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INSTALLATION RESTORATION PROGRAM

(1)

REMEDIAL INVESTIGATION REPORT

MINNESOTA AIR NATIONAL GUARD BASE
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA

VOLUME 6

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Oak Ridge, Tennessee 37831
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For the U.S. DEPARTMENT OF ENERGY under contract DE-AC05-840R21400

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The report describes the remedial actions performed on sites confirmed to contain hazardous waste contamination which endangers the human health. The actions performed are described and the potential for future problems. The study was conducted under the Air National Guard's Installation Restoration Program.

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Oak Ridge, Tennessee

Submitted To

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Duluth, Minnesota

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PREFACE

Engineering-Science (ES) entered into an agreement with the HAZWRAP Support Contractor office operated by Martin Marietta Energy Systems, Inc. for the U.S. Department of Energy (DOE) to perform a Remedial Investigation at the Minnesota Air National Guard Base, Duluth International Airport, Duluth, Minnesota, to be submitted to the National Guard Bureau, Andrews Air Force Base, Maryland. This investigation was initiated in July, 1988 under Task Order Y02, General Order 18B-97387C, which is under DOE contract DE-AC05-84OR21400, with Martin Marietta Energy Systems under Interagency Agreement 1489-1489-A1. The overall objectives of this effort were to define the magnitude, extent, direction, and rate of movement of identified contaminants and to summarize the need for remedial actions based on an assessment of risks to human health and the environment.

This investigation was performed by Engineering-Science personnel from the Oak Ridge, Tennessee office with oversight provided by Martin Marietta Energy Systems. Mr. Larry Janssen, of Martin Marietta Energy Systems was the Technical Monitor for Lt. Col. Michael Washeleski of the National Guard Bureau. Major Joel D. Manns, Minnesota Air National Guard Base, Duluth, Minnesota, provided field support. Engineering-Science personnel included Mr. Robert S. McLeod, P.E., P.G., who served as Project Manager and Mr. John D. Hardeman, P.G., who served as the Field Team Leader. Mr. Robert L. Thoem, P.E. was the ES Technical Director for the project.

Engineering-Science wishes to acknowledge North Star Drilling, Little Falls, Minnesota as the drilling and well installation subcontractor. Salo Engineering, Duluth, Minnesota, provided professional surveying services. ES Berkeley Laboratory, Berkeley, California; ES Atlanta Laboratory, Atlanta, Georgia; MetaTrace, Inc., St. Louis, Missouri; NUS Corporation, Pittsburgh, Pennsylvania; and IT Radiological Sciences Laboratory, Oak Ridge, TN provided analytical laboratory services for sample analyses.

This work was accomplished between July 1988 and March 1989.

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DATA PACKAGE #42

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ES
ENGINEERING-SCIENCE, INC.

RESEARCH AND DEVELOPMENT
LABORATORY
600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 841-7353

REVISED REPORT

Job No.: OR001

Work Order No.: 929

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil sample(s) received by this laboratory on 8-30-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88102186	DANGB-BG-MW32-SS1,2-3'	AS-F	8-29-88		10-10-88	
88102186	DANGB-BG-MW32-SS1,2-3'	BA-I	8-29-88		10-20-88	
88102186	DANGB-BG-MW32-SS1,2-3'	CD-F	8-29-88		10-20-88	
88102186	DANGB-BG-MW32-SS1,2-3'	CR-F	8-29-88		10-20-88	
88102186	DANGB-BG-MW32-SS1,2-3'	HG-C	8-29-88		9-28-88	
88102186	DANGB-BG-MW32-SS1,2-3'	PB-F	8-29-88		10-20-88	
88102186	DANGB-BG-MW32-SS1,2-3'	418.1	8-29-88	9-26-88	9-27-88	
88102186	DANGB-BG-MW32-SS1,2-3'	MOIS	8-29-88		9-07-88	
88102186	DANGB-BG-MW32-SS1,2-3'	8010	8-29-88		9-07-88	9-08-88
88102186	DANGB-BG-MW32-SS1,2-3'	8020	8-29-88		9-07-88	9-08-88
88102186	DANGB-BG-MW32-SS1,2-3'	8080	8-29-88	9-07-88	10-05-88	
88102186	DANGB-BG-MW32-SS1,2-3'	8270	8-29-88	9-08-88	11-30-88	

* If applicable

Job No.: OR001

Work Order No.: 929

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88102187	DANGB-BG-MW32-SS1,11-12'	AS-F	8-29-88		10-10-88	
88102187	DANGB-BG-MW32-SS1,11-12'	BA-I	8-29-88		10-20-88	
88102187	DANGB-BG-MW32-SS1,11-12'	CD-F	8-29-88		10-20-88	
88102187	DANGB-BG-MW32-SS1,11-12'	CR-F	8-29-88		10-20-88	
88102187	DANGB-BG-MW32-SS1,11-12'	HG-C	8-29-88		9-28-88	
88102187	DANGB-BG-MW32-SS1,11-12'	PB-F	8-29-88		10-20-88	
88102187	DANGB-BG-MW32-SS1,11-12'	418.1	8-29-88	9-26-88	9-27-88	
88102187	DANGB-BG-MW32-SS1,11-12'	MOIS	8-29-88		9-07-88	
88102187	DANGB-BG-MW32-SS1,11-12'	8010	8-29-88		9-07-88	9-08-88
88102187	DANGB-BG-MW32-SS1,11-12'	8020	8-29-88		9-07-88	9-08-88
88102187	DANGB-BG-MW32-SS1,11-12'	8080	8-29-88	9-07-88	10-05-88	
88102187	DANGB-BG-MW32-SS1,11-12'	8270	8-29-88	9-08-88	10-17-88	
88102188	DANGB-BG-MW32-SS3,19-20'	AS-F	8-29-88		10-10-88	
88102188	DANGB-BG-MW32-SS3,19-20'	BA-I	8-29-88		10-20-88	
88102188	DANGB-BG-MW32-SS3,19-20'	CD-F	8-29-88		10-20-88	
88102188	DANGB-BG-MW32-SS3,19-20'	CR-F	8-29-88		10-20-88	
88102188	DANGB-BG-MW32-SS3,19-20'	HG-C	8-29-88		9-28-88	
88102188	DANGB-BG-MW32-SS3,19-20'	PB-F	8-29-88		10-20-88	
88102188	DANGB-BG-MW32-SS3,19-20'	418.1	8-29-88	9-26-88	9-27-88	
88102188	DANGB-BG-MW32-SS3,19-20'	MOIS	8-29-88		9-07-88	
88102188	DANGB-BG-MW32-SS3,19-20'	8010	8-29-88		9-07-88	9-08-88
88102188	DANGB-BG-MW32-SS3,19-20'	8020	8-29-88		9-07-88	9-08-88
88102188	DANGB-BG-MW32-SS3,19-20'	8080	8-29-88	9-07-88	10-05-88	
88102188	DANGB-BG-MW32-SS3,19-20'	8270	8-29-88	9-08-88	10-17-88	

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082186-88082188
WORK ORDER NO.: 929

These soil samples were received at the ES Berkeley Laboratory on 8-30-88. They were received cold and intact.

ENGINEERING-SCIENCE INC.
11/14/88

ANALYSIS REPORT

WORK ORDER NUMBER: 929
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/30/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/Kg

TEST COMPOUND	DANGB-BG,MW32, SS1,2-3' 88082186	DANGB-BG,MW32, SS2,11-12' 88082187	DANGB-BG,MW32, SS3,19-20' 88082188
ACID DIG SOIL	NA	NA	NA
ARSENIC	<5.0E	<5.0E	<5.0E
BARIUM	82.6	49.2	34.9
CADMIUM	9.8N	7.6N	6.8N
CHROMIUM	46.8	23.0	22.8
MERCURY	<0.1	<0.1	<0.1
LEAD	6.3N	4.3N	2.9N

ND - Not Detected
NA - Not Analyzed

ANALYSIS REPORT

WORK ORDER NUMBER: 929
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/30/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/Kg

TEST COMPOUND	DANGB-BG,MW32, SS1,2-3' 88082186	DANGB-BG,MW32, SS2,11-12' 88082187	DANGB-BG,MW32, SS3,19-20' 88082188
418.1 PETROLEUM HYDROCARBONS	<100	<100	<100
% MOISTURE	8.2	11.7	14.1

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 929
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/30/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
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OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8010

TEST COMPOUND	DANGB-BG,MW32, SS1,2-3' 88082186	DANGB-BG,MW32, SS2,11-12' 88082187	DANGB-BG,MW32, SS3,19-20' 88082188
BENZYL CHLORIDE	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND
BROMOBENZENE	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND
BROMOFORM	ND	ND	ND
BROMOETHANE	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND
CHLORAL	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
CHLOROETHANE	ND	ND	ND
CHLOROFORM	ND	ND	ND
1-CHLOROHEXANE	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND
CHLOROMETHANE	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND
DICHLOROMETHANE	4.1B	4.0B	1.5B
1,2-DICHLOROPROPANE	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 929

TEST COMPOUND	DANGB-BG,MW32, SS1,2-3' 88082186	DANGB-BG,MW32, SS2,11-12' 88082187	DANGB-BG,MW32, SS3,19-20' 88082188
1,3-DICHLOROPROPYLENE	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT

:ORK ORDER NUMBER: 929
'OB NUMBER : ZB0000000440
'ORK ORDER DATE : 08/30/88

APPROVED BY _____
Lab Supervisor

:EPORT DATA:
:S OAK RIDGE/DULUTH ANGB
'10 S. ILLINOIS AVE. STE. S103
)AK RIDGE, TN 37830
3ILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

:ONTRACT / PO # : OR001
:ONTACT : BILL HAYDEN
(615)-481-3920

'ASK: 4, UNITS: ug/Kg, GROUP 8020

:EST COMPOUND	DANGB-BG,MW32, SS1,2-3' 88082186	DANGB-BG,MW32, SS2,11-12' 88082187	DANGB-BG,MW32, SS3,19-20' 88082188
3ENZENE	ND	ND	ND
:HLOROBENZENE	ND	ND	ND
.,2-DICHLOROBENZENE	ND	ND	ND
.,3-DICHLOROBENZENE	ND	ND	ND
.,4-DICHLOROBENZENE	ND	ND	ND
:THYL BENZENE	ND	ND	ND
:OLUENE	28	47	31
:YLENES	ND	ND	ND

:D - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 929
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/30/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8080

TEST COMPOUND	DANGB-BG,MW32, SS1,2-3' 88082186	DANGB-BG,MW32, SS2,11-12' 88082187	DANGB-BG,MW32, SS3,19-20' 88082188
ALDRIN	ND	ND	ND
ALPHA-BHC	ND	ND	ND
BETA-BHC	ND	ND	ND
DELTA-BHC	ND	ND	ND
GAMMA-BHC	ND	ND	ND
CHLORDANE	ND	ND	ND
4,4'-DDD	ND	ND	ND
4,4'-DDE	ND	ND	ND
4,4'-DDT	ND	ND	ND
DIELDRIN	ND	ND	ND
ENDOSULFAN I	ND	ND	ND
ENDOSULFAN II	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND
ENDRIN	ND	ND	ND
ENDRIN ALDEHYDE	NA	NA	NA
HEPTACHLOR	ND	ND	ND
HEPTACHLOR EPOXIDE	ND	ND	ND
KEPONE	NA	NA	NA
METHOXYCHLOR	ND	ND	ND
TOXAPHENE	ND	ND	ND
PCB-1016	ND	ND	ND
PCB-1221	ND	ND	ND
PCB-1232	ND	ND	ND
PCB-1242	ND	ND	ND
PCB-1248	ND	ND	ND
PCB-1254	ND	ND	ND
PCB-1260	ND	ND	ND

ND - Not Detected
NA - Not Analyzed

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

ate Rece.ved: August 30, 1988
ate Rep.rted: December 6, 1988

Work Order: 929
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

ab Number:	88082186	88082187
ample No.:	DANGB-BG-MW32, SS1 2-3'	DANGB-BG-MW32, SS2 11-12'
ate Sampled:	08-29-88	08-29-88
ime Sampled:	14:50	15:30
ate Extracted:	09-08-88	09-08-88
ate Analyzed:	11-30-88	10-17-88
ercent Moisture:	8	12

ompound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
,3-Dichlorobenzene	330	ND	ND
,4-Dichlorobenzene	330	ND	ND
exachloroethane	330	ND	ND
is(2-chloroethyl)ether	330	ND	ND
,2-Dichlorobenzene	330	ND	ND
-Nitrosodimethylamine	330	ND	ND
is(2-chloroisopropyl)ether	330	ND	ND
-Nitrosodi-n-propylamine	330	ND	ND
exachlorobutadiene	330	ND	ND
,2,4-Trichlorobenzene	330	ND	ND
itrobenzene	330	ND	ND
sophorone	330	ND	ND
aphthalene	330	ND	ND
is(2-chloroethoxy)methane	330	ND	ND
-Chloronaphthalene	330	ND	ND
exachlorocyclopentadiene	330	ND	ND
cenaphthylene	330	ND	ND
cenaphthene	330	ND	ND
imethyl phthalate	330	ND	ND
,6-Dinitrotoluene	330	ND	ND
luorene	330	ND	ND
,4-Dinitrotoluene	330	ND	ND
iethyl phthalate	330	ND	ND
-Nitrosodiphenylamine	330	ND	ND
exachlorobenzene	330	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 30, 1988
Date Reported: December 6, 1988

Work Order: 929
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082186	88082187
Sample No.:	DANGB-BG-MW32, SS1 2-3'	DANGB-BG-MW32, SS2 11-12'
Date Sampled:	08-29-88	08-29-88
Time Sampled:	14:50	15:30
Date Extracted:	09-08-88	09-08-88
Date Analyzed:	11-30-88	10-17-88
Percent Moisture:	8	12

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

B = Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

ate Received: August 30, 1988
ate Reported: December 6, 1988

Work Order: 929
Job Number: OR001

or: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

ab Number:	88082186	88082187
ample No.:	DANGB-BG-MW32, SS1 2-3'	DANGB-BG-MW32, SS2 11-12'
ate Sampled:	08-29-88	08-29-88
ime Sampled:	14:50	15:30
ate Extracted:	09-08-88	09-08-88
ate Analyzed:	11-30-88	10-17-88
ercent Moisture:	8	12

ompound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
cetophenone	--*	ND	ND
niline	--*	ND	ND
-Aminobiphenyl	--*	ND	ND
-Chloroaniline	660	ND	ND
-Chloronaphthalene	--*	ND	ND
ibenzofuran	330	ND	ND
-Dimethylaminoazobenzene	--*	ND	ND
,12-Dimethylbenz(a)anthracene	--*	ND	ND
-,a-Dimethylphenethylamine	--*	ND	ND
iphenylamine	--*	ND	ND
,2-Diphenylhydrazine	--*	ND	ND
thyl methanesulfonate	--*	ND	ND
-Methylcholanthrene	--*	ND	ND
ethyl methanesulfonate	--*	ND	ND
-Methylnaphthalene	330	ND	ND
-Naphthylamine	--*	ND	ND
-Naphthylamine	--*	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroso-di-n-butylamine	--*	ND	ND
-Nitrosopiperidine	--*	ND	ND
entachlorobenzene	--*	ND	ND
entachloronitrobenzene	--*	ND	ND
henacetin	--*	ND	ND
-Picoline	--*	ND	ND
ronamide	--*	ND	ND
,2,4,5-Tetrachlorobenzene	--*	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected n the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

Date Received: August 30, 1988
Date Reported: December 6, 1988

Work Order: 929
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082186	88082187
Sample No.:	DANGB-BG-MW32, SS1 2-3'	DANGB-BG-MW32, SS2 11-12'
Date Sampled:	08-29-88	08-29-88
Time Sampled:	14:50	15:30
Date Extracted:	09-08-88	09-08-88
Date Analyzed:	11-30-88	10-17-88
Percent Moisture:	8	12

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

ate Received: August 30, 1988
ate Reported: December 6, 1988

Work Order: 929
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
ddress:710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

ab Number:	88082186	88082187
ample No.:	DANGB-BG-MW32, SS1 2-3'	DANGB-BG-MW32, SS2 11-12'
ate Sampled:	08-29-88	08-29-88
ime Sampled:	14:50	15:30
ate Extracted:	09-08-88	09-08-88
ate Analyzed:	11-30-88	10-17-88
ercent Moisture:	8	12

ompound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
-Chlorophenol	330	ND	ND
-Nitrophenol	330	ND	ND
nenol	330	ND	ND
,4-Dimethylphenol	330	ND	ND
,4-Dichlorophenol	330	ND	ND
,4,6-Trichlorophenol	330	ND	ND
-Chloro-3-methylphenol	660	ND	ND
,4-Dinitrophenol	1600	ND	ND
,6-Dichlorophenol	--*	ND	ND
-Methyl-4,6-Dinitrophenol	1600	ND	ND
entachlorophenol	1600	ND	ND
-Nitrophenol	1600	ND	ND
enzoic Acid	1600	ND	ND
-Methylphenol	330	ND	ND
- & 4-Methylphenol	330	ND	ND
,3,4,6-Tetrachlorophenol	--*	ND	ND
,4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

OTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

ate Received: August 30, 1988
ate Reported: December 6, 1988

Work Order: 929
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

ab Number:	88082188
Sample No.:	DANGB-BG-MW32-SS3 19-20'
ate Sampled:	08-29-88
ime Sampled:	16:01
Date Extracted:	09-08-88
ate Analyzed:	10-17-88
ercent Moisture:	14

Compound	Detection Limit ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg
,3-Dichlorobenzene	330	ND
,4-Dichlorobenzene	330	ND
Hexachloroethane	330	ND
is(2-chloroethyl)ether	330	ND
,2-Dichlorobenzene	330	ND
N-Nitrosodimethylamine	330	ND
Bis(2-chloroisopropyl)ether	330	ND
-Nitrosodi-n-propylamine	330	ND
exachlorobutadiene	330	ND
1,2,4-Trichlorobenzene	330	ND
itrobenzene	330	ND
sophorone	330	ND
Naphthalene	330	ND
is(2-chloroethoxy)methane	330	ND
-Chloronaphthalene	330	ND
exachlorocyclopentadiene	330	ND
Acenaphthylene	330	ND
cenaphthene	330	ND
imethyl phthalate	330	ND
2,6-Dinitrotoluene	330	ND
luorene	330	ND
,4-Dinitrotoluene	330	ND
Diethyl phthalate	330	ND
N-Nitrosodiphenylamine	330	ND
exachlorobenzene	330	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

ate Received: August 30, 1988
ate Reported: December 6, 1988

Work Order: 929
Job Number: OR001

DR: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

ab Number:	88082188
ample No.:	DANGB-BG-MW32-SS3 19-20'
ate Sampled:	08-29-88
ime Sampled:	16:01
ate Extracted:	09-08-88
ate Analyzed:	10-17-88
ercent Moisture:	14

ompound	Detection Limit ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg
henanthrene	330	ND
nthracene	330	ND
ibutyl phthalate	330	ND
luoranthene	330	ND
-Chlorophenyl phenyl ether	330	ND
yrene	330	ND
utyl Benzyl phthalate	330	ND
is(2-ethylhexyl)phthalate	330	ND
rysene	330	ND
-Bromophenyl phenyl ether	330	ND
enzo(a)anthracene	330	ND
i-n-octylphthalate	330	ND
enzo(b)fluoranthene	330	ND
enzo(k)fluoranthene	330	ND
enzidine	2000	ND
,3'-Dichlorobenzidine	660	ND
enzo(a)pyrene	330	ND
ndeno(1,2,3-cd)pyrene	330	ND
ibenzo(a,h)anthracene	330	ND
enzo(ghi)perylene	330	ND
enzyl Alcohol	660	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 30, 1988
Date Reported: December 6, 1988

Work Order: 929
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082188
Sample No.:	DANGB-BG-MW32-SS3 19-20'
Date Sampled:	08-29-88
Time Sampled:	16:01
Date Extracted:	09-08-88
Date Analyzed:	10-17-88
Percent Moisture:	14

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg
Acetophenone	--*	ND
Aniline	--*	ND
4-Aminobiphenyl	--*	ND
4-Chloroaniline	660	ND
2-Chloronaphthalene	--*	ND
Dibenzofuran	330	ND
p-Dimethylaminoazobenzene	--*	ND
7,12-Dimethylbenz(a)anthracene	--*	ND
a-,a-Dimethylphenethylamine	--*	ND
Diphenylamine	--*	ND
1,2-Diphenylhydrazine	--*	ND
Ethyl methanesulfonate	--*	ND
3-Methylcholanthrene	--*	ND
Methyl methanesulfonate	--*	ND
2-Methylnaphthalene	330	ND
1-Naphthylamine	--*	ND
2-Naphthylamine	--*	ND
2-Nitroaniline	1600	ND
3-Nitroaniline	1600	ND
4-Nitroaniline	1600	ND
N-Nitroso-di-n-butylamine	--*	ND
N-Nitrosopiperidine	--*	ND
Pentachlorobenzene	--*	ND
Pentachloronitrobenzene	--*	ND
Phenacetin	--*	ND
2-Picoline	--*	ND
Pronamide	--*	ND
1,2,4,5-Tetrachlorobenzene	--*	ND

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

ate Received: August 30, 1988
ate Reported: December 6, 1988

Work Order: 929
Job Number: OR001

)R: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

ab Number:	88082188
ample No.:	DANGB-BG-MW32-SS3 19-20'
ate Sampled:	08-29-88
ime Sampled:	16:01
ate Extracted:	09-08-88
ate Analyzed:	10-17-88
ercent Moisture:	14

ompound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg
lpha-BHC	--*	ND
amma-BHC	--*	ND
eta-BHC	660	ND
eptachlor	330	ND
elta-BHC	500	ND
ldrin	330	ND
eptachlor epoxide	330	ND
ndosulfan I	--*	ND
ieldrin	500	ND
,4'-DDE	1000	ND
ndrin	--*	ND
ndosulfan II	--*	ND
,4'-DDD	500	ND
,4'-DDT	830	ND
ndosulfan Sulfate	1000	ND
ndrin aldehyde	--*	ND
ndrin Ketone	--*	ND
lordane	2000	ND
ethoxychlor	--*	ND
oxaphene	2000	ND
roclor-1016	2000	ND
roclor-1221	2000	ND
roclor-1232	2000	ND
roclor-1242	2000	ND
roclor-1248	2000	ND
roclor-1254	2000	ND
roclor-1260	2000	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

Date Received: August 30, 1988
Date Reported: December 6, 1988

Work Order: 929
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082188
Sample No.:	DANGB-BG-MW32-SS3 19-20'
Date Sampled:	08-29-88
Time Sampled:	16:01
Date Extracted:	09-08-88
Date Analyzed:	10-17-88
Percent Moisture:	14

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg
2-Chlorophenol	330	ND
2-Nitrophenol	330	ND
Phenol	330	ND
2,4-Dimethylphenol	330	ND
2,4-Dichlorophenol	330	ND
2,4,6-Trichlorophenol	330	ND
4-Chloro-3-methylphenol	660	ND
2,4-Dinitrophenol	1600	ND
2,6-Dichlorophenol	--*	ND
4-Methyl-4,6-Dinitrophenol	1600	ND
Pentachlorophenol	1600	ND
4-Nitrophenol	1600	ND
Benzoic Acid	1600	ND
2-Methylphenol	330	ND
3- & 4-Methylphenol	330	ND
2,3,4,6-Tetrachlorophenol	--*	ND
2,4,5-Trichlorophenol	330	ND

Analyst

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

CHAIN OF CUSTODY RECORD 928

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature)

SHIP TO:
ENGINEERING-LABORATORY
600 Bancroft Way
Berkeley, CA. 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SOILS ANALYSES REQUIRED: SW8010, 8020	SW8080	SW3270	EPA 418.1	SW6010, 7080, 7191	SW7131, 7421, 7471			REMARKS
8/29/88	1450	DANGB-BG MW32, SS1-2-3'	1	X								882186
8/29/88	1450	DANGB-BG MW32, SS1-2-3'	1		X	X	X	X	X			
8/29/88	1530	DANGB-BG MW32, SS2-11-12'	1	X								882187
8/29/88	1530	DANGB-BG MW32-SS2-11-12'	1		X	X	X	X	X	X		
8/29/88	1601	DANGB-BG MW32-SS3-19-20'	1	X								882188
8/29/88	1601	DANGB-BG MW32-SS3-19-20'	1		X	X	X	X	X	X		

2514

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	8/29/88 1800				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
		Bill Friedman	8.30.88 10:30	Iced cold & intact

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Job No.:

Client:
Attn:
Address:

Project: DULUTH

TICs Found: 7

Project No:
Sample Matrix: Soil
Conc. Unit: ug/kg
Work Order No: 929
Lab Sample ID: E5886
Lab File ID: 88090909, 10, 2186-88 BLANK
Date Received: —
Date Extracted: 9-8-88
Date Analyzed: 10-17-88
Date Reported:
Dilution Factor: 1
% Moisture: —

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	4.74	630	
2.		unknown	5.17	18,000	
3.		unknown	6.36	300	
4.		unknown	6.91	200	
5.		unknown alkyl acid $C_6H_{12}O_2$	24.04	630	
6.		unknown	28.77	930	
7.		unknown	33.25	270	
8.		unknown	35.75	15,000	
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

DANGB-BC-MW32-SS1 2-3'

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 929 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88082186 RDANA

Sample wt/vol: 30 (g/mL) g Lab File ID: S0611

Level: (low/med) low Date Received: 8/30/88

% Moisture: not dec. 8 DCD 3/11/89 dec. _____ Date Extracted: 9/8/88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 11/30/88

GPC Cleanup: (Y/N) N pH: ___ Dilution Factor: 1

Number TICs found: 13 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	3.32	180	
2.		unknown	3.79	1200	
3.		unknown aliphatic	4.35	250	
4.		unknown aliphatic	4.47	180	
5.		unknown aliphatic	4.89	330	
6.	127-18-4	tetrachloroethene	5.09	620	
7.		unknown	5.35	2000	
8.		unknown	5.85	17000	
9.		unknown	24.97	1600	
10.		unknown	29.74	1700	
11.		unknown	34.64	610	
12.		unknown	36.40	170	
13.		unknown	40.84	140	
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Job No.:

Client:
Attn:
Address:

Project: Duluth

TICs Found: 7

Sample
~~Project~~ No: DANGB-BG-MW32-SS2 11-13'
Sample Matrix: Soil
Conc. Unit: ug/kg
Work Order No: 924
Lab Sample ID: E5889
Lab File ID: B8082187
Date Received: 8-30-88
Date Extracted: 9-8-88
Date Analyzed: 10-17-88
Date Reported:
Dilution Factor: 1
% Moisture: 12

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
	unknown	4.80	830 B	
	unknown	5.21	28,000 B	
	unknown	6.36	190 B	
	unknown alkyl acid $C_{16}H_{32}O_2$	24.12	3,000 B	
	unknown	28.77	530 B	
	unknown	35.48	950	
	unknown	35.86	15,000 B	

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Job No.:

Client:
Attn:
Address:

Project: Duluth

TICs Found: 7

Sample
~~Project~~ No: DANGB-BG-MW32-553 19-20'
Sample Matrix: Soil
Conc. Unit: ug/kg
Work Order No: 924
Lab Sample ID: 55890
Lab File ID: 85082188
Date Received: 8-30-88
Date Extracted: 9-8-88
Date Analyzed: 10-17-88
Date Reported:
Dilution Factor: 1
% Moisture: 14

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
	unknown	4.86	230	
	unknown	5.03	3600	
	unknown	5.26	22,000	B
	unknown	17.08	190	
	unknown alkylated $C_{16}H_{32}O_2$	24.08	1300	B
	unknown	28.79	780	B
	unknown	35.80	1600	B

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082156-88082163, 88082186-88082188

QC Report No: AAF-S-0034-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-29-88
Date Reported: 10-28-88
Dilution Factor: See Notes
%Moisture: 19.0

Laboratory Supervisor Approval:

Analyte	Laboratory Sample Nos. Duplicates	Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	SR	SSR	PR	Notes
Arsenic	88082156	88082156	10-10-88	9-29-88	7060	<0.5	<5.0E	<5.0E	NC	4.94	2.34E	11.8	191N	DF=10
Lead	88082156	88082156	10-20-88	9-29-88	7421	<0.5	6.4	6.3	2	6.17	6.4	20.8	233N	DF=NA

2519

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO(S).: ICP-S-0034-88
QC REPORT NO(S).: AAF-S-0034-88

As a result of extreme sample matrix interference, dilution was required for sample analysis. The reporting limit and MDL for the analyte(s) listed have increased as shown.

Analyte	Reporting Limit	MDL
Arsenic	10 mg/Kg	5.0 mg/Kg

The sample used for QC analysis contained concentrations equal to or greater than four times the spike concentration. Data are reported unflagged for the analyte(s): Lead.

Sample results for lead are reported from Furnace analysis for the following Sample No(s).:

88082156, 88082161.

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082156-88082163, 88082186-88082188
88082192-88082199

QC Report No: ICP-S-0034-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-29-88
Date Reported: 10-28-88
Dilution Factor: NA
%Moisture: 19.0

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Note
Barium	88082156	88082156	10-20-88	10-11-88	SW6010	<20	69.5	63.4	9	247	69.5	333	107	
Cadmium	88082156	88082156	10-20-88	10-11-88	SW6010	<0.5	7.5	7.2	4	6.2	7.5	10.6	50N	
Chromium	88082156	88082156	10-20-88	10-11-88	SW6010	<1.0	38.3	36.5	5	24.7	38.3	57.8	79	
Lead	88082156	88082156	10-22-88	10-11-88	SW6010	<10	11.6	<10	NC	61.7	11.6	65.6	88	A

2521

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
A See Case Narrative attached.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No: OR001

Client: ES Oak Ricge
Attn: Bill Hayden
Address: 710 S Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report No: CVM-S-0013-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-30-88
Date Reported: 10-10-88
Dilution Factor: NA
%Moisture: 6

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082186-88082188, 88082192-88082203
88082244-88092246, 88082248-88082249

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	SA	Spike Recovery SR	Spike Recovery SSR	PR	Notes
Mercury	88082186	88082186	9-22-88	9-22-88	7471	<0.1	<0.1	<0.1	NC	0.532	<0.1	0.643	121	

2522

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One,
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-1C3
Oak Ridge, Tn.

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082192-88082203, 88082186-88082188

QC Report No: TPH-S-0081-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-31-88
Date Prepared: 9-26-88
Date Analyzed: 9-27-88
Date Reported: 11-22-88
Dilution Factor: 8
%Moisture: 7.8

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88082192	418.1	<100	<100	1100	760	69	730	66	4	*
Blank	418.1	<100	<100	1000	700	70	800	80	13	*

2523

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* Percent recovery and relative percent difference are within ES Laboratory limits for matrix spike and blank spike.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QC-FRM08S

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: VGC-S-0050-88
QC REPORT NO.: VGC-S-0050-88B

Percent recoveries are out of ES Laboratory range. A blank spike analysis shows the laboratory to be in control.

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082186-88082188
88082192-88082202

QC Report No: VGC-S-0050-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-31-88
Date Prepared: NA
Date Analyzed: 9-12-88
Date Reported: 10-26-88
Dilution Factor: NA
% Moisture: 12.7

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88082199	1,1-dichloroethane	11.5	ND	11.1	97	11.1	97	0	20	58-124
	Trichloroethene	11.5	ND	14.3	124*	12.9	112	10	16	75-110
	Chlorobenzene	11.5	ND	15.2	132*	15.2	132*	0	21	71-125
	Aromatics: 8020									
88082199	Benzene	11.5	ND	15.2	132*	14.5	126*	5	26	75-123
	Toluene	11.5	0.99	15.2	124*	14.3	116*	6	16	79-115
	Chlorobenzene	11.5	ND	15.0	130*	14.5	126*	3	24	82-112

2525

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Case Narrative attached.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082186-88082188
88082192-88082202

QC Report No: VGC-S-0050-88B
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: NA
Date Prepared: NA
Date Analyzed: 9-12-88
Date Reported: 10-26-88
Dilution Factor: NA
% Moisture: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
Blank 9252	1,1-dichloroethane	10	ND	9.19	92	10.3	103	11	20	58-124
	Trichloroethene	10	ND	8.89	88	9.59	96	8	16	75-110
	Chlorobenzene	10	ND	9.24	92	9.39	94	2	21	71-125
	Aromatics: 8020									
Blank	Benzene	10	ND	8.91	89	9.37	94	5	26	75-123
	Toluene	10	ND	8.83	88	9.61	96	8	16	79-115
	Chlorobenzene	10	ND	8.78	88	9.39	94	7	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (PR)} = \frac{MS - MSD}{(MS + MSD)/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(MS \text{ or } MSD) - SR}{SA} \times 100$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/Kg
Date Reported: 10-26-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
80	9-07-88	VGC	Carbopack	75-09-2	Dichloromethane	3.5	0.25	88082186-88082188
				127-18-4	Tetrachloroethylene	0.34	0.03	

2527

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082156-88082163
88082186-88082188
88082250-88082254

QC Report No.: OCP-S-0035-88
QC Sample No.: 88082158
Level (Low/Med): Low
Date Reported: 11-10-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	3060	ND	113	111	46-127
Heptachlor	3060	ND	97.1	95	35-130
Aldrin	3060	ND	138	135*	34-132
Dieldrin	7640	ND	367	144*	31-134
Endrin	7640	ND	346	135	42-139
4,4'-DDT	7640	ND	398	136*	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	94.9	93	111	17	50	46-127
Heptachlor	113	110	95	15	31	35-130
Aldrin	121	118	135*	13	43	34-132
Dieldrin	344	135*	144*	6	38	31-134
Endrin	329	129	135*	5	45	42-139
4,4'-DDT	321	126	156*	21	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 5 out of 12 outside limits

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082156-88082163
88082186-88082188
88082250-88082254

QC Report No.: OCP-S-0035-88B
QC Sample No.: Blank
Level (Low/Med): Low
Date Reported: 11-10-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	ND	55.5	83	46-127
Heptachlor	2000	ND	45.1	68	35-130
Aldrin	2000	ND	72.6	109	34-132
Dieldrin	5000	ND	259	156*	31-134
Endrin	5000	ND	236	142*	42-139
4,4'-DDT	5000	ND	232	139*	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	68.4	103	83	21	50	46-127
Heptachlor	46.2	69	68	2	31	35-130
Aldrin	75.9	114	109	4	43	34-132
Dieldrin	302	181*	156*	15	38	31-134
Endrin	272	163*	142*	14	45	42-139
4,4'-DDT	258	155*	139*	11	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 6 out of 12 outside limits

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-S-0035-88
QC REPORT NO.: OCP-S-0035-88B

Analysis of matrix spikes samples resulted in high recoveries for aldrin, dieldrin, endrin and DDT. Analysis of spiked blanks showed high recoveries for the same compounds. The RPDs were good in both cases. The data related to these analyses were closely examined. No errors or problems were found.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up used on these samples.

PESTICIDE METHOD BLANK SUMMARY

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Lab Name: Engineering Science
Lab Sample No.: Blank

Matrix: Soil
Level (low/med): Low
Extraction:
(SepF/Cont/Sonc): Sonc
Date Reported: 11-11-88

Date Extracted: 9-07-88
Date Analyzed (1): 10-4-88
Time Analyzed (1): 20:38
Instrument ID (1): 5890 #2
GG Column ID (1): OV-1

Date Analyzed (2):
Time Analyzed (2):
Instrument ID (2):
GC Column ID (2):

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88082156	10-04-88		
-	88082157	10-04-88		
-	88082158	10-05-88		
-	88082159	10-05-88		
-	88082160	10-05-88		
-	88082161	10-05-88		
-	88082162	10-05-88		
-	88082163	10-05-88		
-	88082186	10-05-88		
-	88082187	10-05-88		
-	88082188	10-05-88		
-	88082250	10-05-88		
-	88082251	10-05-88		
-	88082252	10-05-88		
-	88082253	10-05-88		

QUALITY CONTROL RESULTS SUMMARY
EPA METHOD 8270

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082156-88082163
88082186-88082188

QC Report No: BNA-S-0042-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-26-88
Date Prepared: 9-06-88
Date Analyzed: 10-14-88
Date Reported: 12-08-88
Dilution Factor: NA
%Moisture: 17

Laboratory Supervisor Approval:

2532

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD	%Recovery
B/N Laboratory Sample # 88082115	1,2,4-Trichlorobenzene	4020	ND	2460	61	2310	57	6	23	38-107
	Acenaphthene	4020	ND	2020	50	1920	48	5	19	31-137
	2,4-Dinitrotoluene	4020	ND	3410	85	2920	73	15	47	28-89
	Pyrene	4020	ND	3300	82	3450	86	4	36	35-142
	N-Nitroso-di-n-Propylamine	4020	ND	3700	92	3790	94	2	38	41-126
	1,4-Dichlorobenzene	4020	ND	1710	43	1380	34	21	27	28-104
ACID Laboratory Sample # 88082115	Pentachlorophenol	8030	ND	8750	109	8470	105	3	47	17-109
	Phenol	8030	ND	6140	76	5300	66	15	35	26-90
	2-Chlorophenol	8030	ND	4740	59	3950	49	18	50	25-102
	4-Chloro-3-Methylphenol	8030	ND	5420	67	5060	63	7	33	26-103
	4-Nitrophenol	8030	ND	2640	33	3080	38	15	50	11-114

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
The quality control sample for this batch is from a different project.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082186-88082188
WORK ORDER NO.: 929

These soil samples were received at the ES Berkeley Laboratory on 8-30-88. They were received cold and intact.

Sample 88082186 (DANGB-BG-MW32,SS1,2-3') was initially analyzed within holding time. The results showed low recoveries of some of the surrogate spike. The sample extract was re-analyzed at a later date, which was out of the holding time. This analysis resulted in acceptable surrogate spike recoveries. No target compounds were found in either analysis.

