

Project C7869.41

November 2, 1998

**CHEMICAL QUALITY ASSURANCE REPORT FOR
PLUM BROOK ORDNANCE WORKS
GROUNDWATER INVESTIGATION
SAMPLE DELIVERY GROUP PB024**

Submitted to:

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Table of Contents

SECTION 1.0: INTRODUCTION AND EXECUTIVE SUMMARY.....	1
SECTION 2.0: LABORATORY QUALITY CONTROL DATA EVALUATION.....	3
2.1 PRIMARY LABORATORY.....	3
2.1.1 Volatile Organic Analyses.....	3
2.1.2 Semivolatile Organic Compounds	3
2.1.3 Polychlorinated Biphenyls	4
2.1.4 Metals	4
2.1.5 Nitroaromatics and Nitramines	4
2.2 QA LABORATORY.....	4
2.2.1 Volatile Organic Analyses.....	5
2.2.2 Semivolatile Organic Compounds	5
2.2.3 Polychlorinated Biphenyls	5
2.2.4 Metals	5
2.2.5 Nitroaromatics and Nitramines	6
SECTION 3.0: PRIMARY AND QA LABORATORY SAMPLE DATA COMPARISON.....	7
3.1 VOLATILE ORGANIC COMPOUNDS	7
3.2 SEMIVOLATILE ORGANIC COMPOUNDS.....	7
3.3 POLYCHLORINATED BIPHENYLS	7
3.4 TOTAL METALS	7
3.5 DISSOLVED METALS	7
3.6 NITROAROMATICS AND NITRAMINES.....	8
Appendix 1. Data Comparison Tables.	
Appendix 2. Analytical Reports and Chain of Custody Documents.	

Section 1.0: Introduction and Executive Summary

This Chemical Quality Assurance Report (CQAR) has been prepared for quality control and quality assurance samples collected during groundwater investigation at the Plum Brook Ordnance Works in Sandusky, Ohio. This report has been prepared in accordance with U.S. Army Corps of Engineers policy EM 200-1-6, **Chemical Quality Assurance for HTRW Projects**, dated 10 October 1997.

The samples included in this report consist of pairs of field duplicates and field split samples that were analyzed by Quanterra, Inc., Knoxville, Tennessee and Curtis & Tompkins, Ltd., Berkeley, California. Quanterra, Inc. served as the primary laboratory for this project, while Curtis & Tompkins served as the quality assurance laboratory.

The sample pairs addressed in this report are identified in Table 1. Samples analyzed by Quanterra (the primary laboratory) are identified as QC samples, while those analyzed by Curtis & Tompkins are identified as QA samples. This table identifies two samples pairs; however, the request for analysis of sample 9012 was cancelled before the analysis was conducted. Therefore, although Table 1 identifies two sample pairs, the remainder of this report addresses sample pair 5416 (analyzed by Quanterra) and 5417 (analyzed by Curtis & Tompkins) as well as QA/QC data generated with these analyses. Table 2 identifies the analytical parameters for each sample.

Table 1. Sample Delivery Group PB024 Samples in Chemical Quality Assurance Report

Sample Pair	Sample Type		Sample Collection	
	QC	QA	Date	Time
9012	X		5/15/98	10:00 A.M.
9013		X	5/15/98	10:00 A.M.
5416	X		5/15/98	10:40 A.M.
5417		X	5/15/98	10:40 A.M.

Table 2. Sample Analytical Parameters

Analytical Parameter	SW846 Method*	QC and QA Sample Set	
		9012	5416
		9013	5417
Volatile Organic Compounds	8260A	Analysis Cancelled	X
Semivolatile Organic Compounds	8270B		X
Polychlorinated Biphenyls	8081		X
Dissolved Metals	6010A/ 7470A		X
Total Metals	6010A/ 7470A		X
Nitroaromatics and Nitramine	8330		X

Section 2.0: Laboratory Quality Control Data Evaluation

2.1 PRIMARY LABORATORY

This section focuses on QC data generated by Quanterra, Inc., the primary laboratory for this effort. All samples were analyzed by Quanterra within recommended holding times.

Sample 5416 was received by Quanterra intact, with custody seals and chain-of-custody documentation present. The sample was received at 3°C.

2.1.1 Volatile Organic Analyses

A review of QC data for sample 5416 revealed the following.

- Surrogate spike recoveries for the sample and a method blank were within recovery limits.
- All laboratory control sample (LCS) and LCS duplicate (LCSD) recoveries and RPDs for analytes and surrogates were within recovery limits.
- The method blank associated with this sample contained estimated concentrations of acetone, 2-butanone, and 2-hexanone. However, none of these compounds were detected in the sample, indicating that laboratory contamination of the sample did not occur

2.1.2 Semivolatile Organic Compounds

Review of QC data for sample 5416 revealed the following.

- Surrogate spike recoveries for the sample and a method blank were within recovery limits.
- All MS/MSD and LCS/LCSD recoveries (for both surrogates and analytes) and RPDs (for analytes) were within limits.
- The method blank associated with this sample was free of contamination.

2.1.3 Polychlorinated Biphenyls

- Surrogate spike recoveries for all method blanks, laboratory control samples, matrix spike / matrix spike duplicates (MS/MSD), and sample 5416 were within recovery limits.
- Analyte recoveries and relative percent differences (RPDs) were within QC limits for all MS/MSD and laboratory control samples.
- The method blank associated with this sample was free of contamination.

2.1.4 Metals

Sample 5416 was analyzed for total and dissolved metals, with the following QA data generated with these analyses.

- All MS/MSD recoveries were within limits, with the exception of iron in the total metals MS/MSD sample and calcium, manganese, and sodium in the dissolved metals MS/MSD sample. However, all RPDs, including those for the parameters with recoveries outside control limits, were within acceptable ranges. This indicates a possible high, consistent bias for the recovery of iron, calcium, manganese, and sodium.
- Laboratory control sample / laboratory control sample duplicate recoveries and RPDs were within recovery limits.
- The method blank associated with this sample was free of contamination.

2.1.5 Nitroaromatics and Nitramines

- Surrogate spike recoveries for all method blanks, matrix spike / matrix spike duplicates (MS/MSD), and the sample were within recovery limits.
- Analyte recoveries and relative percent differences (RPDs) were within QC limits for the MS/MSD samples.
- The method blank associated with this sample was free of contamination.

2.2 QA LABORATORY

Sample 5417 was received intact by Curtis & Tompkins, the quality assurance laboratory for this project. Chain-of-custody documentation was present and custody seals were intact. The sample was received at a temperature of 5.25°C, above the recommended temperature of 4°C.

2.2.1 Volatile Organic Analyses

- Surrogate spike recoveries for the method blank, blank spike / blank spike duplicate (BS/BSD), and sample 5417 were within recovery limits.
- Analyte recoveries and relative percent differences (RPDs) were within QC limits for all BS/BSD samples.
- The method blank associated with this sample was free of contamination.

2.2.2 Semivolatile Organic Compounds

Samples 5452, 5412, and 5702 were analyzed for semivolatile organic compounds. Review of QC data for these analyses revealed the following.

- Surrogate spike recoveries for the method blank, blank spike / blank spike duplicate (BS/BSD), and the sample were within recovery limits.
- BS / BSD analyte recoveries and RPDs were within control limits.
- The method blank associated with this sample was free of contamination.

2.2.3 Polychlorinated Biphenyls

- Surrogate spike recoveries for the method blank, blank spike / blank spike duplicate (BS/BSD), and sample 5417 were within recovery limits.
- A high percent difference for Aroclor 1221 was identified in the continuing calibration verification for this sample batch. However, this Aroclor was not detected in the sample; therefore, there is no apparent effect on the quality of the data.
- All BS/BSD analyte recoveries and RPDs were within control limits.
- The method blank associated with this sample was free of contamination.

2.2.4 Metals

Sample 5417 was analyzed for total metals and dissolved metals. The following QC data was generated with these analyses.

- BS/BSD recoveries and RPDs were within limits.
- Recoveries and RPDs for a sample duplicate analysis associated with this sample batch were within control limits for all parameters except thallium.

- All MS/MSD recoveries and RPDs were within control limits.
- The method / prep blank associated with this sample was free of contamination.

2.2.5 Nitroaromatics and Nitramines

Samples 5417 was analyzed for nitroaromatics and nitramines by Quanterra, West Sacramento, California under contract from Curtis & Tompkins. The following QC data was generated with these analyses.

- Surrogate spike recoveries for the method blank, laboratory control samples and laboratory control sample duplicates, and the sample were within recovery limits.
- Analyte recoveries and RPDs were within control limits for all laboratory control samples and laboratory control sample duplicates.
- The method blank associated with this sample was free of contamination.
- The extraction of sample 5417 was conducted past the holding time for this analysis. The extraction and subsequent analysis of this sample after expiration of the holding time may pose concern about the accuracy and reliability of the analytical results.

