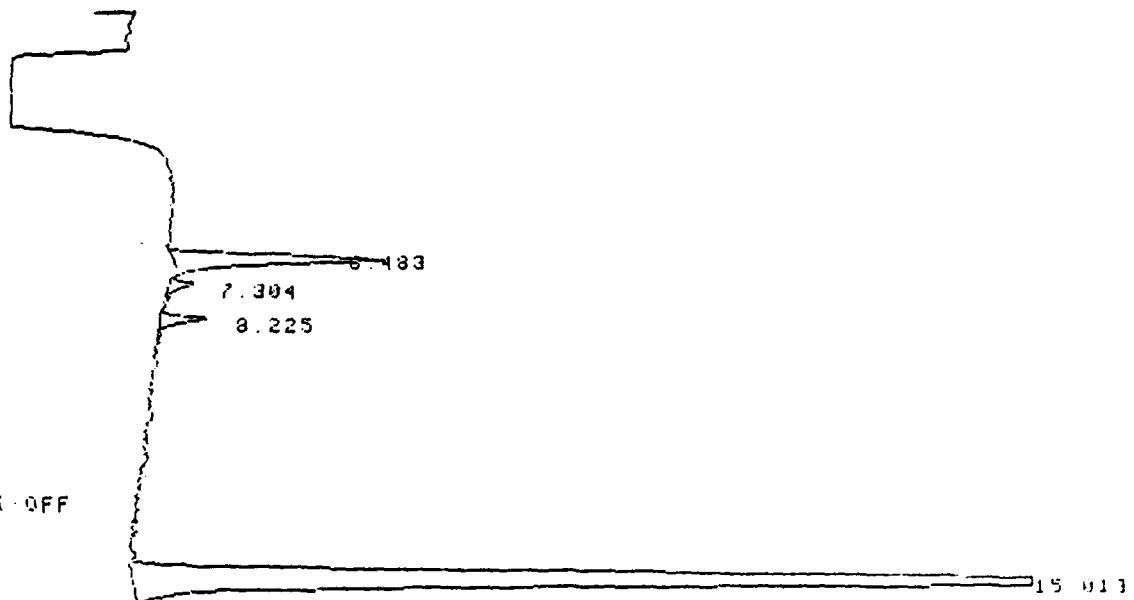


CHART SPEED 0.5 CM/MIN  
ATTEN: 8 ZERO: 20% 5 MIN/TICK

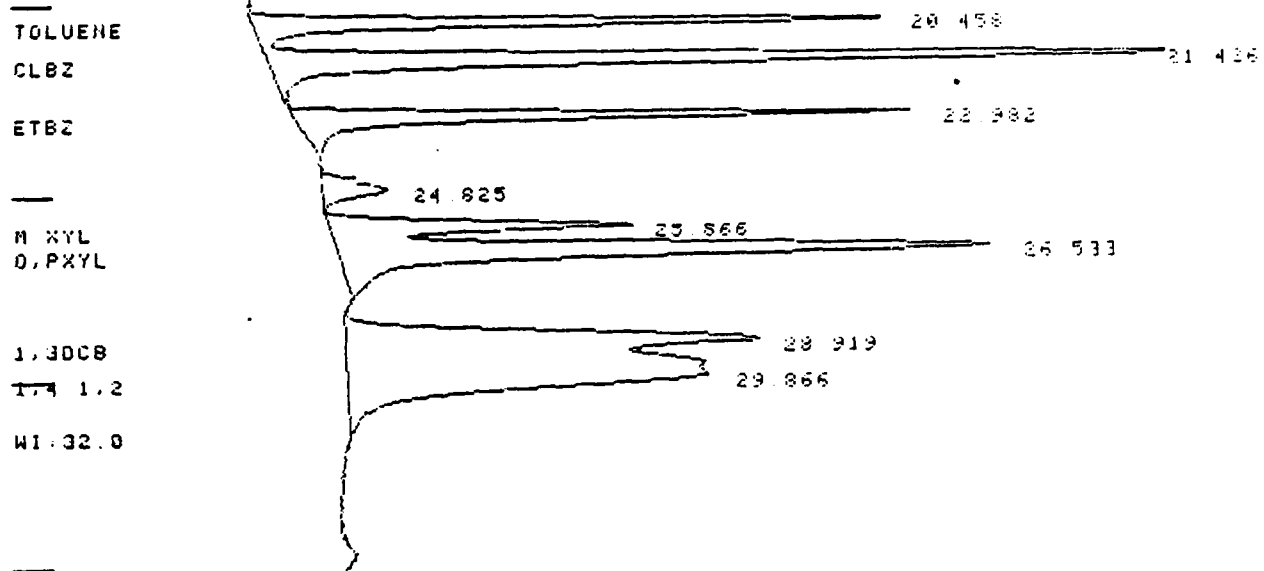
WI-8.0

II-ON/II-OFF

BENZENE  
WI-16.0



WI: 16.0



CHANNEL: 2A - 1 TITLE: RUN# / 17:24 29 OCT 86

SAMPLE: 2-158-82 METHOD: AROCONF CALCULATION: ES - CALIB

PEAK NO	PEAK NAME	RESULT FACTOR	TIME (MIN)	TIME OFFSET	AREA COUNTS	SEP CODE	WI/2 (SEC)
1	BENZENE	0.209662U	15.013	0.013	2384793	BB	16.00
2	TOLUENE	0.695040U	20.458	0.058	719383	BV	12.50
3	CLBZ	0.377876U	21.426	0.026	1323185	VB	15.25
4	ETBZ	0.630556U	22.982	0.082	792951	BB	13.94
5			24.825		121558	BV	21.94
6	M XYL	1.081373U	25.866	0.066	462375	VV	18.75
7	O, PXYL	0.794846U	26.533	0.133	1258105	VB	21.56
8	1,3DCB	0.497501U	28.919	0.119	1005024	BV	? 29.75
9	1,4,1,2-DCB	0.588705U	29.866	0.366	1698645	VB	? 22.25

TOTALS: 0.863 9766019

DETECTED PKGS: 12 REJECTED PKGS: 3

IT STD: 1.00000

ISE: 1314.2 OFFSET: -648

TES:  
 TEBOOK: 228-113 ANALYST: P.M.  
 PURE AREA: JOB# 4-4329, 4340, 4341  
 ST: VARIAN 6000#1 PID 10X1 ATTN: 8  
 COLUMN: 1% SP-1000 CARBOPACK B 60/80  
 SS 1/8" O.D.  
 FLOW: 1.000 ML/MIN  
 1000 111-2200

ecology and environment, inc.  
ANALYTICAL SERVICES CENTER  
CHROMATOGRAPHIC CONDITIONS

Operator _____ Date _____  
Job Number _____ Sample Identification _____  
Solvent Hexane Analytical Method SW8080  
Instrument Varian 6000 #2B Pesticides

COLUMN CHART SPEED, cm/min. 0.5  
Type Glass DETECTOR Electron Capture  
Length 6' Range 10  
Diameter 4mm ID Attenuation 16  
Liquid Phase (% wt.) 1.5% SP2250 1.95% SP2401  
Support Supelcoport TEMPERATURE, °C  
Mesh 100/120 Detector 500  
CARRIER GAS Nitrogen Injection Port 220  
Rotameter NA Column  
Inlet Pressure, psig 80 Initial 200 Isothermal  
Flow Rate, mL/min. 60 Program NA  
Final NA

238082



START INJECT

WI: 8.0/II: ON/II: OFF

0 456

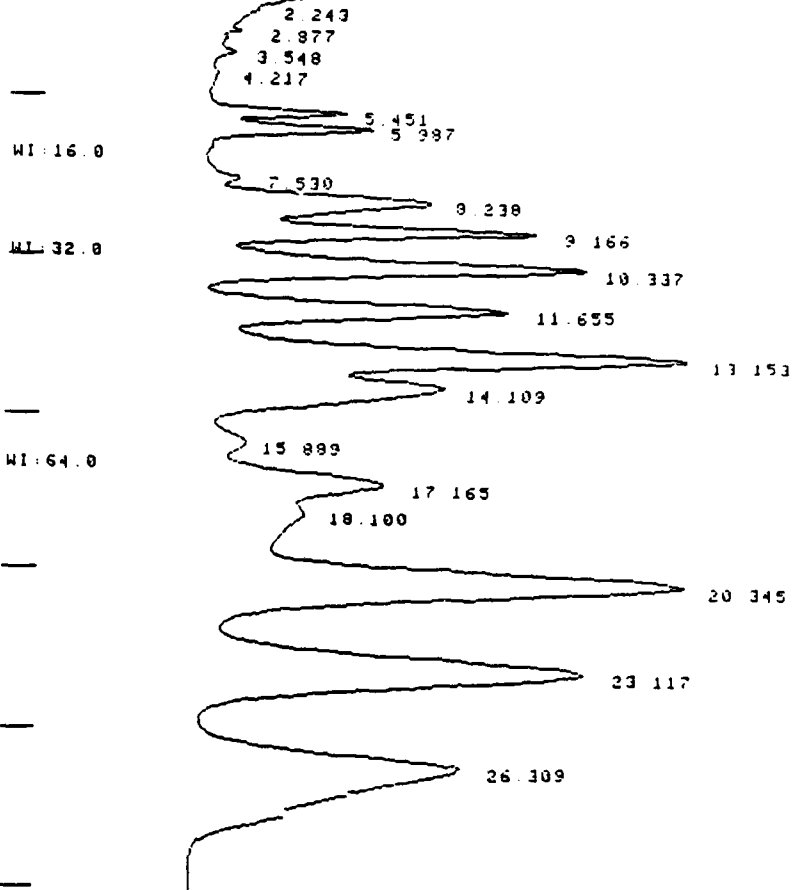
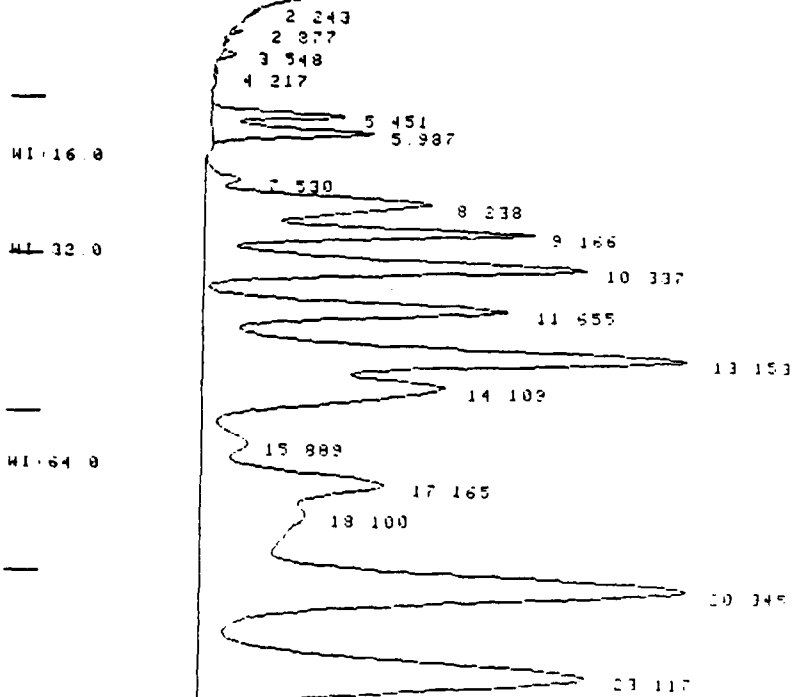


CHART SPEED 0.5 CM/MIN  
ATTEN: 16 ZERO: 10% 5 MIN/TICK

WI: 8.0/II: ON/II: OFF

0 456



F-50

CHANNEL: 2B - 1 TITLE: RUN# 2

17:20 17 OCT 86

SAMPLE: 3-158-3837^{as} METHOD: 1PCB

CALCULATION: AZ - ANALYS

*PUB 1260 1.0ug/ml*

PEAK NO	PEAK NAME	RESULT AREA%	TIME (MIN)	AREA COUNTS	SEP CODE
1		60	0.456	50423352	BB
2		0	2.243	6546	BB
3		0	2.877	14462	BV
4		0	3.135	4532	VB
5		0	3.548	25097	BB
6		0	4.217	7953	BB
7		0.	5.451	393626	BV
8		1	5.987	542700	VB
9		0.	7.530	140785	BV
10		2	8.238	1603741	VV
11		2	9.166	1625193	VV
12		3	10.337	2330487	VV
13		2	11.655	1955458	VV
14		4	13.153	3773851	VV
15		3	14.109	2370645	VV
16		0.	15.889	402261	VV
17		2	17.165	1910190	VV
18		2	18.100	1400393	VV
19		7	20.345	573882	VV
20		6	23.117	403304	VV
21		6	26.309	4635982	VB

$$\frac{1.0}{2885} = 0.0003466$$

TOTALS: 100 84166440

MULTIPLIER: 1.00000

NOTES:  
 NOTEBOOK: 228-103 ANALYST: RICHARD SAMSON  
 SECURE AREA: D JOB#U-422  
 INST: VARIAN 6000 #18 ECD 10X1 ATT: 16  
 COLUMN: 6' GLASS 4MM ID 100/120 SUPELCOPORT  
 LIQUID PHASE: 1.5% SP2250/1.95% SP2401  
 CARRIER GAS: N2 @ 60 ML/MIN.  
 DET: 300 C INJECT: 220 C  
 OVEN TEMP: 210 C ISOTHERMAL 4 UL INJECTION

POST RUN:  
 SAVE FILE: RAW SAM297

APPENDIX G

BIOGRAPHIES OF KEY PERSONNEL

**EDUCATION:**

B.S., Geology, University of London, England  
B.S., Landscape Architecture, University of Kentucky

**EXPERIENCE:**

Mr. Aldis combines experience in geohydrological investigation with a substantial background in hazardous waste site evaluation, remediation, and regulatory compliance concerns.

Mr. Aldis has conducted background data reviews, hydrogeologic assessments; geophysical surveys; and sampling plan development/implementation for groundwater, surface water, soil, and sediment for numerous other sites in New York State, including the Vestal wellfield Superfund site (for which he also conducted groundwater modeling) and facilities located in Watertown, Olean, Ithaca, and all of the western counties. In Pennsylvania, he completed the comprehensive hydrogeologic assessment for the Brodhead Creek investigation near Stroudsburg; as well as for the Keystone Landfill in Hanover and the Fischer and Porter site in Warminster. For these projects, Mr. Aldis also prepared the site investigation work plans, conducted sampling, proposed the necessary remedial measures for surface and subsurface contamination, and assisted in agency negotiations. He participated in the preparation of the hydrogeologic assessments for other major sites including Des Moines TCE in Iowa, the Northside Landfill in Indiana, and the Sauget (Dead Creek) sites in Illinois. In Rapid City, South Dakota, he conducted hydrogeologic evaluations regarding contamination by leaking underground storage tanks.

For four years, Mr. Aldis led E & E's field investigation team that supported EPA in federal Region X. He supervised field investigations ranging from preliminary assessments to detailed geohydrologic investigations of sites throughout Alaska, Idaho, Oregon, and Washington, including work at 10 sites on the National Priorities List. Major geohydrologic investigations included Western Processing, Queen City Farms, Clark County Landfill, American Lake Gardens, Lakewood Water District, and Frontier Chrome in Washington; as well as United Hard Chrome, Alkali Lake, Rhone-Poulenc Chemical Company, and Gould, Inc., in Oregon.

**EDUCATION:**

B.S., Chemistry, cum laude, University of Sussex, Great Britain

**EXPERIENCE:**

As director of E & E's Analytical Services Center (ASC), Mr. Clifton has overall responsibility for the facility's operation as a multi-functional, high-quality environmental laboratory. He directs a staff of over 30 professional chemists and ensures that the laboratory quality assurance/quality control (QA/QC) program, laboratory and field sample chain-of-custody documentation and reporting procedures, and laboratory safety protocol are continually reviewed to incorporate the most current methodologies.

Mr. Clifton was instrumental in attaining the ASC's certification for the United States Environmental Protection Agency Contract Laboratory Program for the organic analysis of Superfund site samples. For this contract, Mr. Clifton is responsible for maintaining the ASC's state-of-the-art capabilities in gas chromatograph/mass spectrometer (GC/MS) and GC/electron capture detection instrumentation, and for insuring that the laboratory produces data that will withstand scrutiny in administrative and judicial proceedings.

With 18 years' experience as an analytical chemist, Mr. Clifton has managed and performed analyses of environmental samples for routine indicators of pollution as well as for specific pollutants such as pesticides, polychlorinated biphenyls and other toxic organics, and heavy metals. He was the manager of the environmental and analytical laboratory operated by E & E for the Royal Commission for Jubail and Yanbu at Madinat Yanbu Al-Sinaiyah, Saudi Arabia, where he was responsible for the analysis of seawater, groundwater, sanitary and industrial wastewater, and drinking water using atomic absorption, autoanalysis, gas chromatography/mass spectrometry, and classical laboratory techniques.

After earning his degree in chemistry, Mr. Clifton worked in marine research with the University College of Swansea (Wales, Great Britain) Oceanography Department, developing methods for trace metal analysis. In particular, he developed and implemented a method for detecting mercury in seawater, sediments, and animal tissue, using atomic absorption and atomic fluorescence spectrophotometry. His studies were published in British scientific journals. Working with a municipal authority in Brighton, England, he used autoanalysis, gas chromatography, atomic absorption, and fluorescence spectroscopy to analyze samples of river water, seawater, groundwater, and sewage for a spectrum of possible pollutants, including bacteria and trace metals.

**EDUCATION:**

M.S., Geology, Oklahoma State University  
B.A., Geology, University of Rochester

**EXPERIENCE:**

Mr. Hemann applies his expertise in the evaluation of geologic, hydrologic, and groundwater resource problems to the investigation of hazardous waste sites and to emergency response activities. He supervises drilling contractors; conducts environmental sampling of soils, surface water, and groundwater; evaluates the source and extent of contamination; determines contaminant pathways; and evaluates and develops associated remedial measures. His fieldwork includes well drilling, installation, and monitoring; soil coring; and aquifer testing. He has participated in hydrogeological investigations to determine aquifer characteristics such as transmissivity, storage capacity, retention, and permeability.

Mr. Hemann has participated in several E & E remedial investigations (RIs) and feasibility studies (FSs). For example, he performed geophysical surveys and assisted in the design of groundwater monitoring programs being undertaken as part of RIs for six Superfund sites. Mr. Hemann was lead geologist for E & E's RI/FS hydrogeologic investigations of the town water supply in Vestal, New York, to define contaminant pathways. For this site, he also prepared a work plan for a focused remedial investigation study including surface soil and water sampling, well drilling, and groundwater sampling and monitoring; supervised the drilling contractor; and conducted drum sampling. For the Bridgeport site in New Jersey, Mr. Hemann reviewed hydrogeological data. He delineated procedures to perform aquifer pump tests at the Hyde Park Landfill in Niagara Falls, New York. All three sites are on the National Priorities List.

For E & E's FS for the Whitehouse Oil Pits federal Superfund site in Jacksonville, Florida, Mr. Hemann evaluated the practicality and cost- and technical effectiveness of the combined use of slurry wall containment and groundwater pumping/treatment as a remedial measure.

**EDUCATION:**

B.A., Geological Sciences, State University of New York College at Buffalo

**EXPERIENCE:**

At E & E, Mr. Holtz specializes in geohydrological and geological investigations of hazardous waste sites. He designs and implements sampling programs for soil, sediment, groundwater, and surface water; designs, implements, and both performs and oversees the drilling and installation of monitoring well networks; and interprets resultant analytical data to characterize hazardous substances and to determine surface and subsurface contaminant migration pathways.

For E & E's extensive hydrogeological investigations at the Bridgeport Rental and Oil Services NPL site in New Jersey, Mr. Holtz installed 28 boreholes around a 12.7-acre PCB lagoon to track contaminant migration, conducted a stability test of the surrounding levee, and performed an extensive subsurface lagoon sampling program. He conducted drilling and geological fieldwork for the installation of 198 four-foot boreholes at the Silvex NPL site in Florida, in order to determine the extent of volatile organic and metal contamination. Mr. Holtz also installed borings at the Sapp Battery hazardous waste site in Florida. At the Pasco Sanitary Landfill in Washington, he led the field team that installed nine 100-foot monitoring wells to determine if there was leakage from drums known to be buried at the site, coordinated all aspects of the drilling and sampling operations, and determined groundwater elevation and flow.

For the Vestal wellfield, a National Priorities List (NPL) site in New York State, he installed monitoring wells and boreholes to assist in the tracking of trichloroethylene contamination. Mr. Holtz also was responsible for sampling and limited trench excavation activities conducted as part of E & E's remedial investigation of a 14.7-acre site in Buffalo, New York, where concern was for polychlorinated biphenyl (PCB), pesticide, heavy metal, and sulfur waste contamination.

**EDUCATION:**

M.S., Environmental Engineering, Polytechnical University of Warsaw,  
Poland  
B.S., Civil Engineering, State University of New York at Buffalo

**EXPERIENCE:**

Mr. Marszalkowski has been a hazardous and toxic substance project manager with E & E for three years. He is presently program technical coordinator for E & E's work in support of the United States Air Force Installation Restoration Program, at various installations nationwide. In particular, Mr. Marszalkowski manages the presurvey and survey activities, including the preparation of work plans and detailed cost estimates for multiple-site remedial investigations (RIs). In other project management assignments for which he was responsible for logistics, timeliness, and technical quality, Mr. Marszalkowski led special investigations in Oregon at five suspected hazardous waste sites, including three municipal/industrial landfills, a munitions factory, and a wood-preserving chemical plant.

Mr. Marszalkowski held responsibility for the development of sampling specifications and estimation of manpower schedules, equipment, and associated costs for waste tank sampling, analysis, decontamination, removal, and disposal at the Bridgeport Rental and Oil Services National Priorities List (NPL) site in New Jersey, which involves the single largest Superfund allocation to date (over \$55 million). He assisted in delineating the complex groundwater situation that exists beneath the site (i.e., three separate groundwater zones with areas of verticle migration between the upper and middle zone and the middle and deep zone); helped define potential contaminant migration pathways; and used this information to resolve engineering questions related to the design of the most appropriate remedial measures.

Mr. Marszalkowski designed remedial action strategies, completed a detailed feasibility evaluation of alternatives, and provided environmental engineering input to the preparation of a community relations presentation describing the selected remedial alternative for the Whitehouse Oil Pits NPL site. He was project manager for RI support activities conducted for the Commonwealth of Pennsylvania at the Welsh Road hazardous waste site, for which he wrote the remedial action master plan and work plan. He also assisted in the engineering review of remedial action plans during E & E's extensive investigative work at the Hyde Park NPL site in Niagara Falls, New York.



**EDUCATION:**

M.S., Environmental Science (Health), George Washington University  
B.S., Chemistry, Carnegie-Mellon University

**EXPERIENCE:**

With 18 years' experience in toxicology, chemistry, and the interpretation of pertinent federal and state regulations, Mr. Weinstein specializes in toxicological risk and endangerment assessment. For E & E investigations of hazardous waste sites, he interprets data concerning chemical characteristics, migration routes, and concentrations to determine exposure media, the human population at risk and potential impacts on sensitive environmental receptors.

For the Sapp Battery federal Superfund site in Florida, Mr. Weinstein conducted a comprehensive multimedia human health and environmental risk assessment for lead and other heavy metals to evaluate potential exposure to the public and to aquatic life. Human exposure routes evaluated included ingestion and inhalation of contaminated soil particles and ingestion of contaminated drinking water and fish. Based on the assessment, Mr. Weinstein developed media-specific cleanup criteria that were used for the selection, screening, and design of remedial alternatives for the site. Mr. Weinstein also has performed risk assessments for the remediation of human health risks posed by dioxins, polychlorinated biphenyls, and other chemicals at the Hyde Park, New York, federal Superfund site.

Mr. Weinstein worked for five years as an industrial hygienist with the Occupational Health and Safety Administration (OSHA) in Washington, DC. As project manager responsible for the development and promulgation of regulations designed to protect workers exposed to carcinogens, he critically evaluated toxicological and epidemiological studies assessing the toxic effects and associated risks of chemicals on humans; and wrote technical analyses representing OSHA determinations concerning the severity of health hazards, feasibility of control technology for reducing exposures, and derivation of the maximum permissible exposure limits.

As a toxicologist in Cambridge, Massachusetts, for two years Mr. Weinstein assisted in the assessment of human health risks associated with multimedia control strategies for six widely used chlorinated solvents. He analyzed toxicological effects, sources, and quantities of each solvent emitted; as well as intermedia transfers, ultimate fate, environmental risk, and human exposure factors. He was the manager and senior author for the preparation of two documents summarizing available data concerning environmental releases of 97 chemicals to air, water, and land.

APPENDIX H

TECHNICAL OPERATIONS PLAN AND  
SITE SAFETY PLAN

**TECHNICAL OPERATIONS PLAN  
PHASE II CONFIRMATION STUDY  
INSTALLATION RESTORATION PROGRAM  
AIR FORCE PLANT NO. 38  
TOWN OF PORTER, NEW YORK**

**September 1986**

**Prepared for:**

**UNITED STATES AIR FORCE  
Occupational and Environmental Health Laboratory  
Technical Services Division  
Brooks Air Force Base, Texas 78235**

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## TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
1	INTRODUCTION .....	1-1
2	PROPOSED WORK PLANS FOR STAGE I SITE INVESTIGATION ....	2-1
	2.1 SITE 1: GENERAL DRAINAGE DITCHES .....	2-4
	2.2 SITE 2: SALVAGE YARD AND CONTAINER STORAGE AREA DITCHES .....	2-4
	2.3 SITE 3: BURN PITS .....	2-4
	2.4 SITE 4: MAINTENANCE, LABORATORY, AND FLUSH BUILDING DRAINAGE DITCHES .....	2-6
	2.5 SITE 5: FUEL STORAGE TANKS AND ELECTRICAL TRANSFORMERS .....	2-6
	2.6 SITE 6: INCINERATOR AND INCINERATOR PAD .....	2-6
	2.7 SITE 7: CONTAINER STORAGE PAD AND SURROUNDING SOILS .....	2-9
3	FIELD SET-UP .....	3-1
4	CALIBRATION OF FIELD EQUIPMENT .....	4-1
5	PREVENTATIVE MAINTENANCE OF FIELD EQUIPMENT .....	5-1
6	FIELD ANALYTICAL PROCEDURES AND DATA REPORTING .....	6-1
	6.1 CHEMICAL DATA .....	6-1
	6.2 HYDRAULIC DATA .....	6-7
	6.3 SOIL BORING DATA .....	6-7
	6.4 SURVEY DATA .....	6-14

Table of Contents (Cont.)