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/KG
Date Reported: 12-12-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
E5897	10-18-88	BNA	2	-	None Detected	-	-	88082186-88082188

2534

ATILE CONTINUING CALIBRATION CHECK

ame:_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____

rument ID:carbopak_____ Calibration Date(s):_9/7/88

AB FILE ID:_81,82_____ Init. Calib. Date(s):9/2/88, 9/2/88

MPOUND	$\overline{RRF}$	RRF50	%D
enzyl chloride_____	0.08		100.00
is (2-chloroethoxy) thane_____	0.04		100.00
is (2-chloroisopropyl ther_____	0.26		100.00
omobenzene_____	1.17	1.06	9.52
omodichloromethane_____	4.54	4.02	11.37
romoform_____	3.48	3.11	10.57
omomethane_____	0.38	0.18	53.05
rbon tetrachloride_____	4.58	4.59	-0.32
hloroacetaldehyde_____	ERR		ERR
hlorobenzene_____	1.48	1.53	-2.99
loroethane_____	0.58	0.51	12.63
loroform_____	4.89	4.40	10.17
-Chlorohexane_____	1.02	0.98	4.36
Chloroethyl vinyl ether_	0.04		100.00
loromethane_____	0.49	0.50	-0.68
hloromethyl methyl ether_	0.17		100.00
m_,& p_Chlorotoluenes _	4.06	4.23	-4.09
promochloromethane_____	5.29	4.07	23.07
ibromomethane_____	3.56	2.48	30.30
2_Dichlorobenzene_____	2.72	2.90	-6.58
3_Dichlorobenzene_____	2.42	2.35	2.70
4_Dichlorobenzene_____	2.36	2.50	-5.92
ichlorodifluormethane____	0.54		100.00
1_Dichlor ethane_____	2.58	2.27	12.19
2_Dichloroethane_____	3.23	2.99	7.46
,1_Dichloroethylene_____	2.79	2.42	12.96
ans_1,2_dichloroethylene	2.99	2.55	14.95
chloromethane _____	3.07	5.19	-69.14
,2_Dichloropropane_____	2.67	2.51	5.85
3_Dichloropropylene_____	5.98	5.18	13.37
1,2,2_Tetrachloroethane_	9.67	9.60	-5.53
,1,1,2_Tetrachloroethane_	4.51	4.65	-3.20
etrachloroethylene_____	9.10	9.60	-5.54
1,1_Trichloroethane_____	3.43	3.05	11.11
1,2_Trichloroethane_____	5.98	5.18	13.38
richloroethylene_____	4.32	4.34	-0.32
richlorofluoromethane____	2.76	2.21	20.07
ichloropropane_____	3.33	3.13	5.94
inyl chloride _____	1.43	0.70	51.23

2535

TILE CONTINUING CALIBRATION CHECK

lame: ENGINEERING SCIENCE_____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____ SDG No.: ____

rument ID.: carbopak Calibration Date(s): 9/7/88 _____

FILE ID: RRF 50 __81_____ Init. Calib: 9/2/88

POUND	$\overline{RRF}$	RRF50	%D
:ene_____	5.93	5.05	-14.88
orobenzene_____	4.90	4.76	-2.82
_Dichlorobenzene_____	3.97	4.05	1.96
_Dichlorobenzene_____	4.57	4.48	-2.05
_Dichorobenzene_____	3.83	3.57	-6.75
yl Benzene_____	3.32	3.19	-3.90
uene_____	3.79	3.860	1.77
enes_____	12.16	11.19	-7.97

DATA PACKAGE #43

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ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the water samples received by this laboratory on 9-12-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092330	DANGB-TB2	8010	9-07-88		9-14-88	9-16-88
88092330	DANGB-TB2	8020	9-07-88		9-14-88	9-16-88
88092331	DANGB-FB4	8010	9-09-88		9-15-88	9-19-88
88092331	DANGB-FB4	8020	9-09-88		9-15-88	9-19-88
88092332	DANGB-FB5	8010	9-09-88		9-15-88	9-19-88
88092332	DANGB-FB5	8020	9-09-88		9-15-88	

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092330-88092332
WORK ORDER NO.: 963

These water samples were received at the ES Berkeley Laboratory on 9-12-88. They were received cold and intact.

11/02/88

ANALYSIS REPORT

WORK ORDER NUMBER: 963
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/12/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/L, GROUP 8010

TEST COMPOUND	DANGB-TB2 88092330	DANGB-FB4 88092331	DANGB-FB5 88092332
BENZYL CHLORIDE	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND
BROMOBENZENE	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND
BROMOFORM	ND	ND	ND
BROMOETHANE	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND
CHLORAL	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
CHLOROETHANE	ND	ND	ND
CHLOROFORM	ND	13	14
1-CHLOROHEXANE	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND
CHLOROMETHANE	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND
DICHLOROMETHANE	1.9B	2.5B	1.4B
1,2-DICHLOROPROPANE	ND	ND	ND

ANALYSIS REPORT FOR WORK ORDER NUMBER 963

TEST COMPOUND	DANGB-TB2 88092330	DANGB-FB4 88092331	DANGB-FB5 88092332
1,3-DICHLOROPROPYLENE	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND

ANALYSIS REPORT

WORK ORDER NUMBER: 963
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/12/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/L, GROUP 8020

	DANGB-TB2	DANGB-FB4	DANGB-FB5
TEST COMPOUND	88092330	88092331	88092332
BENZENE	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
ETHYL BENZENE	ND	ND	ND
TOLUENE	ND	ND	ND
XYLENES	ND	ND	ND

CHAIN OF CUSTODY RECORD

960,963 labels 5 of 5

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature) Kathy L. Davis

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SW8240, 8020	EPA 608	EPA 625	EPA 418.1	SW 8010, 7060, 7131	SW7421, 7470	SW9310, 9315	SM429	REMARKS
9-9-88	0730	DANGB-BR2	5	X								882316
9-7-88	0930	DANGB-TB2	3	X								882330
9-9-88	0830	DANGB-FB4	2	X								882331
9-9-88	0840	DANGB-8-MW15-GW-1	5	X								882317
9-9-88	0930	DANGB-FB5	2	X								882332
9-9-88	0940	DANGB-8-MW17-GW-1	5	X								882314 ~~882313~~ JW
9-9-88	1100	DANGB-8-MW16-GW-1	5	X								882315 ~~882314~~
9-9-88	1330	DANGB-4-MW~~24~~23-GW-1 DW 9/12/88	5	X								882312
9-9-88	1445	DANGB-8-GW8C-GW-1	5	X								882313

SHIP TO:
ENGINEERING-SCIENCE LABORATORY, INC.
600 Bancroft Way
Berkeley, CA 94710

WATER ANALYSES REQUIRED

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Kathy L. Davis	9-9-88 1800	FedEx Airbill # 949031 4293			

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
		[signature]	09/12/88 11:00	Samples received cold and intact.

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

2544

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092322-88092325
88092327-88092332
88092348-88092356, 88092388

QC Report No: VGC-W-0051-88
Sample Matrix: Water
Conc. Unit: ug/L
Date Received: NA
Date Prepared: NA
Date Analyzed: 9-26-88
Date Reported: 10-27-88
Dilution Factor: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88092388	1,1-Dichloroethane	10	ND	9.50	95	9.36	94	2	26	70-130
	Trichloroethene	10	ND	11.3	113	10.8	108	5	19	65-131
	Chlorobenzene	10	ND	11.4	114	11.2	112	2	40	59-137
	Aromatics: 8020									
88092388	Benzene	10	ND	11.1	111	11.3	113	2	20	56-146
	Toluene	10	ND	11.4	114	11.6	116	2	41	42-150
	Chlorobenzene	10	ND	10.5	105	11.2	112	6	36	76-133

2545

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Water
Conc. Unit: ug/L
Date Reported: 10-28-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
82	9-20-88	VGC	Carbopack	75-09-2	Dichloromethane	1.4	0.25	88092323-88092325
				67-66-3	Chloroform	0.42	0.05	88092327
35	9-15-88	VGC	Carbopack	75-09-2	Dichloromethane	1.4	0.25	88092322 88092328-88092332
50	9-16-88	VGC	Carbopack	75-09-2	Dichloromethane	4.6	0.25	88092321
				67-66-3	Chloroform	0.44	0.05	

2546

VOLATILE CONTINUING CALIBRATION CHECK

LabName:_____ Contract:_____

Lab Code:_____ Case No.:_____ SAS No.:_____

Instrument ID:vocal_____ Calibration Date(s):9/15/88

LAB FILE ID:3,4_____ Init. Calib. Date(s):9/14/88

COMPOUND	$\overline{RRF}$	RRF50	%D
Benzyl chloride	4.56	4.35	4.62
bis (2-choroethoxy) methane	0.12		100.00
bis (2-choroisopropyl ether	0.12		100.00
Bromobenzene	3.08	2.55	17.23
Bromodichloromethane	4.57	3.92	14.15
Bromoform	3.13	2.99	4.45
Bromomethane	0.43		100.00
Carbon tetrachloride	4.72	4.10	13.06
Chloroacetaldehyde	0.07		100.00
Chlorobenzene	1.33	1.20	9.77
Chloroethane	0.73		100.00
Chloroform	3.99	3.53	11.41
1-Chorohexane	0.82	0.52	36.31
2-Chloroethyl vinyl ether	0.12		100.00
Chloromethane	1.84		100.00
Chloromethyl methyl ether	0.02		100.00
o_,m_,& p_Chlorotoluenes	3.34	2.59	22.56
Dibromochloromethane	4.22	4.00	5.26
Dibromomethane	3.06	2.46	19.64
1,2_Dichlorobenzene	2.04	1.82	10.70
1,3_Dichlorobenzene	1.75	1.56	10.64
1,4_Dichlorobenzene	1.70	1.53	10.03
Dichlorodifluormethane	0.54		100.00
1,1_Dichloroethane	2.70	2.14	20.90
1,2_Dichloroethane	3.29	2.85	13.26
1,1_Dichloroethylene	1.64	1.18	27.97
trans_1,2_dichloroethylene	2.69	2.13	20.95
Dichloromethane	2.98	1.84	38.14
1,2_Dichloropropane	3.01	2.55	15.41
1,3_Dichloropropylene	0.47	0.40	15.33
1,1,2,2_Tetrachloroethane	3.38	3.17	6.28
1,1,1,2_Tetrachloroethane	4.83	3.73	22.76
Tetrachloroethylene	4.55	3.89	14.59
1,1,1_Trichloroethane	2.64	2.27	14.15
1,1,2_Trichloroethane	4.42	3.55	19.61
Trichloroethylene	3.90	3.29	15.58
Trichlorofluormethane	0.88	0.64	27.23
Trichloropropane	3.08	2.55	17.23
Vinyl chloride	1.84		100.00

Engineering Science Laboratory - Berkeley, CA
VOLATILE CONTINUING CALIBRATION CHECK

Instrument ID.: Vocal

Calibration Date(s): 9/15/88

LAB FILE ID: 3

Inilcalib = 9/14/88

COMPOUND	$\overline{RF}$	RF50	%D
Benzene		215.93	
	4.93	4.318681	-12.40
Chlorobenzene		243.13	
	4.65	4.862637	4.57
1,2_Dichlorobenzene		193.6813	
	4.64	3.873626	-16.52
1,3_Dichlorobenzene		215.1098	
	3.99	4.302197	7.82
1,4_Dichorobenzene		170.6043	
	3.2	3.412087	6.63
Ethyl Benzene		159.0659	
	2.98	3.181318	6.76
Toluene		185.4395	
	3.54	3.708791	4.77
Xylenes		522.9281	
	9.87	10.45856	5.96

Surrogate response:

DATA PACKAGE #44

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ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the water samples received by this laboratory on 9-13-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092348	DANGB-4-MW9-GW1	BA-I	9-11-88		10-09-88	
88092348	DANGB-4-MW9-GW1	CD-F	9-11-88		10-24-88	
88092348	DANGB-4-MW9-GW1	CR-F	9-11-88		11-02-88	
88092348	DANGB-4-MW9-GW1	PB-F	9-11-88		10-26-88	
88092348	DANGB-4-MW9-GW1	418.1	9-11-88	9-28-88	10-05-88	
88092348	DANGB-4-MW9-GW1	8010	9-11-88		9-20-88	9-16-88
88092348	DANGB-4-MW9-GW1	8020	9-11-88		9-20-88	9-16-88
88092349	DANGB-4-GW4B-GW1	BA-I	9-11-88		10-09-88	
88092349	DANGB-4-GW4B-GW1	CD-F	9-11-88		10-24-88	
88092349	DANGB-4-GW4B-GW1	CR-F	9-11-88		11-02-88	
88092349	DANGB-4-GW4B-GW1	PB-F	9-11-88		10-26-88	
88092349	DANGB-4-GW4B-GW1	418.1	9-11-88	9-28-88	10-05-88	
88092349	DANGB-4-MW4B-GW1	8010	9-11-88		9-20-88	9-16-88
88092349	DANGB-4-MW4B-GW1	8020	9-11-88		9-20-88	
88092350	DANGB-BR4	BA-I	9-11-88		10-09-88	
88092350	DANGB-BR4	CD-F	9-11-88		10-24-88	
88092350	DANGB-BR4	CR-F	9-11-88		11-02-88	
88092350	DANGB-BR4	PB-F	9-11-88		10-26-88	
88092350	DANGB-BR4	418.1	9-11-88	9-28-88	10-05-88	
88092350	DANGB-BR4	8010	9-11-88		9-15-88	9-19-88
88092350	DANGB-BR4	8020	9-11-88		9-15-88	
88092351	DANGB-TB4	8010	9-07-88		9-15-88	9-19-88
88092351	DANGB-TB4	8020	9-07-88		9-15-88	
88092352	DANGB-FB7	8010	9-11-88		9-15-88	9-19-88
88092352	DANGB-FB7	8020	9-11-88		9-15-88	
88092353	DANGB-FB8	8010	9-11-88		9-15-88	9-19-88
88092353	DANGB-FB8	8020	9-11-88		9-15-88	

* If applicable

ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the water samples received by this laboratory on 9-13-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092348	DANGB-4-MW9-GW1	BA-I	9-11-88		10-09-88	
88092348	DANGB-4-MW9-GW1	CD-F	9-11-88		10-24-88	
88092348	DANGB-4-MW9-GW1	CR-F	9-11-88		11-02-88	
88092348	DANGB-4-MW9-GW1	PB-F	9-11-88		10-26-88	
88092348	DANGB-4-MW9-GW1	418.1	9-11-88	9-28-88	10-05-88	
88092348	DANGB-4-MW9-GW1	8010	9-11-88		9-20-88	9-16-88
88092348	DANGB-4-MW9-GW1	8020	9-11-88		9-20-88	9-16-88
88092349	DANGB-4-GW4B-GW1	BA-I	9-11-88		10-09-88	
88092349	DANGB-4-GW4B-GW1	CD-F	9-11-88		10-24-88	
88092349	DANGB-4-GW4B-GW1	CR-F	9-11-88		11-02-88	
88092349	DANGB-4-GW4B-GW1	PB-F	9-11-88		10-26-88	
88092349	DANGB-4-GW4B-GW1	418.1	9-11-88	9-28-88	10-05-88	
88092349	DANGB-4-MW4B-GW1	8010	9-11-88		9-20-88	9-16-88
88092349	DANGB-4-MW4B-GW1	8020	9-11-88		9-20-88	
88092350	DANGB-BR4	BA-I	9-11-88		10-09-88	
88092350	DANGB-BR4	CD-F	9-11-88		10-24-88	
88092350	DANGB-BR4	CR-F	9-11-88		11-02-88	
88092350	DANGB-BR4	PB-F	9-11-88		10-26-88	
88092350	DANGB-BR4	418.1	9-11-88	9-28-88	10-05-88	
88092350	DANGB-BR4	8010	9-11-88		9-15-88	9-19-88
88092350	DANGB-BR4	8020	9-11-88		9-15-88	
88092351	DANGB-TB4	8010	9-07-88		9-15-88	9-19-88
88092351	DANGB-TB4	8020	9-07-88		9-15-88	
88092352	DANGB-FB7	8010	9-11-88		9-15-88	9-19-88
88092352	DANGB-FB7	8020	9-11-88		9-15-88	
88092353	DANGB-FB8	8010	9-11-88		9-15-88	9-19-88
88092353	DANGB-FB8	8020	9-11-88		9-15-88	

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092348-88092353
WORK ORDER NO.: 969

These water samples were received at the ES Berkeley Laboratory on 9-13-88. They were received cold and intact.

ANALYSIS REPORT

WORK ORDER NUMBER: 969
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/13/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/L

TEST COMPOUND	DANGB-4-MW9-GW-1 88092348	DANGB-4-GW4B-GW-1 88092349	DANGB-BR4 88092350
ACID DIG FLAME	NA	NA	NA
ACID DIG FURNACE	NA	NA	NA
BARIUM	0.09B	<0.05	<0.05
CADMIUM	0.0025 BW	0.0031 B	<0.001
CHROMIUM	<0.002	0.0022 B	<0.002
LEAD	<0.005	<0.005	<0.005

NA - Not Analyzed

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 969
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/13/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/L

TEST COMPOUND	DANGB-4-MW9-GW-1 88092348	DANGB-4-GW4B-GW-1 88092349	DANGB-BR4 88092350
418.1 PETROLEUM HYDROCARBONS	<1.5	<1.5	<1.5

ND - Not Detected

ANALYSIS REPORT

/ORK ORDER NUMBER: 969
/OB NUMBER : ZB0000000440
/ORK ORDER DATE : 09/13/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

: OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

ASK: 4, UNITS: ug/L, GROUP 8010

ST COMPOUND	DANGB-4-MW9-GW-1 88092348	DANGB-4-GW4B-GW-1 88092349	DANGB-BR4 88092350	DANGB-TB4 88092351	DANGB-FB7 88092352	DANGB-FB8 88092353
NZYL CHLORIDE	ND	ND	ND	ND	ND	ND
S (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
S (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
OMOBENZENE	ND	ND	ND	ND	ND	ND
OMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
OMOFORM	ND	ND	ND	ND	ND	ND
OMOETHANE	ND	ND	ND	ND	ND	ND
RBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
LORACETALDEHYDE	ND	ND	ND	ND	ND	ND
LORAL	ND	ND	ND	ND	ND	ND
LOROBENZENE	ND	ND	ND	ND	ND	ND
LOROETHANE	ND	ND	ND	ND	ND	ND
LOROFORM	ND	ND	15	ND	15	15
CHLOROHEXANE	ND	ND	ND	ND	ND	ND
CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
LOROMETHANE	ND	ND	ND	ND	ND	ND
LOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
LOROTOLUENE	ND	ND	ND	ND	ND	ND
BROMOCHLOROME"HANE	ND	ND	ND	ND	ND	ND
BROMOMETHANE	ND	ND	ND	ND	ND	ND
2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
CHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
ANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	0.37B	0.50B	1.6B	2.0B	1.6B	2.1B
2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND

- Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 969

TEST COMPOUND	DANGB-4-MW9-GW-1 88092348	DANGB-4-GW4B-GW-1 88092349	DANGB-BR4 88092350	DANGB-TB4 88092351	DANGB-FB7 88092352	DANGB-FB8 88092353
[illegible],3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
[illegible],1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
[illegible]ETRACHLOROETHYLENE	ND	ND	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
[illegible]RICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
[illegible]RICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND	ND	ND	ND

ND - Not Detected

ENGINEERING-SCIENCE INC.
11/03/88

ANALYSIS REPORT

WORK ORDER NUMBER: 969
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/13/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR061
CONTACT : BILL HAYDEN
(615)-481-3920

ASK: 4, UNITS: ug/L, GROUP 8020

TEST COMPOUND	DANGB-4-MW9-GW-1 88092348	DANGB-4-GW4B-GW-1 88092349	DANGB-BR4 88092350	DANGB-TB4 88092351	DANGB-FB7 88092352	DANGB-[illegible]8 88092353
BENZENE	3.2	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
ETHYL BENZENE	ND	ND	ND	ND	ND	ND
TOLUENE	ND	ND	ND	ND	ND	ND
XYLENES	2.7	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 969
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/13/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/L

TEST COMPOUND	DANGB-4-MW9-GW-1 88092348	DANGB-4-GW4B-GW-1 88092349	DANGB-BR4 88092350
418.1 PETROLEUM HYDROCARBONS	<1.5	<1.5	<1.5

ND - Not Detected

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature)

SHIP TO:
ENGINEERING-SCIENCE LABORATORY, INC.
600 Bancroft Way
Berkeley, CA 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED: SW8010, 8020	EPA 608	EPA 625	EPA 418.1	SW 6010, 7060, 7131	SW7421, 7470	SW9310, 9315	SM420	REMARKS
9-11-88	0900	DANGB-TB2 5"	5	X								
9-11-88	0920	DANGB-TB4 5"	3	X								
9-11-88	0945	DANGB-EB7 5"	2	X								
9-11-88	1030	DANGB-4-GW4C-GW-1	5	X								
9-11-88	1100	DANGB-4-MW52-GW-1	5	X								
9-11-88	1545	DANGB-TB6 5"	2	X								
9-11-88	1645	DANGB-4-MW1-GW-1	5	X								
9-11-88	1730	DANGB-4-MW4B-GW-1	5	X								

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	9-11-88 0900				
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

0960

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED	SHIP TO:
OR001	Duluth ANGB/Duluth, Mn.			ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA 94710
SAMPLER(S): (Signature)				

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SW8010, 8020	EPA 601	EPA 602	EPA 624	EPA 625	EPA 418.1	SW 8010, 7060, 7131	SW7421, 7420, 7111	SW9310, 9315	SM426	REMARKS
		DANGB-1-1-4	4				X		X	X				
		ANGB-FIELD	2				X							
		ANGB-4-MW4--GW-1	2				X							
	1100	DANGB-4-MW5 2-GW-1					X							

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature]	4-12-88 1400	[signature] 4/12/88 1760			

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

25561

19C2

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature)

SHIP TO:
ENGINEERING-SCIENCE LABORATORY, INC.
600 Bancroft Way
Berkeley, CA 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED: SW8010, 8020	EPA 608	EPA 625	EPA 418.1	SW 6010, 7000, 7131	SW7421, 7470	SW9310, 9315	SM426	REMARKS
1-6	0930	DANGB-4_GW4C-GW-1	2					X	X			
1-6	1000	DANGB-4-MW52-GW-1	2					X	X			
1-6	1545	DANGB-4-MW3-GW-1	4				X	X	X			
1-6	1130	DANGB-4-GW4B-GW-1	4				X	X	X			

2932
2562

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	1-8 0900	Fed Ex Airbill # 9490 : 14.60			

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092422, 88092424-88092427, 88092433
88092509-88092511, 88092513, 88092515-88092516
88092346, 88092348-88092349, 88092350, 88092494-88092495

QC Report No: TPH-W-0070-88
Sample Matrix: Water
Conc. Unit: mg/L
Date Received: NA
Date Prepared: 9-28-88
Date Analyzed: 10-05-88
Date Reported: 11-01-88
Dilution Factor: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88092516	418.1	<1.5	<1.5	39.5	29.6	75	30.4	77	3	*

2563

* Reporting limit for the samples in this batch is provided by the sub-contract laboratory.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092322-88092325
88092327-88092332
88092348-88092356, 88092388

QC Report No: VGC-W-0051-88
Sample Matrix: Water
Conc. Unit: ug/L
Date Received: NA
Date Prepared: NA
Date Analyzed: 9-26-88
Date Reported: 10-27-88
Dilution Factor: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88092388	1,1-Dichloroethane	10	ND	9.50	95	9.36	94	2	26	70-130
	Trichloroethene	10	ND	11.3	113	10.8	108	5	19	65-131
	Chlorobenzene	10	ND	11.4	114	11.2	112	2	40	59-137
	Aromatics: 8020									
88092388	Benzene	10	ND	11.1	111	11.3	113	2	20	56-146
	Toluene	10	ND	11.4	114	11.6	116	2	41	42-150
	Chlorobenzene	10	ND	10.5	105	11.2	112	6	36	76-133

2564

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Water
Conc. Unit: ug/L
Date Reported: 10-31-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
82	9-20-88	VGC	Carbopack	75-09-2	Dichloromethane	1.4	0.25	88092348-88092349
				67-66-3	Chloroform	0.42	0.05	88092354-88092356
35	9-15-88	VGC	Carbopack	75-09-2	Dichloromethane	1.4	0.25	88092350-88092353

2565

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: ICP-W-0050-88
Sample Matrix: Water
Conc. Unit: ug/L
Date Received: 9-13-88
Date Reported: 11-07-88
Dilution Factor: NA

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092348-88092350, 88092354-88092355
88092388-88092390, 88092422-88092427, 88082189

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Barium	88092348	88092348	10-20-88	10-18-88	6010	<0.2	0.089	0.064	NC	2.00	0.089	2.47	119	A
Cadmium	88092348	88092348	10-20-88	10-18-88	6010	<0.005	<0.001	<0.001	NC	0.050	<0.001	0.038	76	

2566

A - See Case Narrative attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: ICP-W-0050-88

The Relative Percent Difference is not calculated for Barium since the sample values are less than five times the reporting limit. Acceptable RPD in this case is defined as duplicate values within one detection limit of each other.

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: AAF-W-0031-88
Sample Matrix: Water
Conc. Unit: ug/L
Date Received: 8-31-88
Date Reported: 11-07-88
Dilution Factor: NA

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092348-88092350, 88092354-88092355, 88092317
88092388-88092390, 88092422-88092427, 88092189

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Arsenic	88082189	88082189	10-26-88	10-18-88	7060	<0.010	<0.005	<0.005	NC	0.040	<0.005	0.0517	129N	
Chromium	88082189	88082189	10-26-88	10-18-88	6010	<0.005	<0.002	<0.002	NC	20.0	<0.002	21.6	108	
Lead	88082189	88082189	10-25-88	10-18-88	7421	<0.010	<0.005	<0.005	NC	0.020	<0.005	0.0227	114	

8952

N - See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

DATA PACKAGE #45

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ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received by this laboratory on 8-22-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082043	DANGB-4-MW22-SS1	BA-I	8-20-88		9-19-88	
88082043	DANGB-4-MW22-SS1	CD-F	8-20-88		9-19-88	
88082043	DANGB-4-MW22-SS1	CR-F	8-20-88		9-19-88	
88082043	DANGB-4-MW22-SS1	PB-F	8-20-88		10-04-88/10-05-88	
88082043	DANGB-4-MW22-SS1	418.1	8-20-88	9-15-88	9-15-88	
88082043	DANGB-4-MW22-SS1	MOIS	8-20-88		8-31-88	
88082043	DANGB-4-MW22-SS1	8010	8-20-88		8-31-88	9-02-88
88082043	DANGB-4-MW22-SS1	8020	8-20-88		8-31-88	8-31-88
88082043	DANGB-4-MW22-SS1	8080	8-20-88	8-31-88	10-03-88	
88082044	DANGB-4-MW22-SS2	BA-I	8-20-88		9-19-88	
88082044	DANGB-4-MW22-SS2	CD-F	8-20-88		9-19-88	
88082044	DANGB-4-MW22-SS2	CR-F	8-20-88		9-19-88	
88082044	DANGB-4-MW22-SS2	PB-F	8-20-88		10-04-88/10-05-88	
88082044	DANGB-4-MW22-SS2	418.1	8-20-88	9-15-88	9-15-88	
88082044	DANGB-4-MW22-SS2	MOIS	8-20-88		8-31-88	
88082044	DANGB-4-MW22-SS2	8010	8-20-88		8-31-88	9-02-88
88082044	DANGB-4-MW22-SS2	8020	8-20-88		8-31-88	8-31-88
88082044	DANGB-4-MW22-SS2	8080	8-20-88	8-30-88	10-03-88	

* If applicable

ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082045	DANGB-4-MW22-SS3	BA-I	8-20-88		9-19-88	
88082045	DANGB-4-MW22-SS3	CD-F	8-20-88		9-19-88	
88082045	DANGB-4-MW22-SS3	CR-F	8-20-88		9-19-88	
88082045	DANGB-4-MW22-SS3	PB-F	8-20-88		10-04-88/10-05-88	
88082045	DANGB-4-MW22-SS3	418.1	8-20-88	9-15-88	9-15-88	
88082045	DANGB-4-MW22-SS3	MOIS	8-20-88		8-31-88	
88082045	DANGB-4-MW22-SS3	8010	8-20-88		9-01-88	9-02-88
88082045	DANGB-4-MW22-SS3	8020	8-20-88		9-01-88	9-01-88
88082045	DANGB-4-MW22-SS3	8080	8-20-88	8-30-88	10-03-88	
88082046	DANGB-4-MW21-SS1	BA-I	8-20-88		9-19-88	
88082046	DANGB-4-MW21-SS1	CD-F	8-20-88		9-19-88	
88082046	DANGB-4-MW21-SS1	CR-F	8-20-88		9-19-88	
88082046	DANGB-4-MW21-SS1	PB-F	8-20-88		10-04-88/10-05-88	
88082046	DANGB-4-MW21-SS1	418.1	8-20-88	9-15-88	9-15-88	
88082046	DANGB-4-MW21-SS1	MOIS	8-20-88		9-02-88	
88082046	DANGB-4-MW21-SS1	8010	8-20-88		9-01-88	9-02-88
88082046	DANGB-4-MW21-SS1	8020	8-20-88		9-01-88	9-01-88
88082046	DANGB-4-MW21-SS1	8080	8-20-88	8-30-88	10-03-88	10-03-88
88082047	DANGB-4-MW21-SS2	BA-I	8-20-88		9-19-88	
88082047	DANGB-4-MW21-SS2	CD-F	8-20-88		9-19-88	
88082047	DANGB-4-MW21-SS2	CR-F	8-20-88		9-19-88	
88082047	DANGB-4-MW21-SS2	PB-F	8-20-88		10-04-88/10-05-88	
88082047	DANGB-4-MW21-SS2	418.1	8-20-88	9-15-88	9-15-88	
88082047	DANGB-4-MW21-SS2	MOIS	8-20-88		8-31-88	
88082047	DANGB-4-MW21-SS2	8010	8-20-88		9-01-88	9-02-88
88082047	DANGB-4-MW21-SS2	8020	8-20-88		9-01-88	9-01-88
88082047	DANGB-4-MW21-SS2	8080	8-20-88	8-31-88	10-03-88	

* If applicable

ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082048	DANGB-4-MW21-SS3	BA-I	8-20-88		9-19-88	
88082048	DANGB-4-MW21-SS3	CD-F	8-20-88		9-19-88	
88082048	DANGB-4-MW21-SS3	CR-F	8-20-88		9-19-88	
88082048	DANGB-4-MW21-SS3	PB-F	8-20-88		10-04-88/10-05-88	
88082048	DANGB-4-MW21-SS3	418.1	8-20-88	9-15-88	9-15-88	
88082048	DANGB-4-MW21-SS3	MOIS	8-20-88		8-31-88	
88082048	DANGB-4-MW21-SS3	8010	8-20-88		9-01-88	9-02-88
88082048	DANGB-4-MW21-SS3	8020	8-20-88		9-01-88	9-01-88
88082048	DANGB-4-MW21-SS3	8080	8-20-88	8-30-88	10-03-88	
88082049	DANGB-4-MP21-SS2	BA-I	8-20-88		9-19-88	
88082049	DANGB-4-MP21-SS2	CD-F	8-20-88		9-19-88	
88082049	DANGB-4-MP21-SS2	CR-F	8-20-88		9-19-88	
88082049	DANGB-4-MP21-SS2	PB-F	8-20-88		10-04-88/10-05-88	
88082049	DANGB-4-MP21-SS2	418.1	8-20-88	9-15-88	9-15-88	
88082049	DANGB-4-MP21-SS2	MOIS	8-20-88		8-31-88	
88082049	DANGB-4-MP21-SS2	8010	8-20-88		9-01-88	9-02-88
88082049	DANGB-4-MP21-SS2	8020	8-20-88		9-01-88	9-01-88
88082049	DANGB-4-MP21-SS2	8080	8-20-88	8-30-88	10-03-88	

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082043-88082049
WORK ORDER NO.: 894

These soil samples were received at the ES Berkeley Laboratory on 8-22-88. They were received cold and intact.

Due to a suspected interelement matrix interference, all cadmium data at levels reportable by ICP analysis ($\geq$1 mg/KG dry wt.) are potentially false positives. This is being investigated and follow-up will be provided when available.