Section 3.0: Primary and QA Laboratory Sample Data Comparison

The following sections provide a comparison between sample data generated by Quanterra, Inc. and Curtis & Tompkins. The definitions of agreement, minor disagreement, and major disagreement used in this discussion are those presented in Table 4-1 (Criteria for Comparing QC and QA Sample Data) of U.S. Army Corps of Engineers policy EM-200-1-6, **Chemical Quality Assurance for HTRW Projects**.

3.1 VOLATILE ORGANIC COMPOUNDS

Results for sample pair 5416 (analyzed by Quanterra) and 5417 (analyzed by Curtis & Tompkins) were in agreement. Only one compound, carbon disulfide, was detected in either sample. This compound was detected at an estimated concentration (below the reporting limit) of 0.24 ug/l in sample 5416. This concentration is less than the reporting limit utilized for this parameter by both laboratories.

3.2 SEMIVOLATILE ORGANIC COMPOUNDS

Results for samples 5416 and 5417 were in agreement, with only detection in either of the samples. The compound bis(2-ethylhexyl)phthalate was detected at an estimated concentration of 2 ug/l in sample 5416. This estimated concentration was less than the reporting limit for this compound that was utilized by each laboratory.

3.3 POLYCHLORINATED BIPHENYLS

Results for sample set 5416 and 5417 were in agreement, with no PCB detections in either sample..

3.4 TOTAL METALS

Results for samples 5416 and 5417 were in agreement for all metals with the exception of sodium. Sodium results (38,300 ug/l in sample 5416, 17,000 ug/l in sample 5417) were in disagreement.

3.5 DISSOLVED METALS

Results for sample set 5416 and 5417 were in agreement for all parameters.

3.6 NITROAROMATICS AND NITRAMINES

Results for sample pair 5416 and 5417 were in agreement. No analytes were detected in either sample.

Appendix 1
Data Comparison Tables

Volatile Organic Compounds

QC Sample No. 5416	QA Sample No. 5417
Date Sampled 5/15/98	Date Sampled 5/15/98
Date Received 5/16/98	Date Received 5/16/98
Date Extracted 5/27/98	Date Extracted 5/29/98
Date Analyzed 5/27/98	Date Analyzed 5/29/98
Method No. SW846-8260A	Method No. SW846-8260A
Matrix: Water	Units: µg/L

PARAMETER	QC RESULT	QA RESULT
Chloromethane	ND	ND
Bromomethane	ND	ND
Vinyl chloride	ND	ND
Chloroethane	ND	ND
Methylene chloride	ND	ND
Acetone	ND	ND
Carbon disulfide	0.24 J	ND
1,1-Dichloroethene	ND	ND
1,1-Dichloroethane	ND	ND
1,2-Dichloroethene (total)	ND	ND
Chloroform	ND	ND
1,2-Dichloroethane	ND	ND
2-Butanone	ND	ND
1,1,1-Trichloroethane	ND	ND
Carbon tetrachloride	ND	ND
Bromodichloromethane	ND	ND
1,2-Dichloropropane	ND	ND
cis-1,3-Dichloropropene	ND	ND
Trichloroethene	ND	ND
Dibromochloromethane	ND	ND
1,1,2-Trichloroethane	ND	ND
Benzene	ND	ND
trans-1,3-Dichloropropene	ND	ND
Bromoform	ND	ND
4-Methyl-2-pentanone	ND	ND
2-Hexanone	ND	ND
Tetrachloroethene	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND
Toluene	ND	ND
Chlorobenzene	ND	ND
Ethylbenzene	ND	ND
Styrene	ND	ND
Xylenes (total)	ND	ND

J – Estimated concentration below the reporting limit. B – Analyte detected in method blank

Semivolatile Organic Compounds

QC Sample No. 5416	QA Sample No. 5452
Date Sampled 5/15/98	Date Sampled 5/15/98
Date Received 5/16/98	Date Received 5/16/98
Date Extracted 5/21/98	Date Extracted 5/21/98
Date Analyzed 6/2/98	Date Analyzed 5/27/98
Method No. SW846-8270B	Method No. SW846-8270B
Matrix: Water	Units: µg/L

PARAMETER	QC RESULT	QA RESULT
Phenol	ND	ND
2-Chlorophenol	ND	ND
2-Methylphenol	ND	ND
3,4-Methylphenol	ND	ND
2-Nitrophenol	ND	ND
2,4-Dimethylphenol	ND	ND
2,4-Dichlorophenol	ND	ND
4-Chloro-3-methylphenol	ND	ND
2,4,6-Trichlorophenol	ND	ND
2,4,5-Trichlorophenol	ND	ND
2,4-Dinitrophenol	ND	ND
4-Nitrophenol	ND	ND
4,6-Dinitro-2-methylphenol	ND	ND
Pentachlorophenol	ND	ND
bis (2-Chloroethyl) ether	ND	ND
1,3-Dichlorobenzene	ND	ND
1,4-Dichlorobenzene	ND	ND
1,2-Dichlorobenzene	ND	ND
bis (2-Chloroisopropyl) ether	ND	ND
N-Nitroso-di-n-propylamine	ND	ND
Hexachloroethane	ND	ND
Nitrobenzene	ND	ND
Isophorone	ND	ND
bis (2-Chloroethoxy) methane	ND	ND
1,2,4-Trichlorobenzene	ND	ND
Naphthalene	ND	ND
4-Chloroaniline	ND	ND
Hexachlorobutadiene	ND	ND
2-Methylnaphthalene	ND	ND
Hexachlorocyclopentadiene	ND	ND
2-Chloronaphthalene	ND	ND
2-Nitroaniline	ND	ND
Dimethylphthalate	ND	ND
Acenaphthylene	ND	ND
2,6-Dinitrotoluene	ND	ND

3-Nitroaniline	ND	ND
Acenaphthene	ND	ND
Dibenzofuran	ND	ND
2-Methylnaphthalene	ND	ND
2,4-Dinitrotoluene	ND	ND
Diethylphthalate	ND	ND
4-Chlorophenyl-phenylether	ND	ND
Fluorene	ND	ND
4, Nitroaniline	ND	ND
N-Nitrosodiphenylamine	ND	ND
4-Bromophenyl-phenylether	ND	ND
Hexachlorobenzene	ND	ND
Phenanthrene	ND	ND
Anthracene	ND	ND
Di-n-butylphthalate	ND	ND
Fluoranthene	ND	ND
Carbazole	ND	ND
Pyrene	ND	ND
Butylbenzylphthalate	ND	ND
3,3'-Dichlorobenzidine	ND	ND
Benzo(a)anthracene	ND	ND
Chrysene	ND	ND
bis(2-Ethylhexyl)phthalate	2.0J	ND
Di-n-octylphthalate	ND	ND
Benzo(b,k)fluoranthene	ND	ND
Benzo(a)pyrene	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND
Dibenz(a,h)anthracene	ND	ND
Benzo(g,h,i)perylene	ND	ND

J – Estimated concentration below the reporting limit.

Polychlorinated Biphenyls

QC Sample No. 5416	QA Sample No. 5417
Date Sampled 5/15/98	Date Sampled 5/15/98
Date Received 5/16/98	Date Received 5/16/98
Date Extracted 5/18/98	Date Extracted 5/20/98
Date Analyzed 6/9/98	Date Analyzed 5/27/98
Method No. EPA 8081	Method No. EPA 8081
Matrix: Water	Units: µg/L

PARAMETER	QC RESULT	QA RESULT
Aroclor 1016	ND	ND
Aroclor 1221	ND	ND
Aroclor 1232	ND	ND
Aroclor 1242	ND	ND
Aroclor 1248	ND	ND
Aroclor 1254	ND	ND
Aroclor 1260	ND	ND

Dissolved Metals

QC Sample No. 5416	QA Sample No. 5417
Date Sampled 5/15/98	Date Sampled 5/15/98
Date Received 5/16/98	Date Received 5/16/98
Date Extracted 5/28/98	Date Extracted Not reported
Date Analyzed 6/12/98	Date Analyzed 5/26/98
Method No. SW846-6010A, SW846-7470A, (Mercury only)	Method No. SW846-6010A, SW846- 7470A, (Mercury only)
Matrix: Water	Units: µg/L

PARAMETER	QC RESULT	QA RESULT
Aluminum	ND	160
Antimony	ND	ND
Arsenic	ND	ND
Barium	ND	68
Beryllium	ND	ND
Cadmium	ND	ND
Calcium	83300	84000
Chromium (total)	ND	ND
Cobalt	ND	23
Copper	ND	ND
Iron	115	2300
Lead	ND	ND
Magnesium	38000	40000
Manganese	667	640
Mercury	ND	ND
Molybdenum		ND
Nickel	ND	ND
Potassium	13000	11000
Selenium	ND	9.8
Silver	ND	ND
Sodium	134000	120000
Thallium	ND	ND
Vanadium	ND	ND
Zinc	32	ND