<u>Section</u>		<u>Page</u>
7	SAMPLE NUMBERING SYSTEM .....	7-1
	7.1 PROJECT IDENTIFICATION .....	7-1
	7.2 SITE IDENTIFICATION .....	7-1
	7.3 SEQUENCE NUMBER .....	7-2
	7.4 SPLIT SAMPLES .....	7-2
	7.5 FIELD QC SAMPLES .....	7-2
8	DRILLING AND INSTALLATION OF GROUNDWATER MONITORING WELLS .....	8-1
	8.1 DRILLING .....	8-1
	8.2 SOIL SAMPLING .....	8-4
	8.3 MONITORING WELL CONSTRUCTION AND COMPLETION .....	8-6
	8.4 WELL DEVELOPMENT .....	8-9
	8.5 GEOPHYSICAL LOGGING .....	8-11
9	AQUIFER TESTING .....	9-1
10	GROUNDWATER MONITORING AND SAMPLING .....	10-1
	10.1 GROUNDWATER LEVEL MEASUREMENT .....	10-1
	10.2 SURVEYING OF WELLS .....	10-1
	10.3 ON-SITE ANALYSIS .....	10-1
	10.4 SAMPLING FOR OFF-SITE ANALYSIS .....	10-3
11	DECONTAMINATION PROCEDURES .....	11-1
	11.1 DRILLING, SOIL SAMPLING, AND MONITORING WELL INSTALLATION .....	11-1
	11.2 WELL DEVELOPMENT AND AQUIFER TESTING .....	11-4
	11.3 WATER LEVEL MEASUREMENTS .....	11-5
	11.4 WATER SAMPLING .....	11-5
	11.5 SEDIMENT SAMPLING .....	11-5

Table of Contents (Cont.)

<u>Section</u>	<u>Page</u>
11.6 PERSONNEL DECONTAMINATION .....	11-5
11.6.1 Organization and Operation of the Personnel Decontamination Station (PDS) .....	11-6
11.6.2 Preparation of Decontamination Solutions .....	11-11
11.6.3 Closure of the PDS .....	11-11
12 SAMPLE HANDLING AND PACKING .....	12-1
12.1 SPLIT SAMPLE PROCEDURES .....	12-1
12.2 SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES .....	12-1
12.3 SAMPLE HANDLING AND DECONTAMINATION .....	12-7
12.4 PROCEDURES FOR PACKING LOW CONCENTRA- TION SAMPLES .....	12-9
12.5 PROCEDURES FOR PACKING MEDIUM CONCEN- TRATION SAMPLES .....	12-10
13 SAMPLE CUSTODY AND DOCUMENTATION .....	13-1
13.1 SAMPLE IDENTIFICATION DOCUMENTS .....	13-1
13.2 CHAIN-OF-CUSTODY RECORDS .....	13-1
13.3 FIELD LOG BOOKS .....	13-3
13.4 CORRECTIONS TO DOCUMENTATION .....	13-3
13.5 TRAFFIC REPORTS, AND SAMPLE LABELS, AND CUSTODY SEALS .....	13-4
13.6 SHIPPING OF SAMPLES .....	13-5
14 SITE CLEAN-UP .....	14-1
15 FIELD TEAM ORGANIZATION AND RESPONSIBILITIES .....	15-1
15.1 ORGANIZATION AND RESPONSIBILITIES .....	15-1
15.2 TEAM SIZE .....	15-7
15.3 TRAINING .....	15-9
16 SCHEDULE .....	16-1

LIST OF TABLES

<u>Table</u>		<u>Page</u>
2-1	Laboratory Analysis for Water Samples .....	2-3
2-2	Storage Tank/Boiler Locations .....	2-7
8-1	Some Available Drilling Methods and Their Limitations .....	8-2
8-2	Summary of Log Applications .....	8-12
11-1	Use of General Purpose Decontamination Solutions .....	11-3
12-1	Recommended Sample Storage, Preservation, and Holding Times of Priority Pollutants: EPA 40 CFR 136 .....	12-2
12-2	Recommended Sample Storage, Preservation, and Holding Times According to Measurement .....	12-3
16-1	Project Milestone Chart .....	16-2



## LIST OF ILLUSTRATIONS

<u>Figure</u>		<u>Page</u>
1-1	Project Location Map .....	1-3
2-1	Sampling Locations .....	2-5
2-2	Fuel Storage Tank Locations .....	2-8
3-1	Organization of the Field Investigation Area .....	3-2
6-1	Field Activities Weekly Progress Report .....	6-2
6-2	Drilling Activities Weekly Progress Report .....	6-3
6-3	Geophysical Surveys Weekly Progress Report .....	6-4
6-4	Water Sampling Weekly Progress Report .....	6-5
6-5	Soil/Sediment Sampling Weekly Progress Report .....	6-6
6-6	Depth to Water Field Log Sheet .....	6-8
6-7	Monitoring Equipment Field Log Sheet .....	6-9
6-8	Pump Test Field Log Sheet .....	6-10
6-9	Swabbing-Bailing Test Field Log Sheet .....	6-11
6-10	Field Log of Boring and Well Installation (Form 1)....	6-12
6-11	Field Log of Boring and Well Installation (Form 2)....	6-13
8-1	Sample Monitoring Well Log .....	8-3
8-2	Typical Detail of Monitoring Wells .....	8-7
11-1	Organization of the Field Investigation Area .....	11-2
11-2	Typical Layout of PDS for Levels B and C Protection...	11-8

## 1. INTRODUCTION

This Technical Operations Plan has been prepared for Air Force Plant #38 (AFP #38), Town of Porter, Niagara County, New York. It presents work plans and field investigation procedures to be used to satisfy the requirements set forth in the delivery order to the Presurvey-Phase II Installation Restoration Program (IRP). This document is the result of an evaluation of the Phase I-Records Search Report, participation in a presurvey tour conducted at the installation cited above, and subsequent meetings and discussions with Emile Baladi, Director of Technical Services and Contract Specialist, Occupational and Environmental Health Laboratory (OEHL), Col. R.C. Wooten, Project Officer and Supervisor of Technical Services, OEHL, and Mr. Tommy Thomas, Chief of the Analytical Services Branch, OEHL. The work plans are designed to address the scope of activities described in Stage I of the program, namely, to provide a qualitative assessment of environmental contamination using a minimum of investigative activities at the sites specified in the delivery order.

The field investigation procedures to be followed are consistent with rules and regulations set forth by the United States Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), Nuclear Regulatory Commission (NRC), and the Department of Transportation (DOT). Investigations will also be conducted in accordance with provisions of the Resource Conservation and Recovery Act (RCRA), and the Comprehensive Environmental Response Compensation and Liability Act (CERCLA).

The history of the installation and practices involving hazardous wastes are described in the Phase I report and will not be reiterated here.

The listing of sites recommended in the Phase I report for investigation is given below:

- Drainage ditches;
- Salvage yard and container storage area;
- Burn pits;
- Flush and maintenance buildings and laboratory;
- Fuel storage tanks and electrical transformers;
- Incinerator and incinerator pad; and
- Container storage pad and surrounding soils.

The location of AFP #38 is shown on Figure 1-1. Descriptions of the proposed scopes of work for each of these sites are included in Section 2.

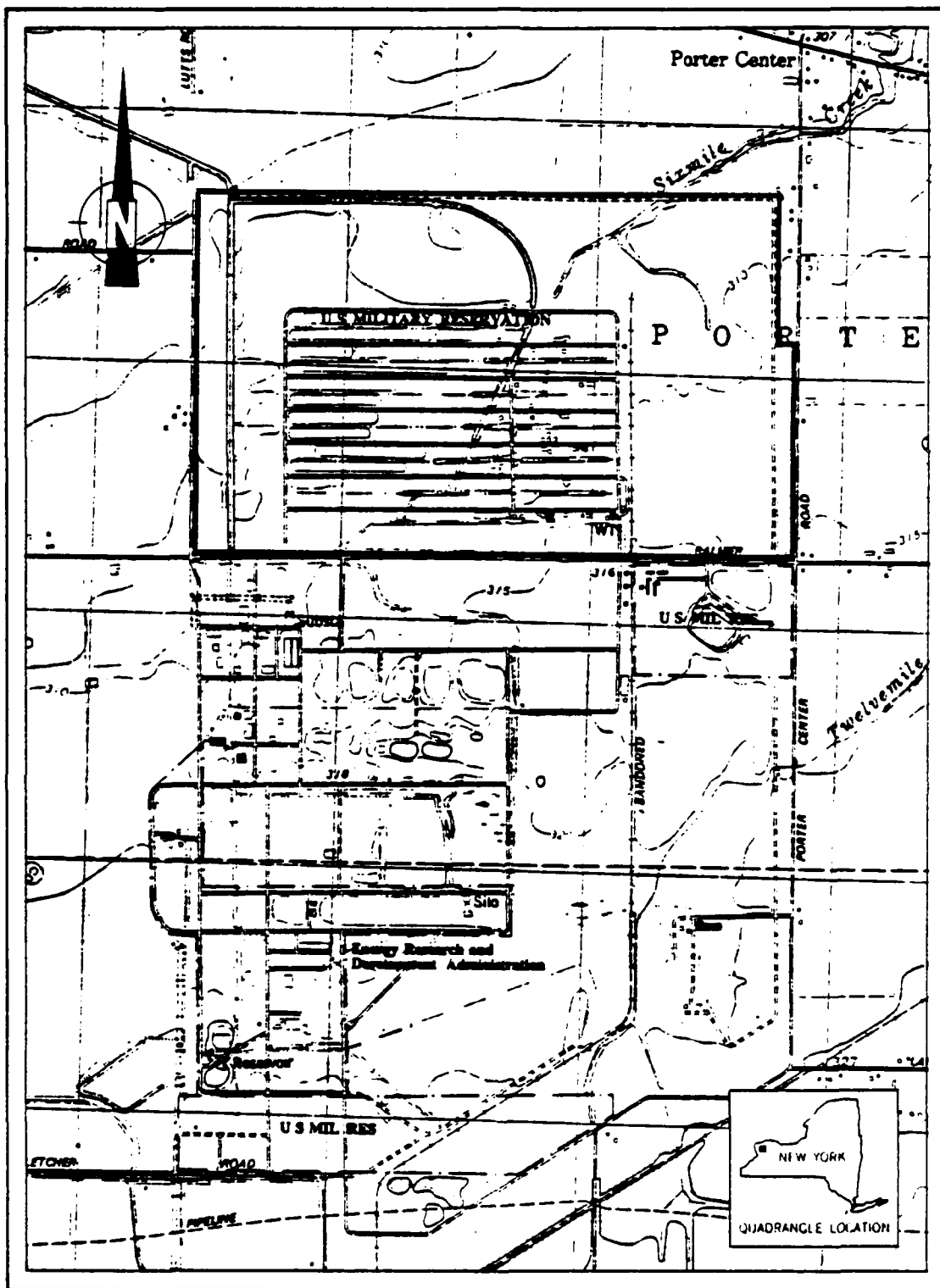


Figure 1-1 PROJECT LOCATION MAP

2. PROPOSED WORK PLANS  
FOR STAGE I  
SITE INVESTIGATION

The work plans were developed to accomplish those objectives designated under directive F33615-83-D-4003, Proposed Order 12, IRP Phase II, Stage I Presurvey, Air Force Plant #38, Porter, New York. These tasks are described in Section 1 of the directive and consist of:

- Confirm the presence or absence of contaminated substances within the specified areas of investigation;
- If contamination exists, determine its magnitude and extent and the potential for migration of these contaminants in the various environmental media;
- Assess the potential environmental and health risks associated with these contaminants in the local environmental setting. This assessment will be based on applicable local, state, and/or federal standards, only; and
- Delineate additional investigations required beyond the present investigation stage to accomplish Phase II objectives.

To accomplish these goals, composite soil/sediment sampling and surface water sampling will be conducted at the areas of potential concern. Prior to sampling activities, a site reconnaissance will be

conducted. This will include locating all storage tanks and electrical transformers, and determining sampling locations at the areas of potential contamination.

The container storage area, salvage yard, burn pits, and incinerator pad will be inspected. An inventory will be made of materials presently in these areas, and any stained locations (potential spill areas) or other outstanding features will be documented. Finally, all ditches on the site will be inspected. The ditches of primary concern are the Magazine Ditch (and containment basin), the Central Drainage Ditch, and the East Drainage Ditch. Any floating debris, stains along the shorelines, or discoloration of the water (pools of oil, etc.) will be documented in the field logbook. In addition, any potential obstacles to sampling in these areas will be noted.

All samples collected during the sampling program will be split in the field and all splits will be sent to OEHL. All soil and sediment samples will be monitored in the field for volatile contaminants. Water samples will be tested in the field for pH, conductivity, and temperature.

Laboratory analyses for water samples, as described under the scope of work for each site, have been assigned identification numbers in the Chemical Analyses Price Schedule of the contract. The parameters and corresponding numbers are listed in Table 2-1.

Sampling, maximum holding time, and preservation of samples will comply with Standard Methods for the Examination of Water and Wastewater, 16th Ed. (1985), pp. 35-42; Water and Environmental Technology, Section II, ASTM; Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, EPA-600/4-82-057; and Methods for Chemical Analysis of Waters and Wastes, EPA Manual 600/4-79-020, pp. xii-xix (1983).

Locations where water, soil, or sediment samples are taken will be designated where possible with a marker, and the location will be documented on a project site map.

The following subsections outline the proposed work plan for each of the sites.

Table 2-1  
LABORATORY ANALYSIS FOR WATER SAMPLES

I.D. Number	Chemical Test Category
1	Trihalomethanes
2	Heavy Metals--Primary
3	Heavy Metals--Secondary
4	Oil and Grease
5	Total Organic Carbon (TOC)
6	Polychlorinated Biphenyls (PCBs)
7	Chlorinated Hydrocarbons (Pesticides)
8	Herbicides
9	Priority Pollutants (GC/MS Confirmation)
10	Purgeable Organics
11	Base/Neutral Extractables
12	Acid Extractables
13	Primary Drinking Water Standards
14	Secondary Drinking Water Standards

## 2.1 SITE 1: GENERAL DRAINAGE DITCHES

The investigation at this site will consist of water and sediment sampling at the Central Drainage Ditch, Magazine Ditch, and East Drainage Ditch, and at Six Mile Creek. Approximate sampling locations are shown on Figure 2-1.

A maximum of six water samples will be collected either by hand or using a Wheaton sampler. At each sampling location, water depth, temperature, and pH will be recorded. All water samples will be analyzed for petroleum hydrocarbons, volatile halocarbons, volatile aromatics, primary metals, nitrate, and fluoride.

A maximum of six sediment samples will be taken to a depth of 1 foot using a split-spoon sampler. Composition and color of each sample will be noted in the field logbook. All sediment samples will be analyzed for the same parameters as the water samples.

## 2.2 SITE 2: SALVAGE YARD AND CONTAINER STORAGE AREA DITCHES

Investigation of the salvage yard will consist of soil/sediment sampling at the yard's drainage ditch at a point downgradient of the site in the direction of Six Mile Creek.

A composite sediment sample will be taken to a depth of 1 foot using a split-spoon sampler. Composition and color of the sample will be noted in the field logbook. The sample will be analyzed for volatile halocarbons, volatile aromatics, and primary metals.

Sediment from the ditch draining the container storage area will be collected at a point immediately below the discharge point of the pipe from below the container storage pad. It will be treated in the same manner as the sample from the salvage area ditch.

## 2.3 SITE 3: BURN PITS

The "C" Street burn pit and the salvage yard burn pit will be investigated for soil contamination.

One composite soil sample will be collected from each of the two burn pit areas. Samples will be taken using a split-spoon sampler to a depth of 1 foot. Surface vegetation and litter will be cleared prior to sampling. Composition and color of each sample will be noted in the field logbook. The samples will be analyzed for volatile halocarbons, volatile aromatics, and primary metals.



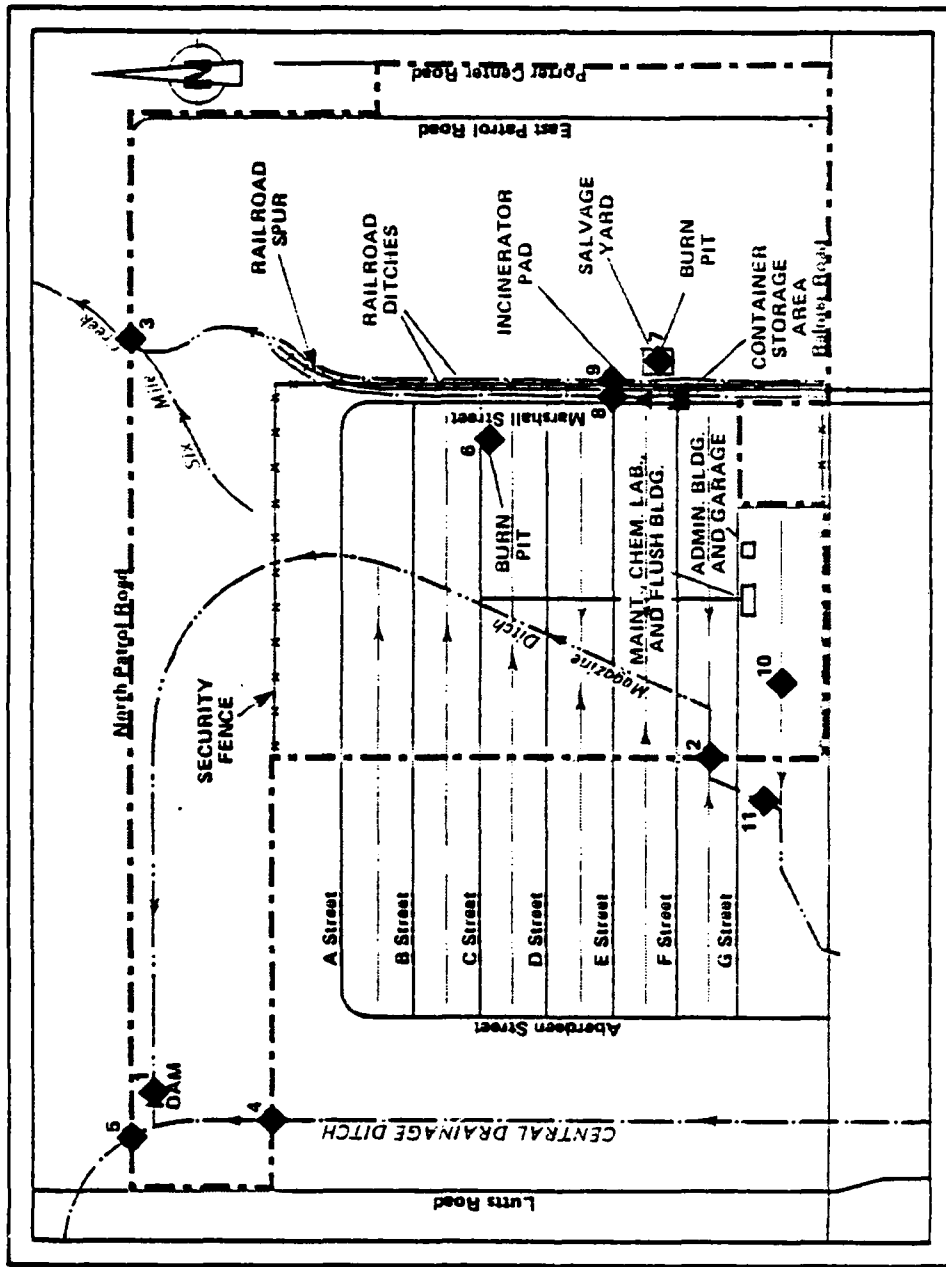


Figure 2-1 SAMPLING LOCATIONS

#### 2.4 SITE 4: MAINTENANCE, LABORATORY, AND FLUSH BUILDING DRAINAGE DITCHES

Investigation of this site will consist of soil/sediment sampling in the drainage ditch near the buildings and sediment/water samples from the Magazine Ditch, below the ditch's discharge (see Figure 2-1).

A water sample will be taken from Magazine Ditch by submerging the sample containers. It will be analyzed for petroleum hydrocarbons, volatile halocarbons, volatile aromatics, primary metals, nitrate and fluoride. A single composite soil or sediment sample will be taken to a depth of 1 foot using a split-spoon sampler. Surface litter will be cleared prior to sampling. Composition and color of each sample will be noted in the field logbook. The samples will be analyzed for priority pollutant organics and primary metals.

#### 2.5 SITE 5: FUEL STORAGE TANKS AND ELECTRICAL TRANSFORMERS

The fuel storage tanks and electrical transformers will be located and inspected. Table 2-2 and Figure 2-2 give the approximate location and size of the 31 storage tanks. The structural condition as well as any contents of the tanks will be noted. In addition, an approximation will be made of the percentage of the tank that is underground. All observations will be recorded in the field logbook.

The electrical transformers will also be located and their size and condition noted in the field logbook. A visual approximation will be made of the size and condition of those transformers that are above ground (i.e., above eye level). Site investigation team members will make their observations from the ground. The inspection will also note whether the transformers have been properly labeled as containing PCBs. The area around the electrical transformers will be checked for oily stains to determine if there were transformer leaks. A sample of oil will be taken from one transformer and analyzed for PCBs.

#### 2.6 SITE 6: INCINERATOR AND INCINERATOR PAD

A sample from the interior surface of the incinerator above the burning zone will be taken. The top surface of the incinerator pad will also be scrape sampled. Both samples will be analyzed for hydrazine.

Table 2-2  
STORAGE TANK/BOILER LOCATIONS

Boiler No.	Location	Storage (in gals)
18A	2C	3,000
19	3C	1,000
20	5C	275
21	1B	1,000
22	2B	1,000
23		275
24	3B	1,000
26	Acid area*	275
27	1A	275
28	5B	1,000
31	4B	275
32	4C	275
40	Neutralization dam	2 (275)
1	Service building	1,000
3	Administration building	1,000
4A	Garage	1,000
4B	Garage	—
5	Maintenance	1,000
6	Machine shop	1,000
7	Igloo 9043*	275
8A	3F - PBPS storage	3,000
8B	Same as above	—
9	1E - Control	1,500
10	2E - Control	1,000
11A	2E boiler building	3,000
11B	2E boiler building	1,000
11C	2E boiler building	—
11D	2E boiler building	—
11E	2E boiler building	—
13	2E Quonset	275
14	1D	1,000
15	2D	1,000
16	3D	1,000
17	1C	1,000

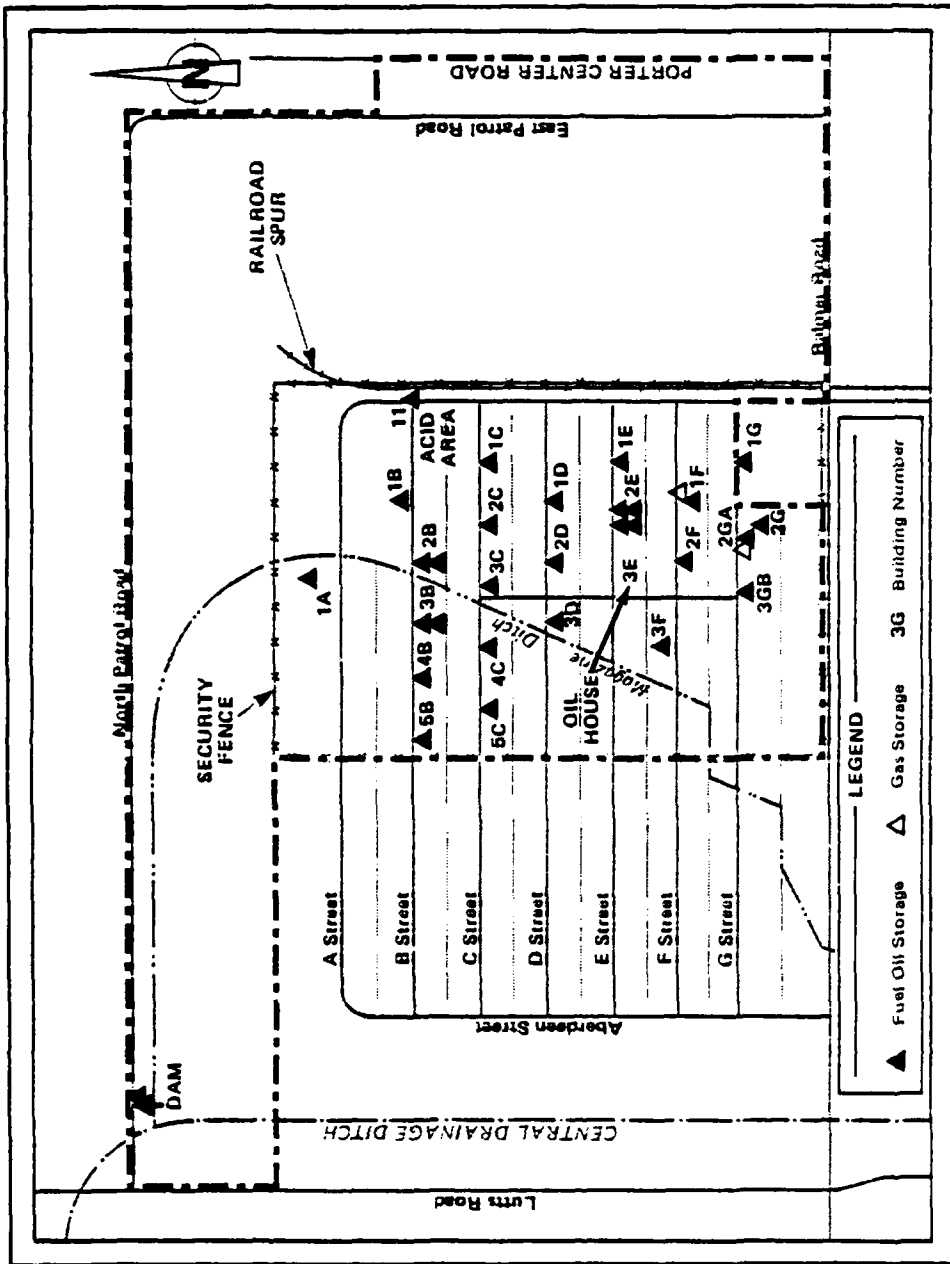


Figure 2-2 FUEL STORAGE TANK LOCATIONS

Four soil borings will be drilled to a depth of 5 feet at the center of each of the four sides of the incinerator pad. The borings will be placed 2 feet from the edge of the pad. Split-spoon samples will be taken at the 1-foot and 5-foot depths from each of the borings. The samples will be analyzed for petroleum hydrocarbons, volatile halocarbons, volatile aromatics, hydrazine, and isopropyl alcohol.

#### 2.7 SITE 7: CONTAINER STORAGE PAD AND SURROUNDING SOILS

A swab sample of the top surface of the container storage pad will be taken. The sample will be analyzed for TOC, TOX, primary metals, volatile halocarbons, and volatile aromatics.

Four soil borings will be drilled to a depth of 5 feet at the center of each of the four sides of the container storage pad. The borings will be placed 2 feet from the edge of the pad. Split-spoon samples will be taken at the 1-foot and 5-foot depths from each of the borings. The samples will be analyzed for TOC, TOX, primary metals, petroleum hydrocarbons, volatile halocarbons, and volatile aromatics.