ANALYSIS REPORT

ORK ORDER NUMBER: 894
OB NUMBER : ZB0000000440
WORK ORDER DATE : 08/22/88

APPROVED BY _____
Lab Supervisor

EPORT DATA:
S OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
ILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

ONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

ASK: 2, UNITS: mg/Kg

EST COMPOUND	DANGB4-MW22-SS1 8-19-88 88082043	DANGB-4-MW22-SS2 88082044	DANGB-4-MW22-SS3 88082045	DANGB-4-MW21-SS1 88082046	DANGB-4-MW21-SS2 88082047	DANGB-4-MW21-SS3 88082048
ACID DIG SOIL	NA	NA	NA	NA	NA	NA
ARIUM	91.7*	85.6*	39.1*	58.3 *	67.8*	49.1*
ADMIUM	0.32B	11.0*N E	9.7*NE	10.8*N E	10.9*NE	10.7*N E
CHROMIUM	11.0	36.8	26.7	30.1	33.1	39.4
EAD	6.5S*	5.9*	2.9*	5.4*	7.3*S	3.2*

A- NOT APPLICABLE
ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 894

SK: 2, UNITS: mg/Kg

ST COMPOUND	DANGB-4-MP21-SS2 88082049
ID DIG SOIL	NA
RIUM	61.0*
DMIUM	10.4*NE
ROMIUM	34.3
AD	3.8*

- NOT APPLICABLE
* Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 894
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/22/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
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710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/Kg

TEST COMPOUND	DANGB4-MW22-SS1 8-19-88 88082043	DANGB-4-MW22-SS2 88082044	DANGB-4-MW22-SS3 88082045	DANGB-4-MW21-SS1 88082046	DANGB-4-MW21-SS2 88082047	DANGB-4-MW21-SS3 88082048
418.1 PETROLEUM HYDROCARBONS	530	<100	<100	<100	<100	<100
% MOISTURE	73.6	21.8	10.5	11.7	19.3	7.2

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 894

ASK: 3, UNITS: mg/Kg

TEST COMPOUND	DANGB-4-MP21-SS2 88082049
8.1 PETROLEUM HYDROCARBONS	<100
MOISTURE	19.2

- Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 894
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/22/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/KG, GROUP 8010

TEST COMPOUND	DANGB4-MW22-SS1 8-19-88 88082043	DANGB-4-MW22-SS2 88082044	DANGB-4-MW22-SS3 88082045	DANGB-4-MW21-SS1 88082046	DANGB-4-MW21-SS2 88082047	DANGB-4-MW21-SS3 88082048
BENZYL CHLORIDE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	1.1	0.56	ND	ND	ND
-CHLOROHEXANE	ND	ND	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND	ND	ND	ND
,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
DICHLOROMETHANE	17B	4.6B	6.0B	6.7B	3.5B	2.8B
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 894

.ST COMPOUND	DANGB4-MW22-SS1 8-19-88 88082043	DANGB-4-MW22-SS2 88082044	DANGB-4-MW22-SS3 88082045	DANGB-4-MW21-SS1 88082046	DANGB-4-MW21-SS2 88082047	DANGB-4-MW21-SS3 88082048
.3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
:TRACHLOROETHYLENE	ND	ND	ND	ND	ND	ND
1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
'ICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
:ICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
'ICHLOROPROPANE	ND	ND	ND	ND	ND	ND
.NYL CHLORIDE	ND	ND	ND	ND	ND	ND

- Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 894
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/22/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/KG, GROUP 8020

TEST COMPOUND	DANGB4-MW22-SS1 8-19-88 88082043	DANGB-4-MW22-SS2 88082044	DANGB-4-MW22-SS3 88082045	DANGB-4-MW21-SS1 88082046	DANGB-4-MW21-SS2 88082047	DANGB-4-MW21-SS3 88082048
BENZENE	ND	ND	ND	ND	11	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
ETHYL BENZENE	ND	ND	ND	ND	ND	ND
TOLUENE	120	100	830	330	120	53
XYLENES	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 894

SK: 4, UNITS: ug/KG, GROUP 8010

ST COMPOUND	DANGB-4-MP21-SS2 88082049
NZYL CHLORIDE	ND
S (2-CHLOROETHOXY)METHANE	ND
S (2-CHLOROISOPROPYL)ETHER	ND
OMOBENZENE	ND
OMODICHLOROMETHANE	ND
OMOFORM	ND
OMOETHANE	ND
RBON TETRACHLORIDE	ND
LORACETALDEHYDE	ND
LORAL	ND
LOROBENZENE	ND
LOROETHANE	ND
LOROFORM	ND
CHLOROHEXANE	ND
-CHLOROETHYL VINYL ETHER	ND
LOROMETHANE	ND
LOROMETHYL METHYL ETHER	ND
LOROTOLUENE	ND
BROMOCHLOROMETHANE	ND
BROMOMETHANE	ND
2-DICHLOROBENZENE	ND
3-DICHLOROBENZENE	ND
4-DICHLOROBENZENE	ND
CHLORODIFLUOROMETHANE	ND
1-DICHLOROETHANE	ND
2-DICHLOROETHANE	ND
1-DICHLOROETHYLENE	ND
ANS-1,2-DICHLOROETHYLENE	ND
CHLOROMETHANE	2.7B
2-DICHLOROPROPANE	ND
3-DICHLOROPROPYLENE	ND
1,2,2-TETRACHLOROETHANE	ND
1,1,2-TETRACHLOROETHANE	ND
TRACHLOROETHYLENE	ND
1,1-TRICHLOROETHANE	ND
1,2-TRICHLOROETHANE	ND
ICHLOROETHYLENE	ND
ICHLOROFLUOROMETHANE	ND
ICHLOROPROPANE	ND
NYL CHLORIDE	ND

- Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 894

TASK: 4, UNITS: ug/KG, GROUP 8020

TEST COMPOUND	DANGB-4-MP21-SS2 88082049
BENZENE	10
CHLOROBENZENE	ND
1,2-DICHLOROBENZENE	ND
1,3-DICHLOROBENZENE	ND
1,4-DICHLOROBENZENE	ND
ETHYL BENZENE	ND
TOLUENE	32
XYLENES	4.1

ND - Not Detected

ANALYSIS REPORT

)RK ORDER NUMBER: 894
)B NUMBER : ZB0000000440
)RK ORDER DATE : 08/22/88

APPROVED BY _____
Lab Supervisor

:PORT DATA:
; OAK RIDGE/DULUTH ANGB
0 S. ILLINOIS AVE. STE. S103
.K RIDGE, TN 37830
LL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

)NTRACT / PO # : OR001
)NTACT : BILL HAYDEN
(615)-481-3920

.SK: 4, UNITS: ug/Kg, GROUP 8080

'ST COMPOUND	DANGB4-MW22-SS1 8-19-88 88082043	DANGB-4-MW22-SS2 88082044	DANGB-4-MW22-SS3 88082045	DANGB-4-MW21-SS1 88082046	DANGB-4-MW21-SS2 88082047	DANGB-4-MW21-SS3 88082048
DRIN	ND	ND	ND	ND	ND	ND
.PHA-BHC	ND	ND	ND	ND	ND	ND
TA-BHC	ND	ND	ND	ND	ND	ND
:LTA-BHC	ND	ND	ND	ND	ND	ND
.MMA-BHC	ND	ND	ND	ND	ND	ND
:LORDANE	ND	ND	ND	ND	ND	ND
4'-DDD	ND	ND	ND	ND	ND	ND
4'-DDE	ND	ND	ND	ND	ND	ND
4'-DDT	ND	ND	ND	19	ND	ND
ELDRIN	ND	ND	ND	ND	ND	ND
:DOSULFAN I	ND	ND	ND	ND	ND	ND
:DOSULFAN II	ND	ND	ND	ND	ND	ND
:DOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
:DRIN	ND	ND	ND	ND	ND	ND
:DRIN ALDEHYDE	NA	NA	NA	NA	NA	NA
'PTACHLOR	ND	ND	ND	ND	ND	ND
PTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
.PONE	NA	NA	NA	NA	NA	NA
THOXYCHLOR	ND	ND	ND	ND	ND	ND
)XAPHENE	ND	ND	ND	ND	ND	ND
:B-1016	ND	ND	ND	ND	ND	ND
:B-1221	ND	ND	ND	ND	ND	ND
:B-1232	ND	ND	ND	ND	ND	ND
:B-1242	ND	ND	ND	ND	ND	ND
:B-1248	ND	ND	ND	ND	ND	ND
'B-1254	ND	ND	ND	ND	ND	ND
:B-1260	ND	ND	ND	ND	ND	ND

- Not Detected

A - Not Analyzed

ANALYSIS REPORT FOR WORK ORDER NUMBER 894

TASK: 4, UNITS: ug/Kg, GROUP 8080

TEST COMPOUND	DANGB-4-MP21-SS2 88082049
ALDRIN	ND
ALPHA-BHC	ND
BETA-BHC	ND
DELTA-BHC	ND
GAMMA-BHC	ND
CHLORDANE	ND
4,4'-DDD	ND
4,4'-DDE	ND
4,4'-DDT	ND
DIELDRIN	ND
ENDOSULFAN I	ND
ENDOSULFAN II	ND
ENDOSULFAN SULFATE	ND
ENDRIN	ND
ENDRIN ALDEHYDE	NA
HEPTACHLOR	ND
HEPTACHLOR EPOXIDE	ND
KEPONE	NA
METHOXYCHLOR	ND
TOXAPHENE	ND
PCB-1016	ND
PCB-1221	ND
PCB-1232	ND
PCB-1242	ND
PCB-1248	ND
PCB-1254	ND
PCB-1260	ND

ND - Not Detected

NA - Not Analyzed

CHAIN OF CUSTODY RECORD 894

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature) Jo-Ann Shermin
Peter E Riemersma

SHIP TO:
ENGINEERING-SCIENCE LABORATORY, INC.
600 Bancroft Way
Berkeley, CA. 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SW8010, 8020	SW8080	SW8270	EPA 418.1	SW8010, 7191	SW7131, 7421			REMARKS
8/20/88	8:15a	DANGB-4-MW22 SS1	1	X	X							932043
8/20/88	8:15a	DANGB-4-MW22 SS1	1				X	X	X			
8/20/88	8:35a	DANGB-4-MW22 SS2	1	X	X							932044
8/20/88	8:35a	DANGB-4-MW22 SS2	1				X	X	X			
8/20/88	9:20a	DANGB-4-MW22 SS3	1	X	X							932045
8/20/88	9:20a	DANGB-4-MW22 SS3	1				X	X	X			
8/20/88	1:45p	DANGB-4-MW21 SS1	1	X	X							932046
8/20/88	1:45p	DANGB-4-MW21 SS1	1				X	X	X			
8/20/88	2:20p	DANGB-4-MW21 SS2	1	X	X							
8/20/88	3:20p	DANGB-4-MP21 SS2	1	X	X							
8/20/88	2:20p	DANGB-4-MW21 SS2	1				X	X	X			932047
8/20/88	3:20p	DANGB-4-MP21 SS2	1				X	X	X			932048
8/20/88	3:55p	DANGB-4-MW21 SS3	1	X	X							
8/20/88	3:55p	DANGB-4-MW21 SS3	1				X	X	X			932049

6953

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Jo-Ann Shermin	8/20/88 4:30p				
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	
		Kathleen C. Lida	8-22-88 1300	Rec'd cold & intact	

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88081969-88081977
88082043-88082049

QC Report No: ICP-S-0031-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-19-88
Date Reported: 10-26-88
Dilution Factor: NA
%Moisture: 8.1

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	SA	Spike Recovery SR	Spike Recovery SSR	PR	Notes
Barium	88081976	88081976	9-10-88	9-11-88	SW6010	<20	57.6	104	58*	218	57.6	271	98	
Cadmium	88081976	88081976	9-10-88	9-11-88	SW6010	<0.5	11.5	9.25	22*	5.44	11.5	14.3	51N	
Chromium	88081976	88081976	9-10-88	9-11-88	SW6010	<1.0	28.9	27.5	5	21.8	28.9	52.2	107	

23987

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Case Narrative attached.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88081969-88031976, 88082043-88082049
SAMPLE NO(S).: 88082099-88082101, 88082102-88082104
SAMPLE NO(S).: 88082130-88082133, 88082146-88082148
QC REPORT NO.: ICP-S-0028-88
QC REPORT NO.: ICP-S-0031-88

Due to a suspected interelement matrix interference, all cadmium data at levels reportable by ICP analysis ($\geq$1 mg/KG dry weight) are potentially false positives. This is being investigated and follow-up will be provided when available.

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082131-88082133, 88082043-88082049
88082100-88082104, 88082146-88082148

QC Report No: AAF-S-0028-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-26-88
Date Reported: 10-13-88
Dilution Factor: See Notes
%Moisture: 7.8

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	SA	Spike Recovery SR	Spike Recovery SSR	PR	Notes
Arsenic	88082133	88082133	10-06-88	9-23-88	7060	<0.5	<0.5E	<0.5E	NC	4.34	2.71E	4.99E	53	DF=10
Lead	88082133	88082133	10-04-88	9-23-88	7421	<0.5	2.82	3.53	22*	5.42	2.82	8.59	106	DF=NA

2589

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
E See Legend attached.
* See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88081898-88081906, 88082000-88082002
88082043-88082049

QC Report No: TPH-S-0050-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-17-88
Date Prepared: 9-12-88
Date Analyzed: 9-13-88
Date Reported: NA
Dilution Factor: 6
%Moisture: 22.2

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	Pk	MSD	PR	RPD	Notes
88081903	418.1	<100	<100	1300	1000	77	820	63	20	*

2590

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* Percent recovery (PR) and relative percent difference (RPD) are within ES Laboratory control limits.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88081898-88081906, 88082000-88082002
88082043-88082049

QC Report No: TPH-S-0050-88B
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: NA
Date Prepared: 9-12-88
Date Analyzed: 9-13-88
Date Reported: 11-15-88
Dilution Factor: NA
%Moisture: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
Blank	418.1	<100	<100	1000	770	77	680	68	12	

2591

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082043-88082049
88082099-88082104
88082130-88082133

QC Report No: VGC-S-0042-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-26-88
Date Prepared: NA
Date Analyzed: 9-07-88
Date Reported: 10-10-88
Dilution Factor: NA
% Moisture: 8.4

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88082130	1,1-dichloroethane	10.9	ND	11.2	103	11.7	107	4	20	58-124
	Trichloroethene	10.9	ND	9.0	83	8.7	80	3	16	75-110
	Chlorobenzene	10.9	ND	9.0	83	9.3	85	3	21	71-125
	Aromatics: 8020									
88082130	Benzene	10.9	ND	9.7	89	9.3	85	4	26	75-123
	Toluene	10.9	0.7	9.8	83	9.7	83	1	16	79-115
	Chlorobenzene	10.9	ND	9.6	88	9.2	84	4	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* The QC analysis was performed on the confirmatory column. Therefore, the sample result (SR) value for toluene is not the same as the one appearing on the final result form for the sample.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/KG
Date Reported: 10-10-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
11	9-01-88	VGC	Carbopack	75-09-2	Dichloromethane	3.4	0.5	88082043-88082049

2593

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082043-88082049

QC Report No.: OCP-S-0032-88
QC Sample No.: 88082004
Level (Low/Med): Low
Date Reported: 12-27-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2280	ND	49.3	65	46-127
Heptachlor	2280	ND	102	135*	35-130
Aldrin	2280	ND	263	347*	34-132
Dieldrin	5690	ND	1425	752*	31-134
Endrin	5690	ND	247	130	42-139
4,4'-DDT	5690	ND	646	341*	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	47.6	63	65	4	50	46-127
Heptachlor	93.0	123	135	9	31	35-130
Aldrin	238	314*	347*	10	43	34-132
Dieldrin	1246	658*	752*	13	38	31-134
Endrin	200	105	130	21	45	42-139
4,4'-DDT	627	331*	341*	3	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 6 out of 12 outside limits

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082043-88082049

QC Report No.: OCP-S-0032-88B
QC Sample No.: Blank
Level (Low/Med): Low
Date Reported: 12-27-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	0	59.6	89	46-127
Heptachlor	2000	0	62.8	94	35-130
Aldrin	2000	0	61.9	93	34-132
Dieldrin	5000	0	86.6	52	31-134
Endrin	5000	0	47.8	29	42-139
4,4'-DDT	5000	0	156	94	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	56.5	85	89	5	50	46-127
Heptachlor	57.9	87	94	8	31	35-130
Aldrin	57.4	86	93	8	43	34-132
Dieldrin	181	109	52	71*	38	31-134
Endrin	161	97	29	68*	45	42-139
4,4'-DDT	166	100	94	6	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 2 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082047, 88082043

QC Report No.: OCP-S-0032-88
QC Sample No.: 88082047
Level (Low/Med): Med
Date Reported: 11-10-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	1240	ND	1250	101	46-127
Heptachlor	1240	ND	1340	108	35-130
Aldrin	1240	ND	1390	112	34-132
Dieldrin	3100	ND	3640	117	31-134
Endrin	3100	ND	3350	108	42-139
4,4'-DDT	3100	ND	3030	98	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	1220	98	101	2	50	46-127
Heptachlor	1330	107	108	1	31	35-130
Aldrin	1340	109	112	4	43	34-132
Dieldrin	3680	119	117	1	38	31-134
Endrin	3230	104	108	4	45	42-139
4,4'-DDT	3180	103	98	5	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082043, 88082047

QC Report No.: OCP-S-0032-88B
QC Sample No.: Blank
Level (Low/Med): Med
Date Reported: 11-10-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	ND	59.6	89	46-127
Heptachlor	2000	ND	62.8	94	35-130
Aldrin	2000	ND	61.9	93	34-132
Dieldrin	5000	ND	86.6	52	31-134
Endrin	5000	ND	47.8	29*	42-139
4,4'-DDT	5000	ND	156	94	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	56.5	85	89	5	50	46-127
Heptachlor	57.9	87	94	8	31	35-130
Aldrin	57.4	86	93	8	43	34-132
Dieldrin	181	109	52	71*	38	31-134
Endrin	161	97	29*	68*	45	42-139
4,4'-DDT	166	100	94	6	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 2 out of 6 outside limits

Spike Recovery: 1 out of 12 outside limits

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-S-0032-88
QC REPORT NO.: OCP-S-0032-88B

The low level matrix spike sample required dilution for analysis. This evoked a large amount of inaccuracy in measuring spike recovery, particularly for aldrin, dieldrin and DDT. When spiked blanks were analyzed, recoveries for all spiked compounds were within EPA QC guidelines, but RPD's were poor for dieldrin and endrin.

Although the high level matrix spikes met EPA QC guidelines, analysis of spiked blanks showed one low recovery for endrin and high RPDs for endrin and dieldrin.

The data associated with these analyses were closely examined. No analytical errors were found.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up used on these samples.

The quality control sample for this batch is from a different project.

PESTICIDE METHOD BLANK SUMMARY

Job No.:	OR001	Lab Name:	Engineering Science
		Lab Sample No.:	Blank
Client:	ES Oak Ridge		
Attn:	Bill Hayden	Matrix:	Soil
Address:	710 S. Illinois Avenue	Level (low/med):	Med
	Suite F-103	Extraction:	
	Oak Ridge, Tn. 37830	(SepF/Cont/Sonc):	Sonc
		Date Reported:	11-11-88
Project:	Duluth ANG3		
Date Extracted:	8-31-88		
Date Analyzed (1):	9-27-88	Date Analyzed (2):	
Time Analyzed (1):	05:06	Time Analyzed (2):	
Instrument ID (1):	5890 #2	Instrument ID (2):	
GC Column ID (1):	OV-1	GC Column ID (2):	

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88082043	9-27-88		
-	88082047	9-27-88		

PESTICIDE METHOD BLANK SUMMARY

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Lab Sample No.: 88082043-2049
Lab File ID:
Matrix:
Level (low/med): Low
Extraction:
(SepF/Cont/Sonc):

Project: Duluth ANGB

Date Extracted: 8-30-88
Date Analyzed (1): 9-26-88
Time Analyzed (1): 21:34
Instrument ID (1): 5890 #2
GG Column ID (1): OV-1

Date Analyzed (2): 10-03-88
Time Analyzed (2): 19:03
Instrument ID (2): 5890 #2
GC Column ID (2): Mixed

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
	88082044	9-27-88	88082046	10-03-88
	88082045	9-27-88	88082004	10-03-88
	88082046	9-27-88		
	88082048	9-27-88		
	88082049	9-27-88		
	88082004	9-26-88		

ATILE CONTINUING CALIBRATION CHECK

Name:_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____

trument ID:CARBOPAK_____ Calibration Date(s):9/1/88

AB FILE ID:_12.13_____ Init. Calib. Date(s):8/30/88 / , 8/15/88

MPOUND	RRF	RRF50	%D
nzyl chloride	0.08	0.17	-111.57
is (2-chloroethoxy) thane	0.04		100.00
s (2-chloroisopropyl ther	0.26		100.00
omobenzene	1.21	1.35	-11.45
omodichloromethane	3.68	3.28	10.80
romoform	1.45	1.27	12.50
omomethane	0.26	0.28	-6.25
rbon tetrachloride	3.20	2.60	18.78
loroacetaldehyde			ERR
hlorobenzene	1.36	1.22	10.02
loroethane	0.55	0.38	30.05
loroform	4.50	3.46	23.15
-Chloroethane	0.92	0.81	12.14
Chloroethyl vinyl ether	0.04		100.00
loromethane	0.34	0.39	-16.16
hloromethyl methyl ether	0.17		100.00
,m_,& p_Chlorotoluenes	3.99	3.15	21.12
bromochloromethane	3.90	3.13	19.67
bromomethane	2.98	2.29	23.28
,2_Dichlorobenzene	2.48	1.82	26.64
3_Dichlorobenzene	1.94	1.56	19.83
4_Dichlorobenzene	2.47	1.78	27.76
ichlorodifluormethane	0.54		100.00
1_Dichloroethane	1.95	1.46	25.18
2_Dichloroethane	2.33	2.13	8.57
,1_Dichloroethylene	2.44	1.80	26.20
ans_1,2_dichloroethylene	1.51	1.51	0.26
chloromethane	4.21	2.71	35.69
,2_Dichloropropane	2.70	2.03	24.81
,3_Dichloropropylene	4.60	3.04	33.93
1,2,2_Tetrachloroethane	6.65	5.46	17.84
1,1,2_Tetrachloroethane	3.61	2.57	28.69
etrachloroethylene	6.65	5.46	17.89
1,1_Trichloroethane	2.20	1.79	18.61
1,2_Trichloroethane	4.60	3.04	33.91
richloroethylene	4.40	3.29	25.26
richlorofluoromethane	2.19	1.80	17.58
chloropropene	3.59	2.08	42.03
nyl chloride	1.08	0.73	32.17

2601

ATILE CONTINUING CALIBRATION CHECK

Name: ENGINEERING SCIENCE_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____ SDG No.:____

trument ID.: carbopak Calibration Date(s): 9/1/88 _____

FILE ID: RRF 50 __12_____ Intial calibratn: 8/30/88

MPOUND	RRF	RRF50	%D
nzene	4.27	4.07	-4.75
lorobenzene	4.19	5.13	22.54
2_Dichlorobenzene	2.24	1.88	-16.29
3_Dichlorobenzene	2.73	2.13	-21.81
4_Dichorobenzene	3.09	2.13	-30.92
yl Benzene	2.54	3.49	37.42
luene	3.22	3.72	15.56
lenes	8.05	6.75	-16.15

DATA PACKAGE #46

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ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received by this laboratory on 9-01-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092244	DANGB-BG-MW32-SS1	AS-F	8-31-88		10-11-88	
88092244	DANGB-BG-MW32-SS1	BA-I	8-31-88		10-20-88	
88092244	DANGB-BG-MW32-SS1	CD-F	8-31-88		10-20-88	
88092244	DANGB-BG-MW32-SS1	CR-F	8-31-88		10-20-88	
88092244	DANGB-BG-MW32-SS1	HG-C	8-31-88		9-22-88	
88092244	DANGB-BG-MW32-SS1	PB-F	8-31-88		10-20-88	
88092244	DANGB-BG-MW32-SS1	418.1	8-31-88	9-22-88	9-23-88	
88092244	DANGB-BG-MW32-SS1	MOIS	8-31-88		9-09-88	
88092244	DANGB-BG-MW32-SS1	8010	8-31-88		9-13-88	9-12-88
88092244	DANGB-BG-MW32-SS1	8020	8-31-88		9-13-88	9-11-88
88092244	DANGB-BG-MW32-SS1	8080	8-31-88	9-09-88	10-05-88	10-07-88
88092244	DANGB-BG-MW32-SS1	8270	8-31-88	9-10-88	10-21-88	

* If applicable

ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092245	DANGB-BG-MW32-SS4	AS-F	8-31-88		10-11-88	
88092245	DANGB-BG-MW32-SS4	BA-I	8-31-88		10-20-88	
88092245	DANGB-BG-MW32-SS4	CD-F	8-31-88		10-20-88	
88092245	DANGB-BG-MW32-SS4	CR-F	8-31-88		10-20-88	
88092245	DANGB-BG-MW32-SS4	HG-C	8-31-88		9-22-88	
88092245	DANGB-BG-MW32-SS4	PB-F	8-31-88		10-22-88	
88092245	DANGB-BG-MW32-SS4	418.1	8-31-88	9-22-88	9-23-88	
88092245	DANGB-BG-MW32-SS4	MOIS	8-31-88		9-09-88	
88092245	DANGB-BG-MW32-SS4	8010	8-31-88		9-13-88	9-12-88
88092245	DANGB-BG-MW32-SS4	8020	8-31-88		9-13-88	9-11-88
88092245	DANGB-BG-MW32-SS4	8080	8-31-88	9-09-88	10-05-88	
88092245	DANGB-BG-MW32-SS4	8270	8-31-88	9-10-88	10-21-88	
88092246	DANGB-SGC4-SS2	AS-F	8-31-88		10-11-88	
88092246	DANGB-SGC4-SS2	BA-I	8-31-88		10-20-88	
88092246	DANGB-SGC4-SS2	CD-F	8-31-88		10-20-88	
88092246	DANGB-SGC4-SS2	CR-F	8-31-88		10-20-88	
88092246	DANGB-SGC4-SS2	HG-C	8-31-88		9-22-88	
88092246	DANGB-SGC4-SS2	PB-F	8-31-88		10-22-88	
88092246	DANGB-SGC4-SS2	418.1	8-31-88	9-22-88	9-23-88	
88092246	DANGB-SGC4-SS2	MOIS	8-31-88		9-09-88	
88092246	DANGB-SGC4-SS2	8010	8-31-88		9-12-88	9-13-88
88092246	DANGB-SGC4-SS2	8020	8-31-88		9-13-88	9-11-88
88092246	DANGB-SGC4-SS2	8080	8-31-88	9-09-88	10-05-88	
88092246	DANGB-SGC4-SS2	8270	8-31-88	9-10-88	10-21-88	

* If applicable

ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
8809 2247	DANGB-SGC4-SS1	MOIS	8-31-88		9-09-88	
8809 2247	DANGB-SGC4-SS1	8010	8-31-88		9-12-88	9-13-88
8809 2247	DANGB-SGC4-SS1	8020	8-31-88		9-13-88	9-11-88
8809 2247	DANGB-SGC4-SS1	8080	8-31-88	9-09-88	10-05-88	
8809 2247	DANGB-SGC4-SS1	8270	8-31-88	9-10-88	10-21-88	
8809 2248	DANGB-SGE4-SS1	AS-F	8-31-88		10-11-88	
8809 2248	DANGB-SGE4-SS1	BA-I	8-31-88		10-20-88	
8809 2248	DANGB-SGE4-SS1	CD-F	8-31-88		10-20-88	
8809 2248	DANGB-SGE4-SS1	CR-F	8-31-88		10-20-88	
8809 2248	DANGB-SGE4-SS1	HG-C	8-31-88		9-22-88	
8809 2248	DANGB-SGE4-SS1	PB-F	8-31-88		10-20-88	
8809 2248	DANGB-SGE4-SS1	418.1	8-31-88	9-22-88	9-23-88	
8809 2248	DANGB-SGE4-SS1	MOIS	8-31-88		9-09-88	
8809 2248	DANGB-SGE4-SS1	8010	8-31-88		9-13-88	9-12-88
8809 2248	DANGB-SGE4-SS1	8020	8-31-88		9-13-88	9-11-88
8809 2248	DANGB-SGE4-SS1	8080	8-31-88	9-09-88	10-05-88	
8809 2248	DANGB-SGE4-SS1	8270	8-31-88	9-10-88	10-24-88	
8809 2249	DANGB-SGE4-SS1	AS-F	8-31-88		10-11-88	
8809 2249	DANGB-SGE4-SS1	BA-I	8-31-88		10-20-88	
8809 2249	DANGB-SGE4-SS1	CD-F	8-31-88		10-20-88	
8809 2249	DANGB-SGE4-SS1	CR-F	8-31-88		10-20-88	
8809 2249	DANGB-SGE4-SS1	HG-C	8-31-88		9-22-88	
8809 2249	DANGB-SGE4-SS1	PB-F	8-31-88		10-22-88	
8809 2249	DANGB-SGE4-SS1	418.1	8-31-88	9-22-88	9-23-88	
8809 2249	DANGB-SGE4-SS1	MOIS	8-31-88		9-09-88	
8809 2249	DANGB-SGE4-SS1	8010	8-31-88		9-13-88	9-12-88
8809 2249	DANGB-SGE4-SS1	8020	8-31-88		9-13-88	9-11-88
8809 2249	DANGB-SGE4-SS1	8080	8-31-88	9-09-88	10-05-88	
8809 2249	DANGB-SGE4-SS1	8270	8-31-88	9-10-88	10-24-88	

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092244-88092249
WORK ORDER NO.: 940

These soil samples were received at the ES Berkeley Laboratory on 9-01-88. They were received cold and intact.

The initial 8270 analysis of these samples was performed one day out of holding time. Analysis of 88092247, 88092248 and 88092249 showed low area counts for the last internal standard in each sample. Re-analysis of the extract of sample 88092247 did not change the result. This indiates a matrix effect. Re-analysis of samples 88092248 and 88092249 resulted in good area counts for all internal standards. Results of the second analysis for these two samples are presented in this report. Since no target compounds were found in these samples, the low internal standard area counts should not affect the results of these analyses.

Sample 88092247 (DANGB,SGC4,SS1) was broken in-house, therefore, the metals and petroleum hydrocarbons could not be analyzed. This sample was re-sampled in order to complete the requested analysis.

ANALYSIS REPORT

WORK ORDER NUMBER: 940
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/01/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/Kg

TEST COMPOUND	DANGB,BG,MW32, SS1 88092244	DANGB,BG,MW32, SS4 88092245	DANGB,SGC4,SS2 88092246	DANGB,SGC4,SS1 88092247	DANGB,SGE4,SS1 88092248	DANGB,SGE4,SS2 88092249
ACID DIG SOIL	NA	NA	NA	NT	NA	NA
ARSENIC	<5.0E	<5.0E	5.4E	NT	<5.0E	<5.0
BARIUM	103	93.4	57.9	NT	39.7	44.0
CADMIUM	7.8N	6.8N	19.2N	NT	5.7N	6.0N
CHROMIUM	17.1	14.4	44.6	NT	25.9	26.6
MERCURY	<0.1	<0.1	<0.1	NT	<0.1	<0.1
LEAD	9.9	16.6	126	NT	4.5	4.5

NA- NOT APPLICABLE
NT- NOT TESTED
ND - Not Detected

ANALYSIS REPORT

)RK ORDER NUMBER: 940
)B NUMBER : ZB0000000440
)RK ORDER DATE : 09/01/88

APPROVED BY _____
Lab Supervisor

:PORT DATA:
; OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
\K RIDGE, TN 37830
'LL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

)NTRACT / PO # : OR001
)NTACT : BILL HAYDEN
(615)-481-3920

\SK: 3, UNITS: mg/Kg

:ST COMPOUND	DANGB,BG,MW32, SS1 88092244	DANGB,BG,MW32, SS4 88092245	DANGB,SGC4,SS2 88092246	DANGB,SGC4,SS1 88092247	DANGB,SGE4,SS1 88092248	DANGB,SGE4,SS2 88092249
:8.1 PETROLEUM HYDROCARBONS	21	13	16	NT	31	23
MOISTURE	17.4	15.0	5.6	5.7	10.0	8.5

:- NOT TESTED
) - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 940
JOB NUMBER : ZB000G0000440
WORK ORDER DATE : 09/01/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8010

TEST COMPOUND	DANGB,BG,MW32, SS1 88092244	DANGB,BG,MW32, SS4 88092245	DANGB,SGC4,SS2 88092246	DANGB,SGC4,SS1 88092247	DANGB,SGE4,SS1 88092248	DANGB,SGE4,SS2 88092249
BENZYL CHLORIDE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND	3.5	ND
1-CHLOROHEXANE	ND	ND	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
DICHLOROMETHANE	1.2B	0.41B	0.30B	0.41B	4.6B	0.55B
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 940

:ST COMPOUND	DANGB,BG,MW32, SS1 88092244	DANGB,BG,MW32, SS4 88092245	DANGB,SGC4,SS2 88092246	DANGB,SGC4,SS1 88092247	DANGB,SGE4,SS1 88092248	DANGB,SGE4,SS2 88092249
3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
.1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
:TRACHLOROETHYLENE	ND	ND	ND	ND	ND	ND
1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
.1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
:ICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
:ICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
:ICHLOROPROPANE	ND	ND	ND	ND	ND	ND
!NYL CHLORIDE	ND	ND	ND	ND	ND	ND

- Not Detected

ANALYSIS REPORT

ORK ORDER NUMBER: 940
OB NUMBER : ZB0000000440
WORK ORDER DATE : 09/01/88

APPROVED BY _____
Lab Supervisor

EPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
AK RIDGE, TN 37830
ILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

ONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

ASK: 4, UNITS: ug/Kg, GROUP 8020

EST COMPOUND	DANGB,BG,MW32, SS1 88092244	DANGB,BG,MW32, SS4 88092245	DANGB,SGC4,SS2 88092246	DANGB,SGC4,SS1 88092247	DANGB,SGE4,SS1 88092248	DANGB,SGE4,SS2 88092249
ENZENE	ND	ND	ND	ND	ND	ND
HLOROBENZENE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
THYL BENZENE	ND	ND	ND	ND	ND	ND
TOLUENE	ND	1.0	0.76	0.92	140	140
YLENES	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT

ORK ORDER NUMBER: 940
OB NUMBER : ZB0000000440
ORK ORDER DATE : 09/01/88

APPROVED BY _____
Lab Supervisor

EPORT DATA:
S OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
AK RIDGE, TN 37830
ILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

ONTRACT / PO # : OR001
ONTACT : BILL HAYDEN
(615)-481-3920

ASK: 4, UNITS: ug/Kg, GROUP 8080

EST COMPOUND	DANGB,BG,MW32, SS1 88092244	DANGB,BG,MW32, SS4 88092245	DANGB,SGC4,SS2 88092246	DANGB,SGC4,SS1 88092247	DANGB,SGE4,SS1 88092248	DANGB,SGE4,SS2 88092249
LDRIN	ND	ND	ND	ND	ND	ND
LPHA-BHC	ND	ND	ND	ND	ND	ND
ETA-BHC	ND	ND	ND	ND	ND	ND
ELTA-BHC	ND	ND	ND	ND	ND	ND
AMMA-BHC	ND	ND	ND	ND	ND	ND
HLORDANE	ND	ND	ND	ND	ND	ND
,4'-DDD	ND	ND	ND	ND	ND	ND
,4'-DDE	ND	ND	ND	ND	ND	ND
,4'-DDT	ND	ND	ND	42	ND	ND
IELDRIN	ND	ND	ND	ND	ND	ND
NDOSULFAN I	ND	ND	ND	ND	ND	ND
NDOSULFAN II	ND	ND	ND	ND	ND	ND
NDOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
NDRIN	ND	ND	ND	ND	ND	ND
NDRIN ALDEHYDE	NA	NA	NA	NA	NA	NA
EPTACHLOR	ND	ND	ND	ND	ND	ND
EPTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
EPONE	NA	NA	NA	NA	NA	NA
ETHOXYCHLOR	ND	ND	ND	ND	ND	ND
OXAPHENE	ND	ND	ND	ND	ND	ND
CB-1016	ND	ND	ND	ND	ND	ND
CB-1221	ND	ND	ND	ND	ND	ND
CB-1232	ND	ND	ND	ND	ND	ND
CB-1242	ND	ND	ND	ND	ND	ND
CB-1248	ND	ND	ND	ND	ND	ND
CB-1254	ND	ND	1100	300	ND	ND
CB-1260	ND	ND	ND	ND	ND	ND

A- NOT ANALYZED
) - Not Detected

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092244	88092245
Sample No.:	DANGB-BG-MW32-SS1	DANGB-BG-MW32-SS4
Date Sampled:	8-31-88	8-31-88
Time Sampled:	10:45	10:45
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	17	15

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Cnloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
. Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: September 1, 1988 Work Order: 940
Date Reported: December 8, 1988 Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB ATTN: Mr. Bill Hayden
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

Lab Number:	88092244	88092245
Sample No.:	DANGB-BG-MW32-SS1	DANGB-BG-MW32-SS4
Date Sampled:	8-31-88	8-31-88
Time Sampled:	10:45	10:45
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	17	15

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092244	88092245
Sample No.:	DANGB-BG-MW32-SS1	DANGB-BG-MW32-SS4
Date Sampled:	8-31-88	8-31-88
Time Sampled:	10:45	10:45
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	17	15

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88092244	88092245
Sample No.:	DANGB-BG-MW32-SS1	DANGB-BG-MW32-SS4
Date Sampled:	8-31-88	8-31-88
Time Sampled:	10:45	10:45
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	17	15

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address:710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092244	88092245
Sample No.:	DANGB-BG-MW32-SS1	DANGB-BG-MW32-SS4
Date Sampled:	8-31-88	8-31-88
Time Sampled:	10:45	10:45
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	17	15

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND

Laura Kuck
Analyst

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092246	88092247
Sample No.:	DANGB-SG-C4-SS2	DANGB-SG-C4-SS1
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:40	11:40
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	6	6

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092246	88092247
Sample No.:	DANGB-SG-C4-SS2	DANGB-SG-C4-SS1
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:40	11:40
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	6	6

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092246	88092247
Sample No.:	DANGB-SG-C4-SS2	DANGB-SG-C4-SS1
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:40	11:40
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	6	6

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88092246	88092247
Sample No.:	DANGB-SG-C1-SS2	DANGB-SG-C4-SS1
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:40	11:40
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	6	6

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092246	88092247
Sample No.:	DANGB-SG-C4-SS2	DANGB-SG-C4-SS1
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:40	11:40
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	6	6

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

b = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092248	88092249
Sample No.:	DANGB-SG-E4-SS1	DANGB-SG-E4-SS2
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:20	11:20
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-24-88	10-24-88
Percent Moisture:	10	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092248	88092249
Sample No.:	DANGB-SG-E4-SS1	DANGB-SG-E4-SS2
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:20	11:20
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-24-88	10-24-88
Percent Moisture:	10	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092248	88092249
Sample No.:	DANGB-SG-E4-SS1	DANGB-SG-E4-SS2
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:20	11:20
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-24-88	10-24-88
Percent Moisture:	10	8

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhycrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88092248	88092249
Sample No.:	DANGB-SG-E4-SS1	DANGB-SG-E4-SS2
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:20	11:20
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-24-88	10-24-88
Percent Moisture:	10	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092248	88092249
Sample No.:	DANGB-SG-E4-SS1	DANGB-SG-E4-SS2
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:20	11:20
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-24-88	10-24-88
Percent Moisture:	10	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
2-Chloropnenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichloropnenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD 940-1

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/ Duluth, Mn.