Total Metals

QC Sample No. 5416	QA Sample No. 5417
Date Sampled 5/15/98	Date Sampled 5/15/98
Date Received 5/16/98	Date Received 5/16/98
Date Extracted 5/28/98	Date Extracted Not reported
Date Analyzed 6/12-13/98	Date Analyzed 5/26-27/98
Method No. SW846-6010A, SW846-7470A, (Mercury only)	Method No. SW846-6010A, SW846- 7470A, (Mercury only)
Matrix: Water	Units: µg/L

PARAMETER	QC RESULT	QA RESULT
Aluminum	ND	180
Antimony	ND	ND
Arsenic	ND	ND
Barium	ND	22
Beryllium	ND	ND
Cadmium	ND	ND
Calcium	64500	58000
Chromium (total)	ND	ND
Cobalt	ND	ND
Copper	ND	ND
Iron	223	320
Lead	ND	ND
Magnesium	24600	21000
Manganese	63.6	37
Mercury	ND	ND
Molybdenum		ND
Nickel	ND	ND
Potassium	6290	3800
Selenium	ND	ND
Silver	ND	ND
Sodium	38300	17000
Thallium	ND	ND
Vanadium	ND	ND
Zinc	59.6	31

Nitroaromatics and Nitramines

QC Sample No. 5416	QA Sample No. 5417
Date Sampled 5/15/98	Date Sampled 5/15/98
Date Received 5/16/98	Date Received 5/16/98
Date Extracted 5/20/98	Date Extracted 5/26/98
Date Analyzed 5/24/98	Date Analyzed 5/28/98
Method No. EPA 8330	Method No. EPA 8330
Matrix: Water	Units: µg/L

PARAMETER	QC RESULT	QA RESULT
HMX	ND	ND
1,3,5-Trinitrobenzene	ND	ND
RDX	ND	ND
1,3-Dinitrobenzene	ND	ND
Nitrobenzene	ND	ND
2,4,6-Trinitrotoluene	ND	ND
Tetryl	ND	ND
2,4-Dinitrotoluene	ND	ND
2,6-Dinitrotoluene	ND	ND
2-Am-DNT	ND	ND
4-Am-DNT		ND
2-Nitrotoluene	ND	ND
4-Nitrotoluene		ND
3-Nitrotoluene	ND	ND

Appendix 2

Analytical Results and Chain-of-Custody Documentation

IT CORPORATION - KNOXVILLE

Client Sample ID: 5416

GC/MS Volatiles

Lot-Sample #...: H8E160155-002 Work Order #...: CH87X101 Matrix.....: WATER
 Date Sampled...: 05/15/98 Date Received...: 05/16/98
 Prep Date.....: 05/27/98 Analysis Date...: 05/27/98
 Prep Batch #...: 8147124
 Dilution Factor: 1 Method.....: SW846 8260A

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING LIMIT</u>	<u>UNITS</u>
Chloromethane	ND	2.0	ug/L
Bromomethane	ND	2.0	ug/L
Vinyl chloride	ND	2.0	ug/L
Chloroethane	ND	2.0	ug/L
Methylene chloride	ND	1.0	ug/L
Acetone	ND	10	ug/L
Carbon disulfide	0.24 J	1.0	ug/L
1,1-Dichloroethene	ND	1.0	ug/L
1,1-Dichloroethane	ND	1.0	ug/L
1,2-Dichloroethene	ND	1.0	ug/L
(total)			
Chloroform	ND	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
2-Butanone	ND	5.0	ug/L
1,1,1-Trichloroethane	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Bromodichloromethane	ND	1.0	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
Trichloroethene	ND	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Benzene	ND	1.0	ug/L
trans-1,3-Dichloropropene	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
4-Methyl-2-pentanone	ND	5.0	ug/L
2-Hexanone	ND	5.0	ug/L
Tetrachloroethene	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Toluene	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Ethylbenzene	ND	1.0	ug/L
Styrene	ND	1.0	ug/L
Xylenes (total)	ND	1.0	ug/L

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
Dibromofluoromethane	90	(67 - 128)
1,2-Dichloroethane-d4	99	(67 - 128)
Toluene-d8	98	(71 - 119)
4-Bromofluorobenzene	101	(76 - 111)

(Continued on next page)

IT CORPORATION - KNOXVILLE

Client Sample ID: 5416

GC/MS Volatiles

Lot-Sample #...: H8E160155-002 Work Order #...: CH87X101 Matrix.....: WATER

NOTE(S) :

J Estimated result. Result is less than RL.

Volatile Organics by GC/MS

 Client: IT Corporation
 Project#: 773206
 Location: Plumbrook Ordinance Wor

 Analysis Method: EPA 8260
 Prep Method: EPA 5030

 Field ID: 9013
 Lab ID: 133702-002
 Matrix: Water
 Batch#: 41134
 Units: ug/L
 Diln Fac: 1

 Sampled: 05/15/98
 Received: 05/16/98
 Extracted: 05/29/98
 Analyzed: 05/29/98

Analyte	Result	Reporting Limit
Chloromethane	ND	10
Vinyl Chloride	ND	10
Bromomethane	ND	10
Chloroethane	ND	10
Acetone	ND	20
1,1-Dichloroethene	ND	5.0
Methylene Chloride	ND	5.0
Carbon Disulfide	ND	5.0
trans-1,2-Dichloroethene	ND	5.0
1,1-Dichloroethane	ND	5.0
2-Butanone	ND	20
cis-1,2-Dichloroethene	ND	5.0
Chloroform	ND	5.0
1,1,1-Trichloroethane	ND	5.0
Carbon Tetrachloride	ND	5.0
1,2-Dichloroethane	ND	5.0
Benzene	ND	5.0
Trichloroethene	ND	5.0
1,2-Dichloropropane	ND	5.0
Bromodichloromethane	ND	5.0
4-Methyl-2-Pentanone	ND	20
cis-1,3-Dichloropropene	ND	5.0
Toluene	ND	5.0
trans-1,3-Dichloropropene	ND	5.0
1,1,2-Trichloroethane	ND	5.0
2-Hexanone	ND	20
Tetrachloroethene	ND	5.0
Dibromochloromethane	ND	5.0
Chlorobenzene	ND	5.0
Ethylbenzene	ND	5.0
m,p-Xylenes	ND	5.0
o-Xylene	ND	5.0
Styrene	ND	5.0
Bromoform	ND	5.0
1,1,2,2-Tetrachloroethane	ND	5.0
Surrogate	%Recovery	Recovery Limits
Dibromofluoromethane	104	76-128
1,2-Dichloroethane-d4	105	85-121
Toluene-d8	99	92-110
Bromofluorobenzene	99	84-115



Volatile Organics by GC/MS

Client: IT Corporation
Project#: 773206
Location: Plumbrook Ordinance WorAnalysis Method: EPA 8260
Prep Method: EPA 5030Field ID: 5417
Lab ID: 133702-001
Matrix: Water
Batch#: 41134
Units: ug/L
Diln Fac: 1Sampled: 05/15/98
Received: 05/16/98
Extracted: 05/29/98
Analyzed: 05/29/98

Analyte	Result	Reporting Limit
---------	--------	-----------------

Chloromethane	ND	10
Vinyl Chloride	ND	10
Bromomethane	ND	10
Chloroethane	ND	10
Acetone	ND	20
1,1-Dichloroethene	ND	5.0
Methylene Chloride	ND	5.0
Carbon Disulfide	ND	5.0
trans-1,2-Dichloroethene	ND	5.0
1,1-Dichloroethane	ND	5.0
2-Butanone	ND	20
cis-1,2-Dichloroethene	ND	5.0
Chloroform	ND	5.0
1,1,1-Trichloroethane	ND	5.0
Carbon Tetrachloride	ND	5.0
1,2-Dichloroethane	ND	5.0
Benzene	ND	5.0
Trichloroethene	ND	5.0
1,2-Dichloropropane	ND	5.0
Bromodichloromethane	ND	5.0
4-Methyl-2-Pentanone	ND	20
cis-1,3-Dichloropropene	ND	5.0
Toluene	ND	5.0
trans-1,3-Dichloropropene	ND	5.0
1,1,2-Trichloroethane	ND	5.0
2-Hexanone	ND	20
Tetrachloroethene	ND	5.0
Dibromochloromethane	ND	5.0
Chlorobenzene	ND	5.0
Ethylbenzene	ND	5.0
m,p-Xylenes	ND	5.0
o-Xylene	ND	5.0
Styrene	ND	5.0
Bromoform	ND	5.0
1,1,2,2-Tetrachloroethane	ND	5.0