### 3. FIELD SET-UP

Following approval of the proposed project plan, E & E will be responsible for ordering, acquiring, and mobilizing all required personnel and equipment to the facility.

The Air Force will be requested to supply a secure building on the facility to which equipment and supplies can be directly sent and stored prior to and during the project. This building will also be used as a central field and equipment maintenance office, and as a sample handling and storage area

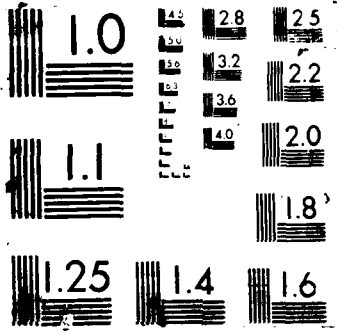
In addition to the building, a secure fenced-in area preferably adjacent to or near the building will be required for storage of the drilling rig and its equipment when not in use.

During the on-site work, equipment and supplies will be staged at the central location prior to being moved to the specific site under investigation. Following the day's activities, all equipment will be returned to the secured storage areas. No equipment will be left unattended at an investigation site.

The actual in-field set-up of equipment at an investigation site will follow E & E's established procedures. Figure 3-1 shows the basic concept of the standard field set-up. Site-specific considerations will probably necessitate some variations. All entry to an immediate work area will be controlled at all times during field activities in order to minimize the potential health and safety risk to both in-field personnel and any observers.

Prior to the start-up of work, a detailed work plan and a site safety plan will be prepared. The site safety plan will include the







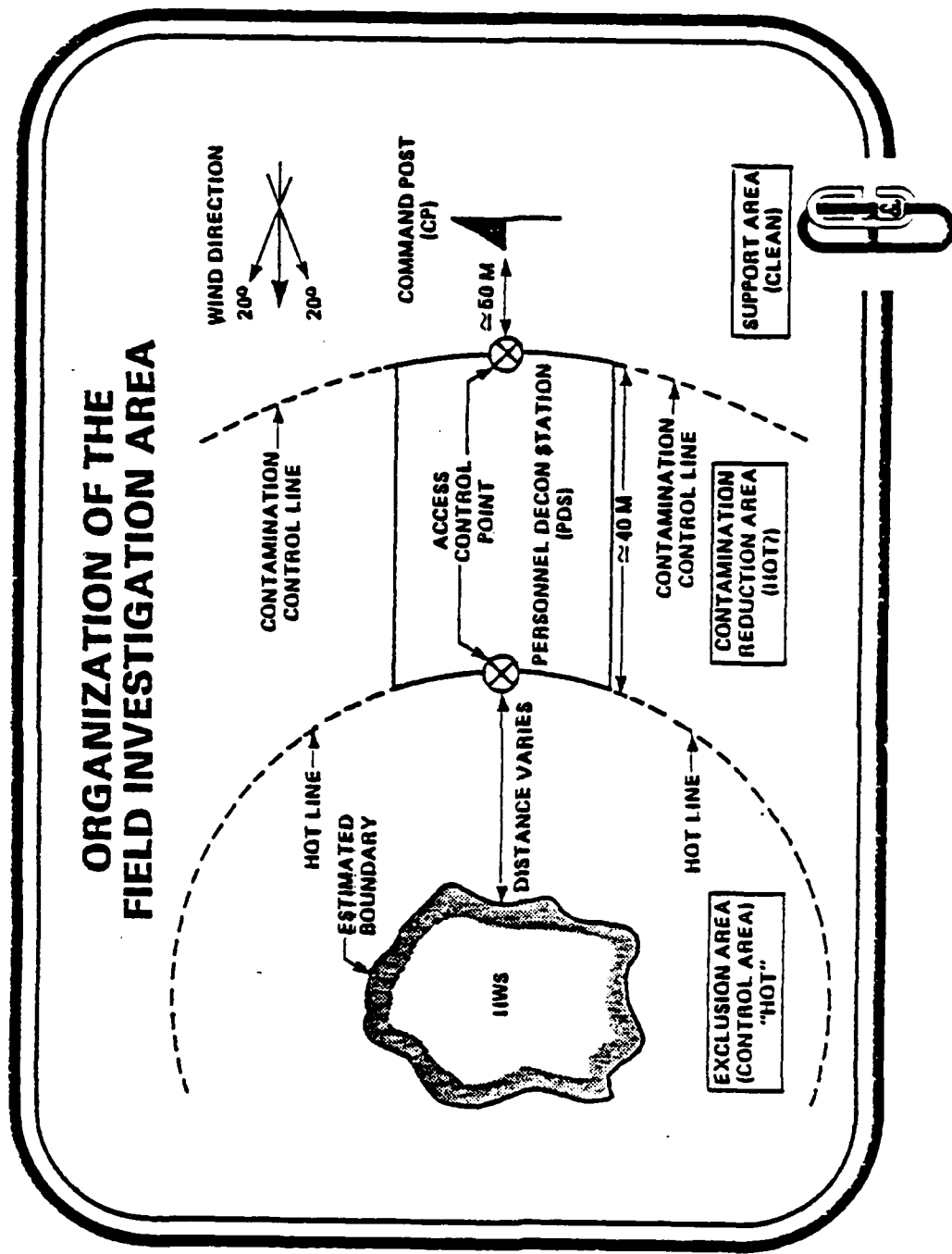


Figure 3-1 ORGANIZATION OF THE FIELD INVESTIGATION AREA

level of personal protection required by on-site personnel. Based on existing information concerning the sites at the facility, Level C presently is planned. However, if necessary, the site safety officer (see Section 15) may upgrade or downgrade the level of protection based on new or changing observations of site conditions. This would result in a cost increase or decrease, respectively. The Health and Safety Plan is presented in Appendix A.

E & E will utilize qualified local subcontractors to support the field investigation, as required. All subcontracted work will be overseen by the E & E project manager to insure compliance with the Statement of Work specified in the delivery order to the Phase II Survey of the IRP.

#### 4. CALIBRATION OF FIELD EQUIPMENT

All field equipment should have been calibrated prior to delivery to the site. However, because of shock received during shipping and handling, the instruments may require either recalibration or an operational check prior to field use. The method and frequency of calibration for each instrument is generally based on such factors as the type of equipment, extent of use, degree of accuracy required, and manufacturer's specifications. Instrument calibration should be certified by documented standards of accuracy, whether performed at E & E headquarters or by outside calibration or repair services. E & E requires that records of calibration dates and standards be maintained for each instrument subject to calibration.

Each piece of equipment requiring periodic calibration or calibration prior to each use must be accompanied by a bound logbook. The logbook will note the instrument's current calibration status with regard to the date last calibrated, instrument settings during calibration, and the initials of the person performing the calibration.

All instruments are to be stored, transported, and handled with care to preserve the equipment's accuracy. Equipment found to be damaged prior to or during use must be taken out of service immediately and cannot be used again until a qualified technician repairs and recalibrates the equipment in question.

## 5. PREVENTATIVE MAINTENANCE OF FIELD EQUIPMENT

All equipment used by E & E in the field is subject to standard preventative maintenance schedules established by corporate equipment protocols. All equipment is inspected at least twice daily, once before start-up in the morning and again at the end of the work shift prior to overnight storage or return to the charging rack. Regular maintenance such as cleaning lenses, replacement of in-line filters, and removal of accumulated dust is to be conducted according to manufacturer's recommendations and in-field need, whichever is appropriate. All preventative maintenance performed will be entered in the individual equipment's logbook and the site safety logbook.

In addition to preventative maintenance procedures, daily calibration checks will be performed at least once a day in the morning prior to use and duly recorded in the respective logbooks. Additional calibration checks will be performed as required.

All logbooks will become part of either the permanent site file or the permanent equipment file.

## 6. FIELD ANALYTICAL PROCEDURES AND DATA REPORTING

All field analytical procedures and sampling at a facility or from the environment may become physical evidence in a legal action. An essential part of E & E's protocols is that the analysis or sample be controlled at all times and thoroughly documented. E & E maintains serialized field data records (FDRs) in the form of individual sheets or bound logbooks. Company analysts record all on-site measurements and field observations in the FDRs, including all pertinent information necessary to explain and reconstruct site operations. Each page of the FDR is dated and signed by all individuals making entries on that page. The leader of the field team on duty is responsible for insuring that the FDR is used during all activities and is stored safely to avoid possible tampering.

In addition to individual field sheets and daily logbooks, project managers must complete weekly summary sheets delineating the past week's activities. All data sheets, logbooks, and weekly summary sheets become part of the permanent site/project file. Figures 6-1 through 6-5 are examples of the weekly summary sheets that will be used.

### 6.1 CHEMICAL DATA

Chemical field analyses are generally limited to preliminary testing of pH and conductivity and surveying for organic vapors or other hazardous emissions (i.e., HCN, H₂S, and contaminated dust). All findings are recorded in the site logbook, site safety logbook,

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FIELD ACTIVITIES  
WEEKLY PROGRESS REPORT

Work Site: _____ E & E Job No.: _____ Week Ending: _____  
Start Date: _____ Percentage of Field Work Completed: _____  
Client: _____  
Contractor(s): _____  
Personnel and Duties: _____

Drilling:

Number of Holes Drilled: _____ Total Feet Drilled: _____ Average Feet/Day: _____  
Material and Types of Equipment Used: _____

Comments: _____

Sampling:

Number of Samples Taken: _____ Water: _____ Soil/Sediment: _____ Average Samples/Day: _____  
Materials and Types of Equipment Used: _____

Comments: _____

Other Field Activities:

Type of Work Performed: _____

Comments: _____

Future Work Plans: _____

_____  
Signature/Date

cc: V.P. Technical Services, Project Director, Project Manager, Project File

447025

Figure 6-1 FIELD ACTIVITIES WEEKLY PROGRESS REPORT

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DRILLING  
WEEKLY PROGRESS REPORT

Work Site: _____ E & E Job No.: _____ Week Ending: _____  
Driller: _____ Driller's Helper: _____ Geologist: _____  
Number of Drill Holes Drilled and Completed: _____ Average Feet/Days: _____

Drill Hole Information:

1. Hole Designation: _____ Total Depth: _____ Static Water Level: _____

How Hole was Drilled and Equipment Used: _____

Was Hole Cased? _____ Type and Amount of Casing Used: _____ Screened Interval: _____

Type and Size of Well Screens: _____

Amount of Sand, Gravel or Cement Used: _____

Was Hole Developed? _____

Problems Encountered: _____

2. Hole Designation: _____ Total Depth: _____ Static Water Level: _____

How Hole was Drilled and Equipment Used: _____

Was Hole Cased? _____ Type and Amount of Casing Used: _____ Screened Interval: _____

Type and Size of Well Screens: _____

Amount of Sand, Gravel or Cement Used: _____

Was Hole Developed? _____

Problems Encountered: _____

3. Hole Designation: _____ Total Depth: _____ Static Water Level: _____

How Hole was Drilled and Equipment Used: _____

Was Hole Cased? _____ Type and Amount of Casing Used: _____ Screened Interval: _____

Type and Size of Well Screens: _____

Amount of Sand, Gravel or Cement Used: _____

Was Hole Developed? _____

Problems Encountered: _____

_____  
Signature/Date

cc: V.P. Technical Services, Project Director, Project Manager, Project File

448025

Figure 6-2 DRILLING ACTIVITIES WEEKLY PROGRESS REPORT

ecology and environment, inc.  
GEOPHYSICAL SURVEYS  
WEEKLY PROGRESS REPORT

Work Sites: _____ E & E Job No.: _____ Week Ending: _____  
Work Completed: _____

Grid System Used (area covered, spacing and designation): _____

EM Survey:

Type Equipment Used: _____

Area Covered: _____ Time (Hours) Required*: _____

Number of Data Points Collected: _____ Fullspace _____ Halfspace _____

Problem Areas: _____

Comments: _____

Magnetometer Survey:

Type Equipment Used: _____

Area Covered: _____ Time (Hours) Required*: _____

Number of Data Points Collected: _____

Problem Areas: _____

Comments: _____

Seismic Survey:

Type Equipment Used (include number of channels): _____

Area Covered: _____ Time (Hours) Required*: _____

Number and Length of Lines Run: _____

Problem Areas: _____

Comments: _____

Other Geophysical Work: _____

*Total hours charged to project.

_____  
Signature/Date

cc: V.P. Technical Services, Project Director, Project Manager, Project File

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Figure 6-3 GEOPHYSICAL SURVEYS WEEKLY PROGRESS REPORT



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WATER SAMPLING  
WEEKLY PROGRESS REPORT

Work Site: _____ E & E Job No.: _____ Week Ending: _____

Total Number of Samples Taken: _____ Average Samples/Day: _____

Procedures and Types of Equipment for Sampling: _____

Comments: _____

A. Sample I.D. and Location: _____

Type of Sample: _____

How Sample was Taken: _____

Comments: _____

B. Sample I.D. and Location: _____

Type of Sample: _____

How Sample was Taken: _____

Comments: _____

C. Sample I.D. and Location: _____

Type of Sample: _____

How Sample was Taken: _____

Comments: _____

D. Sample I.D. and Location: _____

Type of Sample: _____

How Sample was Taken: _____

Comments: _____

E. Sample I.D. and Location: _____

Type of Sample: _____

How Sample was Taken: _____

Comments: _____

F. Sample I.D. and Location: _____

Type of Sample: _____

How Sample was Taken: _____

Comments: _____

_____  
Signature/Date

cc: V.P. Technical Services, Project Director, Project Manager, Project File

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Figure 6-4 WATER SAMPLING WEEKLY PROGRESS REPORT

ecology and environment, inc.

SOIL/SEDIMENT SAMPLING  
WEEKLY PROGRESS REPORT

Work Site: _____ E & E Job No.: _____ Week Ending: _____

Total Number of Samples Taken: _____ Average Samples/Day: _____

Procedures and Types of Equipment for Sampling: _____

Comments: _____

A. Sample I.D. and Location: _____

Type of Sample: _____

How Sample was Taken: _____

Comments: _____

B. Sample I.D. and Location: _____

Type of Sample: _____

How Sample was Taken: _____

Comments: _____

C. Sample I.D. and Location: _____

Type of Sample: _____

How Sample was Taken: _____

Comments: _____

D. Sample I.D. and Location: _____

Type of Sample: _____

How Sample was Taken: _____

Comments: _____

E. Sample I.D. and Location: _____

Type of Sample: _____

How Sample was Taken: _____

Comments: _____

F. Sample I.D. and Location: _____

Type of Sample: _____

How Sample was Taken: _____

Comments: _____

G. Sample I.D. and Location: _____

Type of Sample: _____

How Sample was Taken: _____

Comments: _____

_____  
Signature/Date

cc: V.P. Technical Services, Project Director, Project Manager, Project File

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Figure 6-5 SOIL/SEDIMENT SAMPLING WEEKLY PROGRESS REPORT

and field data sheets, if appropriate. Any further chemical analysis conducted in the field would be recorded using the procedures stated above.

## 6.2 HYDRAULIC DATA

Several techniques are employed in hydrological investigations. These may be employed separately or two or more may be combined, depending on the client's needs and the nature of a particular study. The contract scope of work normally details the procedures to be followed, describes the facilities, and identifies the equipment required to conduct the hydrologic investigations. The degree of calibration necessary and the exact method of documentation are site/project-specific.

Detailed procedures to be used in hydrologic studies during the Phase II Confirmation Study at this facility may include:

- Water sample collection, preparation, and shipment;
- Pump testing;
- Swabbing;
- Surging;
- Limited field analysis of groundwater samples; and
- Determination of water levels.

All data gathered during hydrologic investigations will be maintained in serialized field logbooks or on individual sheets as previously stated. Figures 6-6 through 6-9 are examples of field data sheets which may be used by E & E field personnel.

## 6.3 SOIL BORING DATA

For each boring and well installation, a field log must be completed by the geohydrologist supervising the operation. The completed log describes the operation, identifies any analyses conducted with findings, and provides a graphic description of the geohydrological environment encountered. The field logs become part of the permanent site file and must be kept in a secure location. Figures 6-10 and 6-11 are examples of the typical field log sheets used by E & E personnel.

DEPTH TO WATER

Well Name/Number _____ Date _____ (C.D.T.)  
 Time (Military) #1 _____ #2 _____ #3 _____ #4 _____ (C.S.T.)

Name of Operator _____

I.D. of Equipment (Vehicle or Iron Horse Number) _____

Date of Last Calibration _____ To be Calibrated (Date) _____

Correction Factor _____ Measuring Point (MP) _____

Land Surface Datum (LSD) to MP _____ (Units)

Depth to Water (DTW) from MP (If measurement is within 0.1% of subsequent measurement, only 2 are necessary)

	#1	#2	#3	#4	(Units)
In reading (1)					
Out reading					
Add or subtract (2) from Out reading					
Sum of (1) & (2)					
MP to LSD					
DTW from LSD					
Correction factors of equipment					
Corrected DTW from LSD					

Tool used to obtain DTW (float switch, magnesium (copper) screw, transducer -- if transducer, list range and serial number) _____

Other equipment used (digital multimeter, recorder, etc.) List as appropriate  
 make _____ model _____ serial number _____  
 calibrated _____ calibration date _____

Procedure number used _____

Altitude of MP _____ (Units) Altitude of water level _____ (Units)

Comments _____  
 _____  
 _____

Figure 6-6 DEPTH TO WATER FIELD LOG SHEET

MONITORING EQUIPMENT

Well: _____  
 Date: _____  
 Time: _____ (Time Reference)  
 Name of Operator: _____  
 I.D. of logging equipment (vehicle) and/or cable reel No. _____  
 Serial Number of transducer: _____  
 Range of transducer: 0 to _____ (Units)  
 Calibration of transducer: _____ (mv/ft or mv/m)  
 Voltage to transducer (measured at power supply output with transducer attached): _____  
 Millivolts or volts as related to barometric pressure (ie. barometric pressure may be 26.73 but is printed on data acquisition system as 2.67v. Therefore entry would be 2.67v = 26.73 inches of Mercury): _____  
 Other equipment used (type, Serial Number, when calibrated) _____  
 _____  
 _____  
 _____

TRANSDUCER CALIBRATION POINTS

FT/M ^{1/}	UP	MV	MV Change ^{2/}
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

^{1/} Indicate which units  
^{2/} Per interval or per unit

Figure 6--7 MONITORING EQUIPMENT FIELD LOG SHEET



Swabbing-bailing test form _____ Hole _____ Area _____

Observed by: _____ Date: _____

Hole depth _____ diameter _____ Cased interval _____

Perforated intervals _____ Tested interval _____

Water levels measured with _____

Measuring point is _____ which is _____ below land surface.

Static water level _____ below measuring point.

**BAILING TESTS**

Type of bailer _____ length _____ diameter (ID) _____  
capacity _____

**SWABBING TESTS**

Method of measurement (barrel, tank, etc.) _____

Tank dimensions: Width _____ length _____ height _____

Capacity: 1 = _____ 0.1 = _____ 0.01 = _____

Measuring point _____

Depth casing set _____ Depth swabbing from _____

Weight of fluid at end of cleanout _____ ft.

Time	Bailer or swab trip no.	Water removed	Depth to water below MP	t', time since discharge stopped	Remarks (temperature, color, specific conductance, etc. of sample)

Figure 6-9 SWABBING-BAILING TEST FIELD LOG SHEET







#### 6.4 SURVEY DATA

All site surveying will be recorded at the time of the work in either the site logbook or a separate bound logbook, and retained in the secured permanent site file. All entries will be made in ink, with errors indicated by a single line through the initial entry followed by the corrected entry and the initials of the person making the correction.

All surveying will be conducted to an accuracy of 0.01 feet  $\pm$  0.005 feet, thus enabling static water level measurements to be used to determine groundwater flow directions.

## 7. SAMPLE NUMBERING SYSTEM

### 7.1 PROJECT IDENTIFICATION

Project management is a complex and demanding process that requires an established framework to track a project's progress. E & F has established a Work Breakdown Structure (WBS) management plan which is at the heart of project cost control and tracks a project's progress through the identification of discrete tasks or elements, each with its own specific identification number. The overall project will have a six-digit alphanumeric code called the project number sequentially followed by specific task and subtask codes. All work performed or expenses incurred for the project will be attributed to one of the specific task or subtask codes, thereby enabling easy tracking of the project's progress and cost.

For this facility, specific task and subtask codes will be assigned for the different work segments (i.e., drilling of monitoring wells, sampling of groundwater, etc.) following approval of the work plan and receipt of an authorization to proceed from the Air Force.

### 7.2 SITE IDENTIFICATION

All environmental monitoring and sampling sites will be identified using the Air Force's standard format of a nine-digit, alphanumeric code consistent with that required for completion of AF Form 2752. The identifier will be made up of the installation code, followed by the sampling site type code and site location number. All documentation for a specific site will include the site identification code for ease of tracking.

### 7.3 SEQUENCE NUMBER

All samples collected during the project will be identified with an eight-digit alphanumeric code consistent with that required for completion of AF Form 2752. All documentation referencing samples taken will be identified using this system. The sample numbers will classify the sample as to the method and type of sample and the calendar year, and will sequentially identify each sample taken.

### 7.4 SPLIT SAMPLES

If required, sample splits will be obtained, one portion to be retained by the client and one portion to be sent to E & E's Analytical Services Center (ASC) for analysis. Identical sample numbers will be attached to the two (or more) containers and documented in the site logbook. All sample splits will be retained under standard chain-of-custody procedures until they are relinquished to authorized personnel.

### 7.5 FIELD QC SAMPLES

Additional samples taken in the field are used to evaluate both sampling and analytical methods. The three basic categories are blanks, duplicates, and spiked samples. Field spikes are rarely used because complicated manipulations of measured volumes of solutions are undesirable in the field. General criteria are that there will be one blank sample for each 20 field samples, or for each batch, whichever is smaller. Approximately one in 10 samples will be taken in duplicate. The actual quantities and types of QC samples will be decided by the project manager in consultation with the ASC manager. QC samples will be labelled, preserved, transported, and secured in exactly the same manner as samples (see Sections 12 and 13).

#### Field Blanks

Various types of blanks are used to check the cleanliness of field handling methods. Because field conditions cannot be as rigorously controlled as they are in the laboratory, positive field blank values are not to be subtracted from sample results. It is not possible to set rules for treatment of field blank results which show a degree of contamination. This is the responsibility of the project

manager and the ASC manager, and they will decide to qualify or reject data taking into consideration all factors in a sampling and analysis project. It is possible to design blanks to monitor each and every stage of a sampling exercise: bottle cleaning, sample equipment cleaning, sample collection, transfer to bottles, bottle decontamination, packing, and shipping. Usually, only two types of blanks are used: the transport blank and the field equipment blank (sometimes called the transfer blank or rinsate blank). Field staff may add blanks if field circumstances are such that they consider normal procedures are not sufficient to prevent or control sample contamination, or at the direction of the project manager. Rigorous documentation of all blanks in the site logbooks is mandatory.

#### Transport Blanks

Transport blanks are blank samples designed to demonstrate that the transport of sample bottles to and from the field does not result in sample contamination. One of each type of the prepared bottles to be used during sample collection is filled with pure water, capped, and labelled. The project manager may or may not inform the laboratory that this sample is a blank. If the laboratory is not informed, it is permissible to put false identifying information on the label. If this is done, then the project manager must be responsible for preparation of the final report to the client or agency so that the information on that blank does not show up as a mysterious additional sample. Full documentation must be made in the site logbook.

The blank sample is transported to the site, unpacked, carried into the sampling area, labelled, decontaminated, packed, and shipped back to the laboratory. As far as possible, it should receive the same treatment as a real sample except that the bottle is not opened at any time.

#### Field Equipment Blanks

Field equipment blanks are blank samples (sometimes called transfer blanks or rinsate blanks) designed to demonstrate that sampling equipment has been properly prepared and cleaned before field use, and that cleaning procedures between samples are sufficient to minimize cross contamination. If a sampling team is familiar with a

particular site, they may be able to predict which areas or samples are likely to have the highest concentration of contaminants. Unless other constraints apply, these samples should be taken last to avoid excessive contamination of sampling equipment.

Field equipment blanks can be taken before the sampling apparatus is used to collect any samples at the beginning of the day. In this case, the blanks are used to test the initial preparation of the sampling apparatus. The sampler (bailer, split spoon, coliwasa, etc.) is rinsed with pure water (or, in some cases, solvent) and the rinsate is collected and treated as any other sample. Alternatively, or in addition, field equipment blanks can be taken during a sampling run, in which case they serve to test the efficiency of the field cleaning procedures used to prevent cross contamination. The equipment is cleaned in the recommended way, then rinsed with water (or solvent), which is then collected. In either case, it is the responsibility of the project manager and the ASC manager to interpret the results and reject or qualify data accordingly.

#### Duplicate Samples

Approximately one in 10 samples will be taken in duplicate. Duplicate samples are identical samples (same place and time, or immediately consecutive) placed in identical containers and treated as normal samples. For the purpose of data reporting, one is arbitrarily designated the sample, the other as the duplicate. Both sets of results are reported (not averaged) to give an indication of the precision of the sampling and analytical methods.

The project manager decides which samples are to be duplicated and whether or not to inform the laboratory. If the project manager wishes to make an assessment of the laboratory's precision without the laboratory's knowledge, the duplicate sample can either be labelled simply "duplicate" or with some false identifying information (e.g., a non-existent monitoring well identification number). In this case it is the project manager's responsibility to assess data quality on the basis of the duplicate results.

## 8. DRILLING AND INSTALLATION OF GROUNDWATER MONITORING WELLS

### 8.1 DRILLING

E & E employs a wide range of soil and rock boring techniques, including those using drive casing; both solid- and hollow-stem augers; water, air, and mud rotary and reverse rotary drills; and cable tools. The data requirements for a given well dictate the size and depth of the well, the materials to be used in its construction, and, ultimately, the method of its installation. Table 8-1 lists some available drilling methods and their limitations.

E & E's approach to well drilling and boring design will depend on the specific nature of the past operation, the present data needs, the current environmental setting at each site, and any projected remedial actions. The drilling program will have detailed specifications of procedures and techniques for well and boring location, type, and design; sample collection, preservation, and transportation; analytical procedures; and chain-of-custody control. The use of such specifications will avoid the "hit-or-miss" approach that is typical of less sophisticated programs and will eliminate hidden costs.

Soil samples will be taken every 5 feet (unless otherwise specified by the Air Force) and at every change in strata by driving a 2-inch outside diameter, 2-foot-long split-spoon sampler. Samples will be inspected in the field by a qualified hydrogeologist who will establish site stratigraphy and geologic trends. All field data will be documented in a well log (Figure 8-1) that will be presented to the Air Force. The driller will be required to keep a similar log to serve as a cross-check of the accuracy of the field notes. Representative portions of each sample will be retained in labeled jars.