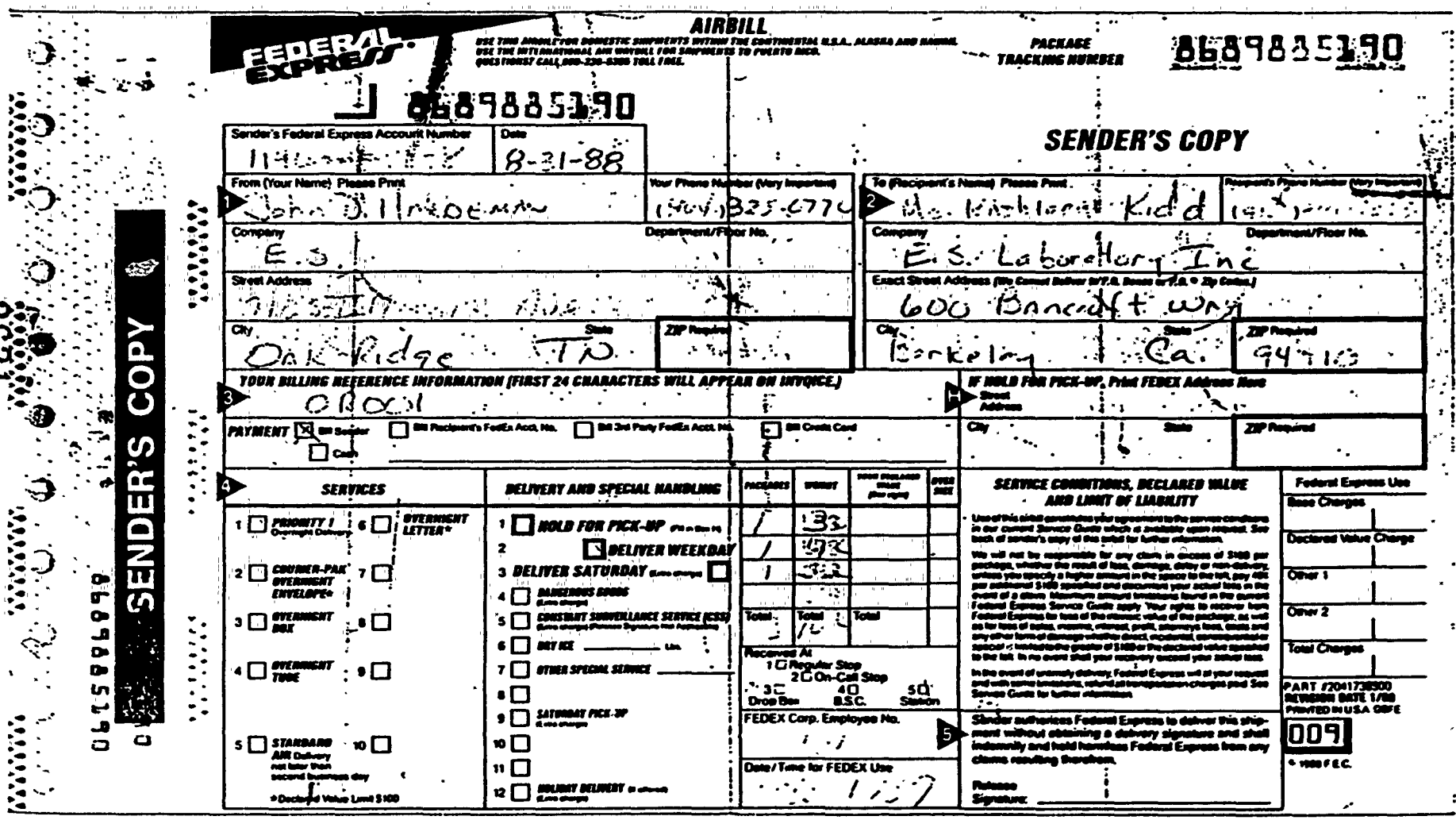
SAMPLER(S): (Signature) Mike Roddy

SHIP TO:
ENGINEERING-SCIENCE LABORATORY, INC.
600 Bancroft Way
Berkeley, CA. 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SOILS ANALYSES REQUIRED: SW8010, 8020	SW8080	SW8270	EPA 418.1	SW8010, 7060, 7191	SW7131, 7421, 7471	REMARKS
8/31/88	10:45	DANGB BG MW32 SS1	1		X	X	X	X	X	882241 Resample (Discard original Sample 8-29-88)
8/31/88	10:45	DANGB BG MW32 SS4	1		X	X	X	X	X	
8/31/88	10:45	DANGB BG MW32 SS1	1	X						882244 Resample (Discard original Sample 8-29-88)
8/31/88	10:45	DANGB BG MW32 SS4	1	X						882245
8/31/88	11:40	DANGB SGC4 SS2	1	X						882246
8/31/88	11:40	DANGB SGC4 SS2	1		X	X	X	X	X	
8/31/88	11:40	DANGB SGC4 SS1 2630	1	X						882247
8/31/88	11:40	DANGB SGC4 SS1	1		X	X	X	X	X	
8/31/88	11:20	DANGB SGE4 SS1	1	X						882248
8/31/88	11:20	DANGB SGE4 SS2	1	X						882249
8/31/88	11:20	DANGB SGE4 SS1	1		X	X	X	X	X	882248
8/31/88	11:20	DANGB SGE4 SS2	1		X	X	X	X	X	882249
										NOTE: All 6010 Analysis for Barium only

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Mike Roddy	8/31/88 1802				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
		Bill Friedman	9-1-88 15:00	rec'd cold & intact



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1 From (Your Name) Please Print: John D. Ilnoeman | Your Phone Number (Very Important): ([illegible]) 825-6770

Company: E.S. | Department/Floor No.:

Street Address: [illegible]

City: Oak Ridge | State: TN | ZIP Required:

2 To (Recipient's Name) Please Print: Ms. Kathleen Kidd | Recipient's Phone Number (Very Important): ([illegible])

Company: E.S. Laboratory Inc | Department/Floor No.:

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zips Codes.): 600 Bancroft Way

City: Berkeley | State: Ca. | ZIP Required: 94710

3 YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE): CBOX1

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4 SERVICES

1 [ ] PRIORITY 1 Overnight Delivery
2 [ ] COURIER-PAK OVERNIGHT ENVELOPE*
3 [ ] OVERNIGHT BOX
4 [ ] OVERNIGHT TUBE
5 [ ] STANDARD AIR Delivery not later than second business day
6 [ ] OVERNIGHT LETTER*
7 [ ]
8 [ ]
9 [ ]
10 [ ]
* Declared Value Limit $100

DELIVERY AND SPECIAL HANDLING

1 [ ] HOLD FOR PICK-UP
2 [X] DELIVER WEEKDAY
3 [ ] DELIVER SATURDAY
4 [ ] DANGEROUS GOODS
5 [ ] CONSTANT SURVEILLANCE SERVICE (CSS)
6 [ ] DRY ICE ____ Lbs.
7 [ ] OTHER SPECIAL SERVICE
8 [ ]
9 [ ] SATURDAY PICK-UP
10 [ ]
11 [ ]
12 [ ] HOLIDAY DELIVERY

PACKAGES	WEIGHT	DECLARED VALUE (See rules)	OVER $100
1	33		
1	33		
1	33		
Total 3	Total 12	Total	

Received At: 1 [ ] Regular Stop 2 [ ] On-Call Stop 3 [ ] Drop Box 4 [ ] B.S.C. 5 [ ] Station

FEDEX Corp. Employee No.:

Date/Time for FEDEX Use: 1/27

5 Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

Release Signature: _____

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T332

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO(S).: AAF-S-0035-88

As a result of extreme sample matrix interference, dilution was required for sample analysis. The reporting limit and MDL for the analyte(s) listed have increased as shown.

Analyte	Reporting Limit	MDL
Arsenic	10 mg/Kg	5.0 mg/Kg

Sample results for lead are reported from Furnace analysis for the following Sample No(s).:

88092244, 88092248, 88092254, 88092227.

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092244-88092246, 88092248-88092249
88092252-88092255, 88092223-88092227

QC Report No: AAF-S-0035-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 9-01-88
Date Reported: 10-28-88
Dilution Factor: See Notes
%Moisture: 8.9

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	SR	SSR	PR	Notes
Arsenic	88092244	88092244	10-11-88	10-4-88	7060	<0.5	<5.0E	<5.0E	NC	4.84	2.42E	6.05	75*	DF=10
Lead	88092244	88092244	10-20-88	10-4-88	7421	<0.5	9.9	11.6	16	6.05	9.9	16.3	106*	DF=NA

2633

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Case Narrative attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082200-88082203, 88092223-88092227
88092244-88092246, 88092248-88092249
88092252-88092255

QC Report No: ICP-S-0033-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-31-88
Date Reported: 10-28-88
Dilution Factor: NA
%Moisture: 8.1

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	SR	SSR	PR	Notes
Barium	88082200	88082200	10-20-88	10-18-88	SW6010	<20	55.8	52.6	7	218	55.8	254	91	
Cadmium	88082200	88082200	10-20-88	10-18-88	SW6010	<0.5	7.4	8.7	16	5.4	7.4	11.0	67N	
Chromium	88082200	88082200	10-20-88	10-18-88	SW6010	<1.0	31.8	37.3	16	21.8	31.8	56.7	114	
Lead	88082200	88082200	10-20-88	10-18-88	SW6010	<10	<10	<10	NC	54.4	<10	49.2	90	A

2634

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
A Sample results for lead are reported from Furnace analyses for the following Sample No(s).: 88082200-88082203, 88082244, 88092248-88092249, 88092252, 88092255.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two
NA = Not Applicable
NC = Not Calculated
ND = Not Detected
SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

[redacted] PETROLEUM [redacted]ROCARBONS [redacted]

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092223-88092227
88092244-88092255

QC Report No: TPH-S-0075-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: NA
Date Prepared: 9-22-88
Date Analyzed: 9-23-88
Date Reported: 11-02-88
Dilution Factor: NA
%Moisture: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
Blank	418.1	<10	8.6J	39.5	38.5	76	37.5	73	3	*

2635

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
J See Legend attached.
* The reporting limit for the sample in this batch is provided by the sub-contract laboratory.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082244-88082254

QC Report No: VGC-S-0049-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 9-01-88
Date Prepared: NA
Date Analyzed: 9-13-88
Date Reported: 10-26-88
Dilution Factor: NA
% Moisture: 17.4

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88082244	1,1-dichloroethane	12.1	ND	10.6	88	10.1	83	5	20	58-124
	Trichloroethene	12.1	ND	11.5	95	12.2	101	6	16	75-110
	Chlorobenzene	12.1	ND	11.3	93	11.9	98	5	21	71-125
	Aromatics: 8020									
88082244	Benzene	12.1	ND	10.9	90	12.1	100	10	26	75-123
	Toluene	12.1	ND	10.9	90	12.1	100	10	16	79-115
	Chlorobenzene	12.1	ND	10.6	88	11.7	97	10	24	82-112

2636

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/Kg
Date Reported: 10-26-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
52 .	9-13-88	VGC	Vocol	75-09-2	Dichloromethane	1.31	0.25	88082244-88082250
				71-43-2	Benzene	1.46	0.20	

2637

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-W-0033-88
QC REPORT NO.: OCP-W-0033-88B

Relative percent difference for endrin exceed the EPA guideline in the matrix spike sample. A blank spike analysis shows the laboratory to be in control.

Heptachlor epoxide was inadvertently used instead of heptachlor in the matrix spiking solution.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up used on these samples.

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082192-88082203
88082244-88082249

QC Report No.: OCP-S-0033-88
QC Sample No.: 88082193
Level (Low/Med): Low
Date Reported: 11-02-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2170	ND	60.7	84	46-127
Heptachlor	2170	ND	57.1	79	35-130
Aldrin	2170	ND	63.0	87	34-132
Dieldrin	5420	ND	182	101	31-134
Endrin	5420	ND	101	56	42-139
4,4'-DDT	5420	ND	202	112	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	64.8	90	84	7	50	46-127
Heptachlor	63.6	88	79	11	31	35-130
Aldrin	66.1	91	87	5	43	34-132
Dieldrin	194	107	101	6	38	31-134
Endrin	175	97	56	54*	45	42-139
4,4'-DDT	210	116	112	4	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 1 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082192-88082203
88082244-88082249

QC Report No.: OCP-S-0033-88B
QC Sample No.: Blank
Level (Low/Med): Low
Date Reported: 11-02-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	ND	68.4	103	46-127
Heptachlor	2000	ND	65.0	97	35-130
Aldrin	2000	ND	69.3	104	34-132
Dieldrin	5000	ND	200	120	31-134
Endrin	5000	ND	123	74	42-139
4,4'-DDT	5000	ND	157	94	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	65.4	98	103	4	50	46-127
Heptachlor	62.3	94	97	4	31	35-130
Aldrin	69.0	103	104	<1	43	34-132
Dieldrin	193	116	120	4	38	31-134
Endrin	173	103	74	34	45	42-139
4,4'-DDT	152	91	94	3	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

Job No.:	OR001	Lab Name:	Engineering Science
		Lab Sample No.:	Blank
Client:	ES Oak Ridge		
Attn:	Bill Hayden	Matrix:	Soil
Address:	710 S. Illinois Avenue	Level (low/med):	Low
	Suite F-103	Extraction-	
	Oak Ridge, Tn. 37830	(SepF/Cont/Sonc):	Sonc
Project:	Duluth ANGB		
Date Extracted:	9-09-88		
Date Analyzed (1):	10-05-88	Date Analyzed (2):	10-06-88
Time Analyzed (1):	11:26	Time Analyzed (2):	23:52
Instrument ID (1):	5890 #2	Instrument ID (2):	5890 #2
GC Column ID (1):	OV-1	GC Column ID (2):	Mixed

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88082192	10-05-88	83082193	10-07-88
-	88082193	10-05-88	88082197	10-07-88
-	88082194	10-05-88	88082246	10-07-88
-	88082195	10-05-88	88082247	10-07-88
-	88082196	10-05-88		
-	88082197	10-05-88		
-	88082198	10-05-88		
-	88082199	10-05-88		
-	88082200	10-05-88		
-	88082201	10-05-88		
-	88082202	10-05-88		
-	88082203	10-05-88		
-	88082244	10-16-88		
-	88082245	10-16-88		
-	88082246	10-16-88		
-	88082247	10-16-88		
-	88082248	10-16-88		
-	88082249	10-16-88		

METHOD BLANK SUMMARY

Job No: GR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/KG
Date Reported: 12-20-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
E5923	10-20-88	BNA	2	-	None Detected	-	-	88082149-88082151 88082192-88082203 88082223-88082227 88092244-88092252

2942

QUALITY CONTROL RESULTS SUMMARY
EPA METHOD 8270

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-1103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092244-88092252

QC Report No: BNA-S-0053-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 9-01-88
Date Prepared: 9-10-88
Date Analyzed: 10-21-88
Date Reported: 12-20-88
Dilution Factor: 1
%Moisture: 17.4

Laboratory Supervisor Approval:

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD	%Recovery
B/N Laboratory Sample # 88092244	1,2,4-Trichlorobenzene	4020	ND	2250	56	2410	60	7	23	38-107
	Acenaphthene	4020	ND	2770	69	2690	67	3	19	31-137
	2,4-Dinitrotoluene	4020	ND	3330	83	2970	74	11	47	28-89
	Pyrene	4020	ND	3490	87	3250	81	7	36	35-142
	N-Nitroso-di-n-Propylamine	4020	ND	3900	97	3780	94	3	38	41-126
	1,4-Dichlorobenzene	4020	ND	1370	34	1410	35	3	27	28-104
ACID Laboratory Sample # 88092244	Pentachlorophenol	8030	ND	4860	60	4100	51	16	47	17-109
	Phenol	8030	ND	5660	70	5300	66	6	35	26-90
	2-Chlorophenol	8030	ND	4860	60	4740	59	2	50	25-102
	4-Chloro-3-Methylphenol	8030	ND	7670	95	6950	86	10	33	26-103
	4-Nitrophenol	8030	ND	8270	103	7030	87	17	50	11-114

2643

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001

Instrument ID: 5890 #2
GC Column ID: OV-1

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Date Reported: 11-14-88

Project: Duluth ANGB

	Date(s) of Analysis	From:	10-04-88	Date of Analysis:	10-05-88
		To:	10-06-88	Time of Analysis:	03:28
	Time(s) of Analysis	From:	11:17	Lab Sample ID: (Standard)	
		To:	23:10		

Compound	RT	RT Window From	RT Window To	Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
alpha-BHC	1.37			342833				
beta-BHC	1.47			164292				
delta-BHC	1.66			218617				
gamma-BHC	1.61			312287	1.61	307266	Y	1.6
Heptachlor	2.61			375600	2.60	364517	Y	3.0
Aldrin	3.24			289633	3.23	305050	Y	5.3
Hept. Epoxide	3.97			293033	3.96	302250	Y	3.1
Endosulfan I	4.96			268850	4.95	268033	Y	0.3
Dieldrin	5.81			246350	5.80	246100	Y	0.1
4,4'-DDE	5.87			256233				
Endrin	6.50			244367				
Endosulfan II	6.62			287442	6.61	288842	Y	0.5
4,4'-DDD	7.42			188158				
Endo. Sulfate	8.60			178158				
4,4'-DDT	9.79			201217	9.77	182192	Y	9.5
Methoxychlor	14.85			140958	14.82	135475	Y	3.9
Endrin Ketone	11.06			300750				
a. Chlordane	5.07			307883				
g. Chlordane	4.56			292750				
Toxaphene								
Aroclor-1016								
Aroclor-1221								
Aroclor-1232								
Aroclor-1242								
Aroclor-1248								
Aroclor-1254								
Aroclor-1260								

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.
%D must be less than or equal to 15.0% for quantitation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRQL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analyt , the single largest peak that is characteristic of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001

Instrument ID: 5890 #2
GC Column ID: OV-1

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Date Reported: 11-14-88

Project: Duluth ANGB

	Date(s) of Analysis	From: 10-04-88	Date of Analysis:	10-05-88
		To: 10-06-88	Time of Analysis:	10:52
	Time(s) of Analysis	From: 11:17	Lab Sample ID:	
		To: 23:10	(Standard)	

Compound	RT	RT Window From	RT Window To	Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
alpha-BHC	1.37			342833	1.37	346167	Y	1.0
beta-BHC	1.47			164292	1.47	164455	Y	0.1
delta-BHC	1.66			218617	1.66	219567	Y	0.5
gamma-BHC	1.61			312287				
Heptachlor	2.61			375600				
Aldrin	3.24			289633				
Hept. Epoxide	3.97			293033				
Endosulfan I	4.96			268850				
Dieldrin	5.81			246350				
4,4'-DDE	5.87			256233	5.86	264100	Y	3.1
Endrin	6.50			244367	6.49	243483	Y	0.4
Endosulfan II	6.62			287442				
4,4'-DDD	7.42			188158	7.41	193458	Y	2.8
Endo. Sulfate	8.60			178158	8.58	174408	Y	2.1
4,4'-DDT	9.79			201217				
Methoxychlor	14.85			140958				
Endrin Ketone	11.06			300750	11.04	307406	Y	2.2
a. Chlordane	5.07			3078 3	5.06	314050	Y	2.0
g. Chlordane	4.56			2927 3	4.56	299733	Y	2.4
Toxaphene								
Aroclor-1016								
Aroclor-1221								
Aroclor-1232								
Aroclor-1242								
Aroclor-1248								
Aroclor-1254								
Aroclor-1260								

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.
%D must be less than or equal to 15.0% for quantitation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRQL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analytes, the single largest peak that is characteristic of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001

Instrument ID: 5890 #2
GC Column ID: OV-1

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Date Reported: 11-14-88

Project: Duluth ANGB

	Date(s) of Analysis	From: 10-04-88	Date of Analysis:	10-05-88	
		To: 10-06-88	Time of Analysis:	18:54	
	Time(s) of Analysis	From: 11:17	Lab Sample ID: (Standard)		
		To: 23:10			

Compound	RT	RT Window From	RT Window To	Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
alpha-BHC	1.37			342833				
beta-BHC	1.47			164292				
delta-BHC	1.66			218617				
gamma-BHC	1.61			312287	1.61	312807	Y	0.2
Heptachlor	2.61			375600	2.61	361317	Y	3.8
Aldrin	3.24			289633	3.24	293650	Y	1.4
Hept. Epoxide	3.97			293033	3.97	298517	Y	1.9
Endosulfan I	4.96			268850	4.96	272467	Y	1.3
Dieldrin	5.81			246350	5.82	251367	Y	2.0
4,4'-DDE	5.87			256233				
Endrin	6.50			244367				
Endosulfan II	6.62			287442	6.63	292992	Y	1.9
4,4'-DDD	7.42			188158				
Endo. Sulfate	8.60			178158				
4,4'-DDT	9.79			201217	9.80	186100	Y	7.5
Methoxychlor	14.85			140958	14.85	132362	Y	6.1
Endrin Ketone	11.06			300750				
a. Chlordane	5.07			307883				
g. Chlordane	4.56			292750				
Toxaphene								
Aroclor-1016								
Aroclor-1221								
Aroclor-1232								
Aroclor-1242								
Aroclor-1248								
Aroclor-1254								
Aroclor-1260								

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.
%D must be less than or equal to 15.0% for quantitation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRQL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analytes, the single largest peak that is characteristic of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

SEMIVOLATILE METHOD BLANK SUMMARY
4B

Job No.:

Client:
Attn:
Address:

Work Order No.:
Lab Sample No.: 03-72
Lab File ID: ES923 continued
Matrix: Soil
Level (low/med):
Date Analyzed: 10-20-88
Time Analyzed: 14:59
Instrument ID:
Date Reported:

Project: Duluth

This Method Blank applies to the following samples, MS and MSD.

Sample Number	Lab Sample ID	Lab File ID	Date of Analysis
DANGB BG-MW30-SS1	8809224 4	ES935	10-21-88
-OG-MW30-SS1	8809224 4 MS	ES936	"
-BG-MW30-SS1	8809224 4 MSD	ES937	"
-BG-MW30-SS4	8809224 5	ES938	"
-SG-C4-SS2	8809224 6	ES939	"
-SG-C4-SS1	8809224 7	E6363	12-1-88
-SG-E4-SS1	8809224 8	E6362	12-1-88
-SG-E4-SS2	8809224 9	E6361	11-30-88
-8-MW14-SS3	8809225 0	ES943	10-21-88
-8-MW14-SS4	8809225 1	ES944	"
-8-MW30-SS5	8809225 2	S0203, S0227	10-21-88, 10-24-88

PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092223-88092227
88092244-88092255

QC Report No: TPH-S-0075-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: NA
Date Prepared: 9-22-88
Date Analyzed: 9-23-88
Date Reported: 11-02-88
Dilution Factor: NA
%Moisture: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
Blank	418.1	<10	8.6J	39.5	38.5	76	37.5	73	3	*

2648

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
J See Legend attached.
* The reporting limit for the sample in this batch is provided by the sub-contract laboratory.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

'OLATILE ORGANICS INITIAL CALIBRATION DATA

LabName: _ENGINEERINGSCIENCE_____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID.: _VOCAL___ Calibration Date(s): 9/12/88____ 9/15/88____

LAB FILE ID: RRF10=45,84_____ RRF20=46,85_____
RRF 50=47,86_____ RRF100=48,87_____ RRF200=49,88_____

COMPOUND	RRF10	RRF20	RRF50	RRF100	RRF200	$\overline{RRF}$	%RSD
Benzyl chloride	5.21	4.65	5.19	4.05	3.70	4.56	14.85
bis (2-choroethoxy) methane	0.09	0.12	0.12	0.14	0.12	0.12	15.16
bis (2-choroisopropyl ether	0.09	0.12	0.12	0.14	0.12	0.12	15.16
Bromobenzene	3.10	3.02	3.45	2.95	2.87	3.08	7.41
Bromodichloromethane	3.09	4.68	2.75	3.72	4.02	3.65	20.84
Bromoform	2.29	3.39	2.11	3.35	3.48	2.92	22.83
Bromomethane	0.70	0.64	0.28	0.29	0.25	0.43	50.34
Carbon tetrachloride	3.51	3.29	3.09	3.46	4.23	3.52	12.28
Chloroacetaldehyde	0.07	0.08	0.08	0.07	0.05	0.07	17.50
Chlorobenzene	0.95	1.25	0.84	1.08	1.25	1.08	17.20
Chloroethane	1.10	1.08	0.63	0.55	0.29	0.73	48.16
Chloroform	4.18	4.22	2.37	3.21	3.62	3.52	21.81
1-Chorohexane	0.80	0.80	0.94	0.79	0.79	0.82	8.23
2-Chloroethyl vinyl ether	0.09	0.12	0.12	0.14	0.12	0.12	15.16
Chloromethane	2.11	1.21	2.21	1.76	1.90	1.84	21.34
Chloromethyl methyl ether	0.02	0.02	0.03	0.02	0.03	0.02	22.82
o_,m_,& p_Chlorotoluenes	3.60	3.45	3.67	3.10	2.87	3.34	10.27
Dibromochloromethane	3.35	4.25	2.72	3.82	4.11	3.65	17.17
Dibromomethane	2.95	2.94	3.42	2.95	3.03	3.06	6.76
1,2_Dichlorobenzene	1.62	2.06	1.23	1.71	1.93	1.71	18.74
1,3_Dichlorobenzene	1.34	1.80	1.10	1.49	1.75	1.50	19.47
1,4_Dichlorobenzene	1.48	1.85	1.10	1.44	1.66	1.51	18.47
Dichlorodifluormethane	0.59	0.77	0.44	0.42	0.49	0.54	26.46
1,1_Dichloroethane	1.92	2.66	1.61	1.94	2.27	2.08	19.20
1,2_Dichloroethane	2.54	3.58	2.20	2.83	3.02	2.83	18.34
1,1_Dichloroethylene	1.64	2.24	1.25	1.56	2.01	1.74	22.30
trans_1,2_dichloroethylene	2.57	2.93	1.76	1.94	2.29	2.30	20.51
Dichloromethane	5.07	4.18	2.02	2.23	2.35	3.17	43.24
1,2_Dichloropropane	2.12	2.97	1.80	2.39	2.61	2.38	18.86
1,3_Dichloropropylene	0.48	0.47	0.54	0.45	0.43	0.47	9.13
1,1,2,2_Tetrachloroethane	3.60	4.47	2.67	3.81	3.85	3.68	17.79
1,1,1,2_Tetrachloroethane	5.32	4.93	5.25	4.40	4.25	4.83	10.12
Tetrachloroethylene	4.04	4.93	3.01	3.49	4.17	3.93	18.52
1,1,1_Trichloroethane	1.98	2.77	1.86	2.08	2.37	2.21	16.59
1,1,2_Trichloroethane	3.91	5.38	5.19	3.91	3.69	4.41	18.16
Trichloroethylene	2.79	3.96	2.44	2.88	3.50	3.11	19.48
Trichlorofluormethane	1.11	1.30	1.15	0.82	0.97	1.07	17.03
Trichloropropane	3.10	3.02	3.45	2.95	2.87	3.06	7.41
Vinyl chloride	2.11	1.21	2.21	1.76	1.90	1.84	21.34

VOLATILE ORGANICS INITIAL CALIBRATION DATA

LabName:ENGINEERING SCIENCE_____ Contract:_____

Lab Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID.:_VOCOL__ Calibration Date(s):___9/12/88_____

LAB FILE ID: RRF 10 ____45_____ RRF 20 ___46_____
RRF 50=____47_____ RRF100=_____48_____ RRF200=_____49_____

COMPOUND	RRF10	RRF20	RRF50	RRF100	RRF200	$\overline{RRF}$	%RSD
Benzene	6.77	12.82	3.63	5.56	8.55	7.47	46.71
Chlorobenzene	5.81	7.98	6.68	8.42	9.91	7.76	20.46
1,2_Dichlorobenzene	9.68	8.95	8.03	6.97	8.10	8.35	12.27
1,3_Dichlorobenzene	8.47	10.28	5.95	7.81	9.27	8.36	19.50
1,4_Dichlorobenzene	6.05	8.35	4.79	6.34	7.54	6.61	20.81
Ethyl Benzene	5.32	6.90	4.16	4.84	6.50	5.54	20.55
Toluene	5.81	7.98	4.89	6.12	7.50	6.46	19.61
Xylenes	17.90	23.59	14.18	17.64	22.13	19.09	19.80

LATILE CONTINUING CALIBRATION CHECK

Name: _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____

trument ID: carbopak _____ Calibration Date(s): 9/12/88

AB FILE ID: 92 _____ Init. Calib. Date(s): 9/2/88 .9/10/88

MPOUND	RRF	RRF50	%D
enzyl chloride	0.08		100.00
s (2-chloroethoxy) thane	0.04		100.00
is (2-chloroisopropyl her	0.26		100.00
omobenzene	0.94	1.32	-41.14
romodichloromethane	3.70	3.68	0.53
romoform	2.59	2.68	-3.59
omomethane	0.38	0.33	14.53
arbon tetrachloride	4.15	4.11	1.08
hloroacetaldehyde	ERR		ERR
hlorobenzene	1.35	1.34	0.80
hloroethane	0.58	0.51	-13.14
hloroform	4.32	4.24	1.93
Chloroethane	0.89	0.77	13.23
Chloroethyl vinyl ether	0.04		100.00
hloromethane	0.49	1.29	-160.18
hloromethyl methyl ether	0.17		100.00
,m-,& p-Dichlorotoluenes	3.83	5.32	-39.09
bromochloromethane	4.03	4.62	-14.75
ibromomethane	2.25	2.86	-27.00
2-Dichlorobenzene	2.61	2.47	5.44
3-Dichlorobenzene	2.21	2.14	3.35
,4-Dichlorobenzene	2.07	1.87	9.47
chlorodifluoromethane	0.54		100.00
1-Dichloroethane	2.25	2.30	-2.06
,2-Dichloroethane	2.85	2.85	-0.02
,1-Dichloroethylene	2.77	2.84	-2.65
ans-1,2-dichloroethylene	2.50	2.56	-2.36
chloromethane	1.76	2.79	-58.31
,2-Dichloropropane	2.48	2.39	3.94
3-Dichloropropylene	4.71	4.97	-5.55
1,2,2-Tetrachloroethane	7.74	8.00	-3.31
,1,1,2-Tetrachloroethane	4.29	6.03	-40.59
etrachloroethylene	7.74	8.00	-3.31
1,1-Trichloroethane	3.06	3.03	0.90
,1,2-Trichloroethane	4.71	4.97	-5.56
richloroethylene	4.62	4.00	13.49
richlorofluoromethane	2.71	1.66	38.50
inyl acetate	2.86	3.53	-23.64
inyl chloride	1.43	0.61	57.38

VTILE CONTINUING CALIBRATION CHECK

Name: ENGINEERING SCIENCE_____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____ SDG No.: ____

Instrument ID.: carbopak Calibration Date(s): 9/12/88 _____

FILE ID: RRF 50 __72_____ Int calib = 9/2/88

COMPOUND	$\overline{RRF}$	RRF50	%D
Benzene	6.42	5.55	-13.55
Chlorobenzene	4.65	4.20	-9.68
2_Dichlorobenzene	5.49	3.45	-37.16
3_Dichlorobenzene	7.18	3.85	-46.38
4_Dichorobenzene	4.33	3.05	-29.56
Ethyl Benzene	4.57	2.90	-36.54
Toluene	3.88	3.20	-17.53
Xylenes	21.99	9.30	-57.71

LATILE CONTINUING CALIBRATION CHECK

Name:_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____

strument ID:carbopa calibration Date(s):9/13/88_____

LabFile ID: 89, 90 Int calib 9/11/88, 9/10/88

MPOUND	RRF	RRF50	%D
enzyl chloride	0.08		100.00
s (2-chloroethoxy) ethane	0.04		100.00
is (2-chloroisopropyl ther	0.26		100.00
romobenzene	0.94	1.13	-20.37
romodichloromethane	3.70	3.52	5.01
romoform	2.59	2.60	-0.71
romomethane	0.38	0.34	10.84
rbon tetrachloride	4.15	3.91	5.86
hloroacetaldehyde	ERR		ERR
hlorobenzene	1.35	1.29	4.56
hloroethane	0.58	0.55	6.07
hloroform	4.32	4.09	5.28
Chloroethane	0.89	0.93	-4.58
Chloroethyl vinyl ether	0.04		100.00
hloromethane	0.49	1.49	-201.51
hloromethyl methyl ether	0.17		100.00
,m_& p_Chlorotoluenes	3.83	4.21	-10.03
bromochloromethane	4.03	3.80	5.60
ibromomethane	2.25	2.69	-19.71
2_Dichlorobenzene	2.61	2.40	8.04
3_Dichlorobenzene	2.21	2.06	7.07
,4_Dichlorobenzene	2.07	1.90	8.29
ichlorodifluoromethane	0.54		100.00
1_Dichloroethane	2.25	2.14	4.85
,2_Dichloroethane	2.85	2.99	-4.66
1_Dichloroethylene	2.77	2.59	6.32
ans_1,2_dichloroethylene	2.50	2.38	4.91
chloromethane	1.76	2.53	-43.82
,2_Dichloropropane	2.48	2.23	10.20
3_Dichloropropylene	4.71	5.02	-6.67
1,2,2_Tetrachloroethane	7.74	7.67	0.87
,1,2_Tetrachloroethane	4.29	3.78	11.80
etrachloroethylene	7.74	7.67	0.96
1,1_Trichloroethane	3.06	2.85	7.03
1,2_Trichloroethane	4.71	5.02	-6.63
richloroethylene	4.62	3.86	15.91
richlorofluoromethane	2.71	1.52	43.81
ichloropropane	2.86	3.07	-7.33
nyl chloride	1.43	0.98	31.67

ATILE CONTINUING CALIBRATION CHECK

Name: ENGINEERING SCIENCE_____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____ SDG No.: ____

trument ID.: carbopak Calibration Date(s): 9/13/88 _____

FILE ID: RRF 50 __89_____ Initcal 9/11/88

MPOUND	$\overline{RRF}$	RRF50	%D
nzene	6.42	6.85	6.66
lorobenzene	4.65	4.83	3.79
2_Dichlorobenzene	5.49	5.09	-7.34
3_Dichlorobenzene	7.18	12.33	71.67
4_Dichlorobenzene	4.33	4.50	3.93
nyl Benzene	4.57	3.26	-28.65
luene	3.88	3.72	-4.19
enes	21.99	20.22	-8.06

DATA PACKAGE #47

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ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the water samples received by this laboratory on 9-9-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092303	DANGB-8-MW-14-GW-1	BA-I	9-08-88		10-17-88	
88092303	DANGB-8-MW-14-GW-1	CD-F	9-08-88		10-24-88	
88092303	DANGB-8-MW-14-GW-1	CR-F	9-08-88		10-28-88	
88092303	DANGB-8-MW-14-GW-1	PB-F	9-08-88		10-20-88	
88092303	DANGB-8-MW-14-GW-1	418.1	9-08-88	9-28-88	10-05-88	
88092303	DANGB-8-MW-14-GW-1	8010	9-08-88		9-16-88	9-14-88
88092303	DANGB-8-MW-14-GW-1	8020	9-08-88		9-16-88	
88092303	DANGB-8-MW-14-GW-1	8080	9-08-88	9-14-88	10-06-88	
88092304	DANGB-8-MW51-GW-1	BA-I	9-08-88		10-17-88	
88092304	DANGB-8-MW51-GW-1	CD-F	9-08-88		10-21-88	
88092304	DANGB-8-MW51-GW-1	CR-F	9-08-88		10-28-88	
88092304	DANGB-8-MW51-GW-1	PB-F	9-08-88		10-20-88	
88092304	DANGB-8-MW51-GW-1	418.1	9-08-88	9-28-88	10-05-88	
88092304	DANGB-8-MW51-GW-1	8010	9-08-88		9-15-88	9-14-88
88092304	DANGB-8-MW51-GW-1	8020	9-08-88		9-15-88	
88092304	DANGB-8-MW51-GW-1	8080	9-08-88	9-14-88	10-06-88	

* If applicable

ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092305	DANGB-BG-MW42-GW-1	AS-F	9-08-88		11-04-88	
88092305	DANGB-BG-MW42-GW-1	BA-I	9-08-88		10-17-88	
88092305	DANGB-BG-MW42-GW-1	CD-F	9-08-88		10-21-88	
88092305	DANGB-BG-MW42-GW-1	CR-F	9-08-88		10-28-88	
88092305	DANGB-BG-MW42-GW-1	HG-C	9-08-88		9-27-88	
88092305	DANGB-BG-MW42-GW-1	PB-F	9-08-88		10-20-88	
88092305	DANGB-BG-MW42-GW-1	418.1	9-08-88	9-28-88	10-05-88	
88092305	DANGB-BG-MW42-GW-1	8010	9-08-88		9-16-88	9-14-88
88092305	DANGB-BG-MW42-GW-1	8020	9-08-88		9-16-88	
88092305	DANGB-BG-MW42-GW-1	8080	9-08-88	9-14-88	10-06-88	
88092305	DANGB-BG-MW42-GW-1	8270	9-08-88	9-14-88	10-23-88	
88092306	DANGB-BG-MW32-GW-1	AS-F	9-08-88		11-04-88	
88092306	DANGB-BG-MW32-GW-1	BA-I	9-08-88		10-17-88	
88092306	DANGB-BG-MW32-GW-1	CD-F	9-08-88		10-24-88	
88092306	DANGB-BG-MW32-GW-1	CR-F	9-08-88		10-28-88	
88092306	DANGB-BG-MW32-GW-1	HG-C	9-08-88		9-27-88	
88092306	DANGB-BG-MW32-GW-1	PB-F	9-08-88		10-20-88	
88092306	DANGB-BG-MW32-GW-1	418.1	9-08-88	9-28-88	10-05-88	
88092306	DANGB-BG-MW32-GW-1	8010	9-08-88		9-16-88	9-14-88
88092306	DANGB-BG-MW32-GW-1	8020	9-08-88		9-16-88	
88092306	DANGB-BG-MW32-GW-1	8080	9-08-88	9-14-88	10-06-88	
88092306	DANGB-BG-MW32-GW-1	8270	9-08-88	9-14-88	10-23-88	
88092307	DANGB-FB2	8010	9-08-88		9-14-88	9-16-88
88092307	DANGB-FB2	8020	9-08-88		9-14-88	
88092308	DANGB-TB1	8010	9-08-88		9-14-88	9-16-88
88092308	DANGB-TB1	8020	9-08-88		9-14-88	
88092309	DANGB-FB3	8010	9-08-88		9-15-88	9-16-88
88092309	DANGB-FB3	8020	9-08-88		9-15-88	

* If applicable

A SUBSIDIARY OF THE PARSONS CORPORATION

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092303-88092309
WORK ORDER NO.: 958

These water samples were received at the ES Berkeley Laboratory on 9-9-88. They were received cold and intact.