Surrogate	%Recovery	Recovery Limits
-----------	-----------	-----------------

Dibromofluoromethane	104	76-128
1,2-Dichloroethane-d4	104	85-121
Toluene-d8	97	92-110
Bromofluorobenzene	99	84-115

IT CORPORATION - KNOXVILLE

Client Sample ID: 5416

GC/MS Semivolatiles

Lot-Sample #....: H8E160155-002 Work Order #....: CH87X102 Matrix.....: WATER
 Date Sampled....: 05/15/98 Date Received...: 05/16/98
 Prep Date.....: 05/21/98 Analysis Date...: 06/02/98
 Prep Batch #....: 8141152
 Dilution Factor: 1 Method.....: SW846 8270B

PARAMETER	RESULT	REPORTING	
		LIMIT	UNITS
Phenol	ND	10	ug/L
bis(2-Chloroethyl) ether	ND	10	ug/L
2-Chlorophenol	ND	10	ug/L
1,3-Dichlorobenzene	ND	10	ug/L
1,4-Dichlorobenzene	ND	10	ug/L
1,2-Dichlorobenzene	ND	10	ug/L
2-Methylphenol	ND	10	ug/L
2,2'-oxybis(1-Chloro- propane)	ND	10	ug/L
4-Methylphenol	ND	10	ug/L
N-Nitrosodi-n-propylamine	ND	10	ug/L
Hexachloroethane	ND	10	ug/L
Nitrobenzene	ND	10	ug/L
Isophorone	ND	10	ug/L
2-Nitrophenol	ND	10	ug/L
2,4-Dimethylphenol	ND	10	ug/L
bis(2-Chloroethoxy) methane	ND	10	ug/L
2,4-Dichlorophenol	ND	10	ug/L
1,2,4-Trichlorobenzene	ND	10	ug/L
Naphthalene	ND	10	ug/L
4-Chloroaniline	ND	10	ug/L
Hexachlorobutadiene	ND	10	ug/L
4-Chloro-3-methylphenol	ND	10	ug/L
2-Methylnaphthalene	ND	10	ug/L
Hexachlorocyclopentadiene	ND	50	ug/L
2,4,6-Trichlorophenol	ND	10	ug/L
2,4,5-Trichlorophenol	ND	10	ug/L
2-Chloronaphthalene	ND	10	ug/L
2-Nitroaniline	ND	50	ug/L
Dimethyl phthalate	ND	10	ug/L
Acenaphthylene	ND	10	ug/L
2,6-Dinitrotoluene	ND	10	ug/L
3-Nitroaniline	ND	50	ug/L
Acenaphthene	ND	10	ug/L
2,4-Dinitrophenol	ND	50	ug/L
4-Nitrophenol	ND	50	ug/L
Dibenzofuran	ND	10	ug/L
2,4-Dinitrotoluene	ND	10	ug/L

(Continued on next page)

IT CORPORATION - KNOXVILLE

Client Sample ID: 5416

GC/MS Semivolatiles

Lot-Sample #....: H8E160155-002 Work Order #....: CH87X102 Matrix.....: WATER

PARAMETER	RESULT	REPORTING	
		LIMIT	UNITS
Diethyl phthalate	ND	10	ug/L
4-Chlorophenyl phenyl ether	ND	10	ug/L
Fluorene	ND	10	ug/L
4-Nitroaniline	ND	50	ug/L
4,6-Dinitro-2-methylphenol	ND	50	ug/L
N-Nitrosodiphenylamine	ND	10	ug/L
4-Bromophenyl phenyl ether	ND	10	ug/L
Hexachlorobenzene	ND	10	ug/L
Pentachlorophenol	ND	50	ug/L
Phenanthrene	ND	10	ug/L
Anthracene	ND	10	ug/L
Carbazole	ND	10	ug/L
Di-n-butyl phthalate	ND	10	ug/L
Fluoranthene	ND	10	ug/L
Pyrene	ND	10	ug/L
Butyl benzyl phthalate	ND	10	ug/L
3,3'-Dichlorobenzidine	ND	50	ug/L
Benzo (a) anthracene	ND	10	ug/L
Chrysene	ND	10	ug/L
bis (2-Ethylhexyl) phthalate	2.0 J	10	ug/L
Di-n-octyl phthalate	ND	10	ug/L
Benzo (b) fluoranthene	ND	10	ug/L
Benzo (k) fluoranthene	ND	10	ug/L
Benzo (a) pyrene	ND	10	ug/L
Indeno (1,2,3-cd) pyrene	ND	10	ug/L
Dibenz (a,h) anthracene	ND	10	ug/L
Benzo (ghi) perylene	ND	10	ug/L

SURROGATE	PERCENT	RECOVERY
	RECOVERY	LIMITS
2-Fluorophenol	66	(27 - 106)
Phenol-d5	75	(27 - 111)
Nitrobenzene-d5	91	(37 - 115)
2-Fluorobiphenyl	89	(43 - 116)
2,4,6-Tribromophenol	92	(27 - 127)
Terphenyl-d14	70	(33 - 141)

NOTE (S) :

J Estimated result. Result is less than RL.



Semivolatile Organics by GC/MS

Client: IT Corporation
Project#: 773206
Location: Plumbrook Ordinance WorAnalysis Method: EPA 8270B
Prep Method: EPA 3520Field ID: 5417
Lab ID: 133702-001
Matrix: Water
Batch#: 41001
Units: ug/L
Diln Fac: 1Sampled: 05/15/98
Received: 05/16/98
Extracted: 05/21/98
Analyzed: 05/27/98

Analyte	Result	Reporting Limit
Phenol	ND	9.8
2-Chlorophenol	ND	9.8
Benzyl alcohol	ND	9.8
2-Methylphenol	ND	9.8
3,4-Methylphenol	ND	9.8
2-Nitrophenol	ND	49
2,4-Dimethylphenol	ND	9.8
Benzoic acid	ND	49
2,4-Dichlorophenol	ND	9.8
4-Chloro-3-methylphenol	ND	9.8
2,4,6-Trichlorophenol	ND	9.8
2,4,5-Trichlorophenol	ND	9.8
2,4-Dinitrophenol	ND	49
4-Nitrophenol	ND	49
4,6-Dinitro-2-methylphenol	ND	49
Pentachlorophenol	ND	9.8
N-Nitrosodimethylamine	ND	9.8
Aniline	ND	9.8
bis(2-Chloroethyl) ether	ND	9.8
1,3-Dichlorobenzene	ND	9.8
1,4-Dichlorobenzene	ND	9.8
1,2-Dichlorobenzene	ND	9.8
bis(2-Chloroisopropyl) ether	ND	9.8
N-Nitroso-di-n-propylamine	ND	9.8
Hexachloroethane	ND	9.8
Nitrobenzene	ND	9.8
Isophorone	ND	9.8
bis(2-Chloroethoxy) methane	ND	9.8
1,2,4-Trichlorobenzene	ND	9.8
Naphthalene	ND	9.8
4-Chloroaniline	ND	9.8
Hexachlorobutadiene	ND	9.8
2-Methylnaphthalene	ND	9.8
Hexachlorocyclopentadiene	ND	49
2-Chloronaphthalene	ND	9.8
2-Nitroaniline	ND	49
Dimethylphthalate	ND	9.8
Acenaphthylene	ND	9.8



Semivolatile Organics by GC/MS

Field ID: 5417	Sampled: 05/15/98
Lab ID: 133702-001	Received: 05/16/98
Matrix: Water	Extracted: 05/21/98
Batch#: 41001	Analyzed: 05/27/98
Units: ug/L	
Diln Fac: 1	

Analyte	Result	Reporting Limit
2,6-Dinitrotoluene	ND	9.8
3-Nitroaniline	ND	49
Acenaphthene	ND	9.8
Dibenzofuran	ND	9.8
2,4-Dinitrotoluene	ND	9.8
Diethylphthalate	ND	9.8
4-Chlorophenyl-phenylether	ND	9.8
Fluorene	ND	9.8
4-Nitroaniline	ND	49
N-Nitrosodiphenylamine	ND	9.8
Azobenzene	ND	9.8
4-Bromophenyl-phenylether	ND	9.8
Hexachlorobenzene	ND	9.8
Phenanthrene	ND	9.8
Anthracene	ND	9.8
Di-n-butylphthalate	ND	9.8
Fluoranthene	ND	9.8
Pyrene	ND	9.8
Butylbenzylphthalate	ND	9.8
3,3'-Dichlorobenzidine	ND	49
Benzo(a)anthracene	ND	9.8
Chrysene	ND	9.8
bis(2-Ethylhexyl)phthalate	ND	9.8
Di-n-octylphthalate	ND	9.8
Benzo(b,k)fluoranthene	ND	9.8
Benzo(a)pyrene	ND	9.8
Indeno(1,2,3-cd)pyrene	ND	9.8
Dibenz(a,h)anthracene	ND	9.8
Benzo(g,h,i)perylene	ND	9.8
Surrogate	%Recovery	Recovery Limits
2-Fluorophenol	57	17-107
Phenol-d5	61	18-115
2,4,6-Tribromophenol	68	14-121
Nitrobenzene-d5	77	36-115
2-Fluorobiphenyl	78	36-113
Terphenyl-d14	73	17-115