Table 8-1

SOME AVAILABLE DRILLING  
METHODS AND THEIR LIMITATIONS

Method	Assets and Limitations
Drive casing	Inexpensive and excellent for shallow, small-diameter wells. Vertical samples can be obtained by split-spoon and Shelby tube samplers with relative ease. Equipment is mobile and can be moved to virtually any location. Equipment can be obtained with coring capabilities. However, the method is relatively slow and is limited to about 100 to 150 feet in depth. A supply of drilling water is necessary. This water is introduced into the boring, thus creating potential cross-contamination or dilution problems. Trouble can be encountered with boulders and coarse gravel.
Hollow-stem auger	Inexpensive and particularly well-suited to shallow wells in unconsolidated formations. Drill rigs are highly mobile and easy to set up. No drilling fluid or washwater is required. Soil and water samples and bedrock cores can be taken through hollow-stem rigs. However, drilling depths are limited to 100 to 150 feet--often less in tight formations or coarse gravels. If boulders are encountered, it is usually necessary to abandon the hole.
Hydraulic rotary	Fast and well-suited to drilling larger-diameter wells in consolidated and unconsolidated formations. Much greater depths can be attained by this method. Core samples can be collected. The chief drawbacks are the expense, complexity of equipment operation, and difficulty in obtaining undisturbed soil samples. In addition, a supply of drilling water is necessary. This water is introduced into the boring, thus creating potential cross-contamination or dilution problems.
Air rotary	Similar to the hydraulic rotary, this method has the added advantage of not having to use drilling fluids while offering the versatility of being able to use a conventional roller cone bit and mud pump. Air rotary is probably the fastest drilling method available. However, the borehole size generally is limited to eight inches.
Cable tool	Relatively simple to operate and can be employed to drill large-diameter wells in consolidated and unconsolidated formations. Core samples can be collected. However, tends to be slow and drilling water may dilute formation water.





Bedrock cores are obtained by the use of diamond-tipped core barrels. All cores will be retained for future study, which may include microscopic examination of rock thin sections under a petrographic microscope to determine rock type, extent of microfracturing, and the like. Knowledge of these properties could aid team hydrogeologists in assessing the likelihood of the bedrock regime's acting as a conduit for off-site migration of contaminants. All drilling and boring will be conducted with strict adherence to ASTM standards, if applicable.

If drilling is conducted in areas suspected of being contaminated by volatile organics, samples of drilling spoils will be collected and placed in 50-mL vials with Teflon-coated septa. "Head-space" samples will be withdrawn and field-screened, using a Century Model 128 OVA, to estimate total volatile organic contamination. These data subsequently will be used to help delineate the vertical extent of contamination, establish the interval over which the well will be screened, and help characterize the contamination in order to determine the level of respiratory protection required on-site.

Stringent safety regulations will be adhered to by all E & E personnel and subcontractors. An in-depth description of the E & E corporate health and safety program, which will be followed by personnel working on Air Force projects, can be provided upon request.

## 8.2 SOIL SAMPLING

Soil samples will be taken at 5-foot intervals or, if warranted, on a continuous basis using split-spoon samplers. Shelby tube samples of undisturbed soil will be obtained for laboratory analysis of parameters such as hydraulic conductivity, shearing strength, and porosity. Bedrock will be obtained using diamond-tipped core barrels. The bedrock cores may be taken to the depth at which the well will be screened.

As soil samples are taken from the split spoon, an OVA will be used to "sniff" them for the presence of organic vapors. Samples will be forwarded to E & E's ASC for additional evaluation, either as composite or discrete samples.

All soils will be classified on-site by a geologist using the Unified Soil Classification Scheme.

Each containerized soil sample to be used in a composite will be sieved through a No. 8 mesh screen to remove stones and debris. Screening will be accomplished using a Teflon scraper to force material through the screen. This insures that the sample weight is not distorted by stones and debris with respect to any compound that may be present. The screened sample will then be weighed and returned to its original container for storage until all soil samples have been screened. The weight of the screened samples will be recorded for future use.

A portion of each screened sample will then be weighed to provide equal portions for the homogenization step. The weighed portions will be mixed thoroughly in a prepared 16-ounce sample bottle using a spatula. A homogeneous mixture will be attained by stirring the sample at least 10 to 15 times. The mixed sample will then be placed on a Teflon sheet and shaped into a rectangular form of even thickness. The rectangle will then be quartered: two diagonal quarters will be combined as the client composite; the alternate diagonal quarters will be combined as a storage composite. For storage, the composites will be placed in prepared containers, sealed, and accompanied by appropriate sample control records. The storage composites will be held at the ASC in a secured storage area until the project is complete.

The soil composites for volatile organic analysis will be prepared in the following manner. During field operations, a portion of each soil sample will be placed in a 40-mL borosilicate vial. Equal portions of soil will be removed from each vial and placed in the composite vial. The composite samples will then be mixed quickly and the vial sealed.

More detailed soil contamination data will be required if soils contaminated with hazardous materials are to be excavated and removed to approved disposal facilities. For this type of investigation, the surface of the disposal site will be surveyed and gridded into areas of approximately 1,000 square feet. (Grid size may vary, depending on the nature of the site and underlying soils.) A borehole will be installed at the center of each grid square; soil samples will be taken at the ground surface and at 5-foot intervals until the appropriate depth has been reached. This depth may vary from as

little as 5 feet in areas underlain by compact clays to as much as 100 feet in areas underlain by coarse sand and gravel. The result of this type of study is a three-dimensional representation of the soil beneath the site to the appropriate depth, with contaminant data for each block.

Surface water drainage channel soil samples will be taken to a depth of 12 inches, typically at 50-foot intervals, to a distance of 150 feet from the site boundary along each channel.

### 8.3 MONITORING WELL CONSTRUCTION AND COMPLETION

Upon completion of the borehole, team hydrogeologists will supervise the installation of the monitoring well(s). The type of materials used in well construction will vary according to data requirements. For example, in a shallow, unconsolidated glacial aquifer contaminated by volatile organic contaminants, the project team normally would specify 2-inch diameter PVC pipe with threaded joints. If contamination by certain ketones or aromatic compounds is suspected, it may be necessary to specify stainless steel casing in order to eliminate potential chemical reactions that could occur if PVC were used. A Johnson-Keck submersible pump would be specified for purging and a Teflon bailer would be specified for sampling. Other variables could include the length of well screen, screen slot size, type of backfill to be used, type and length of seal or grout, and type of well security to be used. All variables will be considered carefully and the best design for the job will be presented to the USAF-OEHL project engineer for approval.

Figure 8-2 shows three alternative types of monitoring wells, each designed to address a different set of data requirements:

- Fully screened wells are used to enable the hydrogeologist to obtain a composite sample of groundwater to establish compliance points and detect the presence of any aquifer contamination. Their use also is recommended in conducting pumping tests to obtain accurate measurements of aquifer response.
- Bedrock wells enable selective sampling of the bedrock aquifer in order to measure groundwater quality and to evaluate the interaction between bedrock and unconsolidated aquifers.

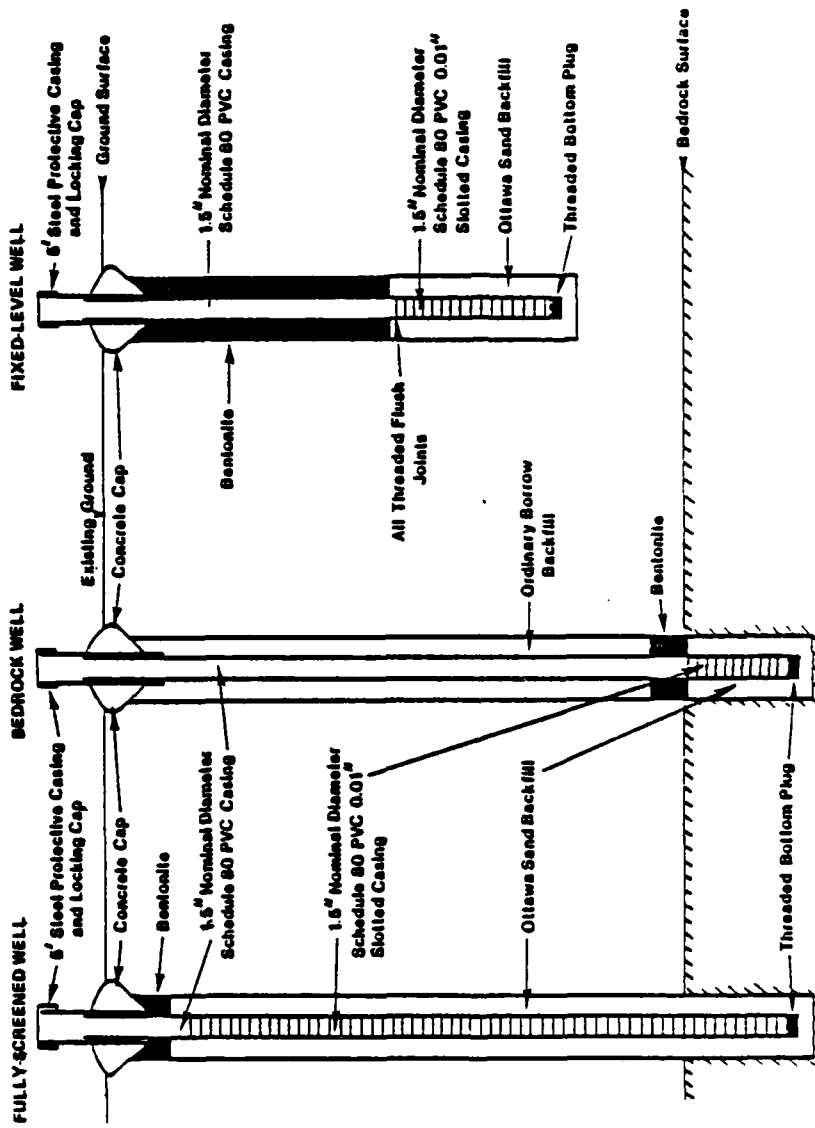


Figure 8-2 TYPICAL DETAIL OF MONITORING WELLS

- Fixed-level wells are utilized to take isolated samples from individual strata suspected of containing contaminated groundwater. These wells also can provide an early warning system to detect the movement of contamination into isolated, pollutant-free aquifers. Great care will be taken to preclude the possibility of cross-contamination of aquifers by carefully reviewing geologic and geophysical data, conducting field analyses of soil samples for contamination, and the placing of grouting material at confining layers.

When drilling in a potentially contaminated environment, it will be necessary to collect and dispose of drilling spoils and washwater and to dispose of or properly decontaminate protective equipment. Furthermore, to prevent cross-contamination between wells, it will be imperative to decontaminate all drilling equipment between wells (see Section 11.1). This may necessitate steam cleaning the equipment, rinsing it with a solvent, and then subjecting it to a second steam cleaning. Subject to all pertinent local, state, and federal regulations, decontamination wastes will be containerized and all contaminated wastes generated on-site subsequently will be removed to an approved disposal facility by a licensed hazardous waste hauler.

Unless otherwise specified, E & E will design all wells as permanent sampling locations. Therefore, care will be taken to locate the wells so that they may be incorporated into future monitoring and remedial operations. Concrete caps and protective, lockable steel casings will be installed around each well, thus reducing the possibility of vandalism while insuring sample integrity.

All well casing top elevations will be surveyed to an accuracy of  $\pm 0.01$  feet, thus enabling static water level measurements to be used to determine groundwater flow directions.

All drilling operations, installation procedures, sampling data, and waste disposal operations will be fully documented in bound field books to assure that the highest degree of care has been taken in completing all required work.

#### 8.4 WELL DEVELOPMENT

At least 48 hours after internal mortar placement, the monitoring wells will be developed according to procedures prescribed below. Well development will be conducted using either a submersible pump, airlift methods, or a bottom discharge bailer, with or without a surge block. The wells will be drilled without the use of drilling fluid and a minimum of five times the amount of the standing water volume in the well, including the well screen, casing, and saturated annulus (assuming 30% porosity), will be removed. Wells will be developed until the well water is clear to the unaided eye, the sediment thickness remaining in the well is less than 5% of the screen length, and the five well volumes (described above) have been removed.

Well development also will include washing the entire well cap and the interior of the well casing above the water table using only water from that well. The result of this operation will be a well casing that is free of extraneous material (grout, bentonite, sand, etc.) inside the riser, well cap, and blank casing between the top of the well casing and the water table. This washing will be conducted before and/or during development, not after development.

The following data will be recorded as part of well development:

- Well designation;
- Date(s) of well installation;
- Date(s) and time of well development;
- Static water level from top of well casing before 24 hours after development;
- Quantity of water lost:
  - During drilling and
  - During fluid purging;

- Quantity of fluid in well prior to development
  - Static water level and
  - Contained in saturated annulus;
- Field measurement of pH before, twice during, and after development;
- Field measurement of specific conductance before, twice during, and after development;
- Depth from top of well casing to bottom of well (from diagram):
- Screen length (from diagram):
- Depth from top of well casing to top of sediment inside well, before and after development:
- Physical characteristics of removed water, including changes during development in clarity, color, and particulates;
- Type and size/capacity of pump and/or bailer used;
- Description of surge technique, if used;
- Height of well casing above ground surface; and
- Quantity of fluid/water removed and time of removal.

The water removed from a well during development will be stored on-site in bulk containers or drums for proper disposal if the water is contaminated.



## 8.5 GEOPHYSICAL LOGGING

All boreholes for monitoring wells will be geophysically logged for the purpose of cataloging and correlating lithology and stratigraphy. Because the boreholes will be drilled without the use of drilling fluids, it is recommended that calibrated nuclear logs, such as neutron and gamma-gamma, along with natural gamma logs, be used. Electric logs, such as spontaneous potential and resistivity, cannot be run due to the lack of drilling mud and, although there may be some water in the drill hole, it is not anticipated that the water height will be sufficient to allow meaningful surveys to be performed. Nuclear logs will supply information pertaining to lithology, stratigraphy, total porosity or bulk density, and moisture content. The advantage of these logs is that they can be used in either cased or uncased boreholes. As a cost-saving benefit, E & E recommends that all geophysical logging be performed upon completion of all well construction, to minimize standby costs.

Table 8-2 contains a summary of log applications that may be used for this project, and the types of information that may be obtained from each.

Table 8-2  
SUMMARY OF LOG APPLICATIONS

Required Information	Widely Available Logging Techniques that Might be Used
Lithology and stratigraphic correlation of aquifers and associated rocks	Electric, sonic, and caliper logs in open holes; nuclear logs in open or cased holes
Total porosity or bulk density	Calibrated sonic logs in open holes; calibrated neutron and gamma-gamma logs in open or cased holes
Location of water level or saturated zones	Electric, temperature, and fluid conductivity in open holes or inside casings; neutron and gamma-gamma logs in open holes or outside casings

## 9. AQUIFER TESTING

The movement of groundwater and any associated contaminant plume through an aquifer is controlled by the physical characteristics of the medium and the hydraulic head gradient. Changes in the potentiometric surface caused by the pumping of local wells can be evaluated to determine formation permeabilities, specific yield, drawdown, and extent of cones of depression. All of these properties are important in assessing the potential impact of a contaminant plume on local groundwater quality. Artificial changes in the hydraulic head caused by withdrawing water from the aquifer can locally distort the potentiometric surface and alter the flow direction of a contaminant plume. Proper placement of a pumping well may locally lower the water table, effectively isolating a potential source of contamination from contact with the groundwater. A pumping well situated in a contaminant plume can be incorporated into a remedial action plan to remove the contaminated water for treatment purposes. A pumping well also can be used as a diagnostic tool to determine the hydraulic connection between adjacent aquifers in order to aid in the siting of proposed landfills, lagoons, and waste storage sites.

By interpreting the aquifer response to any of a variety of field tests, E & E hydrogeologists infer data pertaining to transmissivity, storativity, and boundary conditions, as well as data pertinent to the movement and extent of contaminant plumes.

Existing wells will be used whenever possible to reduce project costs. Generally, a well diameter of at least four inches will be needed. Three or more observation wells usually will be specified.

The wells will provide the water table data for varying distances from the pumping well, which will be used to determine the size and shape of the cone of depression and the aquifer transmissivity.

E & E will supervise the design and installation of suitable wells. Pumping wells will be of sufficient size to accommodate standard submersible pumps and generally will be screened over the entire saturated thickness of the aquifer. Observation wells will be sited to provide the data thought to be necessary and will be screened in the proper strata to accurately gage the aquifer response to pumping.

Normally, a pumping test will be conducted as a 72-hour step-drawdown test. E & E personnel will monitor the wells for the full duration of the test (discharge rates will be measured by a free discharge pipe orifice or by a commercially available flow meter). Hydrogeologists will evaluate the data using type curves for both time-drawdown and distance-drawdown solutions. The methodologies pioneered by C.V. Theis in 1935 will be used to analyze confined aquifer situations; the methodologies developed by S.P. Neuman in 1975 will be used to analyze unconfined aquifer systems.

When pumping tests are conducted in contaminated environments, periodic sampling will be conducted to enable E & E hydrogeologists to assess changes in pollutant content and to determine the effects of pumpage on the contaminant plume. The discharge of contaminated groundwater generated by a pumping test may need to be contained or may require a National/State Pollutant Discharge Elimination System permit from the appropriate regulatory agency if it is discharged to a sewer or to a body of surface water. E & E will assist in the acquisition of any required permits.

On a smaller scale, individual piezometer wells can be used to conduct in-situ permeability tests. Such tests involve creating an instantaneous head change in the piezometer and then recording head recovery versus time as the water level gradually returns to its static condition. In-situ permeability tests are of two types: "slug" tests, in which a volume of water is instantaneously added, and "bail" or "pump" tests, in which a volume of water is instantaneously removed. The method that E & E most commonly uses to interpret these

data and derive a permeability number is the method of Hvorslev*, which uses time/head-change data to graphically calculate a factor,  $T_0$ , "basic time lag." Then, for a piezometer screen length of  $L$ , a sandpack radius of  $R$ , and a well casing radius of  $r$ , the permeability,  $K$ , is defined as:

$$K = \frac{r^2 i n (L/R)}{2L T_0}$$

The computation of  $K$  for each piezometer allows a hydrogeologist to compute the actual rate at which the groundwater (and thus contaminants) leaves the site by applying the following version of the common Darcy equation for groundwater flow:

$$Q = KiA,$$

where  $Q$  is groundwater discharge;  $K$  is permeability;  $i$  is hydraulic gradient (derived from piezometer water levels); and  $A$  is cross-sectional area perpendicular to flow.

A typical aquifer test will include collection of background data for siting purposes, installation of a discharge well and three observation wells, monitoring to establish background conditions, performance of a 72-hour pump test, and interpretation of the results.

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*Hvorslev, M.J., 1951, "Time Lag and Soil Permeability in Groundwater Observations," United States Army Corps of Engineers, Waterways Experiment Station Bulletin 36, Vicksburg, Mississippi.

## 10. GROUNDWATER MONITORING AND SAMPLING

### 10.1 GROUNDWATER LEVEL MEASUREMENT

Water levels will be measured at all monitoring wells and surface water staff gaging stations on a monthly basis. Work will be performed in accordance with established safety requirements by either contractor or subcontractor personnel. All measurements will be taken to within 0.01 foot.

The top of the interior casing of all monitoring wells will be marked at one point, which will be surveyed to determine its elevation. The depth of the water table below the top of the casing will be determined by a steel tape or electric water level indicator. All equipment will be decontaminated between wells to prevent cross-contamination.

### 10.2 SURVEYING OF WELLS

Following completion of the installation of the final well, each installed well location will be surveyed to determine map coordinates (Universal Transverse Mercator, State Planar, or latitude/longitude) to within one meter and entered onto a site map. Elevations of both the ground surface and the top of the well riser will be surveyed to within 0.01 foot (+ 0.005 foot if possible) using the National Geodetic Vertical Datum of 1929. These data will become part of the permanent site file.

### 10.3 ON-SITE ANALYSIS

Groundwater sampling and analysis will involve the following steps:

- Measurement of the static water level;
- Purging of several well volumes;
- Acquisition of the sample;
- On-site analysis; and
- Off-site analysis (see Section 10.4).

Before any water is drawn from a well, the static water level depth from the top of the casing is measured, then the well is purged. If the well can be completely dewatered, the purging process consists of removing a volume equivalent to twice the volume of the standing water originally contained within the monitoring well plus the surrounding sand or gravel pack, if present. If the well cannot be dewatered (because the specific yield is relatively large), the purging consists of the removal of at least five standing volumes (possibly more, depending on the results of pH and specific conductivity testing conducted on the purge water in time series). The values are time plotted and the purging process is considered complete when the values have stabilized. In most cases, a submersible pump is used to accomplish this purging. The most versatile pump of this type is the small-diameter stainless steel Johnson-Keck pump, which is battery operated and small enough to fit into two-inch diameter wells.

To avoid sample cross-contamination, E & E uses bailers constructed of Teflon, PVC, or stainless steel. Each bailer is thoroughly decontaminated before it is used in the next well. Bailer size depends on the requirements of each project. The bailers are constructed of Teflon-extruded, heavy wall tubing and are plugged at the bottom with a short length of Teflon-extruded rod (no glue is used). Water enters the bailer both from the open top and from the bottom through a 3/4-inch hole. It is prevented from flowing out of the hole by a one-inch glass marble, which rests in a conical seat machined into the top of the plug.

On-site analysis is generally restricted to pH, conductivity, and surveys for organic vapors. pH and conductivity are routinely checked during purging operations to determine steady-state conditions between the water within the well column and the existing groundwater. In areas of potential contamination, a flame ionization or photoionization instrument is routinely used to survey the groundwater during

purging and the water samples for organic vapors in order to determine the potential health hazards.

#### 10.4 SAMPLING FOR OFF-SITE ANALYSIS

Sampling of groundwater for off-site analysis is conducted in the same manner as sampling for on-site analysis as described in Section 10.3, with the addition that the water samples are containerized and shipped to an outside laboratory for analysis as described in Sections 12 and 13.



## 11. DECONTAMINATION PROCEDURES

Decontamination of personnel and equipment is an important element of site safety operations. Proper decontamination prevents sample cross-contamination and contamination of personnel, vehicles, and the public; moreover, it supports quality control. Decontamination at the site involves the use of field decontamination stations for personnel, equipment, and clothing.

The decontamination process is designed to control the spread of contaminants to clean areas by physically removing or chemically neutralizing the contaminants. The following subsections delineate the basic decontamination processes for various pieces of field equipment and describe a sample personnel decontamination set-up for a Level B or C site. The actual decontamination layout is generally site-specific but would include most, if not all, of the described stations. A Level D site would involve less protective clothing and fewer stations.

Decontamination procedures normally take place in the contamination reduction area (see Figure 11-1). In this area, all equipment which entered the site is cleaned prior to moving off-site and outside of the contamination control line. Table 11-1 identifies various decontamination wash solutions which can be used depending on the site-specific hazards encountered.

### 11.1 DRILLING, SOIL SAMPLING, AND MONITORING WELL INSTALLATION

Prior to use in the field, and between sampling locations, all equipment, including the full auger rig and all auger flights, will be

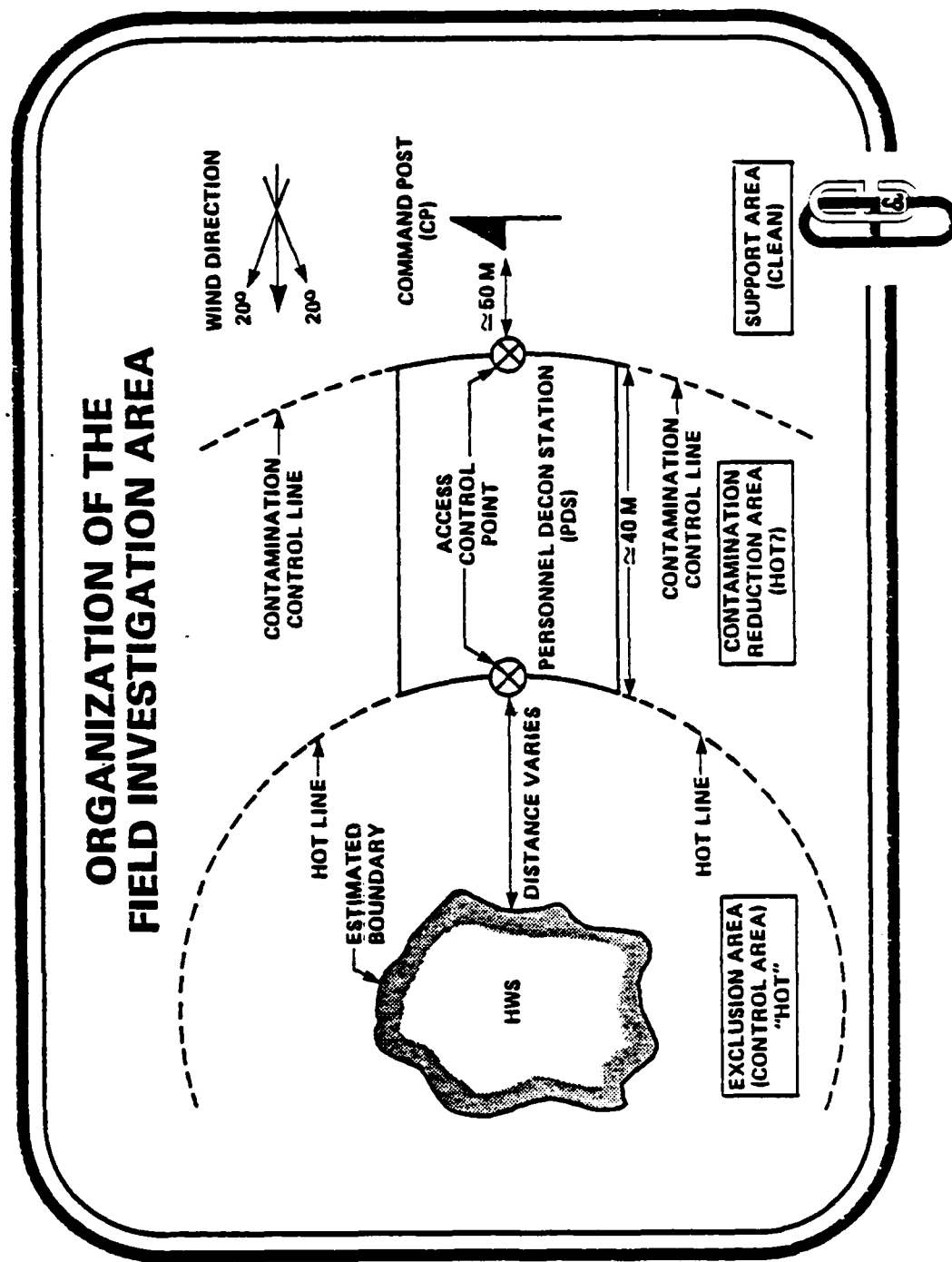


Figure 11-1 ORGANIZATION OF THE FIELD INVESTIGATION AREA

Table 11-1  
USE OF GENERAL PURPOSE DECONTAMINATION SOLUTIONS

Decon Solution	Mixing Solutions	Uses/Remarks
A. An aqueous solution containing a low-sudsing detergent	Follow the mixing instructions written on the particular product label	Generally has the widest range of use; best choice on sites where contaminant is unknown or a wide range of contaminants exists
B. An aqueous solution containing 5% sodium carbonate ( $\text{Na}_2\text{CO}_3$ ) washing soda	To 10 gallons of water, add four pounds of sodium carbonate	Decon solution of choice for base labile compounds such as the organophosphate pesticides; effective in neutralizing inorganic acids; since sodium carbonate is a water softening agent, this characteristic is an aid in physical removal of contaminants.
C. An aqueous solution containing 5% sodium bicarbonate ( $\text{NaHCO}_3$ ) baking soda	To 10 gallons of water, add four pounds of sodium bicarbonate	Sodium bicarbonate is amphoteric and can be used to neutralize either base or acid contaminants; good decon for base labile compounds
D. An aqueous solution containing 2% trisodium phosphate ( $\text{Na}_3\text{PO}_4$ ) (TSP)	To 10 gallons of water, add approximately two pounds of trisodium phosphate	See uses/remarks for decon solution B above
E. An aqueous solution containing 10% calcium hypochlorite ( $\text{CaCl}_2\text{O}_2$ ) (HTH)	To 10 gallons of water, add eight pounds of calcium hypochlorite	Cyanide salts
F. Ethylenediaminetetraacetic acid (EDTA, versene, sesquestrene)	Commercial product; follow product label	EDTA is a chelating agent and is the decon solution of choice for heavy metal contaminants
G. An aqueous solution containing 3 to 5% citric, tartaric, oxalic acids or their respective sodium salts	To 10 gallons of water, add four pounds citric, tartaric, or oxalic acid	These compounds are chelating agents and are the decon solution of choice for heavy metal contaminants

decontaminated using the following cleaning procedures. At least 200 feet of auger will be dedicated to the rig prior to the initiation of drilling. Drilling will be carried out on a plastic tarp pad, nominally 20 by 20 feet. Drill cuttings will be collected on the pad during drilling. Once a hole has been completed, the used augers will be fully cleaned on the pad and the washings will be collected in the cuttings on the pad. The cleaned augers will be returned to the working rig.