ANALYSIS REPORT

ORK ORDER NUMBER: 958
OB NUMBER : ZB0000000440
ORK ORDER DATE : 09/09/88

APPROVED BY _____
Lab Supervisor

EPORT DATA:
S OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
AK RIDGE, TN 37830
ILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

ONTRACT / PO # : OR001
ONTACT : BILL HAYDEN
(615)-481-3920

ASK: 2, UNITS: mg/L

EST COMPOUND	DANGB-8-MW-14-GW-1 88092303	DANGB-8-MW51-GW-1 88092304	DANGB-BG-MW42-GW-1 88092305	DANGB-BG-MW32-GW-1 88092306
CID DIG FLAME	NA	NA	NA	NA
CID DIG FURNACE	NA	NA	NA	NA
RSENIC			<0.005	<0.005
ARIUM	<0.05N	<0.05N	<0.05N	0.12BN
ADMIUM	<0.001	<0.001	<0.001	<0.001
HROMIUM	0.0024	0.0020	<0.002	0.0026
ERCURY			<.0002	<.0002
EAD	<0.005	<0.005	<0.005	<0.005

) - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 958
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/09/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S10?
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/L

TEST COMPOUND	DANGB-8-MW-14-GW-1 88092303	DANGB-8-MW51-GW-1 88092304	DANG-BG-MW42-GW-1 88092305	DANGB-BG-MW32-GW-1 88092306
ACID DIG FLAME	NA	NA	NA	NA
ACID DIG FURNACE	NA	NA	NA	NA
ARSENIC			<0.005	<0.005
BARIUM	<0.05N	<0.05N	<0.05N	0.12BN
CADMIUM	<0.001	<0.001	<0.001	<0.001
CHROMIUM	0.0024 B	0.0020B	<0.002	0.0026B
MERCURY			<.0002	<.0002
LEAD	<0.005	<0.005	<0.005	<0.005

NA - Not Analyzed
ND - Not Detected

ANALYSIS REPORT

ORK ORDER NUMBER: 958
OB NUMBER : ZB0000000440
ORK ORDER DATE : 09/09/88

APPROVED BY _____
Lab Supervisor

EPORT DATA:
S OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
AK RIDGE, TN 37830
ILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

ONTRACT / PO # : OR001
ONTACT : BILL HAYDEN
(615)-481-3920

ASK: 3, UNITS: mg/L

EST COMPOUND	DANGB-8-MW-14-GW-1 88092303	DANGB-8-MW51-GW-1 88092304	DANGB-BG-MW42-GW-1 88092305	DANGB-BG-MW32-GW-1 88092306
EST 3 NOT ON FILE			NT	
18.1 PETROLEUM HYDROCARBONS	<1.5	<1.5	<1.5	<1.5

T- NOT TESTED
) - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 958
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/09/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/L, GROUP 8010

TEST COMPOUND	DANGB-8-MW-14-GW-1 88092303	DANGB-8-MW51-GW-1 88092304	DANGB-BG-MW42-GW-1 88092305	DANGB-BG-MW32-GW-1 88092306	DANGB-FB2 88092307	DANGB-TB1 88092308
BENZYL CHLORIDE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	1.0B	ND	13	ND
1-CHLOROHEXANE	ND	ND	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
DICHLOROMETHANE	1.7B	1.3B	0.98B	2.2B	1.2B	1.5B
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 958

EST COMPOUND	DANGB-8-MW-14-GW-1 88092303	DANGB-8-MW51-GW-1 88092304	DANGB-BG-MW42-GW-1 88092305	DANGB-BG-MW32-GW-1 88092306	DANGB-FB2 88092307	DANGB-TB1 88092308
.3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
,1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
ETRACHLOROETHYLENE	ND	ND	ND	ND	ND	ND
.1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
RICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
RICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
RICHLOROPROPANE	ND	ND	ND	ND	ND	ND
INYL CHLORIDE	ND	ND	ND	ND	ND	ND

D - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 958

TASK: 4, UNITS: ug/L, GROUP 8010

TEST COMPOUND	DANGB-FB3 88092309
BENZYL CHLORIDE	ND
BIS (2-CHLOROETHOXY)METHANE	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND
BROMOBENZENE	ND
BROMODICHLOROMETHANE	ND
BROMOFORM	ND
BROMOETHANE	ND
CARBON TETRACHLORIDE	ND
CHLORACETALDEHYDE	ND
CHLORAL	ND
CHLOROBENZENE	ND
CHLOROETHANE	ND
CHLOROFORM	15
1-CHLOROHEXANE	ND
2-CHLOROETHYL VINYL ETHER	ND
CHLOROMETHANE	ND
CHLOROMETHYL METHYL ETHER	ND
CHLOROTOLUENE	ND
DIBROMOCHLOROMETHANE	ND
DIBROMOMETHANE	ND
1,2-DICHLOROBENZENE	ND
1,3-DICHLOROBENZENE	ND
1,4-DICHLOROBENZENE	ND
DICHLORODIFLUOROMETHANE	ND
1,1-DICHLOROETHANE	ND
1,2-DICHLOROETHANE	ND
1,1-DICHLOROETHYLENE	ND
TRANS-1,2-DICHLOROETHYLENE	ND
DICHLOROMETHANE	1.5B
1,2-DICHLOROPROPANE	ND
1,3-DICHLOROPROPYLENE	ND
1,1,2,2-TETRACHLOROETHANE	ND
1,1,1,2-TETRACHLOROETHANE	ND
TETRACHLOROETHYLENE	ND
1,1,1-TRICHLOROETHANE	ND
1,1,2-TRICHLOROETHANE	ND
TRICHLOROETHYLENE	ND
TRICHLOROFLUOROMETHANE	ND
TRICHLOROPROPANE	ND
VINYL CHLORIDE	ND

ND - Not Detected

ANALYSIS REPORT

ORK ORDER NUMBER: 958
OB NUMBER : ZB0000000440
ORK ORDER DATE : 09/09/88

APPROVED BY _____
Lab Supervisor

EPORT DATA:
S OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
AK RIDGE, TN 37830
ILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

ONTRACT / PO # : OR001
ONTACT : BILL HAYDEN
(615)-481-3920

ASK: 4, UNITS: ug/L, GROUP 8020

EST COMPOUND	DANGB-8-MW-14-GW-1 88092303	DANGB-8-MW51-GW-1 88092304	DANGB-BG-MW42-GW-1 88092305	DANGB-BG-MW32-GW-1 88092306	DANGB-FB2 88092307	DANGB-TB1 88092308
ENZENE	ND	ND	ND	ND	ND	ND
HLOROBENZENE	ND	ND	ND	ND	ND	ND
,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
THYL BENZENE	ND	ND	ND	ND	ND	ND
OLUENE	ND	ND	ND	ND	ND	ND
YLENES	ND	ND	ND	ND	ND	ND

) - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 958

TASK: 4, UNITS: ug/L, GROUP 8020

TEST COMPOUND	DANGB-FB3 88092309
BENZENE	ND
CHLOROBENZENE	ND
1,2-DICHLOROBENZENE	ND
1,3-DICHLOROBENZENE	ND
1,4-DICHLOROBENZENE	ND
ETHYL BENZENE	ND
TOLUENE	ND
XYLENES	ND

ND - Not Detected

ANALYSIS REPORT

)RK ORDER NUMBER: 958
)B NUMBER : ZB0000000440
)RK ORDER DATE : 09/09/88

APPROVED BY _____
Lab Supervisor

:PORT DATA:
; OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
\K RIDGE, TN 37830
:LL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

)NTRACT / PO # : OR001
)NTACT : BILL HAYDEN
(615)-481-3920

\SK: 4, UNITS: ug/L, GROUP 8080

:ST COMPOUND	DANGB-8-MW-14-GW-1 88092303	DANGB-8-MW51-GW-1 88092304	DANGB-BG-MW42-GW-1 88092305	DANGB-BG-MW32-GW-1 88092306
.DRIN	ND	ND	ND	ND
.PHA-BHC	ND	ND	ND	ND
:TA-BHC	ND	ND	ND	ND
:LTA-BHC	ND	ND	ND	ND
\MMA-BHC	ND	ND	ND	ND
HLORDANE	ND	ND	ND	ND
,4'-DDD	ND	ND	ND	ND
,4'-DDE	ND	ND	ND	ND
,4'-DDT	ND	ND	ND	ND
:ELDRIN	ND	ND	ND	ND
)DOSULFAN I	ND	ND	ND	ND
)DOSULFAN II	ND	ND	ND	ND
)DOSULFAN SULFATE	ND	ND	ND	ND
)DRIN	ND	ND	ND	ND
)DRIN ALDEHYDE	NA	NA	NA	NA
:PTACHLOR	ND	ND	ND	ND
:PTACHLOR EPOXIDE	ND	ND	ND	ND
:PONE	ND	ND	ND	ND
:THOXYCHLOR	ND	ND	ND	ND
)XAPHENE	ND	ND	ND	ND
:B-1016	ND	ND	ND	ND
:B-1221	ND	ND	ND	ND
:B-1232	ND	ND	ND	ND
:B-1242	ND	ND	ND	ND
:B-1248	ND	ND	ND	ND
:B-1254	ND	ND	ND	ND
:B-1260	ND	ND	ND	ND

A- NOT ANALYZED
- Not Detected

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Water

Date Received: September 9, 1988
Date Reported: December 8, 1988
Work Order: 958
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830
ATTN: Mr. Bill Hayden

Lab Number:	88082305	88082306
Sample No.:	DANGB-BG-MW42-GW1	DANGB-BG-MW32-GW1
Date Sampled:	09-08-88	09-08-88
Time Sampled:	08:45	11:00
Date Extracted:	09-14-88	09-14-88
Date Analyzed:	10-23-88	10-23-88

Compound	Detection Limits ug/L	ANALYTICAL RESULTS ug/L	ug/L
1,3-Dichlorobenzene	10	ND	ND
1,4-Dichlorobenzene	10	ND	ND
Hexachloroethane	10	ND	ND
Bis(2-chloroethyl)ether	10	ND	ND
1,2-Dichlorobenzene	10	ND	ND
N-Nitrosodimethylamine	10	ND	ND
Bis(2-chloroisopropyl)ether	10	ND	ND
N-Nitrosodi-n-propylamine	10	ND	ND
Hexachlorobutadiene	10	ND	ND
1,2,4-Trichlorobenzene	10	ND	ND
Nitrobenzene	10	ND	ND
Isophorone	10	ND	ND
Naphthalene	10	ND	ND
Bis(2-chloroethoxy)methane	10	ND	ND
2-Chloronaphthalene	10	ND	ND
Hexachlorocyclopentadiene	10	ND	ND
Acenaphthylene	10	ND	ND
Acenaphthene	10	ND	ND
Dimethyl phthalate	10	ND	ND
2,6-Dinitrotoluene	10	ND	ND
Fluorene	10	ND	ND
2,4-Dinitrotoluene	10	ND	ND
Diethyl phthalate	10	ND	ND
N-Nitrosodiphenylamine	10	ND	ND
Hexachlorobenzene	10	ND	ND

B = Compound was detected in the blank.

Base Neutrals - SW 8270
Matrix: Water
(continued)

ate Received: September 9, 1988
ate Reported: December 8, 1988

Work Order: 958
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

ab Number:	88082305	88082306
ample No.:	DANGB-BG-MW42-GW1	DANGB-BG-MW32-GW1
ate Sampled:	09-08-88	09-08-88
ime Sampled:	08:45	11:00
ate Extracted:	09-14-88	09-14-88
ate Analyzed:	10-23-88	10-23-88

ompound	Detection Limits ug/L	ANALYTICAL RESULTS ug/L	ug/L
henanthrene	10	ND	ND
nthracene	10	ND	ND
ibutyl phthalate	10	ND	ND
luoranthene	10	ND	ND
-Chlorophenyl phenyl ether	10	ND	ND
yrene	10	ND	ND
utyl Benzyl phthalate	10	ND	ND
is(2-ethylhexyl) phthalate	10	10 B	ND
hrysene	10	ND	ND
-Bromophenyl phenyl ether	10	ND	ND
enzo(a)anthracene	10	ND	ND
i-n-octylphthalate	10	ND	ND
enzo(b)fluoranthene	10	ND	ND
enzo(k)fluoranthene	10	ND	ND
enzidine	60	ND	ND
,3'-Dichlorobenzidine	20	ND	ND
enzo(a)pyrene	10	ND	ND
ndeno(1,2,3-cd)pyrene	10	ND	ND
ibenzo(a,h)anthracene	10	ND	ND
enzo(ghi)perylene	10	ND	ND
enzyl Alcohol	20	ND	ND

= Compound was detected in the blank.

Base Neutrals - SW 8270
Matrix: Water
(continued)

Date Received: September 9, 1988 Work Order: 958
Date Reported: December 8, 1988 Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB ATTN: Mr. Bill Hayden
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

Lab Number:	88082305	88082306
Sample No.:	DANGB-BG-MW42-GW1	DANGB-BG-MW32-GW1
Date Sampled:	09-08-88	09-08-88
Time Sampled:	08:45	11:00
Date Extracted:	09-14-88	09-14-88
Date Analyzed:	10-23-88	10-23-88

Compound	Detection Limits ug/L	Analytical Results ug/L	ug/L
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	20	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	10	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	10	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	50	ND	ND
3-Nitroaniline	50	ND	ND
4-Nitroaniline	50	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Pesticides and PCBs - SW 8270
Matrix: Water

ate Received: September 9, 1988
ate Reported: December 8, 1988

Work Order: 958
Job Number: OR001

)R: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN:Mr. Bill Hayden

ab Number:	88082305	88082306
ample No.:	DANGB-BG-MW42-GW1	DANGB-BG-MW32-GW1
ate Sampled:	09-08-88	09-08-88
ime Sampled:	08:45	11:00
ate Extracted:	09-14-88	09-14-88
ate Analyzed:	10-23-88	10-23-88

ompound	Detection Limits ug/L	ANALYTICAL RESULTS ug/L	ug/L
lpha-BHC	--*	ND	ND
amma-BHC	__*	ND	ND
eta-BHC	20	ND	ND
eptachlor	10	ND	ND
elta-BHC	15	ND	ND
ldrin	10	ND	ND
eptachlor epoxide	10	ND	ND
ndosulfan I	--*	ND	ND
ieldrin	15	ND	ND
,4'-DDE	30	ND	ND
ndrin	--*	ND	ND
ndosulfan II	--*	ND	ND
,4'-DDD	15	ND	ND
,4'-DDT	25	ND	ND
ndosulfan Sulfate	30	ND	ND
ndrin aldehyde	--*	ND	ND
ndrin Ketone	--*	ND	ND
nlordane	60	ND	ND
ethoxychlor	--*	ND	ND
oxaphene	60	ND	ND
roclor-1016	60	ND	ND
roclor-1221	60	ND	ND
roclor-1232	60	ND	ND
roclor-1242	60	ND	ND
roclor-1248	60	ND	ND
roclor-1254	60	ND	ND
roclor-1260	60	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Acid Extractables -- SW 8270
Matrix: Water

Date Received: September 9, 1988
Date Reported: December 8, 1988

Work Order: 958
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082305	88082306
Sample No.:	DANGB-BG-MW42-GW1	DANGB-BG-MW32-GW1
Date Sampled:	09-08-88	09-08-88
Time Sampled:	08:45	11:00
Date Extracted:	09-14-88	09-14-88
Date Analyzed:	10-23-88	10-23-88

Compound	Detection Limits ug/L	ANALYTICAL RESULTS ug/L	ug/L
2-Chlorophenol	10	ND	ND
2-Nitrophenol	10	ND	ND
Phenol	10	ND	ND
2,4-Dimethylphenol	10	ND	ND
2,4-Dichlorophenol	10	ND	ND
2,4,5-Trichlorophenol	10	ND	ND
4-Chloro-3-methylphenol	20	ND	ND
2,4-Dinitrophenol	50	ND	ND
2,6-Dichlorophenol	--*	ND	ND
4-Methyl-4,6-Dinitrophenol	50	ND	ND
Pentachlorophenol	50	ND	ND
4-Nitrophenol	50	ND	ND
Benzoic Acid	50	ND	ND
2-Methylphenol	10	ND	ND
3- & 4-Methylphenol	10	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	10	ND	ND

Analyst

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED	SHIP TO:
OR001	Duluth ANGB/Duluth, Mn.			ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA 94710
SAMPLER(S): (Signature)				

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SW8010, 8020	EPA 601	EPA 625	EPA 418.1	SW 6010, 7060, 7131	SW7421, 7470	SW9310, 9315	SM429	REMARKS
[illegible]	[illegible]	[illegible]	2	X								
[illegible]	[illegible]	[illegible]	5	X								
[illegible]	0930	DANGB - T151 [illegible]	3	X								
[illegible]	1100	DANGB - TG - MW32 - GW - 1	5	X								
[illegible]	1415	DANGB - FB3										
[illegible]	1400	DANGB - ? - MW14 GW 1	2	X								
[illegible]	1430	DANGB - ? - MW51 - GW 1	5	X								
			5	X								

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[illegible]	[illegible] 1800	[illegible]			
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature)

SHIP TO:
ENGINEERING-SCIENCE LABORATORY, INC.
600 Bancroft Way
Berkeley, CA 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED: SW8010, 8020	EPA 608	EPA 625	EPA 418.1	SW 8010, 7060, 7131	SW7421, 7470, 7741	SW9310, 9315	SM420	REMARKS
[illegible]	1100	MATRIX SPIKE	4				X					(2) matrix spike (2) matrix spike dup.
[illegible]	1100	DANCB-BG-MW32-GW-1	2				X					
[illegible]	1400	DANGB-8-MW1A-GW-1	~~4~~		X			X	X			
[illegible]	1430	DANCB-8-MW51-GW-1	~~4~~		X			X	X			

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[illegible]	[illegible] 1900	[illegible]			

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

6993

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED	SHIP TO:
OR001	Duluth ANGB/Duluth, Mn.			ENGINEERING-SCIENCE LABORATORY, INC. 668 Bancroft Way Berkeley, CA 94710

SAMPLER(S): (Signature) Kathy L. Davis

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SW 846, 8020	EPA 601	EPA 602	EPA 624.1	SW 8010, 7060, 7061	SW7421, 7420	SW 8020, 8240	SM 420	REMARKS
9-8-88	0845	DANGB-BG-MW42-GW-1	1						X			
9-8-88	1100	DANGB-BG-MW32-GW-1	1						X			

9-8-88

Kathy L. Davis

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Kathy L. Davis	9-8-88 1400	Fed Ex Airbill # 949031428 2			

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
		M. Sylvester	9/9/88 1000	

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

9492

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED	SHIP TO:
OR001	Duluth ANGB/Duluth, Mn.			ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA 94710
SAMPLER(S): (Signature)				

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SW8010, 8020	EPA 601	EPA 625	EPA 418.1	SW 8010, 7060, 7131	SW7421, 7470	SW9310, 9315	SM429	REMARKS
11	1145	DANGB-BG-MW32-GW1	5		X	X	X	X	X			
11	1100	DANGB-BG-MW22-GW1	2					X	X			

1.1.93

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	11 1100	11 11			

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED	SHIP TO:
OR001	Duluth ANGB/Duluth, Mn.			ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA 94710
SAMPLER(S): (Signature)				

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SW8010, 8020	EPA 601	EPA 625	EPA 418.1	SW 8010, 7060, 7131	SW7421, 7470	SW3510, 9315	SM429	REMARKS
9-12-88	1100	MAIN [illegible] PIPE	6		X	X						(1) [illegible]
9-12-88	1100	DANGER-EG-MW2-GW-1	4		X	X						

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature]	9-12-88 1100	[signature] 14:14.45			

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

8496

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature)

SHIP TO:
ENGINEERING-SCIENCE LABORATORY, INC.
600 Bancroft Way
Berkeley, CA 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED: SW8010, 8020	EPA 608	EPA 625	EPA 418.1	SW 6010, 7060, 7131	SW7421, 7470	SW8310, 8318	SM429	REMARKS
9/5/8	1400	DANGB-8-MW14-GW-1	2				X					
9/5/8	1430	DANGB-8-MWS1-GW-1	2				X					

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	9/5/8 1600				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

6279

FEDERAL EXPRESS

AIRBILL

USE THIS AIRBILL FOR DOMESTIC SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

PACKAGE TRACKING NUMBER 949031 4234

949031 4234

SENDER'S COPY

Sender's Federal Express Account Number: 1196 - 4207-4 | Date: 4-2-96

From (Your Name) Please Print: Bob McLeod | **Your Phone Number (Very Important):** (423) 777-0770

Company: Engineering Science Inc | Department/Floor No.: 4103

Street Address: 710 S Illinois Ave

City: Oak Ridge | State: TN | ZIP Required: 37830

To (Recipient's Name) Please Print: Wanda Cobb | **Recipient's Phone Number (Very Important):** (404) 350-0770

Company: Engineering Science Inc | Department/Floor No.: 27-690

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 57 Executive Park South NE

City: Atlanta | State: GA | ZIP Required: 30329

3 YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE.)

4 PAYMENT ☐ Bill Sender ☐ Bill Recipient's FedEx Acct. No. ☐ Bill 3rd Party FedEx Acct. No. ☐ Bill Credit Card ☐ Cash

H IF HOLD FOR PICK-UP, Print FEDEX Address Here

Street Address | City | State | ZIP Required

4 SERVICES

1 ☐ PRIORITY 1 Overnight Delivery
2 ☐ COURIER-PAK OVERNIGHT ENVELOPE*
3 ☐ OVERNIGHT BOX
4 ☐ OVERNIGHT TUBE
5 ☐ STANDARD AIR Delivery not later than second business day
6 ☒ OVERNIGHT LETTER*
7 ☐
8 ☐
9 ☐
10 ☐

* Declared Value Limit $100

DELIVERY AND SPECIAL HANDLING

1 ☐ HOLD FOR PICK-UP (If box H)
2 ☒ DELIVER WEEKDAY
3 DELIVER SATURDAY (Extra charges) ☐
4 ☐ DANGEROUS GOODS (Extra charges)
5 ☐ CONSTANT SURVEILLANCE SERVICE (CSS) (Extra charges) (Release Signature Not Applicable)
6 ☐ DRY ICE _____ Lbs.
7 ☐ OTHER SPECIAL SERVICE _____
8 ☐
9 ☐ SATURDAY PICK-UP (Extra charges)
10 ☐
11 ☐
12 ☐ HOLIDAY DELIVERY (If offered) (Extra charges)

PACKAGES	WEIGHT	YOUR DECLARED VALUE (See right)	OVER SIZE
Total	Total	Total	

Received At:
1 ☐ Regular Stop
2 ☐ On-Call Stop
3 ☐ Drop Box
4 ☐ B.S.C.
5 ☐ Station

FEDEX Corp. Employee No.

Date/Time for FEDEX Use

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY

Use of this airbill constitutes your agreement to the service conditions in our current Service Guide which is available upon request. See back of sender's copy of this airbill for further information.

We will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay or non-delivery, unless you specify a higher amount in the space to the left, pay 40¢ per additional $100 specified and document your actual loss in the event of a claim. Maximum amount limitations found in the current Federal Express Service Guide apply. Your rights to recover from Federal Express for loss of the intrinsic value of the package, as well as for loss of sales, income, interest, profit, attorney's fees, costs and any other form of damage whether direct, incidental, consequential or special is limited to the greater of $100 or the declared value specified to the left. In no event shall your recovery exceed your actual loss.

In the event of untimely delivery, Federal Express will at your request and with some limitations, refund all transportation charges paid. See Service Guide for further information.

5 Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

Release Signature: _____

Federal Express Use	
Base Charges	
Declared Value Charge	
Other 1	
Other 2	
Total Charges	

PART #2041738900
REVISION DATE 7/93
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0893

FEDERAL EXPRESS

AIRBILL

USE THIS AIRBILL FOR DOMESTIC SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
FOR INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

PACKAGE TRACKING NUMBER 949031 4245

949031 4245

SENDER'S COPY

Sender's Federal Express Account Number: 1196-4207-B
Date: 9/6/95

1 From (Your Name) Please Print: Kim Davis
Your Phone Number (Very Important): (615) 371-3400
Company: Financial Service
Department/Floor No.: Ste. F103
Street Address: 710 S. Tennessee Ave.
City: Oak Ridge
State: Tn.
ZIP Required: 37830

2 To (Recipient's Name) Please Print: Kathleen Tidd
Recipient's Phone Number (Very Important): (415) 546-7770
Company: Financial Service Inc.
Department/Floor No.:
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 600 Broadway
City: Berkeley
State: Calif.
ZIP Required: 94710

3 YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE.)
OR 2002

PAYMENT ☐ Bill Sender ☐ Bill Recipient's FedEx Acct. No. ☐ Bill 3rd Party FedEx Acct. No. ☐ Bill Credit Card ☐ Cash

H IF HOLD FOR PICK-UP, Print FEDEX Address Here
Street Address:
City: State: ZIP Required:

4 SERVICES

1 ☒ PRIORITY 1 Overnight Delivery
2 ☐ COURIER-PAK OVERNIGHT ENVELOPE*
3 ☐ OVERNIGHT BOX
4 ☐ OVERNIGHT TUBE
5 ☐ STANDARD AIR Delivery not later than second business day
6 ☐ OVERNIGHT LETTER*
7 ☐
8 ☐
9 ☐
10 ☐
*Declared Value Limit $100.

DELIVERY AND SPECIAL HANDLING

1 ☐ HOLD FOR PICK-UP
2 ☒ DELIVER WEEKDAY
3 DELIVER SATURDAY (Extra charge) ☐
4 ☐ DANGEROUS GOODS (Extra charge)
5 ☐ CONSTANT SURVEILLANCE SERVICE (CSS) (Extra charge) (Requires Signature Not Applicable)
6 ☐ DRY ICE ____ Lbs.
7 ☐ OTHER SPECIAL SERVICE
8 ☐
9 ☐ SATURDAY PICK-UP (Extra charge)
10 ☐
11 ☐
12 ☐ HOLIDAY DELIVERY (If offered) (Extra charge)

PACKAGES	WEIGHT	YOUR DECLARED VALUE (See right)	OVER SIZE
5	15 LBS		
	1 LBS		
	1 LBS		
	1 LBS		
Total 5	Total 19	Total	

Received At:
1 ☐ Regular Stop
2 ☐ On-Call Stop
3 ☐ Drop Box
4 ☐ B.S.C.
5 ☐ Station

FEDEX Corp. Employee No.: 1147

Date/Time for FEDEX Use: 11 1 1 1

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY

Use of this airbill constitutes your agreement to the service conditions in our current Service Guide which is available upon request. See back of sender's copy of this airbill for further information.

We will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay or non-delivery, unless you specify a higher amount in the space to the left, pay 40¢ per additional $100 specified and document your actual loss in the event of a claim. Maximum amount limitations found in the current Federal Express Service Guide apply. Your rights to recover from Federal Express for loss of the intrinsic value of the package, as well as for loss of sales, income, interest, profit, attorneys fees, costs and any other form of damage whether direct, incidental, consequential or special is limited to the greater of $100 or the declared value specified to the left. In no event shall your recovery exceed your actual loss.

In the event of untimely delivery Federal Express will at your request and with some limitations, refund all transportation charges paid. See Service Guide for further information.

5 Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

Release Signature: _____

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

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1892

FEDERAL EXPRESS

AIRBILL

USE THIS AIRBILL FOR DOMESTIC SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

PACKAGE TRACKING NUMBER 9490314282

9490314282

SENDER'S COPY

Sender's Federal Express Account Number | Date

From (Your Name) Please Print | Your Phone Number (Very Important)

Company | Department/Floor No.

Street Address

City | State | ZIP Required

To (Recipient's Name) Please Print | Recipient's Phone Number (Very Important)

Company | Department/Floor No.

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. # Zip Codes.)

City | State | ZIP Required

3 YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE.)

PAYMENT ☐ Bill Sender ☐ Bill Recipient's FedEx Acct. No. ☐ Bill 3rd Party FedEx Acct. No. ☐ Bill Credit Card ☐ Cash

H IF HOLD FOR PICK-UP, Print FEDEX Address Here
Street Address
City | State | ZIP Required

4 SERVICES

1 ☐ PRIORITY 1 Overnight Delivery
2 ☐ COURIER-PAK OVERNIGHT ENVELOPE*
3 ☐ OVERNIGHT BOX
4 ☐ OVERNIGHT TUBE
5 ☐ STANDARD AIR Delivery not later than second business day
6 ☐ OVERNIGHT LETTER*
7 ☐
8 ☐
9 ☐
10 ☐

* Declared Value Limit $100

DELIVERY AND SPECIAL HANDLING

1 ☐ HOLD FOR PICK-UP
2 ☐ DELIVER WEEKDAY
3 DELIVER SATURDAY (Extra charges) ☐
4 ☐ DANGEROUS GOODS (Extra charges)
5 ☐ CONSTANT SURVEILLANCE SERVICE (CSS) (Extra charges) (Requires Signature Not Available)
6 ☐ DRY ICE ____ Lbs.
7 ☐ OTHER SPECIAL SERVICE ____
8 ☐
9 ☐ SATURDAY PICK-UP (Extra Charges)
10 ☐
11 ☐
12 ☐ HOLIDAY DELIVERY (If offered) (Extra Charges)

	PACKAGES	WEIGHT	YOUR DECLARED VALUE (See right)	OVER SIZE
	1	10		
Total	1	10		

Received At
1 ☐ Regular Stop
2 ☐ On-Call Stop
Drop Box | SSC | Station

FEDEX Corp Employee No.

Date/Time for FEDEX Use

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY

Use of this airbill constitutes your agreement to the service conditions in our current Service Guide which is available upon request. See back of sender's copy of this airbill for further information.

We will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay or non-delivery, unless you specify a higher amount in the space to the left, pay 40¢ per additional $100 specified and document your actual loss in the event of a claim. Maximum amount limitations found in the current Federal Express Service Guide apply. Your rights to recover from Federal Express for loss of the intrinsic value of the package, as well as for loss of sales, income, interest, profit, attorney's fees, costs and any other form of damage whether direct, incidental, consequential or special is limited to the greater of $100 or the declared value specified to the left. In no event shall your recovery exceed your actual loss.

In the event of untimely delivery, Federal Express will at your request and with some limitations, refund all transportation charges paid. See Service Guide for further information.

5 Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

Release Signature: _____

Federal Express Use

Base Charges	
Declared Value Charge	
Other 1	
Other 2	
Total Charges	

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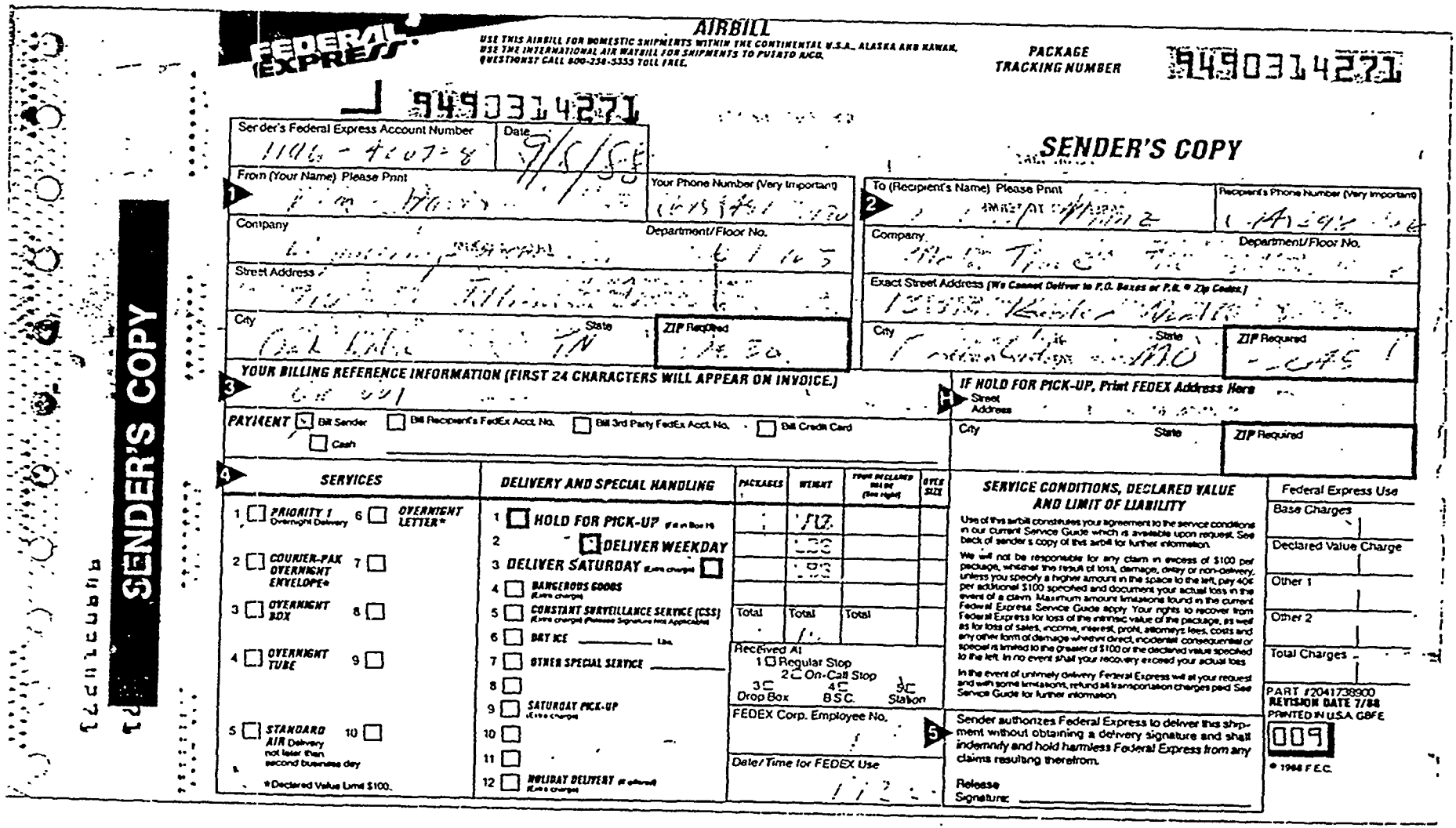

FEDERAL EXPRESS

AIRBILL

USE THIS AIRBILL FOR DOMESTIC SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

PACKAGE TRACKING NUMBER 949031427 1

949031427 1

SENDER'S COPY

Sender's Federal Express Account Number: 1106-4607-8
Date: 9/5/88

1 From (Your Name) Please Print:
Your Phone Number (Very important):
Company:
Department/Floor No.:
Street Address:
City: Oak Hill State: TN ZIP Required:

2 To (Recipient's Name) Please Print:
Recipient's Phone Number (Very important):
Company:
Department/Floor No.:
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. # Zip Codes.):
City: State: ZIP Required:

3 YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE.)

PAYMENT [X] Bill Sender [ ] Bill Recipient's FedEx Acct. No. [ ] Bill 3rd Party FedEx Acct. No. [ ] Bill Credit Card [ ] Cash

4 SERVICES

1 [ ] PRIORITY 1 Overnight Delivery
2 [ ] COURIER-PAK OVERNIGHT ENVELOPE*
3 [ ] OVERNIGHT BOX
4 [ ] OVERNIGHT TUBE
5 [ ] STANDARD AIR Delivery not later than second business day
6 [ ] OVERNIGHT LETTER*
7 [ ]
8 [ ]
9 [ ]
10 [ ]
*Declared Value Limit $100.

DELIVERY AND SPECIAL HANDLING

1 [ ] HOLD FOR PICK-UP If box in Box 1
2 [X] DELIVER WEEKDAY
3 [ ] DELIVER SATURDAY (Extra charges)
4 [ ] DANGEROUS GOODS (Extra charges)
5 [ ] CONSTANT SURVEILLANCE SERVICE (CSS) (Extra charges) (Release Signature Not Applicable)
6 [ ] DRY ICE ____ Lbs.
7 [ ] OTHER SPECIAL SERVICE
8 [ ]
9 [ ] SATURDAY PICK-UP (Extra charges)
10 [ ]
11 [ ]
12 [ ] HOLIDAY DELIVERY (If allowed) (Extra charges)

PACKAGES	WEIGHT	YOUR DECLARED VALUE (See right)	BOX SIZE
1	1LB.		
	LBS.		
	LBS.		
Total 1	Total	Total	

Received At
1 [ ] Regular Stop
2 [ ] On-Call Stop
3 [ ] Drop Box
4 [ ] B.S.C.
5 [ ] Station

FEDEX Corp. Employee No.:

Date/Time for FEDEX Use: 1/2

5 Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

Release Signature:

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY

Use of this airbill constitutes your agreement to the service conditions in our current Service Guide which is available upon request. See back of sender's copy of this airbill for further information.

We will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay or non-delivery, unless you specify a higher amount in the space to the left, pay 40¢ per additional $100 specified and document your actual loss in the event of a claim. Maximum amount limitations found in the current Federal Express Service Guide apply. Your rights to recover from Federal Express for loss of the intrinsic value of the package, as well as for loss of sales, income, interest, profit, attorneys' fees, costs and any other form of damage whether direct, incidental consequential or special is limited to the greater of $100 or the declared value specified to the left. In no event shall your recovery exceed your actual loss.

In the event of untimely delivery Federal Express will at your request and with some limitations, refund all transportation charges paid. See Service Guide for further information.