IT CORPORATION - KNOXVILLE

Client Sample ID: 5416

GC Semivolatiles

Lot-Sample #...: H8E160155-002 Work Order #...: CH87X103 Matrix.....: WATER
 Date Sampled...: 05/15/98 Date Received...: 05/16/98
 Prep Date.....: 05/18/98 Analysis Date...: 06/09/98
 Prep Batch #...: 8138148
 Dilution Factor: 1 Method.....: SW846 8081

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING LIMIT</u>	<u>UNITS</u>
Aroclor 1016	ND	1.0	ug/L
Aroclor 1221	ND	1.0	ug/L
Aroclor 1232	ND	1.0	ug/L
Aroclor 1242	ND	1.0	ug/L
Aroclor 1248	ND	1.0	ug/L
Aroclor 1254	ND	1.0	ug/L
Aroclor 1260	ND	1.0	ug/L

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
Tetrachloro-m-xylene	86	(30 - 133)
Decachlorobiphenyl	91	(30 - 139)



PCBs

Client: IT Corporation
Project#: 773206
Location: Plumbrook Ordinance Wor

Analysis Method: PCB
Prep Method: EPA 3520

Field ID: 5417
Lab ID: 133702-001
Matrix: Water
Batch#: 41000
Units: ug/L
Diln Fac: 1

Sampled: 05/15/98
Received: 05/16/98
Extracted: 05/20/98
Analyzed: 05/27/98

Analyte	Result	Reporting Limit
Aroclor-1016	ND	0.51
Aroclor-1221	ND	1.0
Aroclor-1232	ND	0.51
Aroclor-1242	ND	0.51
Aroclor-1248	ND	0.51
Aroclor-1254	ND	0.51
Aroclor-1260	ND	0.51

Surrogate	%Recovery	Recovery Limits
TCMX	71	19-130
Decachlorobiphenyl	44	22-110

IT CORPORATION - KNOXVILLE

Client Sample ID: 5416

DISSOLVED Metals

Lot-Sample #...: H8E160155-006

Matrix.....: WATER

Date Sampled...: 05/15/98

Date Received...: 05/16/98

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>WORK ORDER #</u>
Prep Batch #...: 8148140						
Aluminum	ND	200	ug/L	SW846 6010A	05/28-06/12/98	CH883101
		Dilution Factor: 1		Analysis Time...: 15:15		
Arsenic	ND	10.0	ug/L	SW846 6010A	05/28-06/13/98	CH883101
		Dilution Factor: 1		Analysis Time...: 15:36		
Lead	ND	3.0	ug/L	SW846 6010A	05/28-06/13/98	CH88310M
		Dilution Factor: 1		Analysis Time...: 15:36		
Antimony	ND	60.0	ug/L	SW846 6010A	05/28-06/12/98	CH883102
		Dilution Factor: 1		Analysis Time...: 15:15		
Barium	ND	200	ug/L	SW846 6010A	05/28-06/12/98	CH883103
		Dilution Factor: 1		Analysis Time...: 15:15		
Selenium	ND	5.0	ug/L	SW846 6010A	05/28-06/13/98	CH88310M
		Dilution Factor: 1		Analysis Time...: 15:36		
Beryllium	ND	5.0	ug/L	SW846 6010A	05/28-06/12/98	CH883104
		Dilution Factor: 1		Analysis Time...: 15:15		
Thallium	ND	10.0	ug/L	SW846 6010A	05/28-06/13/98	CH883101
		Dilution Factor: 1		Analysis Time...: 15:36		
Cadmium	ND	5.0	ug/L	SW846 6010A	05/28-06/12/98	CH883105
		Dilution Factor: 1		Analysis Time...: 15:15		
Calcium	83300	5000	ug/L	SW846 6010A	05/28-06/12/98	CH883106
		Dilution Factor: 1		Analysis Time...: 15:15		
Chromium	ND	10.0	ug/L	SW846 6010A	05/28-06/12/98	CH883107
		Dilution Factor: 1		Analysis Time...: 15:15		
Cobalt	ND	50.0	ug/L	SW846 6010A	05/28-06/12/98	CH883108
		Dilution Factor: 1		Analysis Time...: 15:15		
Copper	ND	25.0	ug/L	SW846 6010A	05/28-06/12/98	CH883109
		Dilution Factor: 1		Analysis Time...: 15:15		
Iron	115	100	ug/L	SW846 6010A	05/28-06/12/98	CH883110
		Dilution Factor: 1		Analysis Time...: 15:15		

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IT CORPORATION - KNOXVILLE

Client Sample ID: 5416

DISSOLVED Metals

Lot-Sample #...: H8E160155-006

Matrix.....: WATER

PARAMETER	RESULT	REPORTING		METHOD	PREPARATION-	WORK
		LIMIT	UNITS		ANALYSIS DATE	ORDER #
Magnesium	38000	5000	ug/L	SW846 6010A	05/28-06/12/98	CH88310C
		Dilution Factor: 1		Analysis Time...: 15:15		
Manganese	667	15.0	ug/L	SW846 6010A	05/28-06/12/98	CH88310D
		Dilution Factor: 1		Analysis Time...: 15:15		
Nickel	ND	40.0	ug/L	SW846 6010A	05/28-06/12/98	CH88310E
		Dilution Factor: 1		Analysis Time...: 15:15		
Potassium	13000	5000	ug/L	SW846 6010A	05/28-06/12/98	CH88310F
		Dilution Factor: 1		Analysis Time...: 15:15		
Silver	ND	10.0	ug/L	SW846 6010A	05/28-06/12/98	CH88310G
		Dilution Factor: 1		Analysis Time...: 15:15		
Sodium	134000	5000	ug/L	SW846 6010A	05/28-06/12/98	CH88310H
		Dilution Factor: 1		Analysis Time...: 15:15		
Vanadium	ND	50.0	ug/L	SW846 6010A	05/28-06/12/98	CH88310J
		Dilution Factor: 1		Analysis Time...: 15:15		
Zinc	32.0	20.0	ug/L	SW846 6010A	05/28-06/12/98	CH88310K
		Dilution Factor: 1		Analysis Time...: 15:15		
Prep Batch #...: 8149106						
Mercury	ND	0.20	ug/L	SW846 7470A	05/29/98	CH88310C
		Dilution Factor: 1		Analysis Time...: 14:37		



Curtis & Tompkins, Ltd.

SAMPLE ID: 5417
LAB ID: 133702-001
CLIENT: IT Corporation
PROJECT ID: 773206
LOCATION: Plumbrook Ordinance Wor
MATRIX: Filtrate

DATE SAMPLED: 05/15/98
DATE RECEIVED: 05/16/98
DATE REPORTED: 05/29/98

TARGET ANALYTE LIST

Compound	Result (ug/L)	Reporting Limit (ug/L)	IDF	QC Batch	Method	Analysis Date
Aluminum	160	100	1	40949	EPA 6010A	05/26/98
Antimony	ND	60	1	40949	EPA 6010A	05/26/98
Arsenic	ND	5.0	1	40949	EPA 6010A	05/26/98
Barium	68	10	1	40949	EPA 6010A	05/26/98
Beryllium	ND	2.0	1	40949	EPA 6010A	05/26/98
Cadmium	ND	5.0	1	40949	EPA 6010A	05/26/98
Calcium	84000	500	1	40949	EPA 6010A	05/26/98
Chromium (total)	ND	10	1	40949	EPA 6010A	05/26/98
Cobalt	23	20	1	40949	EPA 6010A	05/26/98
Copper	ND	10	1	40949	EPA 6010A	05/26/98
Iron	ND	100	1	40949	EPA 6010A	05/26/98
Lead	ND	3.0	1	40949	EPA 6010A	05/26/98
Magnesium	40000	500	1	40949	EPA 6010A	05/26/98
Manganese	640	10	1	40949	EPA 6010A	05/26/98
Mercury	ND	0.20	1	41073	EPA 7470	05/26/98
Molybdenum	ND	20	1	40949	EPA 6010A	05/26/98
Nickel	ND	20	1	40949	EPA 6010A	05/26/98
Potassium	11000	500	1	40949	EPA 6010A	05/26/98
Selenium	9.8	5.0	1	40949	EPA 6010A	05/26/98
Silver	ND	5.0	1	40949	EPA 6010A	05/26/98
Sodium	120000	500	1	40949	EPA 6010A	05/26/98
Thallium	ND	5.0	1	40949	EPA 6010A	05/26/98
Vanadium	ND	10	1	40949	EPA 6010A	05/26/98
Zinc	ND	20	1	40949	EPA 6010A	05/26/98