The equipment washing procedure is as follows:

- The auger flight will be steam-cleaned.
- The auger flight will be fully rinsed with methanol, an organic solvent that is easily volatilized, is not a priority pollutant, and therefore cannot introduce extraneous contamination to the site.
- The auger will be thoroughly rinsed with distilled water and allowed to air-dry.

All soil sampling equipment including split spoons, stainless steel spatulas, screens, and pans will be decontaminated by washing in laboratory-grade detergent, rinsing three times with tap water, rinsing with either pesticide-grade acetone or methanol, and then rinsing with ASTM Type I water. The equipment will be air-dried prior to repeated use. If weather conditions or other factors prohibit air-drying, the equipment will be dried in an oven at 105°C for 15 minutes and allowed to return to room temperature prior to use.

## 11.2 WELL DEVELOPMENT AND AQUIFER TESTING

All equipment used during well development and aquifer testing will either be cleaned/decontaminated or new prior to placement into the well. Equipment such as submersible pumps will be thoroughly decontaminated using the procedures identified in Section 11.1. Several items such as monofilament line, rope, and tubing purchased new will be rinsed with ASTM Type I water.

Following completion of well development and aquifer testing at each well, the equipment removed from the well will be considered as contaminated and subject to the same decontamination process or discarded prior to use in another well.

### 11.3 WATER LEVEL MEASUREMENTS

Water level measurements will generally be taken using a steel tape or electronic water level indicator. All equipment entering the well will be washed and rinsed prior to insertion into the well according to the procedures specified in Section 11.1. Upon completion of the measurement at each well, the equipment will be subjected to the same decontamination process prior to use on any additional wells in order to prevent cross-contamination.

### 11.4 WATER SAMPLING

Water sampling equipment (pumps, bailers, glass sampling jars, etc.) will be cleaned prior to use in any sampling work according to the procedures described in Section 11.1. Following completion of sampling at a specific point, all equipment will be subjected to the same decontamination process to prevent cross-contamination between sampling points.

### 11.5 SEDIMENT SAMPLING

Sediment sampling equipment such as stainless steel scoops, sieves, augers, split spoons, and dredges will be subjected to the same decontamination procedures as other field equipment both prior to and immediately following use at each sampling site.

### 11.6 PERSONNEL DECONTAMINATION

Avoidance of contamination is the first and best method for preventing the spread of contamination from a hazardous site. Every effort should be made to prevent direct contact with the contaminant. Careful planning, knowledge of the contaminant, and attention to where one puts one's hands and feet are all important. Simple common-sense rules of contamination avoidance include not sitting down, not leaning against drums or debris, and not putting equipment on the ground.

No one should enter a site alone, though all tasks should be accomplished with as few team members as possible. Thus, exposure is limited to a minimum number of team members, and the ultimate process of decontamination is simplified.

The first step in the decontamination process may well take place while the team is still on or just off the hazardous site but still in the exclusion area. This is especially true if there is known heavy ground contamination. In areas of spills or heavy leachate runoff, the protective boots will become heavily contaminated. As the team leaves these areas en route to the personnel decontamination station (PDS), a boot rinse with a detergent solution (from a pre-positioned container) will significantly reduce the spread of contamination along the egress route.

The PDS will be established within the contamination reduction area upwind of the hazardous substance site. The PDS will be located between the hot line (upwind boundary of the exclusion area) and the support (clean) area boundary. Figure 11-1 illustrates the organization of the field operations area.

The PDS provides a controlled decontamination and undressing system designed to avoid the transfer of chemical contamination from protective clothing or equipment to the individual. It must be established before the team enters the contaminated area so that members can immediately and safely cope with an emergency. Team members must be briefed on decontamination procedures prior to entering the contaminated area. When the team leaves the area, extreme care must be taken to insure that proper decontamination is performed. Failure to observe these procedures could result in personal injury.

#### 11.6.1 Organization and Operation of the Personnel Decontamination Station (PDS)

The project team leader must exercise professional judgment in determining how the PDS will be organized and what decontaminants will be used. Factors he must consider include:

- The extent and type of hazard expected;
- Explosive potential;
- Meteorological conditions;

- Topography;
- Levels of protection selected; and
- Availability of equipment and supplies.

This section describes the layout of a PDS for personnel dressed in Levels B and C protection.

#### Set-up for Levels B and C Decontamination

Figure 11-2 illustrates a PDS designed to support personnel working in Level B or Level C protection. The following is a description of the PDS layout by station.

- Station A - Equipment Drop: A plastic ground sheet on which field equipment is placed by returning members of the work party.
- Station B - Decontamination of Outer Garments: A wash tub filled with the appropriate decontamination solution.
- Station C - Rinse of Outer Garments: A wash tub filled with a water rinse.
- Station D - Boot Removal: A bench or stool for personnel to sit on during removal of the boot covers; and a plastic-lined container for disposal of booties.
- Station E - Glove Decontamination and Rinse: A portable table containing a small bucket of decontamination solution and water rinse.
- Station F - Boot Decontamination and Rinse: A small bench or stool for personnel to sit on during decontamination; a wash tub containing the appropriate decontamination solution; a wash tub containing a water rinse; and a small can for disposal of masking tape.

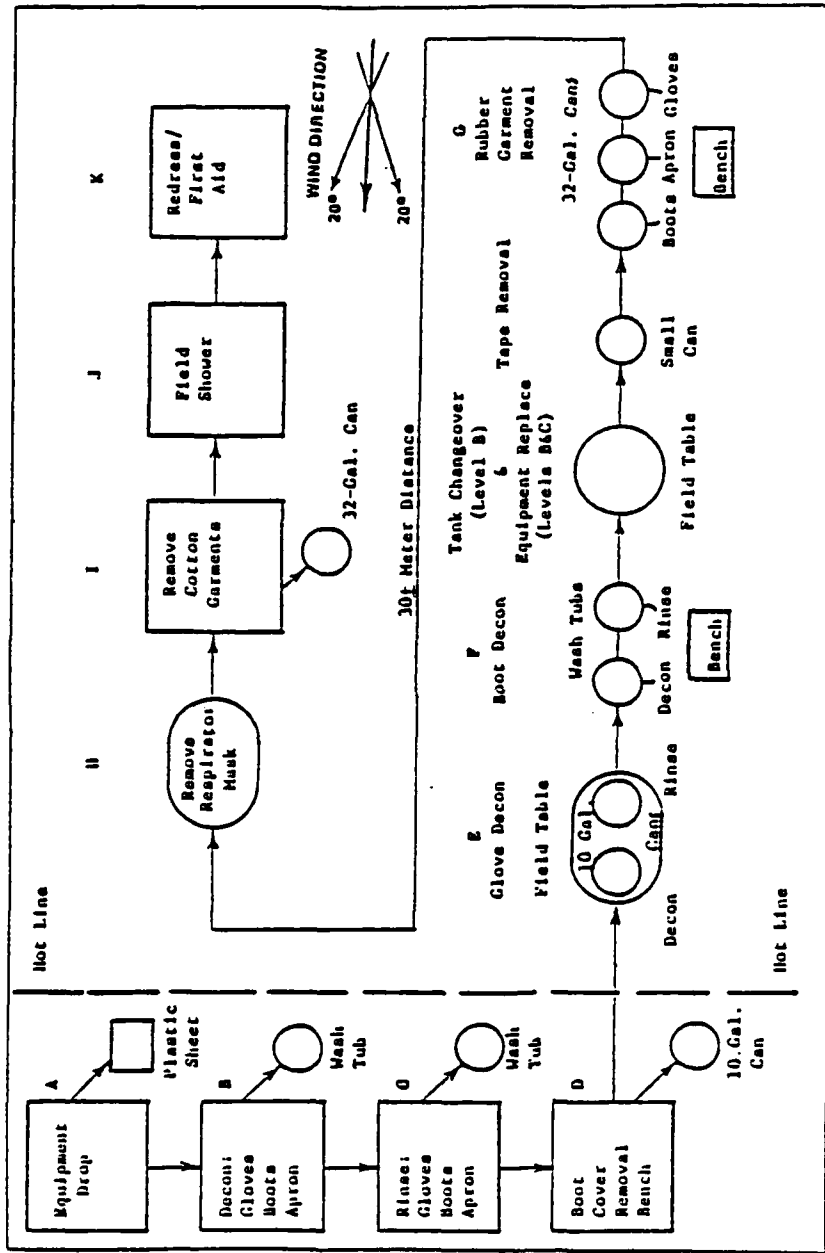


Figure 11-2 TYPICAL LAYOUT OF PDS FOR LEVEL B AND C PROTECTION



- Station G - Boot and Outer Garment Removal: A bench or stool to sit on during removal of boots, aprons, and gloves; and three 32-gallon plastic-lined containers for segregating boots, aprons, and gloves.
- Station H - Removal of Respirator: A portable table approximately 30 meters upwind from Station G on which the self-contained breathing apparatus or air-purifying respirators are placed.
- Station I - Removal of Cotton Garments: A 32-gallon plastic-lined container for disposal of all cotton garments.
- Station J - Field Shower (Optional): A field shower set-up. If impractical or not available, a wash point (container of water, soap, and paper towels) should be provided.
- Station K - Redress and First Aid (Optional): A location to redress and render first aid as necessary. This station separates the contamination reduction area from the support (clean) area.

#### Levels B and C Decontamination Equipment and Procedures

Station A. Equipment such as instrumentation, sample jars, and sampling devices removed from the hazardous site should be placed on the equipment drop at this station. The plastic sheet used for this purpose is positioned on the downwind side of the hot line just inside the exclusion area. Equipment should be decontaminated by PDS operators only after all work party members have been processed through the PDS. Gross contamination can be removed from equipment either by carefully stripping off protective covers such as plastic bags or through a wash process using an appropriate decontamination solution and water. Protective covers which are removed from the equipment can be placed in the same container as the disposable booties at Station D. Equipment should be thoroughly decontaminated before taking it across the hot line.

Station B. This station is the initial and most critical step in the personnel decontamination process. The individual being decontaminated should be directed to stand in the wash tub while the PDS operator, using long-handled brushes, carefully decontaminates all outer rubber garments. Care should be exercised when decontaminating personnel wearing Level B and Level C protection to avoid splashing with decontamination solution.

Station C. This station is a rinse station. Again, the individual being decontaminated should be directed to stand in the wash tub. Care again must be exercised in rinsing the rubber garments.

Station D. Prior to crossing the hot line, the work party member should remove disposable booties and place them in the receptacle located at this station.

Station E. At this station, work party members will decontaminate and rinse their gloves. A field table is recommended to elevate the decontamination and rinse solution to waist height.

Station F. Work party members will sit on the bench provided while PDS operators will sequentially decontaminate and rinse the boots. The small container located between Stations F and G is used to dispose of all used masking tape.

Station G. Work party members will sit on the bench provided and sequentially remove their boots, apron, and gloves.

Station I. The individual will remove all cloth undergarments such as coveralls, socks, and underwear, and place them in the container provided.

Station J. This station is a field shower facility. If a shower is not available, personnel should as a minimum wash their hands and faces before leaving the site. Personnel should be instructed that a shower is required to complete the decontamination process.

Station K. After showering, work party members will redress into clean clothes and receive first aid (e.g., treatment of minor cuts and bruises), if required. The individual then leaves the PDS and moves into the support area.

#### 11.6.2 Preparation of Decontamination Solutions

Ideally, the decontamination solution used should react with and chemically neutralize the contaminants found at a hazardous substance site. However, since the contaminants on a particular site will be unknown in most cases, a decontaminant is more often chosen based on its ability to physically remove (dissolve or suspend) the contaminant in question.

In all decontamination operations water is a recommended solvent. Organic solvents dry the skin and are often more toxic than the hazard one is trying to eliminate. These solvents also accelerate the deterioration and penetration of protective clothing. Water, on the other hand, does not damage protective clothing and does not contribute to secondary contamination.

It must be recognized that there are no universal decontaminants and the project team leader will often be required to make a professional judgment regarding this matter. Table 11-1 lists chemical mixtures suggested as readily available general-purpose decontaminants. Their application and instructions for preparation are also presented in the table.

#### 11.6.3 Closure of the PDS

When the PDS is no longer needed, it should be closed down by the PDS operators. All disposable clothing and plastic sheeting used during the operation should be double-bagged and either contained on-site or removed to an approved off-site disposal facility. Decon and rinse solution could be discarded on-site or also removed to an approved disposal facility. Reusable rubber clothing should be dried and prepared for future use. (If gross contamination has occurred, additional decontamination of these items may be required.) Cloth items should be bagged and removed from the site for final cleaning. All wash tubs, pails, containers, etc., should be thoroughly washed, rinsed, and dried prior to removal from the site.

## 12. SAMPLE HANDLING AND PACKING

### 12.1 SPLIT SAMPLE PROCEDURES

When split samples are requested, identical sample tags will be attached by E & E personnel to the two (or more) containers. The E & E sample will be clearly marked as such and treated in accordance with normal procedures. Any other split samples will remain subject to chain-of-custody procedures until they are relinquished to the person requesting them. E & E personnel also may be required to comply with the custodial procedures preferred by the person requesting the split samples; these procedures will be complied with on a case-by-case basis. All split samples will be documented in the site logbook.

### 12.2 SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

In order to preserve sample integrity either for physical, chemical, or biological analyses as well as to have a sufficient volume of each sample for analysis, all samples will be collected in the appropriate containers, preserved when required, and stored at the appropriate temperature. Various sample containers (e.g., glass, plastic) and container sizes will be used, depending on the specific analyses required. Table 12-1 lists the sample containers, preservatives, and holding times to be used to analyze for the priority pollutants listed in 40 Code of Federal Regulations (CFR) Part 136. Table 12-2 lists the sample bottles to be used, the volumes, the preservatives, and the holding times for biological parameters, physical parameters, metals, inorganic and nonmetallic compounds, and organic compounds. All of the listed sample containers, preservatives, and holding times in the tables are approved and/or recommended by EPA.

Table 12-1  
 RECOMMENDED SAMPLE STORAGE, PRESERVATION,  
 AND HOLDING TIMES OF PRIORITY POLLUTANTS:  
 EPA 40 CFR 136

Parameter	Container*	Preservative	Holding Time
Purgeable halocarbons	A	4°C	7 days
Purgeable aromatics	A	4°C	7 days
Acrolein acrylonitrile	A	4°C	7 days
Phenols	B	4°C	**
Benzidines	B	4°C	**
Phthalate esters	B	4°C	**
Nitrosamines	B	4°C	**
Organochlorine pesticides and polychlorinated biphenyls (PCBs)	B	4°C	**
Nitroaromatics and isophorone	B	4°C	**
Polynuclear aromatic hydrocarbons	B	4°C	**
Haloethers	B	4°C	**
Chlorinated halocarbons	B	4°C	**
2,3,7,8-tetrachloro-dibenzo-p-dioxin	B	4°C	**
Purgeables	A	4°C	7 days
Base/ neutrals, acids, and pesticides	B	4°C	**
EPA 40 CFR 141: Trihalomethanes (THM) (Drinking Water)			
Tap water***	A	4°C	14 days
Open body	A	4°C	14 days

**Key:**

A = 40-mL clear screw-cap septum vials plus caps with 22-mm Tuf-Bond Teflon silicone discs.

B = 1/2-gallon amber glass bottle with Teflon-lined cap.

*The bottles, vials, caps, and discs listed here are those listed in EPA 40 CFR 136 (Federal Register, December 3, 1979, revised October 26, 1984) and EPA 40 CFR 141 (Federal Register, November 29, 1979).

**Extracted within seven days and analyzed within 30 days.

***If the tap water is chlorinated, 2.5 to 3.0 mg of sodium sulfite (NA₂S₂O₃) per 40 mL of water sample is used unless maximum trihalomethane concentration is to be determined.

Table 12-2  
 RECOMMENDED SAMPLE STORAGE, PRESERVATION,  
 AND HOLDING TIMES ACCORDING TO MEASUREMENT¹

Parameter	Minimum Volume Required (mL)	Container ²	Preservative	Holding Time ³
<u>Biological Parameters</u>				
Fecal coliform	100	Autoclaved P,G	Cool, 4°C	6 hours
Total coliform	100	P,G	Cool, 4°C	6 hours
Fecal streptococci	100	P,G	Cool, 4°C	6 hours
Standard plate count	100	P,G	Cool, 4°C	6 hours
Benthos (macrobenthic invertebrates)	--	P,G	Formalin/ Glycerine	6 months
Chlorophyll-a	1,000	P,G	Filter on-site Freeze immediately	3 months
Phytoplankton	250	P,G	2 mL Lugol's Solution	6 months (darkness)
Zooplankton	250	P,G	Formalin/ Glycerine	4 months
<u>Physical Parameters</u>				
Color	50	P,G	Cool, 4°C	24 hours
Conductance	100	P,G	Cool, 4°C	24 hours ⁴
Hardness	100	P,G	Cool, 4°C HNO ₃ to pH <2	6 months ⁵
Odor	200	G only	Cool, 4°C	24 hours
pH	25	P,G	<u>In situ</u>	6 hours
Residue				
Filterable	100	P,G	Cool, 4°C	7 days
Nonfilterable	100	P,G	Cool, 4°C	7 days
Total	100	P,G	Cool, 4°C	7 days
Volatile	100	P,G	Cool, 4°C	7 days
Settleable matter	1,000	P,G	None required	2 days
Temperature	1,000	P,G	<u>In situ</u>	No holding
Turbidity	100	P,G	Cool, 4°C	48 hours

Table 12-2 (Cont.)

Parameter	Minimum Volume Required (mL)	Container ²	Preservative	Holding Time ³
<u>Metals</u>				
Dissolved	200	P,G	Filter on-site HNO ₃ to pH <2	6 months ⁵
Suspended	200		Filter on-site	6 months
Total	100	P,G	HNO ₃ to pH <2	6 months ⁵
<u>Mercury</u>				
Dissolved	100	P,G	Filter on-site HNO ₃ to pH <2	38 days (glass) 28 days (hard plastic)
Total	100	P,G	HNO ₃ to pH <2	38 days (glass) 28 days (hard plastic)
<u>Inorganics, Nonmetallics</u>				
Acidity	100	P,G	None required	24 hours
Alkalinity	100	P,G	Cool, 4°C	24 hours
Bromide	100	P,G	Cool, 4°C	24 hours
Chloride	50	P,G	None required	7 days
Chlorine	200	P,G	Determined on site	No holding
Cyanides	500	P,G	Cool, 4°C NaOH (sodium hydroxide) to pH 12 and Ascorbic Acid-Treat with Cd if Sulfide is present	24 hours
<u>Dissolved oxygen</u>				
Probe	300	G only	<u>In situ</u>	No holding
Winkler	300	G only	Fix on-site	4-8 hours
Fluoride	300	P,G	None required	7 days
Iodide	100	P,G	Cool, 4°C	24 hours
<u>Nitrogen</u>				
Ammonia	400	P,G	Cool, 4°C H ₂ SO ₄ to pH <2	24 hours
Kjeldahl, total	500	P,G	Cool, 4°C H ₂ SO ₄ to pH <2	24 hours ⁶

Table 12-2 (Cont.)

Parameter	Minimum Volume Required (mL)	Container ²	Preservative	Holding Time ³
<u>Inorganics, Nonmetallics (Cont.)</u>				
Nitrate plus nitrite	100	P,G	Cool, 4°C H ₂ SO ₄ to pH <2	24 hours ⁶
Nitrate	100	P,G	Cool, 4°C	24 hours
Nitrite	50	P,G	Cool, 4°C	48 hours
Phosphorus, ortho-phosphate, dissolved	50	P,G	Filter on-site Cool, 4°C	24 hours
Hydrolyzable	50	P,G	Cool, 4°C H ₂ SO ₄ to pH <2	24 hours ⁶
Total	50	P,G	Cool, 4°C H ₂ SO ₄ to pH <2	24 hours ⁶
Total dissolved	50	P,G	Filter on-site Cool, 4°C H ₂ SO ₄ to pH <2	24 hours ⁶
Silica	50	P only	Cool, 4°C	7 days
Sulfate	50	P,G	Cool, 4°C	7 days
Sulfide	500	P,G	2 mL zinc acetate & NaOH	7 days
Sulfite	50	P,G	Determined on-site	No holding
<u>Organics</u>				
BOD	1,000	P,G	Cool, 4°C	24 hours
COD	50	P,G	H ₂ SO ₄ to pH <2	7 days ⁶
Methylene blue active substance (MBAS)	250	P,G	Cool, 4°C	24 hours
Nitrilotriacetic acid (NTA)	50	P,G	Cool, 4°C	24 hours
Oil and grease	1,000	G only	Cool, 4°C H ₂ SO ₄ or HCl to pH <2	24 hours
Organic carbon	25	P,G	Cool, 4°C H ₂ SO ₄ or HCl to pH <2	24 hours
Phenolics	500	G only	Cool, 4°C H ₂ SO ₄ to pH <4 1.0 g CuSO ₄ /l	24 hours



Key:

1. More specific instructions for preservation and sampling are found with each procedure as detailed in E & E's methods manual. A general discussion on sampling of water and industrial wastewater may be found in American Society for Testing and Materials (ASTM), Part 31, p. 72-82 (1976) Method D-3370.
2. Plastic (P) or Glass (G). For metals, polyethylene with a polypropylene cap (no liner) is preferred.
3. The listed holding times are recommended for properly preserved samples based on currently available data. It is recognized that extension of these times may be possible for some sample types while, for other types, the times may be too long. When shipping regulations prevent the use of the proper preservation technique or when the holding time is exceeded, as in the case of a 24-hour composite, the final reported data for these samples should indicate the specific variance. If samples cannot be analyzed within the specified time intervals, the final reported data should indicate the actual holding time.
4. If the sample is stabilized by cooling, it should be warmed to 25°C for reading, or a temperature correction should be made and results reported at 25°C.
5. When HNO₃ cannot be used because of shipping restrictions, the sample may initially be preserved by icing and immediately shipped to the laboratory. Upon receipt at the laboratory, the sample must be acidified to a pH <2 with HNO₃ (normally 3 mL 1:1 HNO₃/liter is sufficient). At the time of analysis, the sample container should be thoroughly rinsed with 1:1 HNO₃ and the washings added to the sample (volume correction may be required).
6. Data obtained from National Enforcement Investigations Center, Denver, Colorado, support a four-week holding time for this parameter in sewerage systems (Standard Industrial Code 4952).

### 12.3 SAMPLE HANDLING AND DECONTAMINATION

E & E will identify all samples using a sample tag or other appropriate identification attached to or folded around the sample. The tag will provide the sample identification number; the date, time, and location of collection; designation of the sample as a grab or composite; notation of the type of sample and preservative; any remarks; and the signature of the sampler. E & E also will record this information in the appropriate logbook, along with any pertinent on-site measurement data and field observations.

After collection and identification, the sample will be preserved and maintained under the chain-of-custody procedures discussed below. In a similar fashion, all tags on blank or duplicate samples will be marked "Blank" or "Duplicate," respectively. Field blind duplicates will be coded and identified as such only in the field logbook.

#### Chain-of-Custody Procedures

Air Force chain-of-custody requirements for this program will be clarified and incorporated in E & E's standard operating procedures. E & E will require that the possession of samples be traceable from the time the samples are collected until they are disposed of through established chain-of-custody procedures. The major elements of these E & E procedures include the following.

Sample Custody. A sample will be considered in custody if:

- It is in the individual's actual possession; or
- It is in the individual's view, after being in his/her physical possession; or
- It was in the individual's physical possession and then he/she locked it up to prevent tampering; or
- It is in a designated secure area.

Field Custody Procedures. E & E will collect only the number needed to provide a fair representation of the media being sampled. The quantity and types of samples and sample locations will be determined prior to the actual fieldwork. As few people as possible will handle the samples. The field sampler will be personally responsible for the care and custody of the collected samples until they are transferred or properly dispatched. Sample tags will be completed for each sample using waterproof ink.

Transfer of Custody and Shipment. Samples will be accompanied by a chain-of-custody record. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record will document the transfer of custody of the samples from the sampler to another person, or to an analytical laboratory.

The samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate record prepared for each laboratory. The "Courier to Airport" space on the chain-of-custody record will be dated and signed, if necessary.

All packages will be accompanied by the chain-of-custody record showing identification of the contents. The original record will accompany the shipment and a copy will be retained by E & E.

Laboratory Custody Procedures. E & E will assure that the possession of samples is traceable from the time the samples are received. To maintain and document sample possession, E & E will follow chain-of-custody procedures. A sample custodian or a designated alternate will receive samples for the laboratory and will verify that the information on the sample tags matches that on the chain-of-custody record included with the shipment. The custodian will sign the custody record in the appropriate space. Couriers picking up samples at the airport, post office, etc., will sign in the appropriate space.