Federal Express Use

Base Charges	
Declared Value Charge	
Other 1	
Other 2	
Total Charges	

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3882

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: AAF-W-0032-88
Sample Matrix: Water
Conc. Unit: ug/l
Date Received: 9-01-88
Date Reported: 11-07-88
Dilution Factor: NA

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092256, 88092303-88092306, 88092291-88092293
88092312-88092316, 88092321-88092327

Laboratory Supervisor Approval:

Analyte	Laboratory Sample Nos. Duplicates, Spike		Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Arsenic	88092256	88092256	11-04-88	10-11-88	7060	<0.010	<0.005	<0.005	NC	0.040	<0.005	0.0410	102	
Cadmium	88092256	88092256	10-26-88	10-11-88	7131	<0.005	<0.001	<0.001	NC	5.0	<0.001	5.26	105	
Chromium	88092256	88092256	10-28-88	10-11-88	6010	<0.005	<0.002	<0.002	NC	20.0	<0.002	20.07	100	
Lead	88092256	88092256	10-20-88	10-11-88	7421	<0.010	<0.005	<0.005	NC	0.020	<0.005	0.0229	114	

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092323, 88092303-88092304
88092306, 88092314

QC Report No: TPH-W-0071-88
Sample Matrix: Water
Conc. Unit: mg/L
Date Received: 9-09-88
Date Prepared: 9-28-88
Date Analyzed: 10-05-88
Date Reported: 11-01-88
Dilution Factor: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88092306	418.1	<1.5	<1.5	39.5	39.5	100	36.3	92	8	*

5862

* Reporting limit for the samples in this batch is provided by the sub-contract laboratory.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082256, 88092291-88092294
88092303-88092309, 88092312-88092317
88092321, 88082189

QC Report No: VGC-W-0047-88
Sample Matrix: Water
Conc. Unit: ug/L
Date Received: 9-12-88
Date Prepared: NA
Date Analyzed: 9-22-88
Date Reported: 10-25-88
Dilution Factor: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88092321 9892	1,1-Dichloroethane	10	ND	9.59	96	9.28	93	3	26	70-130
	Trichloroethene	10	ND	10.2	102	10.3	103	1	19	65-131
	Chlorobenzene	10	ND	10.5	105	10.7	107	2	40	59-137
	Aromatics: 8020									
8897092321	Benzene	10	20	30.8	108	30.8	108	0	20	56-146
	Toluene	10	ND	10.7	107	9.72	97	10	41	42-150
	Chlorobenzene	10	ND	10.1	101	9.37	94	7	36	76-133

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Water
Conc. Unit: ug/L
Date Reported: 10-28-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
19	9-14-88	VGC	Carbopack	75-09-2	Dichloromethane	1.5	0.25	88092307-88092308
35	9-15-88	VGC	Carbopack	75-09-2	Dichloromethane	1.4	0.25	88092304, 88092309
50	9-16-88	VGC	Carbopack	75-09-2	Dichloromethane	4.6	0.25	88092303
				67-66-3	Chloroform	0.44	0.05	88092305-88092306

1892

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092291-88092293, 88092256, 88092303-88092306
88092312-88092317, 88092321-88092327

QC Report No: ICP-W-0051-88
Sample Matrix: Water
Conc. Unit: ug/L
Date Received: 9-08-88
Date Reported: 11-07-88
Dilution Factor: NA

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	Duplicate RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Barium	88092291	88092291	10-17-88	10-14-88	6010	<0.2	<0.05	<0.05	NC	2.0	<0.05	1.38	69N	

8292

N - See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Instrument ID: 5890 #2
GC Column ID: OV-1

Date Reported: 11-14-88

Date(s) of Analysis	From:	10-04-88	Date of Analysis:	10-06-88	
	To:	10-06-88	Time of Analysis:	02:23	
Time(s) of Analysis	From:	11:17	Lab Sample ID: (Standard)		
	To:	23:10			

Compound	RT	RT Window From	RT Window To	Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
alpha-BHC	1.37			342833	1.37	346800	Y	1.2
beta-BHC	1.47			164292	1.46	162338	Y	1.2
delta-BHC	1.66			218617	1.65	223300	Y	2.1
gamma-BHC	1.61			312287				
Heptachlor	2.61			375600				
Aldrin	3.24			289633				
Hept. Epoxide	3.97			293033				
Endosulfan I	4.96			268850				
Dieldrin	5.81			246350				
4,4'-DDE	5.87			256233	5.85	260117	Y	1.5
Endrin	6.50			244367	6.47	244967	Y	0.2
Endosulfan II	6.62			287442				
4,4'-DDD	7.42			188158	7.40	192808	Y	2.5
Endo. Sulfate	8.60			178158	8.57	183383	Y	2.9
4,4'-DDT	9.79			201217				
Methoxychlor	14.85			140958				
Endrin Ketone	11.06			300750	11.02	320183	Y	6.5
a. Chlordane	5.07			307883	5.05	308883	Y	0.3
g. Chlordane	4.56			292750	4.54	297100	Y	1.5
Toxaphene								
Aroclor-1016								
Aroclor-1221								
Aroclor-1232								
Aroclor-1242								
Aroclor-1248								
Aroclor-1254								
Aroclor-1260								

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.
%D must be less than or equal to 15.0% for quantitation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRQL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analytes, the single largest peak that is characteristic of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001

Instrument ID: 5890 #2
GC Column ID: OV-1

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Date Reported: 11-14-88

Project: Duluth ANGB

	Date(s) of Analysis	From: 10-04-88	Date of Analysis:	10-06-88
		To: 10-06-88	Time of Analysis:	09:54
	Time(s) of Analysis	From: 11:17	Lab Sample ID:	
		To: 23:10	(Standard)	

Compound	RT	RT Window From	RT Window To	Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
alpha-BHC	1.37			342833				
beta-BHC	1.47			164292				
delta-BHC	1.66			218617				
gamma-BHC	1.61			312287	1.60	319106	Y	2.2
Heptachlor	2.61			375600	2.60	363383	Y	3.3
Aldrin	3.24			289633	3.23	294033	Y	1.5
Hept. Epoxide	3.97			293033	3.96	297367	Y	1.5
Endosulfan I	4.96			268850	4.94	270883	Y	0.8
Dieldrin	5.81			246350	5.80	250550	Y	1.7
4,4'-DDE	5.87			256233				
Endrin	6.50			244367				
Endosulfan II	6.62			287442	6.61	288767	Y	0.5
4,4'-DDD	7.42			188158				
Endo. Sulfate	8.60			178158				
4,4'-DDT	9.79			201217	9.77	200350	Y	0.4
Methoxychlor	14.85			140958	14.81	139815	Y	0.8
Endrin Ketone	11.06			300750				
a. Chlordane	5.07			307883				
g. Chlordane	4.56			292750				
Toxaphene								
Aroclor-1016								
Aroclor-1221								
Aroclor-1232								
Aroclor-1242								
Aroclor-1248								
Aroclor-1254								
Aroclor-1260								

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.
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Note: Determining that no compounds were found above the CRQL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

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PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Instrument ID: 5890 #2
GC Column ID: OV-1

Date Reported: 11-14-88

Date(s) of Analysis	From:	10-04-88	Date of Analysis:	10-06-88
	To:	10-06-88	Time of Analysis:	17:21
Time(s) of Analysis	From:	11:17	Lab Sample ID: (Standard)	
	To:	23:10		

Compound	RT	RT Window From	RT Window To	Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
alpha-BHC	1.37			342833	1.37	365900	Y	6.7
beta-BHC	1.47			164292	1.47	170967	Y	4.1
delta-BHC	1.66			218617	1.66	237150	Y	8.5
gamma-BHC	1.61			312287				
Heptachlor	2.61			375600				
Aldrin	3.24			289633				
Hept. Epoxide	3.97			293033				
Endosulfan I	4.96			268850				
Dieldrin	5.81			246350				
4,4'-DDE	5.87			256233	5.87	277017	Y	8.1
Endrin	6.50			244367	6.49	263417	Y	7.8
Endosulfan II	6.62			287442				
4,4'-DDD	7.42			188158	7.42	203575	Y	.2
Endo. Sulfate	8.60			178158	8.59	198983	Y	1..7
4,4'-DDT	9.79			201217				
Methoxychlor	14.85			140958				
Endrin Ketone	11.06			300750	11.05	327375	Y	8.9
a. Chlordane	5.07			307883	5.06	326100	Y	5.9
g. Chlordane	4.56			292750	4.56	311567	Y	6.4
Toxaphene								
Aroclor-1016								
Aroclor-1221								
Aroclor-1232								
Aroclor-1242								
Aroclor-1248								
Aroclor-1254								
Aroclor-1260								

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Note: Determining that no compounds were found above the CRQL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

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PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001

Instrument ID: 5890 #2
GC Column ID: OV-1

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Date Reported: 11-14-88

Project: Duluth ANGB

	Date(s) of Analysis	From:	10-04-88	Date of Analysis:	10-06-88
		To:	10-06-88	Time of Analysis:	20:14
	Time(s) of Analysis	From:	11:17	Lab Sample ID:	
		To:	23:10	(Standard)	

Compound	RT	RT Window From	RT Window To	Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
alpha-BHC	1.37			342833	1.37	365300	Y	6.5
beta-BHC	1.47			164292	1.47	171200	Y	4.2
delta-BHC	1.66			218617	1.66	233267	Y	6.7
gamma-BHC	1.61			312287				
Heptachlor	2.61			375600				
Aldrin	3.24			289633				
Hept. Epoxide	3.97			293033				
Endosulfan I	4.96			268850				
Dieldrin	5.81			246350				
4,4'-DDE	5.87			256233	5.86	278783	Y	8.8
Endrin	6.50			244367	6.48	257917	Y	5.5
Endosulfan II	6.62			287442				
4,4'-DDD	7.42			188158	7.41	204950	Y	8.9
Endo. Sulfate	8.60			178158	8.58	191858	Y	7.7
4,4'-DDT	9.79			201217				
Methoxychlor	14.85			140958				
Endrin Ketone	11.06			300750	11.03	319400	Y	6.2
a. Chlordane	5.07			307883	5.06	325700	Y	5.8
g. Chlordane	4.56			292750	4.55	310050	Y	5.9
Toxaphene								
Aroclor-1016								
Aroclor-1221								
Aroclor-1232								
Aroclor-1242								
Aroclor-1248								
Aroclor-1254								
Aroclor-1260								

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.
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PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001

Instrument ID: 5890 #2
GC Column ID: OV-1

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Date Reported: 11-14-88

Project: Duluth ANGB

	Date(s) of Analysis	From:	10-04-88	Date of Analysis:	10-06-88
		To:	10-06-88	Time of Analysis:	22:23
	Time(s) of Analysis	From:	11:17	Lab Sample ID: (Standard)	
		To:	23:10		

Compound	RT	RT Window From	RT Window To	Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
alpha-BHC	1.37			342833				
beta-BHC	1.47			164292				
delta-BHC	1.66			218617				
gamma-BHC	1.61			312287	1.60	336700	Y	7.8
Heptachlor	2.61			375600	2.60	397933	Y	5.9
Aldrin	3.24			289633	3.23	304183	Y	5.0
Hept. Epoxide	3.97			293033	3.96	319850	Y	9.2
Endosulfan I	4.96			268850	4.94	279750	Y	4.1
Dieldrin	5.81			246350	5.79	258717	Y	5.0
4,4'-DDE	5.87			256233				
Endrin	6.50			244367				
Endosulfan II	6.62			287442	6.60	292600	Y	1.8
4,4'-DDD	7.42			188158				
Endo. Sulfate	8.60			178158				
4,4'-DDT	9.79			201217	9.76	226550	Y	12.6
Methoxychlor	14.85			140958	14.81	144690	Y	2.6
Endrin Ketone	11.06			300750				
a. Chlordane	5.07			307883				
g. Chlordane	4.56			292750				
Toxaphene								
Aroclor-1016								
Aroclor-1221								
Aroclor-1232								
Aroclor-1242								
Aroclor-1248								
Aroclor-1254								
Aroclor-1260								

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.
%D must be less than or equal to 15.0% for quantitation, and less than or equal to 20.0% for confirmation.

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PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001

Instrument ID: 5890 #2
GC Column ID: OV-1

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Date Reported: 11-14-88

Project: Duluth ANGB

Date(s) of Analysis	From:	10-04-88	Date of Analysis:	10-06-88	
	To:	10-06-88	Time of Analysis:	23:10	
Time(s) of Analysis	From:	11:17	Lab Sample ID: (Standard)		
	To:	23:10			

Compound	RT	RT Window From	RT Window To	Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
alpha-BHC	1.37			342833	1.36	375767	Y	9.6
beta-BHC	1.47			164292	1.46	175733	Y	7.0
delta-BHC	1.66			218617	1.65	242483	Y	10.9
gamma-BHC	1.61			312287				
Heptachlor	2.61			375600				
Aldrin	3.24			289633				
Hept. Epoxide	3.97			293033				
Endosulfan I	4.96			268850				
Dieldrin	5.81			246350				
4,4'-DDE	5.87			256233	5.85	281083	Y	9.7
Endrin	6.50			244367	6.47	265050	Y	8.5
Endosulfan II	6.62			287442				
4,4'-DDD	7.42			188158	7.39	211867	Y	12.6
Endo. Sulfate	8.60			178158	8.56	195317	Y	9.6
4,4'-DDT	9.79			201217				
Methoxychlor	14.85			140958				
Endrin Ketone	11.06			300750	11.02	328425	Y	9.2
a. Chlordane	5.07			307883	5.04	331600	Y	7.7
g. Chlordane	4.56			292750	4.54	313950	Y	7.2
Toxaphene								
Aroclor-1016								
Aroclor-1221								
Aroclor-1232								
Aroclor-1242								
Aroclor-1248								
Aroclor-1254								
Aroclor-1260								

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.
%D must be less than or equal to 15.0% for quantitation, and less than or equal to 20.0% for confirmation.

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SEMIVOLATILE METHOD BLANK SUMMARY
4B

Job No.:

Client:
Attn:
Address:

Work Order No.:
Lab Sample No.: 03-75
Lab File ID: 50215/216
Matrix: water
Level (low/med):
Date Analyzed: 10-23-88
Time Analyzed: 19:43, 21:43
Instrument ID:
Date Reported:

Project: Duluth

This Method Blank applies to the following samples, MS and MSD.

Sample Number	Lab Sample ID	Lab File ID	Date of Analysis
DANGB - BG - MW42 - GW1	88092305	50217, 50218	10-23-88
DANGB - BG - MW32 - GW1	88092306	50219, 50220	10-24-88

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092323, 88092303-88092304
88092306, 88092314

QC Report No: TPH-W-0071-88
Sample Matrix: Water
Conc. Unit: mg/L
Date Received: 9-09-88
Date Prepared: 9-28-88
Date Analyzed: 10-05-88
Date Reported: 11-01-88
Dilution Factor: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88092306	418.1	<1.5	<1.5	39.5	39.5	100	36.3	92	8	*

9696

* Reporting limit for the samples in this batch is provided by the sub-contract laboratory.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate

SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092291-88092293, 88092305-88092306
88092314-88092317, 88092312, 88092321,
88092354, 88092324, 88092349, 88092388-88092390

QC Report No: TPH-W-0072-88
Sample Matrix: Water
Conc. Unit: mg/L
Date Received: NA
Date Prepared: 9-23-88
Date Analyzed: 9-26-88
Date Reported: 11-01-88
Dilution Factor: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
Blank	418.1	<1.5	<1.5	39.5	38.5	97	37.5	95	3	*

1692

* See Case Narrative attached.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate

SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

File: CONTENT
24 Oct 88

50V 9/15/88

VOLATILE CONTINUING CALIBRATION CHECK

LabName:_____ Contract:_____

Lab Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID.: CARbopak Calibration Date(s): 9/15/89 _____

LAB FILE ID: 30, 31 Init. Calib. Date(s): 9/13/89 9/14/89

COMPOUND	$\overline{RRF}$	RRF50	%D
Benzyl chloride	0.32	0.34	6
bis (2-chloroethoxy methane	—	—	—
bis (2-chloroisopropyl ether	—	—	—
Bromobenzene	1.0	1.1	10
Bromodichloromethane	3.0	3.1	3
Bromoform	1.7	1.7	0
Bromomethane		0.20	
Carbon tetrachloride	4.0	3.6	10
Chloroacetaldehyde	—	—	—
Chlorobenzene	1.2	1.2	0
Chloroethane	0.45	0.40	10
Chloroform	4.2	3.5	17
1-Chorohexane	0.87	0.93	7
2-Chloroethyl vinyl ether	—	—	—
Chloromethane	0.79	0.63	20
Chloromethyl methyl ether	—	—	—
o_,m_,& p_Chlorotoluenes	3.5	4.5	28
Dibromochloromethane	3.4	3.2	6
Dibromomethane	2.4	2.3	4
1,2_Dichlorobenzene	2.2	2.1	4
1,3_Dichlorobenzene	1.9	1.9	0
1,4_Dichlorobenzene	1.9	1.7	10
Dichlorodifluormethane	—	—	—
1,1_Dichloroethane	2.3	1.9	17
1,2_Dichloroethane	2.6	2.2	15
1,1_Dichloroethylene	2.6	2.1	19
trans_1,2_dichloroethylene	2.4	2.1	12
Dichloromethane	3.5	2.9	17
1,2_Dichloropropane	2.3	2.0	13
1,3_Dichloropropylene	4.8	4.1	18
1,1,2,2_Tetrachloroethane	6.5	6.1	6
1,1,1,2_Tetrachloroethane	4.1	4.9	20
Tetrachloroethylene	6.3	6.1	6
1,1,1_Trichloroethane	2.9	2.5	14
1,1,2_Trichloroethane	4.5	4.1	9
Trichloroethylene	3.1	3.3	15
Trichlorofluormethane	2.4	1.9	20
Trichloropropane	2.0	1.6	20
Vinyl chloride	0.98	0.77	21

file: CONTCAL
21 Oct 88

50V
9/15/89

VOLATILE CONTINUING CALIBRATION CHECK

LabName:_____ Contract:_____

Lab Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID.: CARbopak Calibration Date(s): 9/15/89 _____

LAB FILE ID: 30 Init. Calib. Date(s): 9/13/89 9/14/89

COMPOUND	$\overline{RRF}$	RRF50	%D
Benzene	4.6	4.9	7
Chlorobenzene	4.7	5.2	10
1,2_Dichlorobenzene	3.7	3.8	3
1,3_Dichlorobenzene	4.3	4.4	2
1,4_Dichorobenzene	3.3	3.4	3
Ethyl Benzene	3.5	3.6	3
Toluene	3.7	3.6	3
Xylenes	12	11	8

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DATA PACKAGE #48

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ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received by this laboratory on 9-01-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082254	DANGB4-MW24-SS1	BA-I	8-31-88		10-20-88	
88082254	DANGB4-MW24-SS1	CD-F	8-31-88		10-20-88	
88082254	DANGB4-MW24-SS1	CR-F	8-31-88		10-20-88	
88082254	DANGB4-MW24-SS1	PB-F	8-31-88		10-20-88	
88082254	DANGB4-MW24-SS1	418.1	8-31-88	9-22-88	9-23-88	
88082254	DANGB4-MW24-SS1	MOIS	8-31-88		9-09-88	
88082254	DANGB4-MW24-SS1	8010	8-31-88		9-13-88	9-12-88
88082254	DANGB4-MW24-SS1	8020	8-31-88		9-13-88	9-12-88
88082255	DANGB4-MW24-SS1A	BA-I	8-31-88		10-20-88	
88082255	DANGB4-MW24-SS1A	CD-F	8-31-88		10-20-88	
88082255	DANGB4-MW24-SS1A	CR-F	8-31-88		10-20-88	
88082255	DANGB4-MW24-SS1A	PB-F	8-31-88		10-22-88	
88082255	DANGB4-MW24-SS1A	418.1	8-31-88	9-22-88	9-23-88	
88082255	DANGB4-MW24-SS1A	MOIS	8-31-88		9-09-88	
88082255	DANGB4-MW24-SS1A	8010	8-31-88		9-13-88	9-12-88
88082255	DANGB4-MW24-SS1A	8020	8-31-88		9-13-88	9-12-88

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092254-88092255
WORK ORDER NO.: 942

These soil samples were received at the ES Berkeley Laboratory on 9-01-88. They were received cold and intact.

ENGINEERING-SCIENCE INC.
12/05/88

ANALYSIS REPORT

WORK ORDER NUMBER: 942
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/01/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/Kg

TEST COMPOUND	DANGB4,MW24,SS1 88092254	DANGB4,MW24, SS1A 88092255
ACID DIG SOIL	NA	NA
BARIUM	42.7	81.1
CADMIUM	8.0N	15.7N
CHROMIUM	27.3	49.7
LEAD	4.9	21.6

ND - Not Detected

ANALYSIS REPORT

:ORK ORDER NUMBER: 942
OB NUMBER : ZB0000000440
'ORK ORDER DATE : 09/01/88

APPROVED BY _____
Lab Supervisor

:EPORT DATA:
:S OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
)AK RIDGE, TN 37830
:ILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

:ONTRACT / PO # : OR001
:ONTACT : BILL HAYDEN
(615)-481-3920

'ASK: 3, UNITS: mg/Kg

'EST COMPOUND	DANGB4,MW24,SS1 88092254	DANGB4,MW24, SS1A 88092255
.18.1 PETROLEUM HYDROCARBONS	51	24
· MOISTURE	9.6	8.4

:D - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 942
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/01/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8010

TEST COMPOUND	DANGB4,MW24,SS1 88092254	DANGB4,MW24, SS1A 88092255
BENZYL CHLORIDE	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND
BROMOBENZENE	ND	ND
BROMODICHLOROMETHANE	ND	ND
BROMOFORM	ND	ND
BROMOETHANE	ND	ND
CARBON TETRACHLORIDE	ND	ND
CHLORACETALDEHYDE	ND	ND
CHLORAL	ND	ND
CHLOROBENZENE	ND	ND
CHLOROETHANE	ND	ND
CHLOROFORM	ND	ND
1-CHLOROHEXANE	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND
CHLOROMETHANE	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND
CHLOROTOLUENE	ND	ND
DIBROMOCHLOROMETHANE	ND	ND
DIBROMOMETHANE	ND	ND
1,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND
1,1-DICHLOROETHANE	ND	ND
1,2-DICHLOROETHANE	ND	ND
1,1-DICHLOROETHYLENE	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND
DICHLOROMETHANE	2.2B	4.0B
1,2-DICHLOROPROPANE	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 942

'EST COMPOUND	DANGB4,MW24,SS1 88092254	DANGB4,MW24, SS1A 88092255
.,3-DICHLOROPROPYLENE	ND	ND
.,1,2,2-TETRACHLOROETHANE	ND	ND
.,1,1,2-TETRACHLOROETHANE	ND	ND
'ETRACHLOROETHYLENE	ND	ND
.,1,1-TRICHLOROETHANE	ND	ND
.,1,2-TRICHLOROETHANE	ND	ND
'RICHLOROETHYLENE	ND	ND
:RICHLOROFLUOROMETHANE	ND	ND
'RICHLOROPROPANE	ND	ND
'INYL CHLORIDE	ND	ND

ID - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 942
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/01/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8020

TEST COMPOUND	DANGB4,MW24,SS1 88092254	DANGB4,MW24, SS1A 88092255
BENZENE	ND	ND
CHLOROBENZENE	ND	ND
1,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
ETHYL BENZENE	ND	ND
TOLUENE	ND	ND
XYLENES	ND	ND

ND - Not Detected

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD 941 942

3

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature) Mike Roddy

SHIP TO: ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA. 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SW8010, 8020	SW8080	SW8270	EPA 418.1	SW6010, [redacted], 7191	SW7131, 7421, [redacted]	REMARKS
8/31/88	8:20	DANGB8 MW14 SS3	1	X						Resample (Original Sample broken 8-8-88) 882250
8/31/88	8:20	DANGB8 MW14 SS9	1	X						Resample (Discard original Sample 8-8-88) 882251
8/31/88	9:45	DANGB8 MW20 SS5	1	X						882252
8/31/88	8:45	DANGB8 MW20 SS1	1	X				882253		Resample (original Sample Broken 8-5-88)
8/31/88	8:20	DANGB8 MW14 SS3	1		X	X	X	X	X	882250 Resample (original Sample Broken 8-8-88)
8/31/88	8:20	DANGB8 MW14 SS9	1		X	X	X	X	X	882251 Resample (Discard orig. Sample 8-8-88)
8/31/88	8:45	DANGB8 MW20 SS1	1		X	X	X	X	X	882253 Resample (original Sample broken 8-5-88)
8/31/88	8:45	DANGB8 MW20 SS5	1		X	X	X	X	X	882252
8/31/88	10:05	DANGB4 MW24 SS1	1	X				882251		Resample (Discard original Sample broken 8-24-88)
8/31/88	10:05	DANGB4 MW24 SS1A	1	X						882255
8/31/88	10:05	DANGB4 MW24 SS1	1			X	X	X		Resample (Discard original Sample broken 8-24-88) 882254
8/31/88	10:05	DANGB4 MW24 SS1A	1			X	X	X		882255

2210

NOTE All 6010 Analysis for Barium Only

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	8/31/88 1800				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
		Bill [illegible]	9.1.88 1510	rec'd cold & intact

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082200-88082203, 88092223-88092227
88092244-88092246, 88092248-88092249
88092252-88092255

QC Report No: ICP-S-0033-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-31-88
Date Reported: 10-28-88
Dilution Factor: NA
%Moisture: 8.1

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Barium	88082200	88082200	10-20-88	10-18-88	SW6010	<20	55.8	52.6	7	218	55.8	254	91	
Cadmium	88082200	88082200	10-20-88	10-18-88	SW6010	<0.5	7.4	8.7	16	5.4	7.4	11.0	67N	
Chromium	88082200	88082200	10-20-88	10-18-88	SW6010	<1.0	31.8	37.3	16	21.8	31.8	56.7	114	
Lead	88082200	88082200	10-20-88	10-18-88	SW6010	<10	<10	<10	NC	54.4	<10	49.2	90	A

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
A Sample results for lead are reported from Furnace analyses for the following Sample No(s).: 88082200-88082203, 88082244, 88092248-88092249, 88092252, 88092255.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two
NA = Not Applicable
NC = Not Calculated
ND = Not Detected
SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092223-88092227
88092244-88092255

QC Report No: TPH-S-0075-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: NA
Date Prepared: 9-22-88
Date Analyzed: 9-23-88
Date Reported: 11-02-88
Dilution Factor: NA
%Moisture: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
Blank	418.1	<10	8.6J	39.5	38.5	76	37.5	73	3	*

2742

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
J See Legend attached.
* The reporting limit for the sample in this batch is provided by the sub-contract laboratory.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO(S).: VGC-S-0060-88
QC REPORT NO(S).: VGC-S-0060-88B

Percent recovery and relative percent difference for some of the matrix spiking compounds are outside ES Laboratory acceptance limits. A blank spike analysis shows the laboratory to be in control.

Results for Sample No. 88092739 are reported on a wet weight basis, since percentage moisture was not performed.

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082244-88082254

QC Report No: VGC-S-0049-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 9-01-88
Date Prepared: NA
Date Analyzed: 9-13-88
Date Reported: 10-26-88
Dilution Factor: NA
% Moisture: 17.4

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88082244	1,1-dichloroethane	12.1	ND	10.6	88	10.1	83	5	20	58-124
	Trichloroethene	12.1	ND	11.5	95	12.2	101	6	16	75-110
	Chlorobenzene	12.1	ND	11.3	93	11.9	98	5	21	71-125
	Aromatics: 8020									
88082244	Benzene	12.1	ND	10.9	90	12.1	100	10	26	75-123
	Toluene	12.1	ND	10.9	90	12.1	100	10	16	79-115
	Chlorobenzene	12.1	ND	10.6	88	11.7	97	10	24	82-112

2714

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (PR)} = \frac{MS - MSD}{(MS + MSD)/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(MS \text{ or } MSD) - SR}{SA} \times 100$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88092672-88092676, 88092731-88092741
88092781-88092783, 88082255

QC Report No: VGC-S-0060-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 9-27-88
Date Prepared: NA
Date Analyzed: 10-10-88
Date Reported: 11-03-88
Dilution Factor: NA
% Moisture: NT

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
2715	Halocarbons: 8010									
88092739	1,1-dichloroethane	10	ND	8.32	83	5.50	55*	41*	20	58-124
	Trichloroethene	10	ND	7.90	79	6.34	63*	22*	16	75-110
	Chlorobenzene	10	ND	6.06	61*	5.21	52*	15	21	71-125
	Aromatics: 8020									
88092739	Benzene	10	2.3	13.8	115	8.33	60*	49*	26	75-123
	Toluene	10	5.5	16.6	111	11.3	58*	38*	16	79-115
	Chlorobenzene	10	ND	9.40	94	8.21	82	14	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Case Narrative attached.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected
NT = Not Tested

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88092672-88092676, 88092731-88092741
88092781-88092783, 88082255

QC Report No: VGC-S-0060-88B
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: NA
Date Prepared: NA
Date Analyzed: 10-10-88
Date Reported: 11-03-88
Dilution Factor: NA
% Moisture: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
Blank 2716	1,1-dichloroethane	10	ND	9.46	95	10.4	104	9	20	58-124
	Trichloroethene	10	ND	9.33	93	9.61	96	3	16	75-110
	Chlorobenzene	10	ND	8.78	88	9.11	91	4	21	71-125
	Aromatics: 8020									
Blank	Benzene	10	ND	9.24	92	10.0	100	8	26	75-123
	Toluene	10	ND	9.38	94	9.53	95	2	16	79-115
	Chlorobenzene	10	ND	9.10	91	9.25	92	2	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/Kg
Date Reported: 11-03-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
92	9-13-88	VGC	Carbopack	75-09-2	Dichloromethane	2.5	0.25	88092251-88092255
					1,3-Dichlorobenzene	4.4	0.32	

2717

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DATA PACKAGE #49

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ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received by this laboratory on 8-20-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082000	DANGB4-MW23-SS1	BA-I	8-19-88		9-18-88	
88082000	DANGB4-MW23-SS1	CD-F	8-19-88		9-16-88	
88082000	DANGB4-MW23-SS1	CR-F	8-19-88		9-16-88	
88082000	DANGB4-MW23-SS1	PB-F	8-19-88		9-22-88	
88082000	DANGB4-MW23-SS1	418.1	8-19-88	9-15-88	9-15-88	
88082000	DANGB4-MW23-SS1	MOIS	8-19-88		8-29-88	
88082000	DANGB4-MW23-SS1	8010	8-19-88		8-31-88	8-31-88
88082000	DANGB4-MW23-SS1	8020	8-19-88		8-31-88	8-31-88
88082001	DANGB4-MW23-SS2	BA-I	8-19-88		9-18-88	
88082001	DANGB4-MW23-SS2	CD-F	8-19-88		9-16-88	
88082001	DANGB4-MW23-SS2	CR-F	8-19-88		9-16-88	
88082001	DANGB4-MW23-SS2	PB-F	8-19-88		9-22-88	
88082001	DANGB4-MW23-SS2	418.1	8-19-88	9-15-88	9-15-88	
88082001	DANGB4-MW23-SS2	MOIS	8-19-88		8-29-88	
88082001	DANGB4-MW23-SS2	8010	8-19-88		8-31-88	8-31-88
88082001	DANGB4-MW23-SS2	8020	8-19-88		8-31-88	8-31-88
88082002	DANGB4-MW23-SS3	BA-I	8-19-88		9-18-88	
88082002	DANGB4-MW23-SS3	CD-F	8-19-88		9-16-88	
88082002	DANGB4-MW23-SS3	CR-F	8-19-88		9-16-88	
88082002	DANGB4-MW23-SS3	PB-F	8-19-88		9-22-88	
88082002	DANGB4-MW23-SS3	418.1	8-19-88	9-15-88	9-15-88	
88082002	DANGB4-MW23-SS3	MOIS	8-19-88		8-29-88	
88082002	DANGB4-MW23-SS3	8010	8-19-88		8-31-88	8-31-88
88082002	DANGB4-MW23-SS3	8020	8-19-88		8-31-88	8-31-88

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082000-88082002
WORK ORDER NO.: 886

These soil samples were received at the ES Berkeley Laboratory on 8-20-88. They were received cold and intact.

DETECTION LIMITS
HALOGENATED VOLATILE ORGANICS
EPA METHOD 8010
SAMPLES NO.: 88082000-88082002

Compound	Detection Limits	
Benzyl chloride	0.50	ug/KG
bis(2-chloroethoxy)methane	5.0	ug/KG
bis(2-chloroisopropyl)ether	5.0	ug/KG
Bromobenzene	0.50	ug/KG
Bromodichloromethane	0.10	ug/KG
Bromoform	0.20	ug/KG
Bromomethane	1.2	ug/KG
Carbon Tetrachloride	0.12	ug/KG
Chloroacetaldehyde	50.0	ug/KG
Chloral	50.0	ug/KG
Clorobenzene	0.25	ug/KG
Chloroethane	0.52	ug/KG
Cloroform	0.05	ug/KG
1-Chlorohexane	0.50	ug/KG
2-Chloroethyl vinyl ether	0.13	ug/KG
Cloromethane	0.08	ug/KG
Chloromethyl methyl ether	5.0	ug/KG
O-,m-,& p-Chlorotoluenes	0.50	ug/KG
Dibromochloromethane	0.09	ug/KG
Dibromomethane	0.50	ug/KG
1,2-Dichlorobenzene	0.15	ug/KG
1,3-Dichlorobenzene	0.32	ug/KG
1,4-Dichlorobenzene	0.24	ug/KG
Dichlorodifluoromethane	1.8	ug/KG
1,1-Dichloroethane	0.07	ug/KG
1,2-Dichloroethane	0.03	ug/KG
1,1-Dichloroethylene	0.13	ug/KG
trans-1,2-Dichloroethylene	0.10	ug/KG
Dichloromethane	0.25	ug/KG
1,2-Dichloropropane	0.04	ug/KG
trans-1,3-Dichloropropylene	0.34	ug/KG
1,1,2,2-Tetrachloroethane	0.03	ug/KG
1,1,1,2-Tetrachloroethane	0.50	ug/KG
Tetrachloroethylene	0.03	ug/KG
1,1,1-Trichloroethane	0.03	ug/KG
1,1,2-Trichloroethane	0.02	ug/KG
Trichloroethylene	0.12	ug/KG
Trichlorofluoromethane	0.50	ug/KG
Trichloropropane	0.50	ug/KG
Vinyl chloride	0.18	ug/KG

The method detection limits listed are based upon the EPA method listed. Dilution or other deviations from the normal procedures, required due to characteristics of a sample, will influence these values. These changes are described in the report narrative if applicable.

DETECTION LIMITS
AROMATIC VOLATILE ORGANICS
EPA METHOD 8020
SAMPLES NO.: 88082000-88082002

Compound	Detection Limits	
Benzene	0.2	ug/Kg
Chlorobenzene	0.2	ug/Kg
1,2-Dichlorobenzene	0.4	ug/Kg
1,3-Dichlorobenzene	0.4	ug/Kg
1,4-Dichlorobenzene	0.3	ug/Kg
Ethylbenzene	0.2	ug/Kg
Toluene	0.2	ug/Kg
Xylenes (Dimethyl benzene)	0.4	ug/Kg

The method detection limits listed are based upon the EPA method listed. Dilution or other deviations from the normal procedures, required due to characteristics of a sample, will influence these values. These changes are described in the report narrative if applicable.

ENGINEERING-SCIENCE INC.
11/03/88

ANALYSIS REPORT

WORK ORDER NUMBER: 886
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/20/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/Kg

TEST COMPOUND	DANGB4-MW23-SS1 8-19-88 88082000	DANGB4-MW23-SS2 8-19-88 88082001	DANGB4-MW23-SS3 8-19-88 88082002
ACID DIG SOIL	NA	NA	NA
BARIUM	51.3	51.4	27.9
CADMIUM	10.6*N	8.5*N	9.8*N
CHROMIUM	23.6	23.7	20.4
LEAD	3.2NS	4.2N	2.6N

NA - Not Analyzed

ND - Not Detected

ENGINEERING-SCIENCE INC.
11/02/88

ANALYSIS REPORT

/ORK ORDER NUMBER: 886
:OB NUMBER : ZB0000000440
/ORK ORDER DATE : 08/20/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/Kg

TEST COMPOUND	DANGB4-MW23-SS1 8-19-88 88082000	DANGB4-MW23-SS2 8-19-88 88082001	DANGB4-MW23-SS3 8-19-88 88082002
418.1 PETROLEUM HYDROCARBONS	370	<100	<100
% MOISTURE	11.7	16.1	12.3

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

ANALYSIS REPORT

WORK ORDER NUMBER: 886
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/20/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8010

TEST COMPOUND	DANGB4-MW23-SS1 8-19-88 88082000	DANGB4-MW23-SS2 8-19-88 88082001	DANGB4-MW23-SS3 8-19-88 88082002
BENZYL CHLORIDE	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND
BROMOBENZENE	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND
BROMOFORM	ND	ND	ND
BROMOETHANE	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND
CHLORAL	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
CHLOROETHANE	ND	ND	ND
CHLOROFORM	ND	0.40B	0.08B
1-CHLOROHEXANE	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND
CHLOROMETHANE	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND
DICHLOROMETHANE	8.4B	3.2B	5.4B
1,2-DICHLOROPROPANE	ND	ND	ND

ANALYSIS REPORT FOR WORK ORDER NUMBER 886

TEST COMPOUND	DANGB4-MW23-SS1 8-19-88 88082000	DANGB4-MW23-SS2 8-19-88 88082001	DANGB4-MW23-SS3 8-19-88 88082002
1,3-DICHLOROPROPYLENE	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND

ANALYSIS REPORT

WORK ORDER NUMBER: 886
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/20/88

APPROVED BY _____
Lab Supervisor

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710 S. ILLINOIS AVE. STE. S103
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710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8020

TEST COMPOUND	DANGB4-MW23-SS1 8-19-88 88082000	DANGB4-MW23-SS2 8-19-88 88082001	DANGB4-MW23-SS3 8-19-88 88082002
BENZENE	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
ETHYL BENZENE	ND	ND	ND
TOLUENE	1.2	25	13
XYLENES	ND	ND	ND

CHAIN OF CUSTODY RECORD

ES JOB NO:	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature) Jo Ann Sherwin
Peter Ellsworth Tasha Roddy

SHIP TO:
ENGINEERING-SCIENCE LABORATORY, INC.
600 Bancroft Way
Berkeley, CA. 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SW8010, 8020	SW8080	SW8270	EPA 418.1	SW6010, 7191	SW7131, 7421			REMARKS
				SOILS ANALYSES REQUIRED								
8/19/88	3:41	DANGB-4-MW23-SS1	1				X	X	X			882000
8/19/88	3:41	DANGB-4-MW23-SS1	1	X								
8/19/88	4:18	DANGB-4-MW23-SS2	1	X			X	X	X	JS	8/19/88	882001
8/19/88	4:21	DANGB-4-MW23-SS2	1				X	X	X			
8/19/88	4:58	DANGB-4-MW23-SS3	1	X								882002
8/19/88	4:58	DANGB-4-MW23-SS3	1				X	X	X			
	0730											

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Jo Ann Sherwin	8/19/88 5:30				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
		Bill Judson	8.20.88 11:00	[illegible] cold intact

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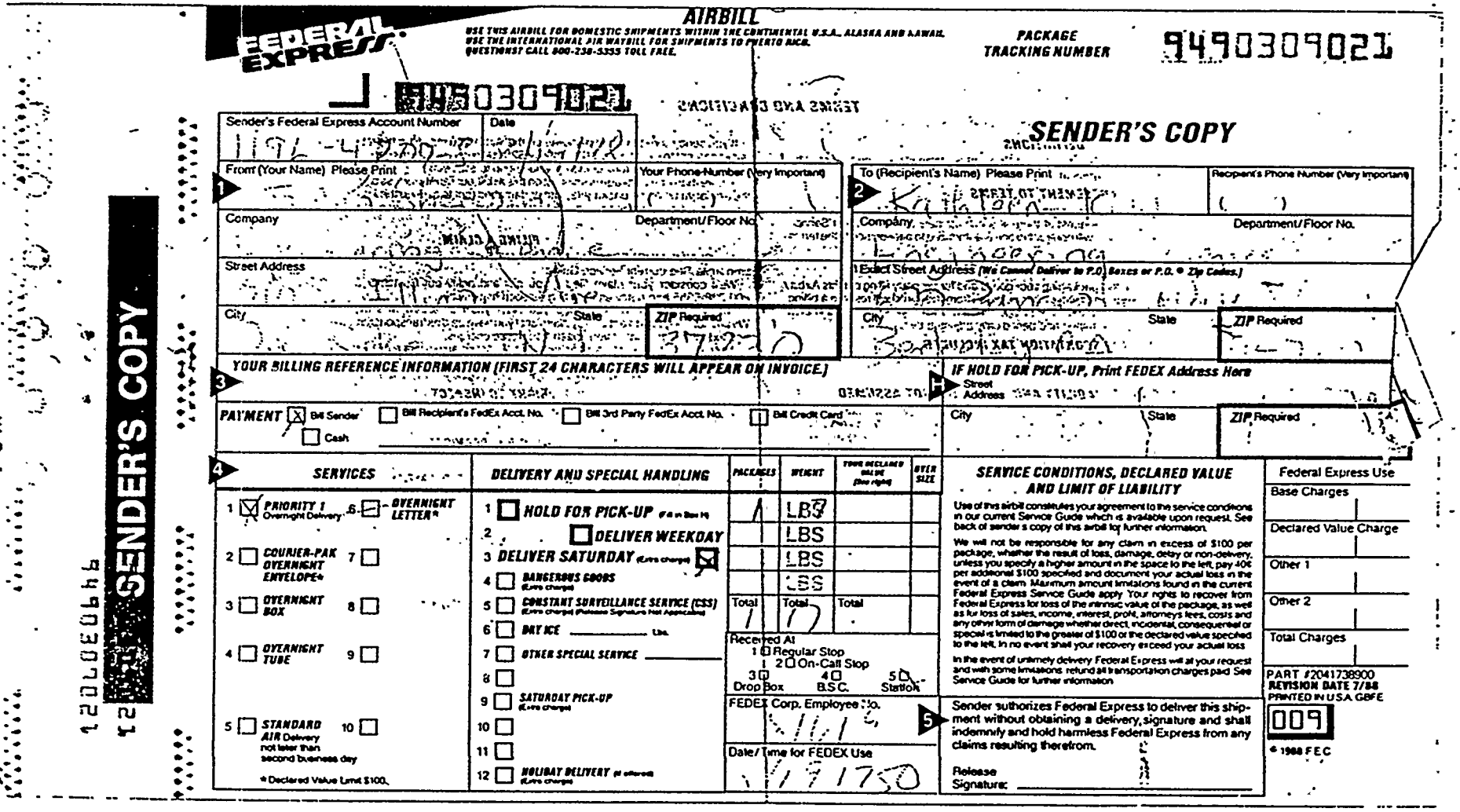

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2731

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88081877-88081879, 88081883-88081890
88081938-88081942, 88082000-88082002 ✓

QC Report No: ICP-S-0027-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-15-88
Date Reported: 10-13-88
Dilution Factor: NA
%Moisture: 9.6

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	SR	SSR	PR	Not
Barium	88081879	88081879	9-18-88	9-09-88	6010	<20	40.2	37.2	8	221	40.2	275	106	
Cadmium	88081879	88081879	9-16-88	9-09-88	6010	<0.5	6.31	10.6	51*	5.53	6.31	14.6	150N	
Chromium	88081879	88081879	9-16-88	9-09-88	6010	<1.0	20.9	22.7	8	22.1	20.9	47.0	118	

2732

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Legend attached.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two
NA = Not Applicable
NC = Not Calculated
ND = Not Detected
SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: AAF-S-0026-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 9-17-88
Date Reported: 10-10-88
Dilution Factor: NA
%Moisture: 15.0

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88081901-88081906, 88081938-88081942
88082000-88092002

Laboratory Supervisor Approval:

_____

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Arsenic	88081902	88081902	10-03-88	9-17-88	7060	<1.0	<5.0E	<5.0E	NC	4.70	4.90E	8.59	79	
Lead	88081902	88081902	9-21-88	9-17-88	7421	<0.5	5.69	5.69	0	4.88	5.69	9.88	68N	

2733

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
N - See Legend attached.
E - See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2}$ X 100

Percent Recovery (PR) = $\frac{SSR - SR}{SA}$ x 100

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
Samples No.: 88081877-88081879
Samples No.: 88081883-88081890
Samples No.: 88081938-88081942
Samples No.: 88082000-88082002

The results obtained for the laboratory control sample (LCS) analyzed with these samples for the analytes Cadmium, Chromium, and Barium exceeded the recommended EPA recoveries. All data associated with this batch was closely inspected and no analytical problems were found. The initial and continuing calibration verification standards and blanks and precision and accuracy recoveries were within acceptable limits with the following exceptions:

Cadmium spike recoveries and precision exceeded acceptable limits. The spike sample was followed by an analytical spike as required by laboratory standard operating procedure. The results of the analytical spike recovery for Cadmium were within acceptable ranges.