ND = Not detected at or above reporting limit

IT CORPORATION - KNOXVILLE

Client Sample ID: 5416

TOTAL Metals

Lot-Sample #...: H8E160155-002

Matrix.....: WATER

Date Sampled...: 05/15/98

Date Received...: 05/16/98

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u>		<u>METHOD</u>	<u>PREPARATION-</u>	<u>WORK</u>
		<u>LIMIT</u>	<u>UNITS</u>		<u>ANALYSIS DATE</u>	<u>ORDER #</u>
Prep Batch #...: 8148126						
Aluminum	ND	200	ug/L	SW846 6010A	05/28-06/12/98	CH87X104
		Dilution Factor: 1		Analysis Time...: 12:51		
Arsenic	ND	10.0	ug/L	SW846 6010A	05/28-06/13/98	CH87X105
		Dilution Factor: 1		Analysis Time...: 13:18		
Lead	ND	3.0	ug/L	SW846 6010A	05/28-06/13/98	CH87X106
		Dilution Factor: 1		Analysis Time...: 13:18		
Antimony	ND	60.0	ug/L	SW846 6010A	05/28-06/12/98	CH87X107
		Dilution Factor: 1		Analysis Time...: 12:51		
Barium	ND	200	ug/L	SW846 6010A	05/28-06/12/98	CH87X108
		Dilution Factor: 1		Analysis Time...: 12:51		
Selenium	ND	5.0	ug/L	SW846 6010A	05/28-06/13/98	CH87X109
		Dilution Factor: 1		Analysis Time...: 13:18		
Beryllium	ND	5.0	ug/L	SW846 6010A	05/28-06/12/98	CH87X110
		Dilution Factor: 1		Analysis Time...: 12:51		
Thallium	ND	10.0	ug/L	SW846 6010A	05/28-06/13/98	CH87X111
		Dilution Factor: 1		Analysis Time...: 13:18		
Cadmium	ND	5.0	ug/L	SW846 6010A	05/28-06/12/98	CH87X112
		Dilution Factor: 1		Analysis Time...: 12:51		
Calcium	64500	5000	ug/L	SW846 6010A	05/28-06/12/98	CH87X113
		Dilution Factor: 1		Analysis Time...: 12:51		
Chromium	ND	10.0	ug/L	SW846 6010A	05/28-06/12/98	CH87X114
		Dilution Factor: 1		Analysis Time...: 12:51		
Cobalt	ND	50.0	ug/L	SW846 6010A	05/28-06/12/98	CH87X115
		Dilution Factor: 1		Analysis Time...: 12:51		
Copper	ND	25.0	ug/L	SW846 6010A	05/28-06/12/98	CH87X116
		Dilution Factor: 1		Analysis Time...: 12:51		
Iron	223	100	ug/L	SW846 6010A	05/28-06/12/98	CH87X117
		Dilution Factor: 1		Analysis Time...: 12:51		

(Continued on next page)

IT CORPORATION - KNOXVILLE

Client Sample ID: 5416

TOTAL Metals

Lot-Sample #...: H8E160155-002

Matrix.....: WATER

PARAMETER	RESULT	REPORTING		METHOD	PREPARATION-	WORK
		LIMIT	UNITS		ANALYSIS DATE	ORDER #
Magnesium	24600	5000	ug/L	SW846 6010A	05/28-06/12/98	CH87X10F
		Dilution Factor: 1		Analysis Time...: 12:51		
Manganese	63.6	15.0	ug/L	SW846 6010A	05/28-06/12/98	CH87X10G
		Dilution Factor: 1		Analysis Time...: 12:51		
Nickel	ND	40.0	ug/L	SW846 6010A	05/28-06/12/98	CH87X10H
		Dilution Factor: 1		Analysis Time...: 12:51		
Potassium	6290	5000	ug/L	SW846 6010A	05/28-06/12/98	CH87X10J
		Dilution Factor: 1		Analysis Time...: 12:51		
Silver	ND	10.0	ug/L	SW846 6010A	05/28-06/12/98	CH87X10K
		Dilution Factor: 1		Analysis Time...: 12:51		
Sodium	38300	5000	ug/L	SW846 6010A	05/28-06/12/98	CH87X10L
		Dilution Factor: 1		Analysis Time...: 12:51		
Vanadium	ND	50.0	ug/L	SW846 6010A	05/28-06/12/98	CH87X10M
		Dilution Factor: 1		Analysis Time...: 12:51		
Zinc	59.6	20.0	ug/L	SW846 6010A	05/28-06/12/98	CH87X10N
		Dilution Factor: 1		Analysis Time...: 12:51		
Prep Batch #...: 8149105						
Mercury	ND	0.20	ug/L	SW846 7470A	05/29/98	CH87X10U
		Dilution Factor: 1		Analysis Time...: 13:35		



SAMPLE ID: 5417
 LAB ID: 133702-001
 CLIENT: IT Corporation
 PROJECT ID: 773206
 LOCATION: Plumbrook Ordinance Wor
 MATRIX: Water

DATE SAMPLED: 05/15/98
 DATE RECEIVED: 05/16/98
 DATE REPORTED: 05/29/98

TARGET ANALYTE LIST

Compound	Result (ug/L)	Reporting Limit (ug/L)	IDF	QC Batch	Method	Analysis Date
Aluminum	180	100	1	41026	EPA 6010A	05/26/98
Antimony	ND	60	1	41026	EPA 6010A	05/26/98
Arsenic	ND	5.0	1	41026	EPA 6010A	05/27/98
Barium	22	10	1	41026	EPA 6010A	05/26/98
Beryllium	ND	2.0	1	41026	EPA 6010A	05/26/98
Cadmium	ND	5.0	1	41026	EPA 6010A	05/26/98
Calcium	58000	500	1	41026	EPA 6010A	05/26/98
Chromium (total)	ND	10	1	41026	EPA 6010A	05/26/98
Cobalt	ND	20	1	41026	EPA 6010A	05/26/98
Copper	ND	10	1	41026	EPA 6010A	05/26/98
Iron	320	100	1	41026	EPA 6010A	05/26/98
Lead	ND	3.0	1	41026	EPA 6010A	05/27/98
Magnesium	21000	500	1	41026	EPA 6010A	05/26/98
Manganese	37	10	1	41026	EPA 6010A	05/26/98
Mercury	ND	0.20	1	40973	EPA 7470	05/20/98
Molybdenum	ND	20	1	41026	EPA 6010A	05/26/98
Nickel	ND	20	1	41026	EPA 6010A	05/26/98
Potassium	3800	500	1	41026	EPA 6010A	05/26/98
Selenium	ND	5.0	1	41026	EPA 6010A	05/27/98
Silver	ND	5.0	1	41026	EPA 6010A	05/26/98
Sodium	17000	500	1	41026	EPA 6010A	05/26/98
Thallium	ND	5.0	1	41026	EPA 6010A	05/27/98
Vanadium	ND	10	1	41026	EPA 6010A	05/26/98
Zinc	31	20	1	41026	EPA 6010A	05/26/98

ND = Not detected at or above reporting limit

IT CORPORATION - KNOXVILLE

Client Sample ID: 5416

HPLC

Lot-Sample #...: H8E160155-002 Work Order #...: CH87X10V Matrix.....: WATER
 Date Sampled...: 05/15/98 Date Received...: 05/16/98
 Prep Date.....: 05/20/98 Analysis Date...: 05/24/98
 Prep Batch #...: 8140278
 Dilution Factor: 1 Method.....: SW846 8330

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING LIMIT</u>	<u>UNITS</u>
4-Amino-2,6-dinitrotoluene	ND	0.20	ug/L
1,3-Dinitrobenzene	ND	0.20	ug/L
2,4-Dinitrotoluene	ND	0.20	ug/L
2,6-Dinitrotoluene	ND	0.20	ug/L
HMX	ND	0.50	ug/L
Nitrobenzene	ND	0.20	ug/L
2-Nitrotoluene	ND	0.20	ug/L
3-Nitrotoluene	ND	0.20	ug/L
RDX	ND	0.50	ug/L
Tetryl	ND	0.20	ug/L
1,3,5-Trinitrobenzene	ND	0.20	ug/L
2,4,6-Trinitrotoluene	ND	0.20	ug/L

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
1-Chloro-3-nitrobenzene	94	(39 - 157)

Nitroaromatics and Nitramines by HPLC
Method 8330

Client Name: Curtis & Tompkins, Ltd.
Client ID: 5417
LAB ID: 099327-0001-SA
Matrix: AQUEOUS
Authorized: 22 MAY 98