Samples forwarded to the laboratories for analysis will be retained after the analyses are completed. These samples may be disposed of only upon the orders of the program manager, and only after all tags have been removed for the permanent file.

### Sample Decontamination

All sampler containers will be considered as contaminated and subject to standard decontamination procedures prior to packaging in preparation for storage and/or shipment to laboratories for analysis. Decontamination procedures will include washing the container in a cleaning solution containing Alconox on TSP, followed by a thorough rinse with clean water. The samples will be immediately placed into a protective plastic wrap to prevent further possible contamination.

#### 12.4 PROCEDURES FOR PACKING LOW CONCENTRATION SAMPLES

All samples must be packaged carefully to avoid breakage or contamination and must be shipped to the laboratory at proper temperatures. The following sample packaging requirements must be followed:

- Sample bottle lids are never to be mixed. All sample lids must stay with the original containers. Custody seals must be affixed.
- The sample volume level can be marked by placing the top of the label at the appropriate sample height, or with grease pencil. This procedure will help the laboratory to determine if any leakage occurred during shipment. The label should not cover any bottle preparation OA/OC marks.
- Unless otherwise specified, all sample bottles must be secured with a custody seal and placed in a plastic bag to minimize the potential for vermiculite contamination.
- Shipping coolers must be filled initially with approximately three inches of vermiculite or zonolite.
- The secured sample bottles must be placed in the cooler in such a way as to ensure that they do not touch one another.
- Low hazard samples (i.e., defined as environmental or less than 10 ppm of any single constituent) are to be cooled.

"Blue ice" or some other artificial icing material is preferred. If unavoidable, ice may be used provided that it is placed in 3-mil plastic bags. Ice is not to be used as a substitute for packing material.

- Any remaining space in the cooler should be filled in with inert packing material. Under no circumstances will locally obtained material (sawdust, sand, etc.) be used.
- The duplicate custody record must be placed in a plastic bag and taped to the bottom of the cooler lid.

#### 12.5 PROCEDURES FOR PACKING MEDIUM CONCENTRATION SAMPLES

The procedures for packing medium concentration samples (defined as containing between 10 and 150,000 ppm of any constituent, or direct but diluted contamination, or material from previous spills, or discolored solid matrices or turbid liquids) are similar to those discussed in Section 12.4 with two notable exceptions. All medium hazard samples must first be placed in paint cans containing sufficient vermiculite or zonolite inert materials to cushion the sample containers and absorb spills. These paint cans are sealed, properly labelled, and then placed in the cooler or other appropriate shipping container, as described in Section 13.6. Medium hazard samples are not to be cooled with ice or some other artificial icing materials.

## 13. SAMPLE CUSTODY AND DOCUMENTATION

### 13.1 SAMPLE IDENTIFICATION DOCUMENTS

All field personnel must verify the sampling methods to be used during sample collection by making proper reference to the project plans. Prior to sampling, the field sampling personnel must ensure that all sample containers are in his physical possession or in his view at all times, or ensure that the containers are stored in a locked place at all times, so as to maintain proper custody. All sample gathering activities must be recorded in the site logbook; all sample transfers must be documented in the chain-of-custody record; all samples are to be identified with sample tags, labels, or other appropriate means of identification (hereinafter referred to as sample tags); and all sample bottles are to be sealed with custody seals. All information is to be recorded in waterproof ink. All E & E field personnel are personally responsible for sample collection and the care and custody of collected samples until the samples are transferred or properly dispatched.

### 13.2 CHAIN-OF-CUSTODY RECORDS

The custody record must be fully completed in duplicate, using black carbon paper where possible, by the field technician who has been designated by the project manager as being responsible for sample shipment to the appropriate laboratory for analysis. The information specified on the chain-of-custody record will contain the same level of detail found in the site logbook, with the exception that the on-site measurement data need not be recorded. The custody record

will include, among other things, the following information: name of person collecting the samples; date samples were collected; type of sampling conducted (composite/grab); location of sampling station; number and type of containers used; and signature of the E & E person relinquishing samples to a non-E & E person, such as a Federal Express agent, with the date and time of transfer noted. In addition, if samples are known to require rapid turnaround in the laboratory because of project time constraints or analytical concerns (e.g., extraction time or sample retention period limitations, etc.), the person completing the chain-of-custody record should note these constraints in the remarks section of the custody record.

If it is not practicable to seal all containers at a Federal Express office, they should be sealed beforehand. The duplicate custody record will therefore have the signature of the relinquishing field technician and a statement of intent such as "To Federal Express (Baltimore office) p.m. 6/31/84." The duplicate custody record is then placed in a plastic bag, taped to the underside of the box lid, and the box closed. The container is to be tightly bound with filament tape, and if required, at the discretion of the project manager, may be padlocked. Finally, at least two custody seals are to be signed by the individual relinquishing custody and affixed in such a way that the box cannot be opened without breaking them.

At the shipping agent's office, the relinquishing individual will put all the specific shipping data (airway bill number, office, time, and date) on the original custody record which is to be transmitted to the project manager (by mail or by hand as appropriate). The original and duplicate custody records and the airway bill or delivery note together constitute a complete record and it is the project manager's responsibility to ensure that all are consistent and they are made part of the permanent job file maintained at the ASC.

At the laboratory, the sample custodian will open the package, retrieve the duplicate record, and complete the "Received for Laboratory by" box by affixing his signature. The custodian also is to fill in the "Method of Shipment" box with the shipper's name (e.g., Federal Express) and airway bill number.

### 13.3 FIELD LOG BOOKS

Site logbook(s) must be maintained for each project. All site logbooks must be bound, contain numbered pages, and be waterproof. The following documentation is to be recorded in the site logbooks: sampling locations, station numbers, dates, times, sampler's name, designation of the sample as a grab or composite, notation of the type of sample (e.g., groundwater, soil boring, etc.), preservatives used, on-site measurement data, and other field observations and remarks. Each series of site logbook entries for a particular sampling effort must be initialed by the person recording the information and, where appropriate, summary entries that organize and/or clarify data presented in the logbook are to be prepared by the person recording the information. After reviewing the entries, the field team leader must sign each page of the site logbook on the top and the bottom.

As with all data logbooks, no pages will be removed for any reason. If corrections are necessary, these must be made by drawing a single line through the original entry (in such a manner that the original entry can still be read) and writing the corrected entry alongside. The correction must be initialed and dated. Most corrected errors will require a footnote explaining the correction.

The site logbook is the prime repository of information of actual site conditions and as such is an important link in the analytical chain. Any details which may be relevant to the analysis or integrity of samples must be recorded. Preliminary sample descriptions are helpful. Any unusual circumstances should be noted, e.g., heavy rain or difficulty in pH meter calibration. At the completion of the sampling exercise, the logbook must be retained by and/or returned to the project manager and is to be made part of the permanent project file. To the extent that any information contained in the logbook is relevant to sample analysis to be performed, such data are to be made available to the laboratory performing said analyses by the project manager.

### 13.4 CORRECTIONS TO DOCUMENTATION

As with data logbooks, if corrections to any site documentation are necessary, these must be made by drawing a single line through the original entry (in such a manner that the original entry can still be



read) and writing the corrected entry alongside. The correction must be initialed and dated. Most corrected errors will require a footnote explaining the correction.

When completing any of the laboratory logs, all crossouts and/or changes in logbook entries must be made with a single line and initialed by the same custodian who is responsible for the original entry; corrections also may be supplemented by a footnoted explanation, so long as the footnote is initialed by the same custodian responsible for the original entry. This general rule may be relaxed only if the ASC director or manager authorizes such a deviation from the rule and initials the change together with the other custodian making the correction.

### 13.5 TRAFFIC REPORTS, SAMPLE LABELS, AND CUSTODY SEALS

#### Traffic Reports

The documentation system provides the means to individually identify, track, and monitor each sample from the point of collection through final data reporting based on the use of sample traffic reports, each printed with a unique sample identification number. One traffic report and identification number is assigned by the sampler to each sample taken. Then, regardless of where a sample was collected or analyzed, the sample can always be identified and tracked by use of the assigned number. Traffic reports are used in conjunction with chain-of-custody and other document requirements.

To provide a permanent record for each sample collected, the sampler completes the traffic report in triplicate at the time the sample is taken. Data required include the project identification number, site location and number, dates and times when samples were taken, shipping information, name of laboratory performing analysis, and estimated and sample concentration. The top copy becomes the sampler's file copy. The bottom two copies are sent with the samples to the designated laboratory. Upon receipt of the samples, the laboratory completes the required information concerning sample conditions and documentation. The laboratory then returns one copy to the project manager and retains a copy for their files.

### Sample Tags

E & E field personnel will properly identify all samples taken in the field by using a sample tag attached to or affixed around the sample container. The sample tag must contain the field identification number; the date, time, and location of sample collection; designation of the sample as a grab or composite; notation of the type of sample (e.g., groundwater, soil boring, etc.); identification of preservatives used; any remarks; and the signature of the sampler. The sample tags are to be placed on the bottles so as not to obscure any QA/QC data on the bottles. Sample information must be printed in a legible manner using waterproof ink. Field identification must be sufficient to enable cross-reference with the site logbook.

### Custody Seals

Custody seals are preprinted adhesive-backed seals with security slots designed to break if they are disturbed. Individual sample bottles are sealed over the cap by the sampling technician. Sample shipping containers (coolers, cardboard boxes, etc., as appropriate) are sealed in as many places as necessary to ensure security. Seals are signed and dated before use. On receipt at the laboratory, the custodian will check (and certify, by completing logbook entries) that seals on boxes and bottles are intact.

### 13.6 SHIPPING OF SAMPLES

Environmental and hazardous samples will be properly packaged and labelled for shipment and dispatched to the appropriate laboratory for analysis. A separate chain-of-custody record must be prepared for each laboratory. The following requirements for shipping containers must be followed:

- United States Department of Transportation (DOT) regulations covering the transport of hazardous materials are contained in 49 CFR Parts 170-179.
- Shipping containers must be padlocked or custody-sealed for shipment, as appropriate. The package custody seal is to consist of filament tape wrapped around the package at least

twice and a custody seal affixed at appropriate access points. In this way, access to the package can be gained only by cutting the filament tape and breaking the seal.

- All of the shipping coolers/package containers must be secured by field personnel with a proper custody seal, marked with indelible pen or ink, and addressed to Ecology and Environment, Inc., Analytical Services Center, 4285 Genesee Street, Buffalo, NY 14225, or another laboratory as appropriate.
- Field personnel must make arrangements for transportation of samples to the ASC. When custody is relinquished to a shipper, E & E field personnel must telephone the ASC custodian (716/631-0360) to inform him of the expected time of arrival of the sample shipment and to advise him of any existing time constraints on sample analysis.

#### 14. SITE CLEAN-UP

The objective of site clean-up is to leave the areas of investigation essentially as they were found, except of course for the physical addition of monitoring wells and guard posts. Site clean-up also includes close coordination with base personnel to insure that clean-up operations are in accordance with overall management of base operations.

E & E has responsibility for assuring the safe and proper conduct of subcontractors in this work and the associated equipment. Decontamination procedures will be conducted to insure that potential contamination remains on-site. General cleanup of equipment and vehicles will be conducted consistent with accepted facility practices and in close coordination with the Base Engineer (BE).

Drill cuttings and investigation-derived wastes (e.g., expendables such as Tyvek over-suits) become the property of the facility. These materials will be labeled and staged in the secure area (with assistance from the BE) pending the results of analyses that will determine whether these wastes can be generally disposed or must be disposed as contaminated or hazardous waste.

## 15. FIELD TEAM ORGANIZATION AND RESPONSIBILITIES

Once the strategy and objectives of the work plan have been developed, a team must be organized to implement the plan. The specific techniques described in the work plan are likely to include: environmental sampling, sampling of hazardous substances, drilling operations, mapping, hazardous substance inventory, etc.

Hazardous substance sites present many hazards, physical conditions, and situations that require a wide variety of expertise and scientific support to insure safe entry and data collection. It is impractical to design a standard site entry team given the significant differences among sites. Therefore, each site requires a team tailored to the potential hazards and objectives of each specific site. The field investigation team will likely consist of individuals with various technical backgrounds, i.e., chemist, engineer, hydrogeologist, who will also fill field positions such as site safety officer or command post supervisor.

A team entering a hazardous substance site is organized for mutual support and safety. Hazardous site investigations require a complete respect for safety by all team members to prevent injury or loss of life.

### 15.1 ORGANIZATION AND RESPONSIBILITIES

There are eight roles which may be required for a field investigation team. These roles are dictated by the potential site hazards. Dual role assignments are not encouraged but may be acceptable when

hazardous substances and physical conditions at a site are well documented.

The following addresses the duties and responsibilities of the eight roles:

- Project team leader;
- Field team leader;
- Site safety officer;
- Personnel decontamination station (PDS) operator/equipment specialist;
- Command post supervisor;
- Initial entry party;
- Work party; and
- Emergency response team.

#### Project Team Leader

The project team leader is primarily an administrator when not participating in the field investigation as field team leader or command post supervisor. The project team leader is responsible for:

- All the team does or fails to do. Some of this responsibility may be passed on to the field team leader and site safety officer;
- Preparation and organization of all project work;
- Selection of team personnel and briefing them on specific assignments;
- Obtaining permission to enter the site from the owner;

- Coordinating with the field team leader to complete the work plan;
- Completing final reports and preparation of the evidentiary file; and
- Insuring that safety and equipment requirements are complete.

#### Field Team Leader

The field team leader is responsible for the overall operation and safety of the field team. As mentioned, this role can be filled by the project team leader or his designated representative. The field team leader may join the work party. He is responsible for:

- Safety and safety procedure enforcement;
- Field operations management;
- Public relations/state and federal liaison;
- Site control;
- Compliance of field documentation and sampling methods with evidence collection procedures;
- Execution of the site work plan; and
- Determination of the level of personal protection required (in conjunction with the site safety officer).

#### Site Safety Officer

The site safety officer has primary responsibility for all safety procedures and operations on-site. Ideally, the site safety officer will report to the person responsible for safety in the organization rather than to the field team leader or project team leader. This allows two separate lines of authority. It also allows decisions based on safety to be represented on an equal basis with decisions

based on the pressures for accomplishing the investigation according to schedule.

The site safety officer remains half-dressed in the appropriate level of protective equipment to respond to emergencies. He stays on the clean side of the exclusion area while monitoring the work party and site activities. The site safety officer is also responsible for:

- Updating equipment or procedures based on new information gathered during the site inspection;
- Upgrading the levels of protection based on site observations;
- Enforcing the "buddy system";
- Determining and posting locations and routes to medical facilities, including poison control centers; arranging for emergency transportation to medical facilities;
- Notifying local public emergency officers, i.e., police and fire department, of the nature of the team's operations, and posting their telephone numbers;
- Controlling entry (if possible) of unauthorized persons to the site;
- Entering the exclusion area in emergencies when at least one other member of the field team is available to stay behind and notify emergency services, or after he has notified emergency services;
- Examining work party members for symptoms of exposure or stress;
- Determining the suitability of a team member for work in the exclusion area, based on the team member's physical profile determined by the health and safety program and the team member's current physical condition; and



- Providing emergency medical care and first aid as necessary on-site. The site safety officer has the ultimate responsibility to stop any operation that threatens the health or safety of the team or surrounding populace.

#### PDS Operator/Equipment Specialist

The PDS operator/equipment specialist functions in two roles that do not require concurrent attention. As the equipment specialist, he is charged with:

- Insuring that all equipment is properly maintained and operating;
- Inspecting all equipment before and after use;
- Insuring that all required equipment is available; and
- Decontaminating all personnel, samples, and equipment returning from the exclusion area.

The PDS operator/equipment specialist is responsible for design and setup of the PDS and for preparing the necessary decontamination solutions to insure that chemical contamination is not transported into the clean area by inspection equipment, samples, protective clothing, or personnel. Failure to properly execute these duties reduces the effectiveness of the protective equipment and threatens the rest of the field team. The PDS operator/equipment specialist also manages the mechanics of removing contaminated clothing from the work party and the proper disposal of discarded contaminated clothing and decontamination solutions.

#### Command Post Supervisor

The command post supervisor functions as the clearinghouse for communications. He does not enter the exclusion area to assist the work party except for certain emergency situations. Should an emergency arise, the command post supervisor notifies emergency support personnel by phone, radio, etc., to respond to the situation.

Depending on the team size and the nature of the emergency, the command post supervisor may in extreme situations assist the site safety officer in effecting a rescue. Usually, the command post supervisor may be called upon to assist the PDS operator/equipment specialist in operating the PDS during an emergency, and assist the site safety officer in emergency medical measures. The field team leader may assume the position of command post supervisor.

The command post supervisor is also responsible for:

- Maintaining a log of communications and site activities such as duration of work periods with respirators;
- Sustaining communication and line-of-sight contact with the work party;
- Maintaining public relations in the absence of the field team leader; and
- Assisting the site safety officer and PDS operator/equipment specialist as required.

#### Initial Entry Party

The initial entry party enters the site first, employing specialized instrumentation to characterize site hazards. Usually the field team leader should be a part of the initial entry party to familiarize himself with conditions and dangers associated with the site. The major purpose of this team is to measure existing hazards and survey the site to ascertain if the level of personal protection determined from preliminary assessment and site inspection must be adjusted.

The initial entry party can consist of as few as two people if a wheelbarrow or other device is used to transport all the instrumentation. Three or four people are able to do the job more efficiently.

#### Work Party

The work party performs the on-site tasks necessary to fulfill the objectives of the investigation, e.g., obtaining samples or determining locations for monitoring wells. No team member should enter or

exit the exclusion area alone. The work party consists of a minimum of two individuals, and any work party should follow this buddy system. Besides the safety considerations, it is much easier for two persons dressed in protective clothing to perform such tasks as note-taking, photographing, and sampling.

#### Emergency Response Team

Extensive assignments requiring long hours and large work parties (more than five) necessitate the use of a standby emergency response team. The emergency response team is half-dressed in protective gear so that it can quickly enter the exclusion area in the event of an emergency. This team is particularly valuable at dangerous sites where protective equipment produces stress and heat loads on the work party.

#### 15.2 TEAM SIZE

The size of a team employed in an investigation is determined by two sometimes contradictory requirements: the need for a team large enough to maximize safety versus the desire for economy. Team size is dependent upon site organization, levels of protection, work objectives, and site hazards. Additional team members can always be added according to the roles required.

#### Two-Person Team

The two-person team is the minimum for a hazardous substance site investigation, but is very limited. Such a team should never enter an inactive hazardous substance site. The two-person team is best suited for off-site surveys and inspections or obtaining environmental (non-hazardous, off-site) samples. Ground truthing of aerial photographic surveys, inspection of files, or interviews can all be accomplished by the two-person team.

#### Three-Person Team

The three-person team can be employed on sites requiring Level C protection and, in some cases, on sites requiring Level B protection. This team is composed of field team leader; an individual fulfilling the combined functions of PDS operator/equipment specialist, site

safety officer, and command post supervisor; and another individual to enter the site with the field team leader.

The three-person team is used where extensive PDS procedures are not required and where the likelihood of emergency rescue is low. This field investigation team is best utilized in non-IDLH (immediately dangerous to life and health) atmospheres where the primary objective is to map, photograph, or inventory. Its use assumes that at no time will the work party be exposed to hazardous situations.

Considerable care and thought are necessary before a three-person team is employed on a site because each individual has numerous responsibilities. In the event of an accident, the third member does not enter the site to offer emergency assistance until he has summoned outside assistance, and even then, only when he feels rescue will not endanger his own life.

#### Four-Person Team

Most Level B operations can be conducted with a four-person team. These operations would include work on active sites where facility personnel are present or on inactive sites with potentially IDLH atmospheres. The objectives of a four-person team at a site requiring Level B protection might include sampling of ponds, soils, or open containers and inspections at sites known for poor housekeeping, i.e., spills, leaks, etc.

The team consists of the standard two-person work party, a combination site safety officer and PDS operator/equipment specialist, and a command post supervisor who may assist in the PDS operation. Because life-threatening hazards are assumed or known to be present at a Level B site, it is essential that all personnel be fully acquainted with their duties. During an emergency, the command post supervisor stays in the support area to maintain communication while the site safety officer/PDS operator/equipment specialist enters the exclusion area to aid the work party. Once the work party is in the contamination reduction area, the command post supervisor can then offer assistance on the PDS or provide fresh equipment from the support area.

#### Five-Person Team

The five-person team is the minimum size for most Level B operations or when known percutaneous hazards exist or there is an absence

of historical information. The site hazards that require Level B protection, combined with the limitations and stresses placed on personnel by wearing Level B protection, generally necessitate a full-time PDS operator/equipment specialist who can also serve in emergency response. In the event of a serious emergency such as a fire, explosion, or acutely toxic release, both the site safety officer and PDS operator/equipment specialist may need to enter the exclusion area dressed in Level B gear. The command post supervisor remains in the support area to direct outside help to the site and then assume the functions of PDS operator/equipment specialist.

#### Teams of Seven or More

Certain hazardous substance sites requiring sampling operations necessitate larger or alternating work parties and additional support personnel in the contamination reduction area. The seven-person team employs the basic five-person structure plus an additional work party for alternating work loads. The eight-person team includes an additional PDS operator/equipment specialist to assist in the continuous decontamination tasks involved with alternating work parties, and to decontaminate and pack samples as they are received.

It is not unusual to employ larger teams where such tasks as drum opening may require three work parties downrange working concurrently or may require a team to work under rigorous safety procedures. Larger teams can be designed with additional work parties and support personnel to safely gather the site data and insure communication and site control.

### 15.3 TRAINING

Although trained and experienced personnel are assigned, training is essential to successful project completion.

#### Mobilization Meeting

Before mobilization begins, a team training meeting is held to discuss assignments and the needs of the work, including equipment and health and safety requirements.

### On-Site Start-Up Meeting

During site start-up, a team training meeting and site tour are conducted to review the health and safety plan, particular protocols for the project, and the project objectives. In keeping with E & E corporate health and safety policies, every site worker must complete this orientation regardless of when they begin initial site work on the project. Records are maintained of this meeting and the topics covered.

### Daily Briefings and De-Briefings

Each morning a short briefing is held for all team members to outline the objectives for the day and allow health and safety monitoring. Instrument calibration checks usually occur during this time also. On sites with high potential for chemical exposure, a site survey tour would be made with monitoring instruments before fieldwork is allowed to begin. Based on current knowledge, this daily survey team is not needed for the work at Reese AFB.

At the end of each work day, a short de-briefing meeting is held to review accomplishment vs. objectives and to identify objectives for the next day's work. Data evaluation, planning, and sample management and shipping often follow this meeting.

## 16. SCHEDULE

A project milestone chart is presented in Table 16-1 to illustrate the sequence of tasks as approximated at the beginning of the project. Field conditions may impose minor variations in the schedule.

Table 16-1  
PROJECT MILESTONE CHART

Time (Weeks from Start)	Site	Activity
0-2	All	Project start-up tasks: preparation of work plan, site safety plan, securement of drilling subcontract, equipment, and supplies
2-3	1, 2, 3, 4, 6, 7	Field work commences: perform soil/water sampling; borings at sites 6 and 7
3-4	5	Perform fuel tank survey; sample transformer; begin data reduction
4-12	All	Preparation of draft final report



SITE SAFETY PLAN  
for  
Air Force Plant 38 IRP Study  
AFP 38, Porter, NY

Prepared for:  
United States Air Force OEHL

Prepared by:  
Ecology & Environment, Inc.

September 2, 1986

HAZARDOUS AND TOXIC MATERIALS TEAM  
SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Air Force Plant 38 Job No.: DF-3000

LOCATION: Porter, New York

PLAN PREPARED BY: P. Brodzik DATE: 9/2/86

APPROVED BY: Corp H/S Group [Signature] DATE: 10 Sept 86

OBJECTIVE(S): Surface and subsurface soil sampling, geophysics.

PROPOSED DATE OF INVESTIGATION: Start 9/29/86 complete

BACKGROUND REVIEW: Complete: X Preliminary:     

DOCUMENTATION/SUMMARY: Overall Hazard: Serious:      Moderate: X  
Low: X Unknown: X

B. SITE/WASTE CHARACTERISTICS

WASTE TYPE(S): Liquid X Solid X Sludge X Gas X  
Corrosive X Ignitable X Radioactive X Volatile X  
Toxic X Reactive X Unknown X Other (Name)     

FACILITY DESCRIPTION: Inactive Air Force munitions plant and former  
propellants test site for Bell Aerospace.

Principal Disposal Method (type and location): Varied: runoff, disposal pits  
incinerator

Unusual Features (dike integrity, power lines, terrain, etc.): Multiple  
locations of contamination. System of drainage ditches throughout  
site.

Status: (active, inactive, unknown) Inactive

History: (injuries; complaints; previous agency action): See Attachment A:  
History and Overview of Base.

**C. HAZARD EVALUATION**  
(Use Supplemental Sheets if Necessary)

Summary (attach copy of available chemical information from Saxes, Merck, Index, Ohmtads, etc.): Heat Stress (see Attachment B)

Hydrazine

Monomethyl Hydrazine (MMH)

Unsymmetrical dimethyl Hydrazine (UDMH)

Freon

Isopropyl Alcohol

Methyl Alcohol

Methylene Chloride

1,1,1-Trichloroethane

Trichloroflouromethane

Hydroflouric Acid

1,2 dimethyl Hydrazine

Triaryl Phosphate

Nitrogen Tetroxide

Flourine

Toluene

Possible Radiologically contaminated soil

**D. SITE SAFETY WORK PLAN**

PERIMETER ESTABLISHMENT: Map/Sketch Attached?  X  Site Secured?  X

Perimeter Identified?  X  Zone(s) of Contamination Identified?  X

**PERSONAL PROTECTION:**

Level of Protection: A      B      C  X  D  X

Modifications: APRs readily available but not worn with continuous air monitoring. APR's worn for all PCB sampling, ash and soil sampling.

Surveillance Equipment and Materials: HNU, OVA, Explosimeter, O₂-meter (tape) radiation alarm mini rad TLD Badges

Explosimeter: between 20% and 50% LEL continue inspection but monitor carefully. At greater than 50% LEL evacuate site immediately. At less than 19.5% and greater than 25% oxygen, evacuate site. Any depressions in the earth will be cleared with the O₂ meter and

explosimeter prior to entry. Any alarm from mini rad (on most sensitive setting) will be cause for evacuation. HNU or OVA: 0ppm above background

Level D respiratory protection. Any reading above background to 5 ppm above background- Level C respiratory protection.

7/84 Revised JLD

5 ppm or greater - evacuate site and confer with Corporate Safety Director.

SPECIAL SITE CONSIDERATIONS: Personnel working from man-lift will be secured by life line. Man-lift operations will conform to all OSHA requirements.

DECONTAMINATION PROCEDURES:

Personal: Remove contaminated clothing; wash with soap and water.