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88081898-88081906, 88082000-88082002
88082043-88082049

QC Report No: TPH-S-0050-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-17-88
Date Prepared: 9-12-88
Date Analyzed: 9-13-88
Date Reported: NA
Dilution Factor: 6
%Moisture: 22.2

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88081903	418.1	<100	<100	1300	1000	77	820	63	20	*

2735

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* Percent recovery (PR) and relative percent difference (RPD) are within ES Laboratory control limits.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88081971-88081977
88082000-88082002

QC Report No: VGC-S-0038-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-20-88
Date Prepared: NA
Date Analyzed: 9-01-88
Date Reported: 9-27-88
Dilution Factor: NA
% Moisture: 11.7

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88082000	1,1-dichloroethane	11.3	ND	10.2	90	9.04	80	12	20	58-124
	Trichloroethene	11.3	ND	10.6	94	9.9	88	7	16	75-110
	Chlorobenzene	11.3	ND	10.7	95	9.9	88	8	21	71-125
	Aromatics: 8020									
88082000	Benzene	11.3	ND	10.7	95	9.9	88	8	26	75-123
	Toluene	11.3	ND	11.4	101	10.7	95	6	16	79-115
	Chlorobenzene	11.3	ND	10.5	93	10.1	89	4	24	82-112

2736

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/KG
Date Reported: 10-07-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
02	8-31-88	VGC	Carbopack	75-09-2	Dichloromethane	2.9	0.25	88082000-88082002
				67-66-3	Chloroform	0.15	0.5	
57	8-30-88	VGC	Carbopack	75-09-2	Dichloromethane	4.0	0.25	88081971
				71-55-6	1,1,1-Trichloromethane	0.35	0.25	
77	9-26-88	VGC	Carbopack	75-09-2	Dichloromethane	2.5	0.5	88081972-88081977
				75-35-4	1,1-Dichloroethene	0.41	0.13	
				67-66-3	Chloroform	0.07	0.05	
				71-55-6	1,1,1-Trichloroethane	0.30	0.03	
				127-18-4	Tetrachloroethene	0.32	0.12	
				108-88-3	Toluene	2.8	0.20	

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DATA PACKAGE #50

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ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received by this laboratory on 8-25-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082099	DANGB-4-MW24-SS1	BA-I	8-24-88		9-19-88	
88082099	DANGB-4-MW24-SS1	CD-F	8-24-88		9-19-88	
88082099	DANGB-4-MW24-SS1	CR-F	8-24-88		9-19-88	
88082099	DANGB-4-MW24-SS1	PB-F	8-24-88		10-4-88	
88082099	DANGB-4-MW24-SS1	418.1	8-24-88	9-17-88	9-19-88	
88082099	DANGB-4-MW24-SS1	MOIS	8-24-88		9-02-88	
88082099	DANGB-4-MW24-SS1	8010	8-24-88		9-01-88	9-1-88/9-2-88
88082099	DANGB-4-MW24-SS1	8020	8-24-88		9-01-88	9-01-88
88082100	DANGB-4-MW24-SS2	BA-I	8-24-88		9-19-88	
88082100	DANGB-4-MW24-SS2	CD-F	-24-88		9-19-88	
88082100	DANGB-4-MW24-SS2	CR-F	-24-88		9-19-88	
88082100	DANGB-4-MW24-SS2	PB-F	8-24-88		10-4-88	
88082100	DANGB-4-MW24-SS2	418.1	8-24-88	9-17-88	9-19-88	
88082100	DANGB-4-MW24-SS2	MOIS	8-24-88		9-02-88	
88082100	DANGB-4-MW24-SS2	8010	8-24-88		9-01-88	9-1-88/9-2-88
88082100	DANGB-4-MW24-SS2	8020	8-24-88		9-01-88	9-01-88
88082101	DANGB-4-MW24-SS3	BA-I	8-24-88		9-19-88	
88082101	DANGB-4-MW24-SS3	CD-F	8-24-88		9-19-88	
88082101	DANGB-4-MW24-SS3	CR-F	8-24-88		9-19-88	
88082101	DANGB-4-MW24-SS3	PB-F	8-24-88		10-4-88	
88082101	DANGB-4-MW24-SS3	418.1	8-24-88	9-17-88	9-19-88	
88082101	DANGB-4-MW24-SS3	MOIS	8-24-88		9-02-88	
88082101	DANGB-4-MW24-SS3	8010	8-24-88		9-01-88	9-1-88/9-2-88
88082101	DANGB-4-MW24-SS3	8020	8-24-88		9-01-88	9-02-88

* If applicable

A SUBSIDIARY OF THE PARSONS CORPORATION

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082099-88082101
WORK ORDER NO.: 908

These soil samples were received at the ES Berkeley Laboratory on 8-25-88. They were received cold and intact.

Due to a suspected interelement matrix interference, all cadmium data at levels reportable by ICP analysis ($\geq$1 mg/KG dry wt.) are potentially false positives. This is being investigated and follow-up will be provided when available.

ENGINEERING-SCIENCE INC.
11/02/88

ANALYSIS REPORT

WORK ORDER NUMBER: 908
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/25/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/Kg

TEST COMPOUND	DANGB-4-MW24-SS1 88082099	DANGB-4-MW24-SS2 88082100	DANGB-4-MW24-SS3 88082101
ACID DIG SOIL	NA	NA	NA
BARIUM	49.0	40.2	45.9
CADMIUM	11.4N E	8.8N E	11.5N E
CHROMIUM	32.6	25.6	49.3
LEAD	6.4N	2.8*	4.1N

ANALYSIS REPORT

WORK ORDER NUMBER: 908
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/25/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/Kg

TEST COMPOUND	DANGB-4-MW24-SS1 88082099	DANGB-4-MW24-SS2 88082100	DANGB-4-MW24-SS3 88082101
418.1 PETROLEUM HYDROCARBONS	150	<100	<100
% MOISTURE	12.8	14.7	9.3

ANALYSIS REPORT

WORK ORDER NUMBER: 908
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/25/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/KG, GROUP 8010

TEST COMPOUND	DANGB-4-MW24-SS1 88082099	DANGB-4-MW24-SS2 88082100	DANGB-4-MW24-SS3 88082101
BENZYL CHLORIDE	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND
BROMOBENZENE	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND
BROMOFORM	ND	ND	ND
BROMOETHANE	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND
CHLORAL	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
CHLOROETHANE	ND	ND	ND
CHLOROFORM	ND	ND	ND
1-CHLOROHEXANE	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND
CHLOROMETHANE	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND
DICHLOROMETHANE	2.9B	4.3B	3.6B
1,2-DICHLOROPROPANE	ND	ND	ND

ANALYSIS REPORT FOR WORK ORDER NUMBER 908

'EST COMPOUND	DANGB-4-MW24-SS1 88082099	DANGB-4-MW24-SS2 88082100	DANGB-4-MW24-SS3 88082101
.,3-DICHLOROPROPYLENE	ND	ND	ND
.,1,2,2-TETRACHLOROETHANE	ND	ND	ND
.,1,1,2-TETRACHLOROETHANE	ND	ND	ND
'ETRACHLOROETHYLENE	ND	ND	ND
',1,1-TRICHLOROETHANE	ND	ND	ND
',1,2-TRICHLOROETHANE	ND	ND	ND
'RICHLOROETHYLENE	ND	ND	ND
'RICHLOROFLUOROMETHANE	ND	ND	ND
'RICHLOROPROPANE	ND	ND	ND
/INYL CHLORIDE	ND	ND	ND

ANALYSIS REPORT

WORK ORDER NUMBER: 908
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/25/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/KG, GROUP 8020

TEST COMPOUND	DANGB-4-MW24-SS1 88082099	DANGB-4-MW24-SS2 88082100	DANGB-4-MW24-SS3 88082101
BENZENE	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
ETHYL BENZENE	ND	ND	ND
TOLUENE	39	150	950
XYLENES	ND	ND	ND

CHAIN OF CUSTODY RECORD 708, 709

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature) J. Ann Sherwin, Linda Reddy

SHIP TO: ENGINEERING-SCIENCE LABORATORY, INC.
600 Bancroft Way
Berkeley, CA. 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SW8010, 8020	SW8080	SW8270	EPA 418.1	SW8010, 7191	SW7131, 7421	[illegible]	[illegible]	REMARKS
8/24/88	8:10a	DANGB-4-MW24 SS1	1	X								882099 908
8/24/88	8:10a	DANGB-4-MW24 SS1	1				X	X	X			882100
8/24/88	8:20a	DANGB-4-MW24 SS2	1	X								
8/24/88	8:20a	DANGB 4-MW24 SS2	1				X	X	X			
8/24/88	9:30a	DANGB-4-MW24 SS3	1	X								882101
8/24/88	9:30a	DANGB-4-MW24 SS3	1				X	X	X			
8/24/88	3:38	DANGB-3-MW27 SS1	1	X								882102 909
8/24/88	3:38	DANGB 3-MW27 SS1	1		✓	✓	✓	✓	✓	✓	✓	
8/24/88	4:10	DANGB-3-MW27 SS2	1	X								882103
8/24/88	4:10	DANGB-3-MW27 SS2	1		✓	✓	✓	✓	✓	✓	✓	
8/24/88	4:32	DANGB-3-MW27 SS3	1	X								882104
8/24/88	4:32	DANGB-3-MW27 SS3	1		✓	✓	✓	✓	✓	✓	✓	

SOILS ANALYSES REQUIRED

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
J. Ann Sherwin	8/24/88 5:30p				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
		Bill Friedman	8.25.88 12:45	rec'd cold & intact

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

2nd 8412

DATA PACKAGE #51

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ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received by this laboratory on 8-31-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88102192	DANGB3-MW30-SS1	AS-F	8-30-88		10-10-88	
88102192	DANGB3-MW30-SS1	BA-I	8-30-88		10-20-88	
88102192	DANGB3-MW30-SS1	CD-F	8-30-88		10-20-88	
88102192	DANGB3-MW30-SS1	CR-F	8-30-88		10-20-88	
88102192	DANGB3-MW30-SS1	HG-C	8-30-88		9-22-88	
88102192	DANGB3-MW30-SS1	PB-F	8-30-88		10-20-88	
88102192	DANGB3-MW30-SS1	418.1	8-30-88	9-26-88	9-27-88	
88102192	DANGB3-MW30-SS1	MOIS	8-30-88		9-07-88	
88102192	DANGB3-MW30-SS1	8010	8-30-88		9-08-88	9-08-88
88102192	DANGB3-MW30-SS1	8020	8-30-88		9-08-88	9-08-88
88102192	DANGB3-MW30-SS1	8080	8-30-88	9-09-88	10-05-88	
88102193	DANGB3-MW30-SS1A	AS-F	8-30-88		10-10-88	
88102193	DANGB3-MW30-SS1A	BA-I	8-30-88		10-20-88	
88102193	DANGB3-MW30-SS1A	CD-F	8-30-88		10-20-88	
88102193	DANGB3-MW30-SS1A	CR-F	8-30-88		10-20-88	
88102193	DANGB3-MW30-SS1A	HG-C	8-30-88		9-22-88	
88102193	DANGB3-MW30-SS1A	PB-F	8-30-88		10-20-88	
88102193	DANGB3-MW30-SS1A	418.1	8-30-88	9-26-88	9-27-88	
88102193	DANGB3-MW30-SS1A	MOIS	8-30-88		9-07-88	
88102193	DANGB3-MW30-SS1A	8010	8-30-88		9-08-88	9-08-88
88102193	DANGB3-MW30-SS1A	8020	8-30-88		9-08-88	9-08-88
88102193	DANGB3-MW30-SS1A	8080	8-30-88	9-09-88	10-05-88	10-7-88

* If applicable

ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88102194	DANGB3-MW30-SS2	AS-F	8-30-88		10-10-88	
88102194	DANGB3-MW30-SS2	BA-I	8-30-88		10-20-88	
88102194	DANGB3-MW30-SS2	CD-F	8-30-88		10-20-88	
88102194	DANGB3-MW30-SS2	CR-F	8-30-88		10-20-88	
88102194	DANGB3-MW30-SS2	HG-C	8-30-88		9-22-88	
88102194	DANGB3-MW30-SS2	PB-F	8-30-88		10-20-88	
88102194	DANGB3-MW30-SS2	418.1	8-30-88	9-26-88	9-27-88	
88102194	DANGB3-MW30-SS2	MOIS	8-30-88		9-07-88	
88102194	DANGB3-MW30-SS2	8010	8-30-88		9-08-88	9-08-88
88102194	DANGB3-MW30-SS2	8020	8-30-88		9-08-88	9-08-88
88102194	DANGB3-MW30-SS2	8080	8-30-88	9-09-88	10-05-88	
88102195	DANGB3-MW30-SS3	AS-F	8-30-88		10-10-88	
88102195	DANGB3-MW30-SS3	BA-I	8-30-88		10-20-88	
88102195	DANGB3-MW30-SS3	CD-F	8-30-88		10-20-88	
88102195	DANGB3-MW30-SS3	CR-F	8-30-88		10-20-88	
88102195	DANGB3-MW30-SS3	HG-C	8-30-88		9-22-88	
88102195	DANGB3-MW30-SS3	PB-F	8-30-88		10-20-88	
88102195	DANGB3-MW30-SS3	418.1	8-30-88	9-26-88	9-27-88	
88102195	DANGB3-MW30-SS3	MOIS	8-30-88		9-07-88	
88102195	DANGB3-MW30-SS3	8010	8-30-88		9-08-88	9-08-88
88102195	DANGB3-MW30-SS3	8020	8-30-88		9-08-88	9-09-88
88102195	DANGB3-MW30-SS3	8080	8-30-88	9-09-88	10-05-88	
88102196	DANGB3-MW29-SS1	AS-F	8-30-88		10-10-88	
88102196	DANGB3-MW29-SS1	BA-I	8-30-88		10-20-88	
88102196	DANGB3-MW29-SS1	CD-F	8-30-88		10-20-88	
88102196	DANGB3-MW29-SS1	CR-F	8-30-88		10-20-88	
88102196	DANGB3-MW29-SS1	HG-C	8-30-88		9-22-88	
88102196	DANGB3-MW29-SS1	PB-F	8-30-88		10-20-88	
88102196	DANGB3-MW29-SS1	418.1	8-30-88	9-26-88	9-27-88	
88102196	DANGB3-MW29-SS1	MOIS	8-30-88		9-07-88	
88102196	DANGB3-MW29-SS1	8010	8-30-88		9-08-88	9-08-88
88102196	DANGB3-MW29-SS1	8020	8-30-88		9-08-88	9-09-88
88102196	DANGB3-MW29-SS1	8080	8-30-88	9-09-88	10-05-88	10-07-88

* If applicable

ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88102197	DANGB3-MW29-SS2	AS-F	8-30-88		10-10-88	
88102197	DANGB3-MW29-SS2	BA-I	8-30-88		10-20-88	
88102197	DANGB3-MW29-SS2	CD-F	8-30-88		10-20-88	
88102197	DANGB3-MW29-SS2	CR-F	8-30-88		10-20-88	
88102197	DANGB3-MW29-SS2	HG-C	8-30-88		9-22-88	
88102197	DANGB3-MW29-SS2	PB-F	8-30-88		10-20-88	
88102197	DANGB3-MW29-SS2	418.1	8-30-88	9-26-88	9-27-88	
88102197	DANGB3-MW29-SS2	MOIS	8-30-88		9-07-88	
88102197	DANGB3-MW29-SS2	8010	8-30-88		9-08-88	9-09-88
88102197	DANGB3-MW29-SS2	8020	8-30-88		9-08-88	9-09-88
88102197	DANGB3-MW29-SS2	8080	8-30-88	9-09-88	10-05-88	10-07-88
88102198	DANGB3-MW29-SS3	AS-F	8-30-88		10-10-88	
88102198	DANGB3-MW29-SS3	BA-I	8-30-88		10-20-88	
88102198	DANGB3-MW29-SS3	CD-F	8-30-88		10-20-88	
88102198	DANGB3-MW29-SS3	CR-F	8-30-88		10-20-88	
88102198	DANGB3-MW29-SS3	HG-C	8-30-88		9-22-88	
88102198	DANGB3-MW29-SS3	PB-F	8-30-88		10-20-88	
88102198	DANGB3-MW29-SS3	418.1	8-30-88	9-26-88	9-27-88	
88102198	DANGB3-MW29-SS3	MOIS	8-30-88		9-07-88	
88102198	DANGB3-MW29-SS3	8010	8-30-88		9-08-88	9-09-88
88102198	DANGB3-MW29-SS3	8020	8-30-88		9-08-88	9-09-88
88102198	DANGB3-MW29-SS3	8080	8-30-88	9-09-88	10-05-88	
88102199	DANGB3-MW29-SS3A	AS-F	8-30-88		10-10-88	
88102199	DANGB3-MW29-SS3A	BA-I	8-30-88		10-20-88	
88102199	DANGB3-MW29-SS3A	CD-F	8-30-88		10-20-88	
88102199	DANGB3-MW29-SS3A	CR-F	8-30-88		10-20-88	
88102199	DANGB3-MW29-SS3A	HG-C	8-30-88		9-22-88	
88102199	DANGB3-MW29-SS3A	PB-F	8-30-88		10-20-88	
88102199	DANGB3-MW29-SS3A	418.1	8-30-88	9-26-88	9-27-88	
88102199	DANGB3-MW29-SS3A	MOIS	8-30-88		9-07-88	
88102199	DANGB3-MW29-SS3A	8010	8-30-88		9-08-88	9-08-88
88102199	DANGB3-MW29-SS3A	8020	8-30-88		9-08-88	9-09-88
88102199	DANGB3-MW29-SS3A	8080	8-30-88	9-09-88	10-05-88	

* If applicable

ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88102200	DANGB3-SGD3-SS1	AS-F	8-30-88		10-10-88	
88102200	DANGB3-SGD3-SS1	BA-I	8-30-88		10-20-88	
88102200	DANGB3-SGD3-SS1	CD-F	8-30-88		10-20-88	
88102200	DANGB3-SGD3-SS1	CR-F	8-30-88		10-20-88	
88102200	DANGB3-SGD3-SS1	HG-C	8-30-88		9-22-88	
88102200	DANGB3-SGD3-SS1	PB-F	8-30-88		10-20-88	
88102200	DANGB3-SGD3-SS1	418.1	8-30-88	9-26-88	9-27-88	
88102200	DANGB3-SGD3-SS1	MOIS	8-30-88		9-07-88	
88102200	DANGB3-SGD3-SS1	8010	8-30-88		9-08-88	9-08-88
88102200	DANGB3-SGD3-SS1	8020	8-30-88		9-08-88	9-09-88
88102200	DANGB3-SGD3-SS1	8080	8-30-88	9-09-88	10-05-88	
88102201	DANGB3-SGD3-SS1A	AS-F	8-30-88		10-10-88	
88102201	DANGB3-SGD3-SS1A	BA-I	8-30-88		10-20-88	
88102201	DANGB3-SGD3-SS1A	CD-F	8-30-88		10-20-88	
88102201	DANGB3-SGD3-SS1A	CR-F	8-30-88		10-20-88	
88102201	DANGB3-SGD3-SS1A	HG-C	8-30-88		9-22-88	
88102201	DANGB3-SGD3-SS1A	PB-F	8-30-88		10-20-88	
88102201	DANGB3-SGD3-SS1A	418.1	8-30-88	9-26-88	9-27-88	
88102201	DANGB3-SGD3-SS1A	MOIS	8-30-88		9-07-88	
88102201	DANGB3-SGD3-SS1A	8010	8-30-88		9-08-88	9-09-88
88102201	DANGB3-SGD3-SS1A	8020	8-30-88		9-08-88	9-09-88
88102201	DANGB3-SGD3-SS1A	8080	8-30-88	9-09-88	10-05-88	
88102202	DANGB3-3SG3-SS1	AS-F	8-30-88		10-10-88	
88102202	DANGB3-3SG3-SS1	BA-I	8-30-88		10-20-88	
88102202	DANGB3-3SG3-SS1	CD-F	8-30-88		10-20-88	
88102202	DANGB3-3SG3-SS1	CR-F	8-30-88		10-20-88	
88102202	DANGB3-3SG3-SS1	HG-C	8-30-88		9-22-88	
88102202	DANGB3-3SG3-SS1	PB-F	8-30-88		10-20-88	
88102202	DANGB3-3SG3-SS1	418.1	8-30-88	9-26-88	9-27-88	
88102202	DANGB3-3SG3-SS1	MOIS	8-30-88		9-07-88	
88102202	DANGB3-3SG3-SS1	8010	8-30-88		9-08-88	9-09-88
88102202	DANGB3-3SG3-SS1	8020	8-30-88		9-08-88	9-09-88
88102202	DANGB3-3SG3-SS1	8080	8-30-88	9-09-88	10-05-88	

3SGE3

* If applicable

ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88102203	DANGB3-3SG3-SS1A	AS-F	8-30-88		10-10-88	
88102203	DANGB3-3SG3-SS1A	BA-I	8-30-88		10-20-88	
88102203	DANGB3-3SG3-SS1A	CD-F	8-30-88		10-20-88	
88102203	DANGB3-3SG3-SS1A	CR-F	8-30-88		10-20-88	
88102203	DANGB3-3SG3-SS1A	HG-C	8-30-88		9-22-88	
88102203	DANGB3-3SG3-SS1A	PB-F	8-30-88		10-20-88	
88102203	DANGB3-3SG3-SS1A	418.1	8-30-88	9-26-88	9-27-88	
88102203	DANGB3-3SG3-SS1A	MOIS	8-30-88		9-07-88	
88102203	DANGB3-3SG3-SS1A	8010	8-30-88		9-08-88	9-09-88
88102203	DANGB3-3SG3-SS1A	8020	8-30-88		9-08-88	9-09-88
88102203	DANGB3-3SG3-SS1A	8080	8-30-88	9-09-88	10-05-88	

3SGE3

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88102192-88102203
WORK ORDER NO.: 932

These soil samples were received at the ES Berkeley Laboratory on 8-31-88. They were received cold and intact.

ANALYSIS REPORT

WORK ORDER NUMBER: 932
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/02/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: MG/KG

TEST COMPOUND	DANGB3-MW30-SS1 88102192	DANGB3-MW30-SS1A 88102193	DANGB3-MW30-SS2 88102194	DANGB3-MW30-SS3 88102195	DANGB3-MW29-SS1 88102196	DANGB3-MW29-SS2 88102197
ACID DIG SOIL	NA	NA	NA	NA	NA	NA
ARSENIC	<5.0NE	<5.0NE	<5.0NE	<5.0NE	<5.0NE	<5.0NE
BARIUM	64.0	58.3	45.1	32.2	58.6	43.2
CADMIUM	7.2N	10.8N	9.4N	6.1N	7.5N	7.4N
CHROMIUM	30.4	41.0	34.1	21.5	36.2	27.6
MERCURY	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
LEAD	4.5N	5.3N	7.1N	3.5N	5.8N	8.2N

NA - Not Analyzed
ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 932

SK: 2, UNITS: MG/KG

ST COMPOUND	DANGB3-MW29-SS3 88102198	DANGB3-MW29-SS3A 88102199	DANGB3-SGD3-SS1 88102200	DANGB3-SGD3-SS1A 88102201	DANGB3-3SG3-SS1 88102202	DANGB3-3SG3-SS1A 88102203
ID DIG SOIL	NA	NA	NA	NA	NA	NA
SENIC	<5.0NE	<5.0NE	<5.0NE	<5.0NE	<5.0NE	<5.0NE
RIUM	31.8	34.7	55.8	58.8	55.7	68.0
DMIUM	7.6N	7.1N	7.4N	9.2N	9.9N	10.7N
ROMIUM	25.3	26.0	31.8	42.8	31.0	27.9
RCURY	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
AD	4.3N	3.4N	4.1N	5.0N	4.2N	4.1N

- Not Analyzed
- Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 932
JOB NUMBER : ZB0000000440 APPROVED BY _____
WORK ORDER DATE : 09/02/88 Lab Supervisor

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OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/Kg

TEST COMPOUND	DANGB3-MW30-SS1 88102192	DANGB3-MW30-SS1A 88102193	DANGB3-MW30-SS2 88102194	DANGB3-MW30-SS3 88102195	DANGB3-MW29-SS1 88102196	DANGB3-MW29-SS2 88102197
418.1 PETROLEUM HYDROCARBONS	<100	<100	<100	<100	<100	<100
% MOISTURE	7.8	7.7	8.3	10.5	9.6	9.8

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 932

SK: 3, UNITS: mg/Kg

ST COMPOUND	DANGB3-MW29-SS3 88102198	DANGB3-MW29-SS3A 88102199	DANGB3-SGD3-SS1 88102200	DANGB3-SGD3-SS1A 88102201	DANGB3-3SG3-SS1 88102202	DANGB3-3SG3-SS1A 88102203
8.1 PETROLEUM HYDROCARBONS	<100	<100	<100	<100	<100	<100
MOISTURE	11.4	12.7	8.1	7.9	9.5	9.3

- Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 932
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/02/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

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710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: UG/KG, GROUP 8010

TEST COMPOUND	DANGB3-MW30-SS1 88102192	DANGB3-MW30-SS1A 88102193	DANGB3-MW30-SS2 88102194	DANGB3-MW30-SS3 88102195	DANGB3-MW29-SS1 88102196	DANGB3-MW29-SS2 88102197
BENZYL CHLORIDE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND	ND	ND
1-CHLOROHEXANE	ND	ND	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
DICHLOROMETHANE	1.2B	1.3B	ND	1.2B	0.94B	0.57B
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 932

ST COMPOUND	DANGB3-MW30-SS1 88102192	DANGB3-MW30-SS1A 88102193	DANGB3-MW30-SS2 88102194	DANGB3-MW30-SS3 88102195	DANGB3-MW29-SS1 88102196	DANGB3-MW29-SS2 88102197
3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
TRACHLOROETHYLENE	ND	ND	ND	ND	ND	ND
1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
ICHLOROETHYLENE	ND	ND	ND	ND	0.74	3.1
ICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
ICHLOROPROPANE	ND	ND	ND	ND	ND	ND
NYL CHLORIDE	ND	ND	ND	ND	ND	ND

- Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 932

TASK: 4, UNITS: UG/KG, GROUP 8010

TEST COMPOUND	DANGB3-MW29-SS3 88102198	DANGB3-MW29-SS3A 88102199	DANGB3-SGD3-SS1 88102200	DANGB3-SGD3-SS1A 88102201	DANGB3-3SG3-SS1 88102202	DANGB3-3SG3-SS1A 88102203
ENZYL CHLORIDE	ND	ND	ND	ND	ND	ND
IS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND	ND	ND
ROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
ROMOFORM	ND	ND	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND	ND	ND
ARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
HLORACETALDEHYDE	ND	ND	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
HLOROETHANE	ND	ND	ND	ND	ND	ND
HLOROFORM	ND	ND	ND	ND	ND	ND
1-CHLOROHEXANE	ND	ND	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
HLOROMETHANE	ND	ND	ND	ND	ND	ND
HLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND	ND	ND
IBROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
IBROMOMETHANE	ND	ND	ND	ND	ND	ND
,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
ICHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
RANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
DICHLOROMETHANE	ND	0.67B	1.5B	2.2B	5.4B	8.1B
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND
,3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
ETRACHLOROETHYLENE	ND	0.41	ND	ND	ND	ND
,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
RICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
RICHLOROPROPANE	ND	ND	ND	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT

RK ORDER NUMBER: 932
B NUMBER : ZB0000000440
RK ORDER DATE : 09/02/88

APPROVED BY _____
Lab Supervisor

PORT DATA:
OAK RIDGE/DULUTH ANGB
0 S. ILLINOIS AVE. STE. S103
K RIDGE, TN 37830
LL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

NTRACT / PO # : OR001
NTACT : BILL HAYDEN
(615)-481-3920

SK: 4, UNITS: UG/KG, GROUP 8020

ST COMPOUND	DANGB3-MW30-SS1 88102192	DANGB3-MW30-SS1A 88102193	DANGB3-MW30-SS2 88102194	DANGB3-MW30-SS3 88102195	DANGB3-MW29-SS1 88102196	DANGB3-MW29-SS2 88102197
NZENE	ND	ND	ND	ND	ND	ND
LOROBENZENE	ND	ND	ND	ND	ND	ND
2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
HYL BENZENE	ND	ND	ND	ND	ND	ND
LUENE	ND	ND	ND	20	18	38
LENES	ND	ND	ND	ND	ND	ND

- Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 932

TASK: 4, UNITS: UG/KG, GROUP 8020

TEST COMPOUND	DANGB3-MW29-SS3 88102198	DANGB3-MW29-SS3A 88102199	DANGB3-SGD3-SS1 88102200	DANGB3-SGD3-SS1A 88102201	DANGB3-3SG3-SS1 88102202	DANGB3-3SG3-SS1A 88102203
BENZENE	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	.D
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
ETHYL BENZENE	ND	ND	ND	ND	ND	ND
TOLUENE	7.0	7.1	44	23	8.8	22
XYLENES	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT

RK ORDER NUMBER: 932
'B NUMBER : ZB0000000440
RK ORDER DATE : 09/02/88

APPROVED BY _____
Lab Supervisor

PORT DATA:
OAK RIDGE/DULUTH ANGB
0 S. ILLINOIS AVE. STE. S103
K RIDGE, TN 37830
LL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

NTRACT / PO # : OR001
NTACT : BILL HAYDEN
(615)-481-3920

SK: 4, UNITS: UG/KG, GROUP 8080

ST COMPOUND	DANGB3-MW30-SS1 88102192	DANGB3-MW30-SS1A 88102193	DANGB3-MW30-SS2 88102194	DANGB3-MW30-SS3 88102195	DANGB3-MW29-SS1 88102196	DANGB3-MW29-SS2 88102197
DRIN	ND	ND	ND	ND	ND	ND
PHA-BHC	ND	ND	ND	ND	ND	ND
TA-BHC	ND	ND	ND	ND	ND	ND
LTA-BHC	ND	ND	ND	ND	ND	ND
MMA-BHC	ND	ND	ND	ND	ND	ND
LORDANE	ND	ND	ND	ND	ND	ND
4'-DDD	ND	ND	ND	ND	ND	ND
4'-DDE	ND	ND	ND	ND	ND	ND
4'-DDT	ND	ND	ND	ND	ND	22
ELDRIN	ND	ND	ND	ND	ND	ND
DOSULFAN I	ND	ND	ND	ND	ND	ND
DOSULFAN II	ND	ND	ND	ND	ND	ND
DOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
DRIN	ND	ND	ND	ND	ND	ND
DRIN ALDEHYDE	NA	NA	NA	NA	NA	NA
PTACHLOR	ND	ND	ND	ND	ND	ND
PTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
PONE	NA	NA	NA	NA	NA	NA
THOXYCHLOR	ND	ND	ND	ND	ND	ND
XAPHENE	ND	ND	ND	ND	ND	ND
B-1016	ND	ND	ND	ND	ND	ND
B-1221	ND	ND	ND	ND	ND	ND
B-1232	ND	ND	ND	ND	ND	ND
B-1242	ND	ND	ND	ND	ND	ND
B-1248	ND	ND	ND	ND	ND	ND
B-1254	ND	ND	ND	ND	ND	ND
B-1260	ND	ND	ND	ND	ND	ND

- Not Analyzed
- Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 932

TASK: 4, UNITS: UG/KG, GROUP 8080

TEST COMPOUND	DANGB3-MW29-SS3 88102198	DANGB3-MW29-SS3A 88102199	DANGB3-SGD3-SS1 88102200	DANGB3-SGD3-SS1A 88102201	DANGB3-3SG3-SS1 88102202	DANGB3-3SG3-SS1A 88102203
ALDRIN	ND	ND	ND	ND	ND	ND
ALPHA-BHC	.D	ND	ND	ND	ND	ND
BETA-BHC	ND	ND	ND	ND	ND	ND
DELTA-BHC	ND	ND	ND	ND	ND	ND
GAMMA-BHC	ND	ND	ND	ND	ND	ND
CHLORDANE	ND	ND	ND	ND	ND	ND
4,4'-DDD	ND	ND	ND	ND	ND	ND
4,4'-DDE	ND	ND	ND	ND	ND	ND
4,4'-DDT	ND	ND	ND	ND	ND	ND
DIELDRIN	ND	ND	ND	ND	ND	ND
ENDOSULFAN I	ND	ND	ND	ND	ND	ND
ENDOSULFAN II	ND	ND	ND	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
ENDRIN	ND	ND	ND	ND	ND	ND
ENDRIN ALDEHYDE	NA	NA	NA	NA	NA	NA
HEPTACHLOR	ND	ND	ND	ND	ND	ND
HEPTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
KEPONE	NA	NA	NA	NA	NA	NA
METHOXYCHLOR	ND	ND	ND	ND	ND	ND
TOXAPHENE	ND	ND	ND	ND	ND	ND
PCB-1016	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND	ND

NA - Not Analzyed

ND - Not Detected

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD 932-1

10/2

S JOB NO.	PROJECT NAME/LOCATION	NO. OF CONTAINERS	SOILS ANALYSES REQUIRED	SHIP TO:
OR001	Duluth ANGB/Duluth, Mn.			ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA. 94
SAMPLER(S): (Signature) John L Hardee Mike Roddey				

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SW8010, 8020	SW8080	SW8270	EPA 418.1	SW6010, 7060, 7191	SW7131, 7421, 7471	REMARKS
9/30/88	1110	DANGB 3 MW30 SS 1	1	X						882197
	1110	DANGB 3 MW30 SS 1	1		X	X	X	X	X	
	1112	DANGB 3 MW30 SS 1A	1	X						882193
	1112	DANGB 3 MW 30 SS 1A	1		X	X	X	X	X	
	1124	DANGB 3 MW 30 SS 2	1	X						882194
	1124	DANGB 3 MW 30 SS 2	1		X	X	X	X	X	
	1130	DANGB 3 MW 30 SS 3	1	X						882195
	1130	DANGB 3 MW 30 SS 3	1		X	X	X	X	X	
	0940	DANGB, 3MW29 SS 1	1	X						882196
	0940	DANGB, 3MW29 SS 1	1		X	X	X	X	X	
	0955	DANGB, 3MW 29 SS 2	1	X						882197
	0955	DANGB, 3MW 29 SS 2	1		X	X	X	X	X	
	1000	DANGB, 3MW29 SS 3	1	X						882198
	1000	DANGB, 3MW 29 SS 3	1		X	X	X	X	X	
	1007	DANGB, 3MW 29 SS 3A	1	X						882199

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
ed by: (Signature)	Date/Time	Received by: (Signature)
	9/30/88 1730	
Signature)	Date/Time	Received for Laboratory by: (Signature)
		Bill Anderson

Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Date/Time	Remarks
8.31.88 12:00	rec'd cold & intact

CHAIN OF CUSTODY RECORD

2 of 2

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature) J. Sandin, Mike Robb

SHIP TO: ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA. 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SOILS ANALYSES REQUIRED: SW8010, 8020	SW8080	SW8270	EPA 418.1	SW8010, 7060, 7191	SW7131, 7421, 7471			REMARKS
5/6/88	1007	DANGB, 3MW29, SS3A	1		X	X	X	X	X			
5/6/88	1155	DANGB, 3SGD3, SS1	1	X								
	1155	DANGB, 3SGD3, SS1	1		X	X	X	X	X			
	1155	DANGB, 3SGD3, SS1A	1	X								
	1155	DANGB, 3SGD3, SS1A	1		X	X	X	X	X			
	1200	DANGB, 3SGE3, SS1	1	X								
	1200	DANGB, 3SGE3, SS1	1		X	X	X	X	X			
5/6/88	1200	DANGB, 3SG, E3, SS1A	1	X								
5/6/88	1200	DANGB, 3SG, E3, SS1A	1		X	X	X	X	X			

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
J. Sandin	5/6/88 1130				
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082156-88082163, 88082186-88082188
88082192-88082199

QC Report No: ICP-S-0034-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-29-88
Date Reported: 10-28-88
Dilution Factor: NA
%Moisture: 19.0

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	Duplicate RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Barium	88082156	88082156	10-20-88	10-11-88	SW6010	<20	69.5	63.4	9	247	69.5	333	107	
Cadmium	88082156	88082156	10-20-88	10-11-88	SW6010	<0.5	7.5	7.2	4	6.2	7.5	10.6	50N	
Chromium	88082156	88082156	10-20-88	10-11-88	SW6010	<1.0	38.3	36.5	5	24.7	38.3	57.8	79	
Lead	88082156	88082156	10-22-88	10-11-88	SW6010	<10	11.6	<10	NC	61.7	11.6	65.6	88	A

2770

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
A See Case Narrative attached.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082200-88082203, 88092223-88092227
88092244-88092246, 88092248-88092249
88092252-88092255

QC Report No: ICP-S-0033-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-31-88
Date Reported: 10-28-88
Dilution Factor: NA
%Moisture: 8.1

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Barium	88082200	88082200	10-20-88	10-18-88	SW6010	<20	55.8	52.6	7	218	55.8	254	91	
Cadmium	88082200	88082200	10-20-88	10-18-88	SW6010	<0.5	7.4	8.7	16	5.4	7.4	11.0	67N	
Chromium	88082200	88082200	10-20-88	10-18-88	SW6010	<1.0	31.8	37.3	16	21.8	31.8	56.7	114	
Lead	88082200	88082200	10-20-88	10-18-88	SW6010	<10	<10	<10	NC	54.4	<10	49.2	90	A

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
A Sample results for lead are reported from Furnace analyses for the following Sample No(s).: 88082200-88082203, 88082244, 88092248-88092249, 88092252, 88092255.
N See Legend attached.