Sampled: 15 MAY 98
Prepared: 26 MAY 98

Received: 22 MAY 98
Analyzed: 28 MAY 98

Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Qualifier
HMX	ND	ug/L	1.0	
1,3,5-Trinitrobenzene	ND	ug/L	0.30	
RDX	ND	ug/L	0.80	
1,3-Dinitrobenzene	ND	ug/L	0.10	
Nitrobenzene	ND	ug/L	1.0	
2,4,6-Trinitrotoluene	ND	ug/L	0.10	
Tetryl	ND	ug/L	1.0	
2,4-Dinitrotoluene	ND	ug/L	0.10	
2,6-Dinitrotoluene	ND	ug/L	0.30	
2-Am-DNT	ND	ug/L	0.10	
4-Am-DNT	ND	ug/L	0.10	
2-Nitrotoluene	ND	ug/L	1.0	
4-Nitrotoluene	ND	ug/L	1.0	
3-Nitrotoluene	ND	ug/L	1.0	

Surrogate	Recovery	Acceptable Range
2,4-Dinitrofluorobenzene	103 %	65 - 135

ND = Not Detected

Reported By: Jon Edmondson

Approved By: Emily Uebelhoer

The cover letter is an integral part of this report.
Rev 230787



133702

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

Reference Document No: PBGW-051598CURT
Page 1 of 1

Project Number: 773206

Samples Shipment Date: 15-MAY-98

Bill To: Accounts Receivable

Project Name: PLUMBROOK ORDNANCE WORKS Lab Destination: Curtis and Tomkins Lab

312 Directors Drive
Knoxville TN 37923

Sample Coordinator: Duane Nielsen

Lab Contact: Carol Wortham (PM) or

Report To: Kim Napier

312 Directors Drive
Knoxville TN 37923

Turnaround Time:

Project Contact: Kim Napier

Carrier/Waybill No.: Fed Ex/800185091259

Special Instructions:

Possible Hazard Identification:

Non-hazard Flammable Skin Irritant Poison B Unknown

Sample Disposal:

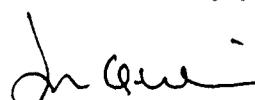
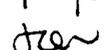
Return to Client Disposal by Lab Archive (mos.)

1. Relinquished By 
(Signature/Affiliation)
2. Relinquished By
(Signature/Affiliation)
3. Relinquished By
(Signature/Affiliation)

Date: 5/15/98
Time: 1800

Date:
Time:

Date:
Time:

1. Received By 
(Signature/Affiliation) Date: 5/16/98
Time: 
2. Received By
(Signature/Affiliation) Date: 5/16/98
Time: 
3. Received By
(Signature/Affiliation) Date:
Time:

Comments:

Sample No	Sample Name	Sample Date	Sample Time	Container	Ctr Qty	Preservative	Requested Testing Program	File CID	Condition On Receipt
5417	PBOW-98-3W-BG8-BEDGW-001-5417	15-MAY-98	10:40	1 L HDPE	2	HNO3, pH<2	TAL Metals by SW-846 6010A/7470 in water	N	
5417	PBOW-98-3W-BG8-BEDGW-001-5417	15-MAY-98	10:40	1 L Amb. Glass	1	None except cool to 4 C	Nitroaromatics by SW-846 8330 in soil	N	
5417	PBOW-98-3W-BG8-BEDGW-001-5417	15-MAY-98	10:40	40 ml GVIAL, SEP	3	HCl, pH<2	TCL Volatiles by SW-846 8260A	N	
5417	PBOW-98-3W-BG8-BEDGW-001-5417	15-MAY-98	10:40	1 L Amb. Glass	2	None except cool to 4 C	TCL Semivolatiles by SW-846 8270B in soil	N	
5417	PBOW-98-3W-BG8-BEDGW-001-5417	15-MAY-98	10:40	1 L Amb. Glass	2	None except cool to 4 C	PCBs by SW8081	N	
9013	PBOW-98-3W-BG8-BEDGW-001-9013	15-MAY-98	10:00	40 ml GVIAL, SEP	3	HCl<pH 2	TCL Volatiles by SW-846 8260A	N	

003

Plumbhook



Curtis & Tompkins, LLC

COOLER RECEIPT CHECKLIST

Login#: 133702 Date Received: 5/16 Number of Coolers: 1
 Client: IT Project: Plumbhook

A. Preliminary Examination Phase

Date Opened: 5/18 By (print): J. Williams (sign) [Signature]

1. Did cooler come with a shipping slip (airbill, etc.)?..... YES NO
If YES, enter carrier name and airbill number: Fed Ex
2. Were custody seals on outside of cooler?..... YES NO
How many and where? 2 Front Seal date: 5/15 Seal name: _____
3. Were custody seals unbroken and intact at the date and time of arrival?..... YES NO
4. Were custody papers dry and intact when received?..... YES NO
5. Were custody papers filled out properly (ink, signed, etc.)?..... YES NO
6. Did you sign the custody papers in the appropriate place?..... YES NO
7. Was project identifiable from custody papers?..... YES NO
If YES, enter project name at the top of this form.
8. If required, was sufficient ice used?..... YES NO
Type of ice: cube Temperature: 5.25°C

B. Login Phase

Date Logged In: 5/18 By (print): J. Williams (sign) [Signature]

1. Describe type of packing in cooler: various
2. Did all bottles arrive unbroken?..... YES NO
3. Were labels in good condition and complete (ID, date, time, signature, etc.)?..... YES NO
4. Did bottle labels agree with custody papers?..... YES NO
5. Were appropriate containers used for the tests indicated?..... YES NO
6. Were correct preservatives added to samples?..... YES NO
7. Was sufficient amount of sample sent for tests indicated?..... YES NO
8. Were bubbles absent in VOA samples? If NO, list sample IDs below..... YES NO
9. Was the client contacted concerning this sample delivery?..... YES NO
If YES, give details below.
Who was called? _____ By whom? _____ Date: _____

Additional Comments:

Filename: F:\qc\forms\cooler.wpd

FedEx

Emp# 257019 16MAY98

TRK# 8001 8509 1259 FORM 0200

P1



0004

**QUANTERRA KNOXVILLE LABORATORY
SAMPLE RECEIPT/CONDITION UPON RECEIPT ANOMALY CHECKLIST**

Page 1 of 2

CLIENT: IT Corp PROJECT: Plumbrook Lot No.: H&E/60155

TO BE COMPLETED BY SAMPLE RECEIPT ASSOCIATE:

- | | | | |
|--|-------------------------------------|-------------------------------------|-------------------------------------|
| 1. Sample Receipt: | YES | NO | NA |
| a. Do sample container labels match COC? (IDs, Dates, Times) | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Is the cooler temperature within acceptance limits? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Were samples received with correct preservative (excluding Encore)? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| d. Were custody seals present/intact on cooler and/or containers? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Were all of the samples listed on the COC received? <i>BBB</i> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| f. Were all of the sample containers received intact? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| g. Were containers received for VOAs received without headspace? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| h. Were samples received in the appropriate containers? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| i. Did you check for residual chlorine, if necessary? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| j. Were samples received within 1/2 of the (QAMP) holding time? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| k. Were samples screened for radioactivity? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| l. Were client's sample documents (RFA/COC) received? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| m. Has the RFA/COC been relinquished? (Signed, Dated, Timed) | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| n. Are test/parameters listed for each sample? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| o. Is the matrix of the samples noted? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| p. Is the date/time of sample collection noted? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| q. Is the client and project name/No. identified? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

SAMPLE RECEIVING ASSOCIATE: Bryan Blomquist DATE: 5/16/98

TO BE COMPLETED BY PROJECT MANAGER :

- | | | | |
|--|--------------------------|--------------------------|-------------------------------------|
| 1. Project manager "Sample Greet": | YES | NO | NA |
| a. Quote number to be logged-in under <u>20941</u> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| b. Informed Login associates of special instructions ? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

2. If custody seals were missing/not intact, was client notified?

PROJECT MANAGER : JL DATE: 5/16/98 (performed RFA)

Client Sample ID	Analysis Requested	Condition (see legend)	Comments/Action
5545	Diss Metals	4d	pH=3 / resample pH=2
5685	T+D Metals	4d	pH=3/
9012	VOA	4b	*Cancel analysis...