Equipment: Soap, water, and TSP wash/Hexane rinse  
Deionized water rinse.

INVESTIGATION - DERIVED MATERIAL DISPOSAL: (Note - If material is proposed to be left on site, written authorization is to be received by the Project Team Leader prior to the initiation of on site activities): Material to be tested to determine if it is hazardous waste. If hazardous, disposal is the responsibility of the Air Force; if non-hazardous, material will be disposed of on-site (containment and drumming of spoils and decon fluids).

SITE ENTRY PROCEDURES: E & E personnel will check in with site custodian at gate prior to any site activities. E & E personnel will receive visitor badges to be worn on site from USAF POC. Prior to PCB sampling of transformers, assure electricity is off. E & E personnel will work in areas outlined as sampling areas only; no one will enter enclosed buildings.

<u>Team Member</u>	<u>Responsibility</u>
<u>Hussein Aldis</u>	<u>Project Manager</u>
<u>Paul Brodzik</u>	<u>Assistant Project Manager/ Site Safety Officer</u>
<u>Randy Holtz</u>	<u>Sampler</u>
<u>Greg Jones</u>	<u>Sampler</u>
<u>Mark Hemann</u>	<u>Geologist</u>
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**E. EMERGENCY INFORMATION**

(Use Supplemental Sheets if Necessary)

**EMERGENCY PRECAUTIONS**

**Acute Exposure Symptoms**

Hydrocarbon vapors  
Heat stroke, anoxia  
_____  
_____  
_____  
_____  
_____

**First Aid**

Fresh air, rest  
Rest, shade, fluids, cool body,  
monitor heart rate and  
temperature.  
_____  
_____  
_____  
_____

**LOCAL RESOURCES**

(Name, Address and Phone Number)

Ambulance Mt. St. Mary's Hospital, 5300 Military Rd., Lewiston, 278-4000  
Hospital Emergency Room Niagara Falls Memorial Medical Center, 621 10th N.F. 278-4000  
Poison Control Center 878-7654  
Police (incl. Local, County Sheriff, State) 911 Sherriff (Niagara Falls) 297-0755, (Lockport)  
Fire Department 911 Lockport 433-4482 439-9393  
Airport _____  
Explosives Unit _____  
Agency Contact (EPA, State, Local, USCG, etc.) _____  
Local Laboratory _____  
UPS/Federal Express _____  
Client Contact _____

**SITE RESOURCES**

Water Supply _____  
Telephone _____  
Radio _____  
Other _____

---

Emergency Contacts

1. Mr. Raymond Harbison (University of Arkansas) ..... (501) 661-5766 or 661-5767  
(501) 370-8263 (24 hour)
  
2. Ecology and Environment, Inc., Safety Coordinator/  
P. Jonmaire ..... (716) 632-4491 (office)  
(716) 655-1260 (home)

Medtox Hotline

1. Twenty-four hour answering service - (501) 370-8263

What to Report:

- o State: "This is an emergency."
  - o Your name, region, and site.
  - o Telephone number to reach you.
  - o Your location.
  - o Name of person injured or exposed.
  - o Nature of emergency.
  - o Action taken.
2. One of three toxicologists (Drs. Raymond Harbison, Richard Freeman, or Robert James) will contact you. Repeat the information given to the answering service.
  3. If a toxicologist does not return your call within 15 minutes, call the following persons in order until contact is made:
    - E & E Corporate Headquarters (EST 0830-1700) - (716) 632-4491
    - a. Twenty-four hour line - (716) 631-9530
    - b. Corporate Safety Director - Paul Jonmaire (home - (716) 655-1260)
    - c. Assistant Corporate Safety Officer - Steve Sherman (home - (716) 688-0084)

Emergency Routes

Directions to Hospital (incl. MAP) To Mt. St. Mary's Hospital (Lewiston):  
Exit AFP 38; head West on Balmer Road; Turn left and head south on State  
Highway 18; Turn left on State Highway 104 (Lewiston Rd.) head south;  
Turn left on to State Highway 265 (Military Rd.); Hospital at 5300  
Military Rd.

Other To Niagara Falls Memorial Medical Center: Exit AFP 38; head west on  
Balmer Road; turn left and head south on State Highway 18; turn left and  
head south on State Highway 104; bear left into Portage Road in Niagara  
Falls; turn right on Pine Ave. (RT. 62A); turn left on 10th St.; Hospital  
at 621 10th Avenue.

F. EQUIPMENT CHECKLIST

PROTECTIVE GEAR

LEVEL A

SCBA _____  
 SPARE AIR TANKS _____  
 ENCAPSULATED SUIT _____  
 SURGICAL GLOVES _____  
 NEOPRENE SAFETY BOOTS _____  
 BOOTIES _____  
 GLOVES (TYPE _____) _____  
 OUTER WORK GLOVES _____  
 HARD HAT _____  
 CASCADE SYSTEM _____  
 _____  
 _____  
 _____  
 _____

LEVEL C

ULTRA-TWIN RESPIRATOR _____  
 POWER AIR PURIFYING RESPIRATOR _____  
 CARTRIDGES (TYPE GMC-H) X  
 ROBERTSHAW ESCAPE MASK _____  
 CHEMICAL RESISTANT COVERALLS X  
 PROTECTIVE COVERALL  
 (TYPE Iyvek, Saranex) X  
 RAIN SUIT _____  
 BUTYL APRON _____  
 SURGICAL GLOVES X  
 GLOVES (TYPE Butyl Rubber) X  
 OUTER WORK GLOVES X  
 NEOPRENE SAFETY BOOTS X  
 HARD HAT WITH FACE SHIELD X  
 Booties X

LEVEL B

SCBA _____  
 SPARE AIR TANKS _____  
 CHEMICAL RESISTANT COVERALLS _____  
 PROTECTIVE COVERALL  
 (TYPE _____) _____  
 RAIN SUIT _____  
 BUTYL APRON _____  
 SURGICAL GLOVES _____  
 GLOVES (TYPE _____) _____  
 OUTER WORK GLOVES _____  
 NEOPRENE SAFETY BOOTS _____  
 BOOTIES _____  
 HARD HAT WITH FACE SHIELD _____  
 CASCADE SYSTEM _____  
 MANIFOLD SYSTEM _____

LEVEL D

ULTRA-TWIN RESPIRATOR (AVAILABLE) X  
 CARTRIDGES (TYPE GMC-H) X  
 ROBERTSHAW ESCAPE MASK (AVAILABLE) _____  
 CHEMICAL RESISTANT COVERALLS X  
 PROTECTIVE COVERALL  
 (TYPE Iyvek) X  
 RAIN SUIT _____  
 NEOPRENE SAFETY BOOTS X  
 BOOTIES _____  
 WORK GLOVES X  
 HARD HAT WITH FACE SHIELD X  
 SAFETY GLASSES _____  
Surgical Gloves X  
 _____

INSTRUMENTATION

OVA X  
 THERMAL DESORBER _____  
 O2/EXPLOSIMETER X  
 EXPLOSIMETER CALIBRATION KIT X  
 HNU X  
 VICTOREEN 471 _____  
 MAGNETOMETER X  
 PIPE LOCATOR _____  
 WEATHER STATION _____  
 DRAEGER PUMP _____  
 BRUNTON COMPASS _____

DECON EQUIPMENT (CONT.)

PLASTIC SHEETING X  
 TARPS X  
 TRASH BAGS X  
 TRASH CANS X  
 MASKING TAPE X  
 DUCT TAPE X  
 PAPER TOWELS X  
 FACE MASK _____  
 FACE MASK SANITIZER _____  
 FOLDING CHAIRS X  
 STEP LADDERS _____

FIRST AID EQUIPMENT

FIRST AID KIT X  
 OXYGEN ADMINISTRATOR _____  
 STRECHER _____  
 PORTABLE EYE WASH _____  
 BLOOD PRESSURE MONITOR _____  
 RADIATION BADGES _____  
 FIRE EXTINGUISHER _____

SAMPLING EQUIPMENT

Bottles X  
Split-spoons X  
Stainless Steel Tablespoons X

DECON EQUIPMENT

WASH TUBS X  
 BUCKETS X  
 SCRUB BRUSHES X  
 PRESSURIZED SPRAYER X  
 DETERGENT (TYPE TSP) X  
 SOLVENT (TYPE Hexane) X





ON-SITE SAFETY MEETING

Project Air Force Plant 38  
Date _____ Time _____ Job No. DF-3000  
Address Porter, New York  
Specific Location _____  
Type of Work Surface, subsurface soil sampling, surface water sampling,  
incinerator residue and transformer oil sampling.

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment Levels B/C/D  
Chemical Hazards Hydrazine, solvents, PCBs  
Physical Hazards Heat Stress, drilling hazards  
Emergency Procedures First Air/CPR/Water/Shade/Oxygen  
Hospital/Clinic Niagara Falls Memorial Medical Phone 278-4000  
Hospital Address 621 10th Avenue, Niagara Falls  
Special Equipment _____  
Other _____

ATTENDEES

Name Printed

Signature

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Meeting Conducted By: _____  
Name Printed _____ Signature _____  
Site Safety Officer _____ Team Leader _____

ecology and environment, inc.

HAZARD EVALUATION OF CHEMICALS

Chemical Name Hydrazine Date 9/2/86  
DOT Name/U.N. No. UN2029 Job No. DF-3000  
CAS Number _____

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Index Hazardline Chris (Vol. II)  
Toxic and Hazardous Safety Manual ACGIH Other: _____

Chemical Properties: (Synonyms: NONE)  
Chemical Formula N₂H₄ Molecular Weight 32.05  
Physical State Liquid Solubility (H₂O) _____ Boiling Point 236.3° F  
Flash Point 100° F Vapor Pressure/Density _____ Freezing Point 34.7° F  
Specific Gravity _____ Odor/Odor Threshold 3-4 ppm Flammable Limits 4.7%-100%  
Incompatibilities _____

Biological Properties:

TLV-TWA 1 ppm PEL _____ Odor Characteristic Ammonia-like  
IDLH _____ Human _____ Aquatic 146 ppm Rat/Mouse LD₅₀ 50 to 500 mg/  
Route of Exposure _____  
Carcinogen _____ Teratogen _____ Mutagen _____

Handling Recommendations: (Personal protective measures):

Impermeable clothing should be worn, including gloves and boots; eye protection; respirators with cartridges at 1 ppm;

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

Poison: Vapor-more to fresh air; artificial respiration; oxygen. Liquid-remove contaminated clothing, flush with water; if swallowed, give milk or water. Do not induce vomiting. Call Doctor.

Symptoms: Acute: Itching, swelling, blistering of eyelids, skin, nose, throat; temporary blindness. Ingestion causes nausea, dizziness  
Chronic: Headache. Severe exposure may cause death.

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Methyl Alcohol Date 9/2/86  
DOT Name/U.N. No. UN1230 Job No. DF-3000  
CAS Number _____

References Consulted (circle):

NIOSH/OSHA Pocket Guide _____ Verschueren _____ Merck Index _____ Hazardline Chris (Vol. II)  
Toxic and Hazardous Safety Manual _____ ACGIH _____ Other: _____

Chemical Properties: (Synonyms: Methanol, Wood Alcohol)

Chemical Formula CH₃OH Molecular Weight 32.04  
Physical State Liquid Solubility (H₂O) _____ Boiling Point 148.1° F  
Flash Point 54° F Vapor Pressure/Density _____ Freezing Point -144.0° F  
Specific Gravity _____ Odor/Odor Threshold 100 ppm Flammable Limits 6.0%-36.5%  
Incompatibilities _____

Biological Properties:

TLV-TWA 200 ppm PEL _____ Odor Characteristic Alcohol odor  
IDLH _____ Human _____ Aquatic _____ Rat/Mouse _____  
Route of Exposure Inhalation, Ingestion  
Carcinogen _____ Teratogen _____ Mutagen _____

Handling Recommendations: (Personal protective measures)

organic vapor canister for high concentrations; rubber gloves;  
chemical goggles or face shield.

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid: Flammable, Call Doctor

Vapor: move to fresh air; artificial respiration; oxygen. Liquid: remove  
contaminated clothing; flush with water; in eyes-flush with water; if swallowed-  
give milk or water.

Symptoms: Acute: Exposure to vapor can cause eye irritation, headache,  
fatigue, or drowsiness. High concentrations may cause  
Chronic: central nervous system damage; swallowing may cause  
death or eye damage.

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Isopropyl Alcohol Date 9/2/86  
DOT Name/U.N. No. UN1219 Job No. DF-3000  
CAS Number _____

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschuieren Merck Index Hazardline Chris (Vol. II)  
Toxic and Hazardous Safety Manual ACGIH Other: _____

Chemical Properties: (Synonyms: Isopropanol, 2-propanol, Rubbing Alcohol)  
Chemical Formula CH₃CH(OH)CH₃ Molecular Weight 60.10  
Physical State _____ Solubility (H₂O) _____ Boiling Point 180.1° F  
Flash Point 65° F Vapor Pressure/Density _____ Freezing Point -127.3° F  
Specific Gravity _____ Odor/Odor Threshold _____ Flammable Limits 2.3%-12.7%  
Incompatibilities _____

Biological Properties:

TLV-TWA 400 ppm PEL _____ Odor Characteristic Sharp, like ethyl alcohol  
IDLH _____ Human _____ Aquatic 900-1100ppm Rat/Mouse LD₅₀ 5 to 15 mg/kg  
Route of Exposure Inhalation, Ingestion  
Carcinogen _____ Teratogen _____ Mutagen _____

Handling Recommendations: (Personal protective measures)

Organic vapor canister or air supplied mask; impermeable clothing should be worn.

Monitoring Recommendations:

Disposal/Waste Treatment:

Disperse with water and flush

Health Hazards and First Aid: Flammable. Call Doctor

Inhalation: move to fresh air; artificial respiration; oxygen.

Ingestion: give milk or water. In eyes: flush with water.

Symptoms: Acute: mild irritation of eyes and upper respiratory tract;  
high concentration may be anesthetic.

Chronic: _____

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HAZARD EVALUATION OF CHEMICALS

Chemical Name 1,1,1-trichloroethane Date 9/2/86  
DOT Name/U.N. No. UN2831 Job No. DF-3000  
CAS Number _____

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Index Hazardline Chris (Vol. II)  
Toxic and Hazardous Safety Manual ACGIH Other: _____

Chemical Properties: (Synonyms: Methylchloroform)

Chemical Formula CH₃CCl₃ Molecular Weight 133.41

Physical State Liquid Solubility (H₂O) _____ Boiling Point 165° F

Flash Point _____ Vapor Pressure/Density _____ Freezing Point <-38° F

Specific Gravity _____ Odor/Odor Threshold 100 ppm Flammable Limits 7% - 16%

Incompatibilities Reacts with water slowly releasing corrosive hydrochloric acid.

Biological Properties:

TLV-TWA 350 ppm PEL _____ Odor Characteristic Sweet; chloroform-like

IDLH _____ Human _____ Aquatic _____ Rat/Mouse _____

Route of Exposure Inhalation, Ingestion, Dermal

Carcinogen _____ Teratogen _____ Mutagen _____

Handling Recommendations: (Personal protective measures)

organic vapor - acid gas canister; SCBA for emergencies; neoprene gloves; face shield

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid: Call doctor.

Vapor: move to fresh air; artificial respiration; oxygen. Liquid: remove contaminated clothing; flush with water; if swallowed, give milk or water and induce vomiting.

Symptoms: Acute: Inhalation: loss of equilibrium; loss of consciousness  
Ingestion: same as above; nausea. Skin: irritation; dermatitis

Chronic: _____

ecology and environment, inc.

HAZARD EVALUATION OF CHEMICALS

Chemical Name Methylene Chloride Date 9/2/86  
DOT Name/U.N. No. UN1593 Job No. DF-3000  
CAS Number _____

References Consulted (circle):

NIOSH/OSHA Pocket Guide    Verschueren    Merck Index    Hazardline    Chris (Vol. II)  
Toxic and Hazardous Safety Manual    ACGIH    Other: _____

Chemical Properties: (Synonyms: Dichloromethane, Methylene dichloride)

Chemical Formula CH₂Cl₂ Molecular Weight _____  
Physical State Liquid Solubility (H₂O) _____ Boiling Point 104° F  
Flash Point _____ Vapor Pressure/Density _____ Freezing Point -142° F  
Specific Gravity _____ Odor/Odor Threshold 205-307 ppm Flammable Limits 12%-19%  
Incompatibilities _____

Biological Properties:

TLV-TWA 500 ppm PEL _____ Odor Characteristic aromatic; like chloroform  
IDLH _____ Human _____ Aquatic _____ Rat/Mouse LD₅₀ 0.5 to 5 g/kg  
Route of Exposure Inhalation; Ingestion  
Carcinogen _____ Teratogen _____ Mutagen _____

Handling Recommendations: (Personal protective measures)

Organic vapor canister mask; safety glasses; protective clothing

Monitoring Recommendations:

Disposal/Waste Treatment:

Disperse and Flush

Health Hazards and First Aid: Call doctor

Vapor: move to fresh air; artificial respiration; oxygen. Liquid: remove contaminated clothing; flush with water; if swallowed give milk or water.

Symptoms: Acute: Inhalation: anesthetic effects, nausea, drunkenness  
Skin/eye contact: skin irritation, eye irritation

Chronic: _____

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Flourine Date 9/2/86  
DOT Name/U.N. No. UN1045 Job No. DF-3000  
CAS Number _____

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Index Hazardline Chris (Vol. II)  
Toxic and Hazardous Safety Manual ACGIH Other: _____

Chemical Properties: (Synonyms: NONE)  
Chemical Formula F₂ Molecular Weight 37.99  
Physical State Gas Solubility (H₂O) _____ Boiling Point -306.9° F  
Flash Point - Vapor Pressure/Density _____ Freezing Point -362° F  
Specific Gravity _____ Odor/Odor Threshold .035 ppm Flammable Limits -  
Incompatibilities _____

Biological Properties:

TLV-TWA 1 ppm PEL _____ Odor Characteristic _____  
IDLH _____ Human _____ Aquatic _____ Rat/Mouse _____  
Route of Exposure Inhalation; Dermal  
Carcinogen _____ Teratogen _____ Mutagen _____

Handling Recommendations: (Personal protective measures)

Tight fitting chemical goggles; impermeable clothing

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid: Call doctor.

Vapor: Poisonous; move to fresh air; artificial respiration; oxygen

Symptoms: Acute: Severe burning of eyes, skin and respiratory system  
burns may develop slowly after exposure.  
Chronic: _____



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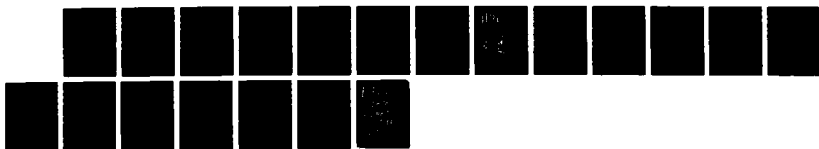
INSTALLATION RESTORATION PROGRAM PHASE 2  
CONFIRMATION/QUANTIFICATION STAG. (U) ECOLOGY AND  
ENVIRONMENT INC LANCASTER NY BUFFALO CORPORATE CE.  
APR 88 F33615-83-D-4003

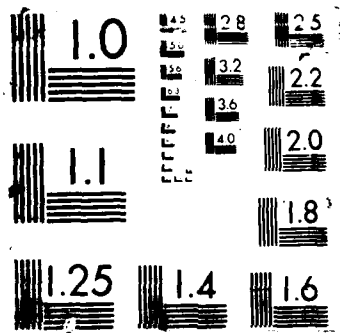
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Attachment A  
to Site Safety Plan

1. History and Overview of the Base

Air Force Plant (AFP) 38 is an inactive Air Force plant located in Porter, New York. The site was intended as an ordnance depot (Lake Ontario Ordnance Depot) at the end of World War II to act as a storage area for an ammunition manufacturing plant constructed south of Balmer Road. The area was drained by a series of ditches dug by the U.S. Army Corps of Engineers, and the ammunition storage magazines (bunkers or igloos) were built but never used. The Atomic Energy Commission (AEC), which had a facility across Balmer Road, did store some wastes on the site. The facility was later used by Bell Aerospace as a rocket missile and laser development site from the 1950's. The Magazine Ditch was dammed during the mid-1950's to enable Bell to collect and neutralize any spills or discharges from their facility. The site was also used for loading minuteman missiles with propellants.

Wastes generated by AFP 38 operations and support activities included: Freon; isopropyl alcohol; hydrofluoric acid; spent solvents such as 1,1,1-Trichloroethane, toluene, and methylene chloride; waste propellants such as hydrazine, monomethyl hydrazine (MMH), and unsymmetrical dimethyl hydrazine (UDMH); and oxidizers such as  $N_2O_4$ . On-site waste management activities included storage in 55-gallon drums, incineration, and collection of test area deluge water and general plant runoff in a containment basin via a facility-wide drainage ditch system. Additionally, a salvage yard was used for the storage of scrap materials.

For the purpose of this investigation, AFP 38 has been divided into seven sites. The seven sites include:

- . Site 1 - General Drainage Ditches
- . Site 2 - Salvage Yard and Container Storage Area Drainage Ditches
- . Site 3 - Burn Pits
- . Site 4 - Maintenance, Laboratory and Flush Building Drainage Ditches
- . Site 5 - Fuel Storage Tanks and Electrical Transformers
- . Site 6 - Incinerator and Incinerator Pad
- . Site 7 - Container Storage Pad and Surrounding Soils

## 2. General Operations

Sampling during this phase of the project will include surface water, surface soil, subsurface soils, incinerator residues, and transformer oils. A total of 7 water samples, 26 1-foot surface soil/sediment samples, 8 5-foot subsurface soil samples, 3 residue samples, and 1 transformer oil sample will be collected during this project. These totals do not include QA/QC samples.

Geophysical surveys will be performed prior to drilling to aid in the selection of safe boring locations. All borings will be monitored with the OVA or HNU during drilling to establish the level of respiratory protection required.

Ambient air monitoring will be continuously performed using an HNU and an OVA. As dictated by the air monitoring, the level of respiratory protection may be changed. Upgrade/downgrade can be made according to the following guidelines:

- . Level D - 0 ppm above background.
- . Level C - Anything above background to 5 ppm. 5 to 500 ppm above background, abandon site, re-evaluate and contact the Corporate Safety Director.

Air monitoring equipment will be chosen based on the type of contaminants expected and the weather conditions. The HNU has several different probes. E & E will use the 11.7 ev probe as it can photoionize the greatest number of compounds. Additionally, humid air quenches ions and decreases the instrument readings, making the HNU ineffective at relative humidities over 80%. The higher the EV of the detector probe lamp, the more sensitive the instrument is to humidity quenching. Cold weather can also affect the readings on the HNU, as condensation can settle inside the probe. The OVA will be substituted under such conditions.

A radiation alert-mini (Rad-mini) survey meter will be utilized to monitor the work site for radiation. Any reading above background will be cause for evacuation. If radiation is detected, work crew will evacuate the site and notify the Corporate Safety Office and the Air Force POC.

### 3. Site - Specific Descriptions

#### 3.1 Site 1 - General Drainage Ditches

The following drainage ditches constitute Site 1:

- 1) central drainage ditch downstream of the dam;
- 2) central drainage ditch upstream of the intersection of magazine ditch and central ditch;
- 3) magazine ditch upstream of the dam;
- 4) magazine ditch upstream of the first intersection with any ditch on the plant;
- 5) railroad ditch upstream close to Balmer Road; and
- 6) Six Mile Creek at the boundary of the plant.

A water sample and a sediment sample will be collected at each of the fore-mentioned areas. Modified Level C protection will be worn (APRs readily available but not worn). Continuous air monitoring of the breathing zone will be conducted during the sampling operation.

#### 3.2 Site 2 - Salvage Yard and Container Storage Area Drainage Ditches

The Salvage Yard and Container Storage Area are located along the east boundary of AFP 38. Previous sampling of these areas conducted by JRB Associates shows elevated levels of TOC (1,000 to 19,000 ppm), nitrate (3.4 ppm), and oil and grease (520 ppm).

Two soil/sediment samples will be collected from drainage ditches within the area. Modified Level C protection will be worn (APRs readily available but not worn). Continuous air monitoring of the breathing zone will be conducted during the sampling operations.

#### 3.3 Site 3 - Burn Pits

The two burn pits located near "C" Street and within the salvage yard constitute Site 3. This area lies near the east boundary of AFP 38.

Four 1-foot soil samples will be collected at each location. Level C protection will be worn. Continuous air monitoring of the breathing zone will be conducted during the sampling operations.

### 3.4 Site 4 - Maintenance, Laboratory and Flush Building Drainage Ditches

The buildings are located near the south boundary of AFP 38. One water sample will be collected from the nearby magazine ditch. Two 1-foot soil/sediment samples will be collected from the adjacent drainage ditch and from the magazine ditch. Modified Level C protection will be worn. Continuous air monitoring of the breathing zone will be conducted during the sampling operations.

### 3.5 Site 5 - Fuel Storage Tanks and Electrical Transformers

Numerous above and below-ground fuel storage tanks exist at AFP 38. The tanks are used principally for No. 2 Fuel Oil. Numerous electrical transformers exist at AFP 38 and are suspected to contain PCB oil. One sample of transformers oil will be collected from a random transformers. Level C protection will be worn. Saranex outer garment and butyl rubber gloves will be worn by personnel collecting the transformers oil. Continuous air monitoring will be conducted during the sampling operation.

Inspection of the electrical transformers will be conducted from a man-lift. Personnel will adhere to OSHA guidelines for utilizing man-lifts. Personnel working from the man-lift platform will be secured to the platform with a life line.

### 3.6 Site 6 - Incinerator and Incinerator Pad

Residue samples will be collected from the interior of the incinerator and from the surface of the incinerator pad. In addition, 4 5-foot soil borings will be drilled around the perimeter of the incinerator pad. Of the material used at AFP 38 which are recorded, it is noted that the incinerator burned MMH (monomethyl hydrazine), UDMH (unsymmetrical dimethyl hydrazine), and isopropyl alcohol.

Collection of residue samples from the incinerator pad and the collection of the 1-foot and 5-foot soil/sediment samples will be conducted in Level C protection.