- Client informed on 5/18/98 by JDR . Person contacted: KIM NAPIER .
- Noted actions in comments section above.
- No action necessary, process as is.
- Project Manager: JL Date: 5/18/98

**QUANTERRA KNOXVILLE LABORATORY
SAMPLE RECEIPT/CONDITION UPON RECEIPT ANOMALY CHECKLIST LEGEND**

Item	Condition
Cooler:	1a Not received, COC available 1b Leaking 1c Other: _____
Temperature:	2a Temp Blank = _____ 2b Cooler Temp = _____ (cooler temp should be used only if there is no temp blank)
Container:	3a Leaking 3b Broken 3c Extra 3d No labels 3e Headspace (VOA only) 3f Other: _____
Samples:	4a Samples received but not on COC 4b Samples not received but on COC 4c Holding time expired 4d Sample preservative: <u>pH=3</u> 4e Other: _____
Custody Seals:	5a None 5b Not intact 5c Other: _____
Chain of Custody (COC):	6a Not relinquished by client 6b Incomplete information 6c Other: _____
Container Labels:	7a Doesn't match COC 7b Incomplete information 7c Marking smeared 7d Label torn 7e Other: _____
Other (8):	_____

QUANTERRA KNOXVILLE LABORATORY
SAMPLE LOG-IN (LOT SUMMARY) REVIEW CHECKLIST

CLIENT: I.T. Kno PROJECT: PBOW Lot No.: 18E160153

TO BE COMPETED BY PROJECT MANAGER:

- | | | | |
|---|-------------------------------------|--------------------------|-------------------------------------|
| 1. Client Documents (Request for Analysis/Chain of Custody): | YES | NO | NA |
| a. Was QuanTIMS lot number documented on all paperwork? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Was RFA/COC signed upon receipt, including date/time? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Is preservative check (pH) noted on RFA/COC? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Is cooler temperature & custody seal condition noted on COC? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Log-in (Lot Folder) Review: | YES | NO | NA |
| a. Do client IDs on Client Summaries match RFA/COC? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Were tests/parameters assigned correctly? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Were correct analytical and report due dates assigned? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| d. Has the correct fax due date been assigned to the lot? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| e. Is the correct report format noted in the lot summary? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f. Is percent moisture logged for samples requiring this analysis? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| g. Are client assigned QC samples properly defined? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 3. Contract/Subcontract Review: | YES | NO | NA |
| a. Is there a contract number or PO for this work? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. If the purchase order number is given, is it noted in Lot header? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. If samples were subcontracted, was copy of COC in folder? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 4. SDG Review: | YES | NO | NA |
| a. If SDG is required, is SDG form in Lot folder? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Is SDG number noted in Lot header & sample comments? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. If SDG is complete, has the due date been revised & marked closed? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 5. Checklist Review: | YES | NO | NA |
| a. Has Sample Receipt Checklist been filled-out? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Was there a CUR? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Were all issues resolved? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

LOT FOLDER REVIEWED BY: _____

DATE: 5/18/20

Quote # 20941

H8E160155



ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

Reference Document No: PBGW-051598QESK
Page 1 of 2

Project Number: 773208

Samples Shipment Date: 15-MAY-98

Bill To: Accounts Receivable

Project Name: PLUMBROOK ORDNANCE WOR ab Destination: Quanterra - Knoxville

312 Directors Drive
Knoxville TN 37923

Sample Coordinator: Duane Nielsen

Lab Contact: John Reynolds

Report To: Kim Napier

Turnaround Time:

Project Contact: Kim Napier

312 Directors Drive
Knoxville TN 37923

Carrier/Waybill No.: Fed Ex 801624849895

Special Instructions:

Possible Hazard Identification:
 Non-hazard Flammable Skin Irritant Poison B Unknown

Sample Disposal:
 Return to Client Disposal by Lab Archive (mos.)

1. Relinquished By (Signature/Affiliation) <i>[Signature]</i>	Date: 5/15/98 Time: 1800	1. Received By (Signature/Affiliation) <i>[Signature]</i>	Date: 5-16-98 Time: 10:50
2. Relinquished By (Signature/Affiliation)	Date: Time:	2. Received By (Signature/Affiliation)	Date: Time:
3. Relinquished By (Signature/Affiliation)	Date: Time:	3. Received By (Signature/Affiliation)	Date: Time:

Comments: 1L TOTAL METALS; 1L FILTERED METALS

Sample No	Sample Name	Sample Date	Sample Time	Container	Ctr Qty	Preservative	Requested Testing Program	File CID	Condition On Receipt
5415	PBOW-98-GW-BG8-BEDGW-001-5415	15-MAY-98	10:40	1 L HDPE	2	HNO3, pH<2	TAL Metals by SW-848 6010A/7470 in water	N	pH<2
5415	PBOW-98-GW-BG8-BEDGW-001-5415	15-MAY-98	10:40	1 L Amb. Glass	1	None except cool to 4 C	Nitroaromatics by SW-848 8330 in soil	N	pH<2
5415	PBOW-98-GW-BG8-BEDGW-001-5415	15-MAY-98	10:40	1 L Amb. Glass	2	None except cool to 4 C	TCL Semivolatiles by SW-848 8270B in soil	N	
5415	PBOW-98-GW-BG8-BEDGW-001-5415	15-MAY-98	10:40	40 ml GVIAL, SEP	3	HCl, pH<2	TCL Volatiles by SW-848 8280A	N	
5415	PBOW-98-GW-BG8-BEDGW-001-5415	15-MAY-98	10:40	1 L Amb. Glass	2	None except cool to 4 C	PCBs by SW8081	N	
5416	PBOW-98-GW-BG8-BEDGW-001-5416	15-MAY-98	10:40	1 L HDPE	2	HNO3, pH<2	TAL Metals by SW-848 6010A/7470 in water	N	pH<2
5416	PBOW-98-GW-BG8-BEDGW-001-5416	15-MAY-98	10:40	1 L Amb. Glass	2	None except cool to 4 C	PCBs by SW8081	N	pH<2

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**INTERNATIONAL
TECHNOLOGY
CORPORATION**

**ANALYSIS REQUEST AND
CHAIN OF CUSTODY RECORD**

Reference Document No: PBGW-051598QESK

Page 2 of 2

H8E160155

Sample No	Sample Name	Sample Date	Sample Time	Container	Preservative	Requested Testing Program	File	CID	Condition On Receipt
5416	PBOW-98-GW-BG8-BEDGW-001-5416	15-MAY-98	10:40	1 L Amb. Glass	2 None except cool to 4 C	TCL Semivolatiles by SW-846 8270B in soil	N		
5416	PBOW-98-GW-BG8-BEDGW-001-5416	15-MAY-98	10:40	1 L Amb. Glass	1 None except cool to 4 C	Nitroaromatics by SW-846 8330 in soil	N		
5416	PBOW-98-GW-BG8-BEDGW-001-5416	15-MAY-98	10:40	40 ml GVIAL, SEP	3 HCl, pH<2	TCL Volatiles by SW-846 8260A	N		
5545	PBOW-98-GW-ITMW02-5545	15-MAY-98	09:50	1 L Amb. Glass	1 None except cool to 4 C	Nitroaromatics by SW-846 8330 in soil	N		
5545	PBOW-98-GW-ITMW02-5545	15-MAY-98	09:50	40 ml GVIAL, SEP	3 HCl, pH<2	TCL Volatiles by SW-846 8260A	N		
5545	PBOW-98-GW-ITMW02-5545	15-MAY-98	09:50	1 L Amb. Glass	2 None except cool to 4 C	TCL Semivolatiles by SW-846 8270B in soil	N		
5545	PBOW-98-GW-ITMW02-5545	15-MAY-98	09:50	1 L HDPE	2 HNO3, pH<2	TAL Metals by SW-846 6010A/7470 in water	N		T = pH < 2 D = pH = 3
5545	PBOW-98-GW-ITMW02-5545	15-MAY-98	09:50	1 L Amb. Glass	2 None except cool to 4 C	PCBs by SW8081	N		
5685	PBOW-98-GW-WAMW2-5685	15-MAY-98	08:30	1 L HDPE	2 HNO3, pH<2	TAL Metals by SW-846 6010A/7470 in water	N		T = pH = 3 D = pH = 3
5685	PBOW-98-GW-WAMW2-5685	15-MAY-98	08:30	1 L Amb. Glass	1 None except cool to 4 C	Nitroaromatics by SW-846 8330 in soil	N		
5685	PBOW-98-GW-WAMW2-5685	15-MAY-98	08:30	40 ml GVIAL, SEP	3 HCl, pH<2	TCL Volatiles by SW-846 8260A	N		
5685	PBOW-98-GW-WAMW2-5685	15-MAY-98	08:30	1 L Amb. Glass	2 None except cool to 4 C	TCL Semivolatiles by SW-846 8270B in soil	N		
5685	PBOW-98-GW-WAMW2-5685	15-MAY-98	08:30	1 L Amb. Glass	2 None except cool to 4 C	PCBs by SW8081	N		
9012		15-MAY-98	10:00	40 ml GVIAL, SEP	3 HCl-pH 2	TCL Volatiles by SW-846 8260A	N		Did not receive BPA 5/16/98

00000006