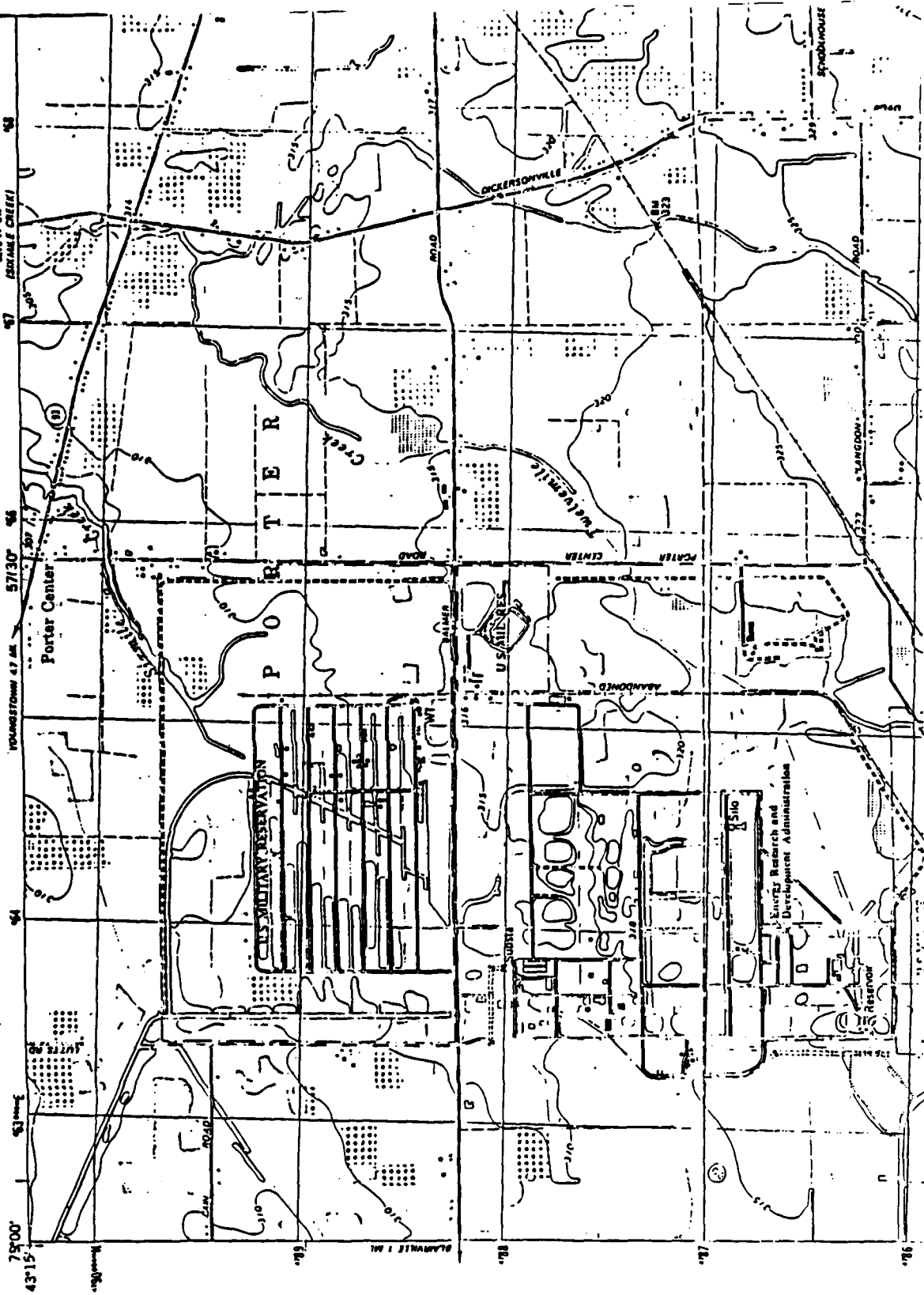
### 3.7 Site 7 - Container Storage Pad and Surrounding Soils

The container storage area is located near the southeast boundary of AFP 38. One residue sample will be collected from the container storage pad. Four 1-foot and four 5-foot soil/sediment samples will be collected from borings located around the perimeter of the pad. Level C protection will be worn. Continuous air monitoring of the breathing zone will be conducted during the sampling operation.

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

STATE OF NEW YORK  
DEPARTMENT OF TRANSPORTATION

11781 SE  
(FORT MAGARA)






A  
B  
C  
D  
E  
F  
G

TOWNS	POINTS OF INTEREST	Counties	Other Cities
Albion	Albion	Albion	Albion
Amherst	Amherst	Amherst	Amherst
Buffalo	Buffalo	Buffalo	Buffalo
Getzville	Getzville	Getzville	Getzville
Tonawanda	Tonawanda	Tonawanda	Tonawanda
West Tonawanda	West Tonawanda	West Tonawanda	West Tonawanda
Wheatfield	Wheatfield	Wheatfield	Wheatfield
Youngstown	Youngstown	Youngstown	Youngstown
...	...	...	...

**BUFFALO-NIAGARA FALLS**  
N.Y.-ONT.  
AND VICINITY



——— Limited Access Divided Highways  
 (also in various colors or sizes)

——— Other Divided Highways

——— State and Provincial Highways

——— County Trunk or Regional Highways

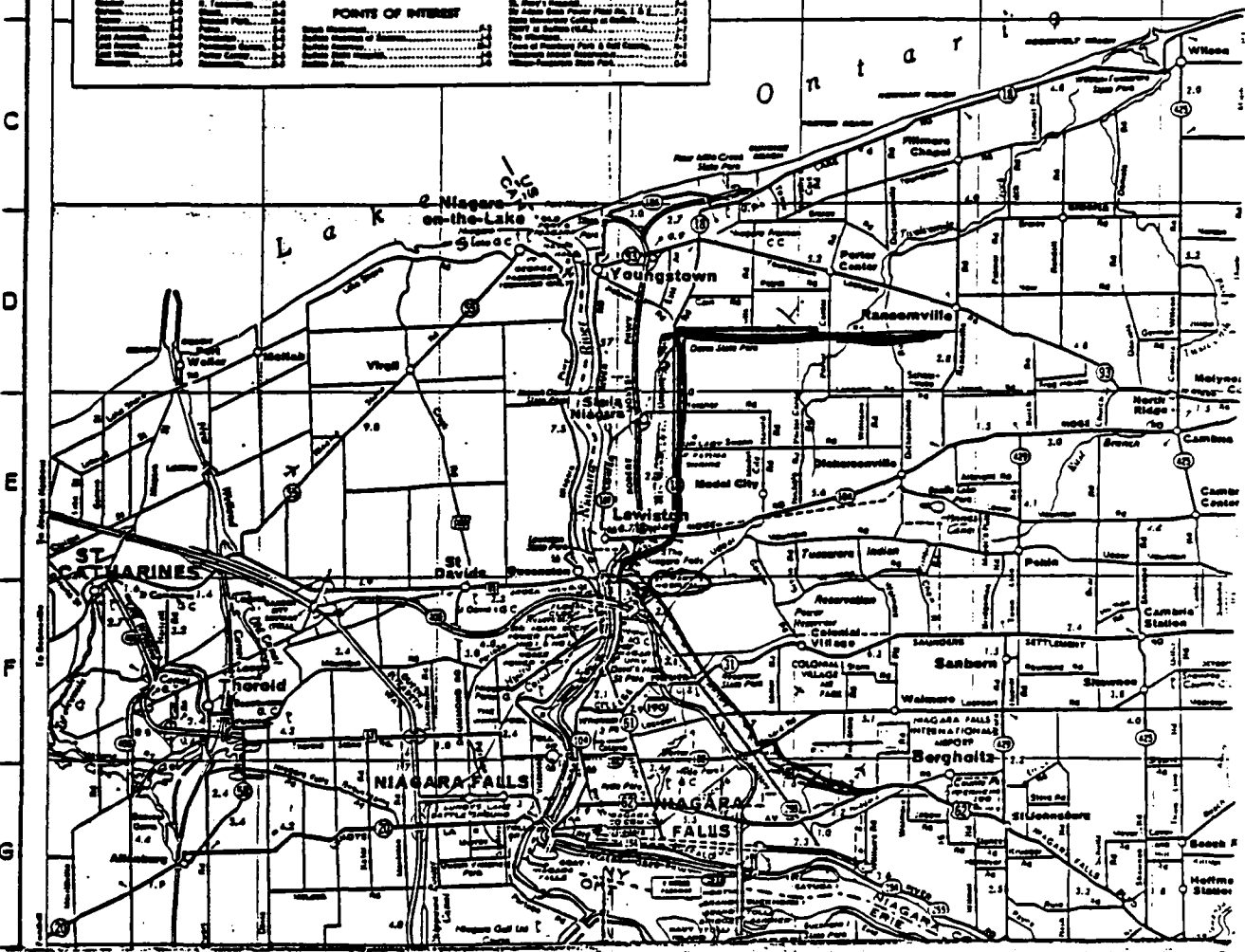
——— U.S. Highways

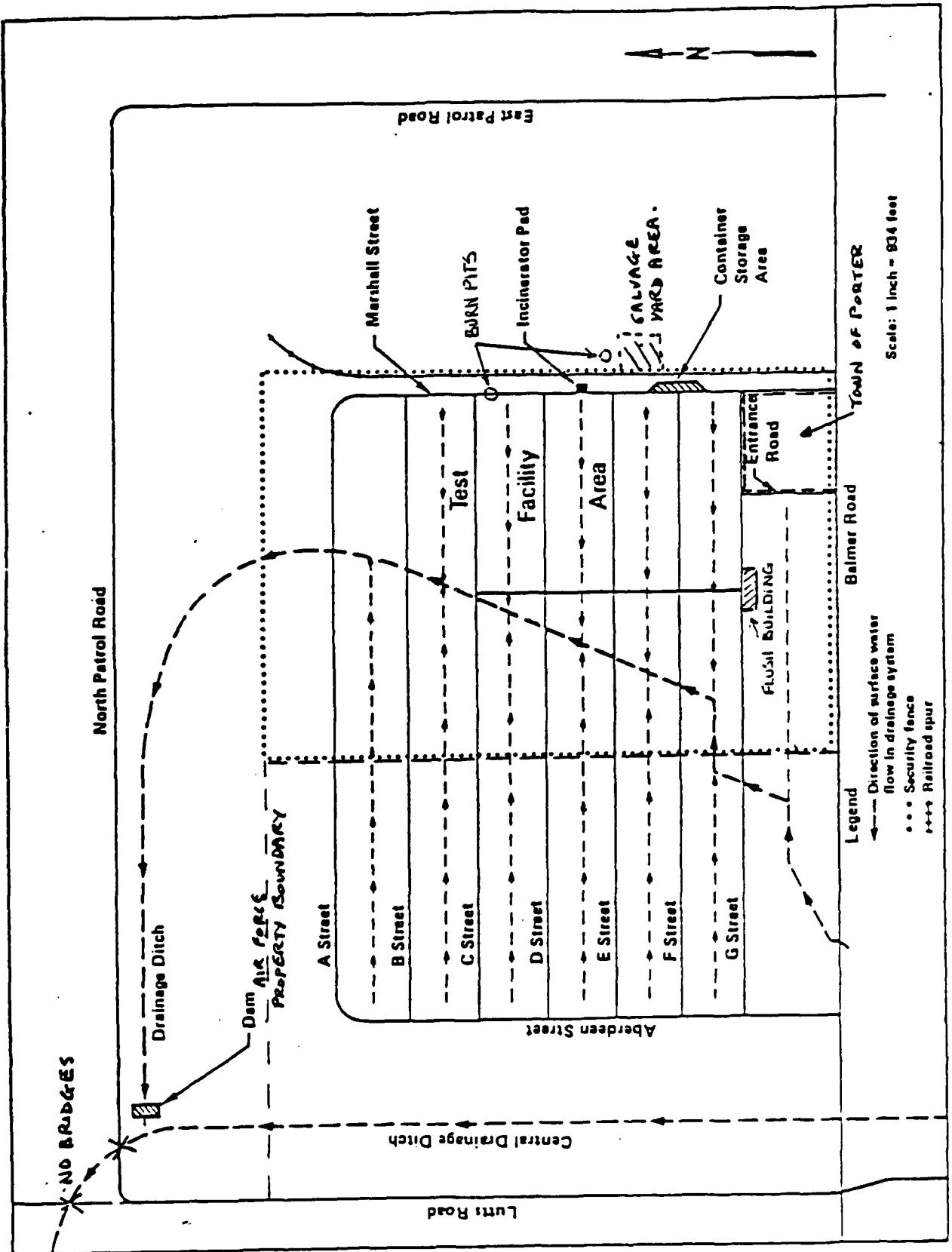
——— Mileage in Red between Points

One inch equals approximately 3 miles

Scale: 1 inch = 3 miles

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Scale: 1 inch = 804 feet

- Legend**
- Direction of surface water flow in drainage system
  - ..... Security fence
  - + + + + Railroad spur

Site Plan - AF Plant 38 (Bell Test Center)

**ECOLOGY AND ENVIRONMENT, INC.,  
STANDARD OPERATING PROCEDURES FOR  
EMERGENCIES DUE TO HEAT AND HEAT STRESS MONITORING**

Field operations during the summer months can create a variety of hazards to the employee. Heat cramps, heat exhaustion, and heat stroke can be experienced and, if not remedied, can threaten life or health. Therefore, it is important that all employees be able to recognize symptoms of these conditions and be capable of arresting the problem as quickly as possible.

**THE EFFECTS OF HEAT**

As the result of normal oxidation processes within the body, a predictable amount of heat is generated. If the heat is liberated as it is formed, there is no change in body temperature. If the heat is liberated more rapidly, the body cools to a point at which the production of heat is accelerated and the excess is available to bring the body temperature back to normal.

Interference with the elimination of heat leads to its accumulation and thus to the elevation of body temperature. As a result, the person is said to have a fever. When such a condition exists, it produces a vicious cycle in which certain body processes speed up and generate additional heat. Then the body must eliminate not only the normal but also the additional quantities of heat.

Heat produced within the body is brought to the surface largely by the bloodstream and escapes to the cooler surroundings by conduction and radiation. If air movement or a breeze strikes the body, additional heat is lost by convection. However, when the temperature of the surrounding air becomes equal to or rises above that of the body, all of the heat must be lost by vaporization of the moisture or sweat from the skin surface. As the air becomes more humid (contains more moisture), vaporization from the skin slows down. Thus, on a day when the temperature is 95 to 100°F, with high humidity and little or no breeze, conditions are ideal for the retention of heat within the body. It is on such a day or, more commonly, a succession of such days (a heat wave) that medical emergencies due to heat are likely to occur. Such emergencies are classified in three categories: heat cramps, heat exhaustion, and heat stroke.

**HEAT CRAMPS**

Heat cramps usually affect people who work in hot environments and perspire a great deal. Loss of salt from the body causes very painful cramps of the leg and abdominal muscles. Heat cramps also may result from drinking iced water or other drinks either too quickly or in too large a quantity.

Heat Cramp Symptoms. The symptoms of heat cramp are:

- Muscle cramps in legs and abdomen,
- Pain accompanying the cramps,
- Faintness, and
- Profuse perspiration.

Heat Cramp Emergency Care. Remove the patient to a cool place. Give him sips of liquids such as "Gatorade" or its equivalent. Apply manual pressure to the cramped muscle. Remove the patient to a hospital if there is any indication of a more serious problem.

### HEAT EXHAUSTION

Heat exhaustion occurs in individuals working in hot environments, and may be associated with heat cramps. Heat exhaustion is caused by the pooling of blood in the vessels of the skin. The heat is transported from the interior of the body to the surface by the blood. The blood vessels in the skin become dilated and a large amount of blood is pooled in the skin. This condition, plus the blood pooled in the lower extremities when an individual is in an upright position, may lead to an inadequate return of blood to the heart and eventually to physical collapse.

Heat Exhaustion Symptoms. The symptoms of heat exhaustion are:

- Weak pulse;
- Rapid and usually shallow breathing;
- Generalized weakness;
- Pale, clammy skin;
- Profuse perspiration;
- Dizziness;
- Unconsciousness; and
- Appearance of having fainted (the patient responds to the same treatment administered in cases of fainting).

Heat Exhaustion Emergency Care. Remove the patient to a cool place and remove as much clothing as possible. Administer cool water, "Gatorade," or its equivalent. If possible, fan the patient continually to remove heat by convection, but do not allow chilling or overcooling. Treat the patient for shock, and remove him to a medical facility if there is any indication of a more serious problem.

### HEAT STROKE

Heat stroke is a profound disturbance of the heat-regulating mechanism, associated with high fever and collapse. Sometimes this condition results in convulsions, unconsciousness, and even death. Direct

exposure to sun, poor air circulation, poor physical condition, and advanced age (over 40) bear directly on the tendency to heat stroke. It is a serious threat to life and carries a 20% mortality rate. Alcoholics are extremely susceptible.

Heat Stroke Symptoms. The symptoms of heat stroke are:

- Sudden onset;
- Dry, hot, and flushed skin;
- Dilated pupils;
- Early loss of consciousness;
- Full and fast pulse;
- Breathing deep at first, later shallow and even almost absent;
- Muscle twitching, growing into convulsions; and
- Body temperature reaching 105 to 106°F or higher.

Heat Stroke Emergency Care. Remember that this is a true emergency. Transportation to a medical facility should not be delayed. Remove the patient to a cool environment if possible, and remove as much clothing as possible. Assure an open airway. Reduce body temperature promptly--preferably by wrapping in a wet sheet or else by dousing the body with water. If cold packs are available, place them under the arms, around the neck, at the ankles, or at any place where blood vessels that lie close to the skin can be cooled. Protect the patient from injury during convulsions, especially from tongue biting.

#### AVOIDANCE OF HEAT-RELATED EMERGENCIES

Please note that, in the case of heat cramps or heat exhaustion, "Gatorade" or its equivalent is suggested as part of the treatment regime. The reason for this type of liquid refreshment is that such beverages will return much-needed electrolytes to the system. Without these electrolytes, body systems cannot function properly, thereby increasing the represented health hazard. Therefore, when personnel are working in situations where the ambient temperatures and humidity are high--and especially in situations where protection Levels A, B, and C are required--the site safety officer must:

- Assure that all employees drink plenty of fluids ("Gatorade" or its equivalent);
- Assure that frequent breaks are scheduled so overheating does not occur; and
- Revise work schedules, when necessary, to take advantage of the cooler parts of the day (i.e., 5:00 a.m. to 1:00 p.m., and 6:00 p.m. to nightfall).

If protective clothing must be worn, especially Levels A and B, the suggested guidelines for ambient temperature and maximum wearing time per excursion are:

<u>Ambient Temperature (°F)</u>	<u>Maximum Wearing Time per Excursion (Minutes)</u>
Above 90	15
85 to 90	30
80 to 85	60
70 to 80	90
60 to 70	120
50 to 60	180

One method of measuring the effectiveness of employees' rest-recovery regime is by monitoring the heart rate. The "Brouha guideline" is one such method:

- During a three-minute period, count the pulse rate for the last 30 seconds of the first minute, the last 30 seconds of the second minute, and the last 30 seconds of the third minute.
- Double the count.

If the recovery pulse rate during the last 30 seconds of the first minute is at 110 beats/minute or less and the deceleration between the first, second, and third minutes is at least 10 beats/minute, the work-recovery regime is acceptable. If the employee's rate is above that specified, a longer rest period is required, accompanied by an increased intake of fluids.

## ANNEX 3

### LEVEL C DECONTAMINATION

#### A. EQUIPMENT WORN

The full decontamination procedure outlined is for workers wearing Level C protection (with taped joints between gloves, boots, and suit) consisting of:

- One-piece, hooded, chemical-resistant splash suit.
- Canister equipped, full-face mask.
- Hard hat.
- Chemical-resistant, steel toe and shank boots.
- Boot covers.
- Inner and outer gloves.

#### 9. PROCEDURE FOR FULL DECONTAMINATION

##### Station 1: Segregated Equipment Drop

Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross-contamination.

Equipment: various size containers  
plastic liners  
plastic drop cloths

##### Station 2: Boot Cover and Glove Wash

Scrub outer boot covers and gloves with decon solution or detergent water.

Equipment: container (20-30 gallons)  
decon solution  
or  
detergent water  
2-3 long-handle, soft-bristle scrub brushes

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Station 3: Boot Cover and Glove Rinse

Rinse off decon solution from Station 2 using copious amounts of water. Repeat as many times as necessary.

Equipment: container (30-50 gallons)  
                  or  
                  high-pressure spray unit  
                  water  
                  2-3 long-handle, soft-bristle scrub brushes

Station 4: Tape Removal

Remove tape around boots and gloves and deposit in container with plastic liner.

Equipment: container (20-30 gallons)  
                  plastic liners

Station 5: Boot Cover Removal

Remove boot covers and deposit in container with plastic liner.

Equipment: container (30-50 gallons);  
                  plastic liners  
                  bench or stool

Station 6: Outer Glove Removal

Remove outer gloves and deposit in container with plastic liner.

Equipment: container (20-30 gallons)  
                  plastic liners

Station 7: Suit/Safety Boot Wash

Thoroughly wash splash suit and safety boots. Scrub with long-handle, soft-bristle scrub brush and copious amounts of decon solution or detergent/water. Repeat as many times as necessary.

Equipment: container (30-50 gallons)  
                  decon solution  
                  or  
                  detergent/water  
                  2-3 long-handle, soft-bristle scrub brushes

Station 8: Suit/Safety Boot Rinse

Rinse off decon solution or detergent/water using copious amounts of water. Repeat as many times as necessary.



Equipment: container (30-50 gallons)  
or  
high-pressure spray unit  
water  
2-3 long-handle, soft-bristle scrub brushes

Station 9: Canister or Mask Change

If worker leaves Exclusion Zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boots covers donned, and joints taped. Worker returns to duty.

Equipment: canister (or mask)  
tape  
boot covers  
gloves

Station 10: Safety Boot Removal

Remove safety boots and deposit in container with plastic liner.

Equipment: container (30-50 gallons)  
plastic liners  
bench or stool  
boot jack

Station 11: Splash Suit Removal

With assistance of helper, remove splash suit. Deposit in container with plastic liner.

Equipment: container (30-50 gallons)  
bench or stool  
plastic liner

Station 12: Inner Glove Wash

Wash inner gloves with decon solution or detergent water that will not harm skin. Repeat as many times as necessary.

Equipment: decon solution  
or  
detergent/water  
basin or bucket

Station 13: Inner Glove Rinse

Rinse inner gloves with water. Repeat as many times as necessary.

Equipment: water  
basin or bucket  
small table

Station 14: Facepiece Removal

Remove facepiece. Avoid touching face with gloves. Deposit facepiece in container with plastic liner.

Equipment: container (30-50 gallons)  
plastic liners

Station 15: Inner Glove Removal

Remove inner gloves and deposit in container with plastic liner.

Equipment: container (20-30 gallons)  
plastic liners

Station 16: Inner Clothing Removal

Remove clothing soaked with perspiration. Place in container with plastic liner. Do not wear inner clothing off-site since there is a possibility small amounts of contaminants might have been transferred in removing fully encapsulating suit.

Equipment: container (20-50 gallons)  
plastic liners

Station 17: Field Wash

Shower if highly toxic, skin-corrosive or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.

Equipment: water  
soap  
tables  
wash basins/buckets  
field showers

Station 18: Redress

Put on clean clothes. A dressing trailer is needed in inclement weather.

Equipment: tables  
chairs  
lockers  
clothes

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C. FULL DECONTAMINATION (SIT. 1) AND THREE MODIFICATIONS

S I T	STATION NUMBER																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
2	X	X	X	X	X	X	X	X	X									
3	X						X	X		X	X			X	X	X	X	
4	X						X	X	X									

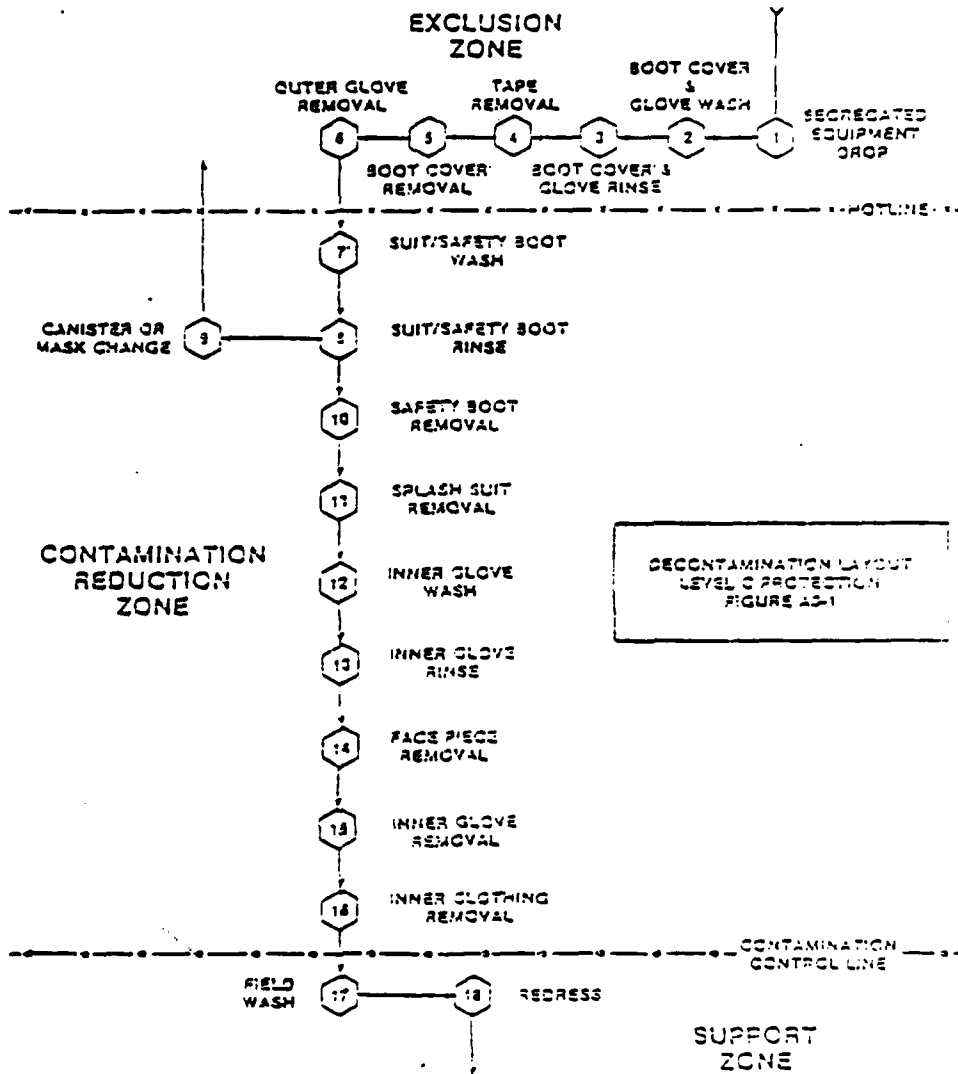
Situation 1: The individual entering the Contamination Reduction Corridor is observed to be grossly contaminated or extremely skin-corrosive substances are known or suspected to be present.

Situation 2: Same as Situation 1 except individual needs new respirator or mask and will return to Exclusion Zone.

Situation 3: Individual entering the IRC is expected to be minimally contaminated. Extremely skin-corrosive materials are not present. No outer gloves or boot covers are worn. Inner gloves are not contaminated.

Situation 4: Same as Situation 3 except individual needs new respirator or mask and will return to Exclusion Zone.

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