2771

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two
NA = Not Applicable
NC = Not Calculated
ND = Not Detected
SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082192-88082203, 88082099, 88082101
88082130

QC Report No: AAF-S-0033-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-31-88
Date Reported: 10-28-88
Dilution Factor: See Notes
%Moisture: 7.8

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	PR	Notes
Arsenic	88082192	88082192	10-10-88	9-29-88	7060	<0.5	<5.0E	<5.0E	NC	4.34	0.76E	9.0	190N	DF=10
Lead	88082192	88082192	10-20-88	9-29-88	7421	<0.5	4.3	4.3	0	5.42	4.3	15.7	210N	DF=NA

2772

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two
NA = Not Applicable
NC = Not Calculated
ND = Not Detected
SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082192-88082203

As a result of extreme sample matrix interference, dilution was required for sample analysis. The reporting limit and MDL for the analyte(s) listed have increased as shown.

Analyte	Reporting Limit	MDL
Arsenic	10 mg/Kg	5.0 mg/Kg

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn.

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082192-88082203, 88082186-88082188

QC Report No: TPH-S-0081-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-31-88
Date Prepared: 9-26-88
Date Analyzed: 9-27-88
Date Reported: 11-22-88
Dilution Factor: 8
%Moisture: 7.8

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88082192	418.1	<100	<100	1100	760	69	730	66	4	*
Blank	418.1	<100	<100	1000	700	70	800	80	13	*

2774

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* Percent recovery and relative percent difference are within ES Laboratory limits for matrix spike and blank spike.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate

SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082186-88082188
88082192-88082202

QC Report No: VGC-S-0057-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-30-88
Date Prepared: NA
Date Analyzed: 9-12-88
Date Reported: 10-31-88
Dilution Factor: NA
% Moisture: 12.7

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88082199	1,1-dicaloroethane	11.5	ND	11.1	97	11.1	97	0	20	58-124
	Trichloroethene	11.5	ND	14.3	*124	12.9	112*	10	16	75-110
	Chlorobenzene	11.5	ND	15.2	*132	15.2	*132	0	21	71-125
	Aromatics: 8020									
88082199	Benzene	11.5	ND	15.2	*132	14.5	*126	5	26	75-123
	Toluene	11.5	0.99	15.2	*124	14.3	*116	6	16	79-115
	Chlorobenzene	11.5	ND	15.0	*130	14.5	*126	3	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Case Narrative attached.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082186-88082188
88082192-88082202

QC Report No: VGC-S-0057-88B
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: NA
Date Prepared: NA
Date Analyzed: 9-12-88
Date Reported: 10-31-88
Dilution Factor: NA
% Moisture: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
Blank	1,1-dichloroethane	10	ND	9.19	92	10.3	103	11	20	58-124
	Trichloroethene	10	ND	8.89	88	9.59	96	8	16	75-110
	Chlorobenzene	10	ND	9.24	92	9.39	94	2	21	71-125
	Aromatics: 8020									
Blank	Benzene	10	ND	8.91	89	9.37	94	5	26	75-123
	Toluene	10	ND	8.83	88	9.61	96	8	16	79-115
	Chlorobenzene	10	ND	8.78	88	9.39	94	7	24	82-112

9272

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO(S).: VGC-S-0057-88
QC REPORT NO(S).: VGC-S-0057-88B

Percent recoveries exceed the ES Laboratory limits. A blank spike analysis shows the laboratory to be in control.

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/Kg
Date Reported: 10-31-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
12	9-08-88	VGC	Carbopack	75-09-2	Dichloromethane	0.89	0.25	88082192-88082203
				67-66-3	Chloroform	0.89	0.05	
				1130-20-7	Xylene	0.77	0.4	

2778

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082192-88082203
88082244-88082249

QC Report No.: OCP-S-0033-88
QC Sample No.: 88082193
Level (Low/Med): Low
Date Reported: 11-02-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2170	ND	60.7	84	46-127
Heptachlor	2170	ND	57.1	79	35-130
Aldrin	2170	ND	63.0	87	34-132
Dieldrin	5420	ND	182	101	31-134
Endrin	5420	ND	101	56	42-139
4,4'-DDT	5420	ND	202	112	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	64.8	90	84	7	50	46-127
Heptachlor	63.6	88	79	11	31	35-130
Aldrin	66.1	91	87	5	43	34-132
Dieldrin	194	107	101	6	38	31-134
Endrin	175	97	56	54*	45	42-139
4,4'-DDT	210	116	112	4	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 1 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082192-88082203
88082244-88082249

QC Report No.: OCP-S-0033-88B
QC Sample No.: Blank
Level (Low/Med): Low
Date Reported: 11-02-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	ND	68.4	103	46-127
Heptachlor	2000	ND	65.0	97	35-130
Aldrin	2000	ND	69.3	104	34-132
Dieldrin	5000	ND	200	120	31-134
Endrin	5000	ND	123	74	42-139
4,4'-DDT	5000	ND	157	94	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	65.4	98	103	4	50	46-127
Heptachlor	62.3	94	97	4	31	35-130
Aldrin	69.0	103	104	<1	43	34-132
Dieldrin	193	116	120	4	38	31-134
Endrin	173	103	74	34	45	42-139
4,4'-DDT	152	91	94	3	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-W-0033-88
QC REPORT NO.: OCP-W-0033-88B

Relative percent difference for endrin exceed the EPA guideline in the matrix spike sample. A blank spike analysis shows the laboratory to be in control.

Heptachlor epoxide was inadvertently used instead of heptachlor in the matrix spiking solution.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up used on these samples.

PESTICIDE METHOD BLANK SUMMARY

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Lab Name: Engineering Science
Lab Sample No.: Blank

Matrix: Soil
Level (low/med): Low
Extraction-
(SepF/Cont/Sonc): Sonc

Project: Duluth ANGB

Date Extracted: 9-09-88
Date Analyzed (1): 10-05-88
Time Analyzed (1): 11:26
Instrument ID (1): 5890 #2
GG Column ID (1): OV-1

Date Analyzed (2): 10-06-88
Time Analyzed (2): 23:52
Instrument ID (2): 5890 #2
GC Column ID (2): Mixed

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88082192	10-05-88	88082193	10-07-88
-	88082193	10-05-88	88082197	10-07-88
-	88082194	10-05-88	88082246	10-07-88
-	88082195	10-05-88	88082247	10-07-88
-	88082196	10-05-88		
-	88082197	10-05-88		
-	88082198	10-05-88		
-	88082199	10-05-88		
-	88082200	10-05-88		
-	88082201	10-05-88		
-	88082202	10-05-88		
-	88082203	10-05-88		
-	88082244	10-16-88		
-	88082245	10-16-88		
-	88082246	10-16-88		
-	88082247	10-16-88		
-	88082248	10-16-88		
-	88082249	10-16-88		

ATILE CONTINUING CALIBRATION CHECK

Name:_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____

trument ID:_carbopak_____ Calibration Date(s):__9/8/88

AB FILE ID:10,11_____ Init. Calib. Date(s):9/2/88, 9/2/88

OMPOUND	RRF	RRF50	%D
nzyl chloride_____	0.08		100.00
is (2-chloroethoxy) thane_____	0.04		100.00
s (2-chloroisopropyl ther_____	0.26		100.00
omobenzene_____	1.17	1.11	100.00
omodichloromethane_____	4.54	3.94	100.00
omoform_____	3.48	2.99	100.00
omomethane_____	0.38	0.10	100.00
rbon tetrachloride_____	4.58	4.31	100.00
loroacetaldehyde_____	ERR		ERR
nlorobenzene_____	1.48	1.57	100.00
loroethane_____	0.58	0.48	100.00
loroform_____	4.89	4.37	100.00
-Chlorohexane_____	1.02	0.98	100.00
-Chloroethyl vinyl ether_	0.04		100.00
loromethane_____	0.49	0.39	100.00
loromethyl methyl ether_	0.17		100.00
_,m_,& p_Chlorotoluenes _	4.06	4.06	100.00
bromochloromethane_____	3.29	3.77	100.00
bromomethane_____	3.56	2.31	100.00
,2_Dichlorobenzene_____	2.72	2.72	100.00
3_Dichlorobenzene_____	2.42	2.35	100.00
4_Dichlorobenzene_____	2.36	2.29	100.00
chlorodifluormethane____	0.54		100.00
1_Dichloroethane_____	2.58	2.22	100.00
2_Dichloroethane_____	3.23	2.92	100.00
1_Dichloroethylene_____	2.79	2.46	100.00
rans_1,2_dichloroethylene	2.99	2.49	100.00
chloromethane _____	3.07	1.89	100.00
2_Dichloropropane_____	2.67	2.40	100.00
,3_Dichloropropylene_____	5.98	4.84	100.00
,2,2_Tetrachloroethane_	9.09	9.59	100.00
,1,2_Tetrachloroethane_	4.51	4.38	100.00
trachloroethylene_____	9.10	9.59	100.00
,1,1_Trichloroethane_____	3.43	3.08	100.00
,2_Trichloroethane_____	5.98	4.84	100.00
richloroethylene_____	4.32	4.16	100.00
richlorofluoromethane_____	2.76	2.12	100.00
ichloropropane_____	3.33	3.08	100.00
nyl chloride_____	1.43	0.61	100.00

2783

ATILE CONTINUING CALIBRATION CHECK

Name: ENGINEERING SCIENCE_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____ SDG No.:____

trument ID.: carbopak Calibration Date(s): 9/8/88 _____

FILE ID: RRF 50 __10_____ Init calib = 9/2/88

MPOUND	$\overline{RRF}$	RRF50	%D
nzene	5.93	5.00	-15.68
.orobenzene	4.90	5.17	5.59
2_Dichlorobenzene	3.97	3.70	-6.91
3_Dichlorobenzene	4.57	5.22	14.17
4_Dichorobenzene	3.83	3.70	-3.51
nyl Benzene	3.32	4.39	32.27
uene	3.79	3.70	-2.49
lenes	12.16	18.61	53.03

DATA PACKAGE #52

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ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received by this laboratory on 8-16-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081883	DANGB2-MW37-SS1	BA-I	8-15-88		9-18-88	
88081883	DANGB2-MW37-SS1	CD-I	8-15-88		9-16-88	
88081883	DANGB2-MW37-SS1	CR-I	8-15-88		9-16-88	
88081883	DANGB2-MW37-SS1	PB-I	8-15-88		9-23-88	
88081883	DANGB2-MW37-SS1	418.1	8-15-88	9-09-88	9-11-88	
88081883	DANGB2-MW37-SS1	MOIS	8-15-88		8-21-88	
88081883	DANGB2-MW37-SS1	8010	8-15-88		8-23-88	8-2
88081883	DANGB2-MW37-SS1	8020	8-15-88		8-23-88	8-24-88
88081884	DANGB2-MW37-SS2	BA-I	8-15-88		9-18-88	
88081884	DANGB2-MW37-SS2	CD-I	8-15-88		9-16-88	
88081884	DANGB2-MW37-SS2	CR-I	8-15-88		9-16-88	
88081884	DANGB2-MW37-SS2	PB-I	8-15-88		9-23-88	
88081884	DANGB2-MW37-SS2	418.1	8-15-88	9-09-88	9-11-88	
88081884	DANGB2-MW37-SS2	MOIS	8-15-88		8-21-88	
88081884	DANGB2-MW37-SS2	8010	8-15-88		8-23-88	8-23-88
88081884	DANGB2-MW37-SS2	8020	8-15-88		8-23-88	8-23-88
88081885	DANGB2-MW37-SS3	BA-I	8-15-88		9-18-88	
88081885	DANGB2-MW37-SS3	CD-I	8-15-88		9-16-88	
88081885	DANGB2-MW37-SS3	CR-I	8-15-88		9-16-88	
88081885	DANGB2-MW37-SS3	PB-I	8-15-88		9-23-88	
88081885	DANGB2-MW37-SS3	418.1	8-15-88	9-09-88	9-11-88	
88081885	DANGB2-MW37-SS3	MOIS	8-15-88		8-21-88	
88081885	DANGB2-MW37-SS3	8010	8-15-88		8-23-88	8-24-88
88081885	DANGB2-MW37-SS3	8020	8-15-88		8-23-88	8-24-88

* If applicable

A SUBSIDIARY OF THE PARSONS CORPORATION

ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received by this laboratory on 8-16-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081886	DANGB2-MW37-SS4	BA-I	8-15-88		9-18-88	
88081886	DANGB2-MW37-SS4	CD-I	8-15-88		9-16-88	
88081886	DANGB2-MW37-SS4	CR-I	8-15-88		9-16-88	
88081886	DANGB2-MW37-SS4	PB-I	8-15-88		9-23-88	
88081886	DANGB2-MW37-SS4	418.1	8-15-88	9-09-88	9-11-88	
88081886	DANGB2-MW37-SS4	MOIS	8-15-88		8-21-88	
88081886	DANGB2-MW37-SS4	8010	8-15-88		8-23-88	8-24-88
88081886	DANGB2-MW37-SS4	8020	8-15-88		8-23-88	8-24-88
88081887	DANGB2-MW37-SS5	BA-I	8-15-88		9-18-88	
88081887	DANGB2-MW37-SS5	CD-I	8-15-88		9-16-88	
88081887	DANGB2-MW37-SS5	CR-I	8-15-88		9-16-88	
88081887	DANGB2-MW37-SS5	PB-I	8-15-88		9-23-88	
88081887	DANGB2-MW37-SS5	418.1	8-15-88	9-09-88	9-11-88	
88081887	DANGB2-MW37-SS5	MOIS	8-15-88		8-21-88	
88081887	DANGB2-MW37-SS5	8010	8-15-88		8-23-88	8-24-88
88081887	DANGB2-MW37-SS5	8020	8-15-88		8-23-88	8-24-88
88081888	DANGB2-MW39-SS1	BA-I	8-15-88		9-18-88	
88081888	DANGB2-MW39-SS1	CD-I	8-15-88		9-16-88	
88081888	DANGB2-MW39-SS1	CR-I	8-15-88		9-16-88	
88081888	DANGB2-MW39-SS1	PB-I	8-15-88		9-23-88	
88081888	DANGB2-MW39-SS1	418.1	8-15-88	9-09-88	9-11-88	
88081888	DANGB2-MW39-SS1	MOIS	8-15-88		8-21-88	
88081888	DANGB2-MW39-SS1	8010	8-15-88		8-24-88	8-23-88
88081888	DANGB2-MW39-SS1	8020	8-15-88		8-24-88	8-24-88

* If applicable

A SUBSIDIARY OF THE PARSONS CORPORATION

ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received by this laboratory on 8-16-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081889	DANGB2-MW39-SS2	BA-I	8-15-88		9-18-88	
88081889	DANGB2-MW39-SS2	CD-I	8-15-88		9-16-88	
88081889	DANGB2-MW39-SS2	CR-I	8-15-88		9-16-88	
88081889	DANGB2-MW39-SS2	PB-I	8-15-88		9-23-88	
88081889	DANGB2-MW39-SS2	418.1	8-15-88	9-09-88	9-11-88	
88081889	DANGB2-MW39-SS2	MOIS	8-15-88		8-21-88	
88081889	DANGB2-MW39-SS2	8010	8-15-88		8-24-88	8-24-88
88081889	DANGB2-MW39-SS2	8020	8-15-88		8-23-88	8-24-88
88081890	DANGB2-MW39-SS3	BA-I	8-15-88		9-18-88	
88081890	DANGB2-MW39-SS3	CD-I	8-15-88		9-16-88	
88081890	DANGB2-MW39-SS3	CR-I	8-15-88		9-16-88	
88081890	DANGB2-MW39-SS3	PB-I	8-15-88		9-23-88	
88081890	DANGB2-MW39-SS3	418.1	8-15-88	9-09-88	9-11-88	
88081890	DANGB2-MW39-SS3	MOIS	8-15-88		8-21-88	
88081890	DANGB2-MW39-SS3	8010	8-15-88		8-25-88	8-23-88
88081890	DANGB2-MW39-SS3	8020	8-15-88		8-25-88	8-25-88

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88081883-88081890
WORK ORDER NO.: 856

These soil samples were received at the ES Berkeley Laboratory on 8-16-88. They were received cold and intact.

ANALYSIS REPORT

WORK ORDER NUMBER: 85:
JOB NUMBER : ZB#000000446
WORK ORDER DATE : 06/16/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB [134:
710 S ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : 0P091
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2. UNITS: mg/Kg

TEST COMPOUND	DANGB2-MW37-SS1 8-15-88 88081883	DANGB2-MW37-SS2 8-15-88 88081884	DANGB2-MW37-SS3 8-15-88 88081885	DANGB2-MW37-SS4 8-15-88 88081886	DANGB2-MW37-SS5 8-15-88 88081887	DANGB2-MW39-SS1 8-15-88 85081888
ACID DIG SOIL	NA	NA	NA	NA	NA	NA
BARIUM	75.0	52.5	52.0	38.4	55.4	61.2
CADMIUM	13.5*N	12.2*N	11.5*N	11.2*N	11.8*N	12.0*N
CHROMIUM	37.9	24.6	29.6	27.8	25.6	23.1
LEAD	4.2	3.5	2.0	4.05	3.4	4.1

NA - Not Analyzed

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 356

PQL's 2. UNITS: ug/L

EST COMPOUND	DANGB2-MW29-552 8-15-88 9808188	DANGB2-MW39-553 8-15-88 9808189
TOTAL DIG SOIL	ND	ND
BARIUM	65.6	40.3
CADMIUM	12.1	11.6
CHROMIUM	2.0	22.0
LEAD	3.5	2.1

NA - Not Analyzed

- Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 856
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/15/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : 9R001
CONTACT : BILL HAYDEN
1615-481-3920

TASK: 3, UNITS: mg/Kg

TEST COMPOUND	DANGB2-MW37-SS1 8-15-88 88081883	DANGB2-MW37-SS2 8-15-88 88081884	DANGB2-MW37-SS3 8-15-88 88081885	DANGB2-MW37-SS4 8-15-88 88081886	DANGB2-MW37-SS5 8-15-88 88081887	DANGB2-MW39-SS1 8-15-88 88081888
418.1 PETROLEUM HYDROCARBONS	<100	<100	<100	<100	<100	<100
% MOISTURE	14.0	10.8	14.8	8.4	9.9	11.7

ND = Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 8F4

ES#: 3, UNITS: ug/kg

TEST COMPOUND	DANGB2-MW39-SS2 8-15-88 8508189	DANGB2-MW39-SS3 8-15-88 8508190
EP I PETROLEUM HYDROCARBONS	<100	<100
MOISTURE	12.5	8.8

< - Not detected

ENGINEER SCIENTIST IN
08/16/88

ANALYSIS REPORT

WORK ORDER NUMBER: 256
JOB NUMBER : Z60000000440
WORK ORDER DATE : 08/16/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (1341
710 S. ILLINOIS AVE STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : 86001
CONTACT : BILL HAYDEN
(615)-461-3920

TASK: 4, UNITS: ug/Kg, GROUP 8010

TEST COMPOUND	DANGB2-MW37-SS1 8-15-88 88081885	DANGB2-MW37-SS2 8-15-88 88081884	DANGB2-MW37-SS3 8-15-88 88081865	DANGB2-MW37-SS4 8-15-88 88081886	DANGB2-MW37-SS5 8-15-88 88081887	DANGB2-MW39-SS1 8-15-88 88081888
BENZYL CHLORIDE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND	ND	ND
CHLOROFORM	0.178	ND	ND	ND	ND	ND
1-CHLOROHEXANE	ND	ND	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND		ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
DICHLOROMETHANE	6.38	2.93	2.15	2.29	3.68	1.88
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR LOGY ORDER NUMBER EFO

EST COMPOUND	DANGB2-MW37-SS1 8-15-88 8F081987	DANGB2-MW37-SS2 8-15-88 8808138H	DANGB2-MW37-SS3 8-15-88 88081685	DANGB2-MW37-SS4 8-15-88 8808:886	DANGB2-MW37-SS5 8-15-88 88081987	DANGB2-MW38-SS1 8-15-88 88081888
,3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
ETRACHLOROETHYLENE	ND	ND	ND	ND	ND	ND
,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
RICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
ROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
ICHLOROPROPANE	ND	ND	ND	ND	ND	ND
NYL CHLORIDE	ND	ND	ND	ND	ND	ND

D - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 886

TASK: 4, UNITS: ug/kg, GROUP 8010

TEST COMPOUND	DANGB2-MW39-SS2 8-15-88 88081889	DANGS2-MW39-SS3 8-15-88 88081890
BENZYL CHLORIDE	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND
BROMOBENZENE	ND	ND
BROMODICHLOROMETHANE	ND	ND
BROMOFORM	ND	ND
BROMOETHANE	ND	ND
CARBON TETRACHLORIDE	ND	ND
CHLOROACETALDEHYDE	ND	ND
CHLORAL	ND	ND
CHLOROBENZENE	ND	ND
CHLOROETHANE	ND	ND
CHLOROFORM	ND	ND
1-CHLOROHEXANE	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND
CHLOROMETHANE	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND
CHLOROTOLUENE	ND	ND
DIBROMOCHLOROMETHANE	ND	ND
DIBROMOMETHANE	ND	ND
1,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND
1,1-DICHLOROETHANE	ND	ND
1,2-DICHLOROETHANE	ND	ND
1,1-DICHLOROETHYLENE	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND
DICHLOROMETHANE	4.68	49B
1,2-DICHLOROPROPANE	ND	ND
1,3-DICHLOROPROPYLENE	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND
TETRACHLOROETHYLENE	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND
TRICHLOROETHYLENE	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND
TRICHLOROPROPANE	ND	ND
VINYL CHLORIDE	ND	ND

ND - Not Detected

ANALYSIS REPORT

ORDER NUMBER: 88[illegible]
NUMBER : 2300000000440 APPROVED BY
ORK ORDER DATE : 08/16/88 Lab Supervisor

REPORT DATA:
E OAK RIDGE/DULUTH ANGE
10 S. ILLINOIS AVE. STE. 0103
K RIDGE, TN 37830
LL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGE (1741
710 S. ILLINOIS AVE. STE. 0103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1.

NTRACT PO # : 00401
NTACT : BILL HAYDEN
(615)-481-7920

ASF: 4, UNITS: ug/kg, GROUP 8020

EST COMPOUND	OANGB2-MW37-SS1 8-15-88 88081883	OANGB2-MW37-SS2 8-15-88 88081884	OANGB2-MW37-SS3 8-15-88 88081885	OANGB2-MW37-SS4 8-15-88 88081886	OANGB2-MW37-SS5 8-15-88 88081887	OANGB2-MW39-SS1 8-15-88 88081888
ENZENE	ND	ND	ND	ND	ND	ND
HLOROBENZENE	ND	ND	ND	ND	ND	ND
,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
THYL BENZENE	ND	ND	ND	ND	ND	ND
LUENE	38	90	44	56	51	1.4
LENES	ND	ND	ND	ND	ND	ND

- Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 85o

TASK: 4, UNITS: ug/Kg, GROUP 8020

TEST COMPOUND	DANGB2-MW39-SS2 8-15-88 8808188^	DANGB2-MW39-S33 8-15-88 E8081390
BENZENE	ND	ND
CHLOROBENZENE	ND	ND
1,2-DICHLOROBENZENE	ND	ND
1,3-DICHLORGBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
ETHYL BENZENE	ND	ND
TOLUENE	52^	12
XYLENES	ND	ND

ND - Not Detected

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature)

SHIP TO:
ENGINEERING-SCIENCE LABORATORY, INC.
600 Bancroft Way
Berkeley, CA. 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SOILS ANALYSES REQUIRED: SW8010, 8020	SW8080	SW8270	EPA 418.1	SW6010, 7191	SW7131, 7421			REMARKS
8-15-88	1255	DANGB2-MW37-551	1	X								
8-15-88	1255	DANGB2-MW37-551	1			X	X	X	X			SW6010 is for Barium only.
8-15-88	1324	DANGB2-MW37-552	1	X								
8-15-88	1328	DANGB2-MW37-552	1			X	X	X	X			" "
8-15-88	1326	DANGB2-MW37-553	1	X								
8-15-88	1326	DANGB2-MW37-553	1			X	X	X	X			" "
8-15-88	1322	DANGB2-MW37-554	1	X								
8-15-88	1322	DANGB2-MW37-554	1			X	X	X	X			" "
8-15-88	1324	DANGB2-MW37-555 DUP	1	X								
8-15-88	1324	DANGB2-MW37-555 / 552				X	X	X	X			" "

2800

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	8-15-88 1745				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION	NO. OF CONTAINERS	SOILS ANALYSES REQUIRED	SHIP TO:
OR001	Duluth ANGB/Duluth, Mn.			ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA. 94710
SAMPLER(S): (Signature)				

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SW8010, 8020	SW8050	SW8270	EPA 418.1	SW6010, 7191	SW7131, 7421	REMARKS
8-15-88	1624	DANGB2 - MW39 - SS1	1	X						
8-15-88	1624	DANGB2 - MW39 - SS1	1			X	X	X	X	SW6010 is for Ba only
8-15-88	1642	DANGB2 - MW39 - SS2	1	X						
8-15-88	1642	DANGB2 - MW39 - SS2	1			X	X	X	X	4 4
8-15-88	1705	DANGB2 - MW39 - SS3	1	X						
8-15-88	1705	DANGB2 - MW39 - SS3	1			X	X	X	X	4 4

2801

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	8-15-88 1745				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88081749-88081754, 88081877-88081879,
88081883-88081890

QC Report No: VGC-S-0035-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-15-88
Date Prepared: NA
Date Analyzed: 8-25-88
Date Reported: 9-16-88
Dilution Factor: NA
% Moisture: 10.8

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88081878	1,1-dichloroethane	11.2	ND	14.4	129*	12.3	110	16	20	58-124
	Trichloroethene	11.2	ND	14.0	125*	12.1	108	15	16	75-110
	Chlorobenzene	11.2	ND	12.7	113	10.8	97	16	21	71-125
	Aromatics: 8020									
88081878	Benzene	11.2	ND	11.3	101	11.2	100	1	26	75-123
	Toluene	11.2	1.4	12.1	96	10.8	84	11	16	79-115
	Chlorobenzene	11.2	ND	10.6	95	9.8	88	8	24	82-112

2082

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* Percent recoveries do not meet the ES QC limits. Blank spike analysis shows the laboratory to be in control.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite E-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88081749-88081754, 88081877-88081879
88081883-88081890

QC Report No: VGC-S-0035-88B
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: NA
Date Prepared: NA
Date Analyzed: 8-25-88
Date Reported: 9-16-88
Dilution Factor: NA
% Moisture: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
Blank	1,1-dichloroethane	10.0	ND	9.73	97	9.82	98	1	20	58-124
	Trichloroethene	10.0	ND	9.82	98	10.1	101	3	16	75-110
	Chlorobenzene	10.0	ND	10.1	101	9.55	96	6	21	71-125
	Aromatics: 8020									
Blank	Benzene	10.0	ND	9.46	95	10.0	100	6	26	75-123
	Toluene	10.0	ND	8.75	88	9.28	93	6	16	79-115
	Chlorobenzene	10.0	ND	10.2	102	9.89	98	4	24	82-112

2803

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

SA = Spike Added (Concentration)
MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: ORD01

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/KG
Date Reported: 9-16-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
59	8-23-88	VGC	Carbopack	75-09-2	Dichloromethane	5.8	0.5	88081877-88081889
				67-66-3	Chloroform	0.1	0.05	
93	8-25-88	VGC	Carbopack	75-09-2	Dichloromethane	9.3	0.5	88081890

2804

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
Samples No.: 88081877-88081879
Samples No.: 88081883-88081890
Samples No.: 88081938-88081942
Samples No.: 88082000-88082002

The results obtained for the laboratory control sample (LCS) analyzed with these samples for the analytes Cadmium, Chromium, and Barium exceeded the recommended EPA recoveries. All data associated with this batch was closely inspected and no analytical problems were found. The initial and continuing calibration verification standards and blanks and precision and accuracy recoveries were within acceptable limits with the following exceptions:

Cadmium spike recoveries and precision exceeded acceptable limits. The spike sample was followed by an analytical spike as required by laboratory standard operating procedure. The results of the analytical spike recovery for Cadmium were within acceptable ranges.

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88081749-88081754, 88081877-88081879
88081883-88081890

QC Report No: TPH-S-0045-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-11-88
Date Prepared: 9-09-88
Date Analyzed: 9-11-88
Date Reported: 9-21-88
Dilution Factor: 6.5
%Moisture: 17.8

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88081749	418.1	<100	<100	1220	1050	86	876	83	18	

2805

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate

SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: ICP-S-0027-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-15-88
Date Reported: 10-13-88
Dilution Factor: NA
%Moisture: 9.6

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88081877-88081879, 88081883-88081890
88081938-88081942, 88082000-88082002

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	SR	SSR	PR	Notes
Barium	88081879	88081879	9-18-88	9-09-88	6010	<20	40.2	37.2	8	221	40.2	275	106	
Cadmium	88081879	88081879	9-16-88	9-09-88	6010	<0.5	6.31	10.6	51*	5.53	6.31	14.6	150N	
Chromium	88081879	88081879	9-16-88	9-09-88	6010	<1.0	20.9	22.7	8	22.1	20.9	47.0	118	

2807

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Legend attached.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88081877-88081879, 88081883-88081890
88081898-88081900

QC Report No: AAF-S-0027-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-15-88
Date Reported: 10-10-88
DDilution Factor: NA
%Moisture: 9.6

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	Duplicate RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Lead	88081879	88081879	9-21-88	9-17-88	7421	<0.5	2.81	2.52	11	5.53	2.81	7.43	84	

8083

NOTE: If moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address:710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address:710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081887	88081889
Sample No.:	DANGB2-MW37-SS5	DANGB2-MW39-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:42
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	10	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081887	88081889
Sample No.:	DANGB2-MW37-SS5	DANGB2-MW39-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:42
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	10	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081887	88081889
Sample No.:	DANGB2-MW37-SS5	DANGB2-MW39-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:42
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	10	13

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	-	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88081887	88081889
Sample No.:	DANGB2-MW37-SS5	DANGB2-MW39-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:42
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	10	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081887	88081889
Sample No.:	DANGB2-MW37-SS5	DANGB2-MW39-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:42
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	10	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081888	88081890
Sample No.:	DANGB2-MW39-SS1	DANGB2-MW39-SS3
Date Sampled:	8-15-88	8-15-88
Time Sampled:	16:24	17:05
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-03-88	10-03-88
Percent Moisture:	12	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phtnalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081888	88081890
Sample No.:	DANGB2-MW39-SS1	DANGB2-MW39-SS3
Date Sampled:	8-15-88	8-15-88
Time Sampled:	16:24	17:05
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-03-88	10-03-88
Percent Moisture:	12	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081888	88081890
Sample No.:	DANGB2-MW39-SS1	DANGB2-MW39-SS3
Date Sampled:	8-15-88	8-15-88
Time Sampled:	16:24	17:05
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-03-88	10-03-88
Percent Moisture:	12	8

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88081888	88081890
Sample No.:	DANGB2-MW39-SS1	DANGB2-MW39-SS3
Date Sampled:	8-15-88	8-15-88
Time Sampled:	16:24	17:05
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-03-88	10-03-88
Percent Moisture:	12	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4 -DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081888	88081890
Sample No.:	DANGB2-MW39-SS1	DANGB2-MW39-SS3
Date Sampled:	8-15-88	8-15-88
Time Sampled:	16:24	17:05
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-03-88	10-03-88
Percent Moisture:	12	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

SEMIVOLATILE METHOD BLANK SUMMARY
4B

Job No.:

Client:
Attn:
Address:

Work Order No.:
Lab Sample No.: 03-55
Lab File ID: E5797
Matrix: Soil
Level (low/med):
Date Analyzed: 10-3-88
Time Analyzed: 18:18
Instrument ID:
Date Reported:

Project: Duluth

This Method Blank applies to the following samples, MS and MSD.

Sample Number	Lab Sample ID	Lab File ID	Date of Analysis
NOT DULUTH	88081869	S0127	9-30-88
NOT DULUTH	88081869 MS	S0128	"
NOT DULUTH	88081869 MSD	S0129	10-01-88
DANG02 - mw37 - SS1	88081883	S0130	"
-SS2	88081884	S0131	"
-SS3	88081885	S0132	"
-SS4	88081886	E5790	10-1-88
-SS5	88081887	E5791, E5815	10-1-88, 10-5-88
DANG02 - mw39 - SS1	88081888	E5792	10-1-88
-SS2	88081889	E5793, E5816	10-1-88, 10-5-88
-SS3	88081890	E5794	10-1-88
———	BLANK MS	E5795	10-1-88
———	BLANK MSD	E5796	10-1-88

SEMIVOLATILE METHOD BLANK SUMMARY
4B

Job No.:

Client:
Attn:
Address:

Project: Duluth

Work Order No.:
Lab Sample No.: 04-18
Lab File ID: 50333
Matrix: Soil
Level (low/med):
Date Analyzed: 11-2-88
Time Analyzed: 4:38
Instrument ID:
Date Reported:

This Method Blank applies to the following samples, MS and MSD.

Sample Number	Lab Sample ID	Lab File ID	Date of Analysis
DANGB2-MW39-SS2	88081889Rex	50334	11-2-88

2830

GC/MS TUNING AND MASS CALIBRATION

Decafluorotriphenylphosphine (DFTPP)

Case No. AD-76 Contractor ENG SCI(9/7/88) Contract No. 99-99-99

Instrument ID #1 Date / Time 9/30/88 14:38

Lab ID >T0930::01 Data Release Authorized By: _____

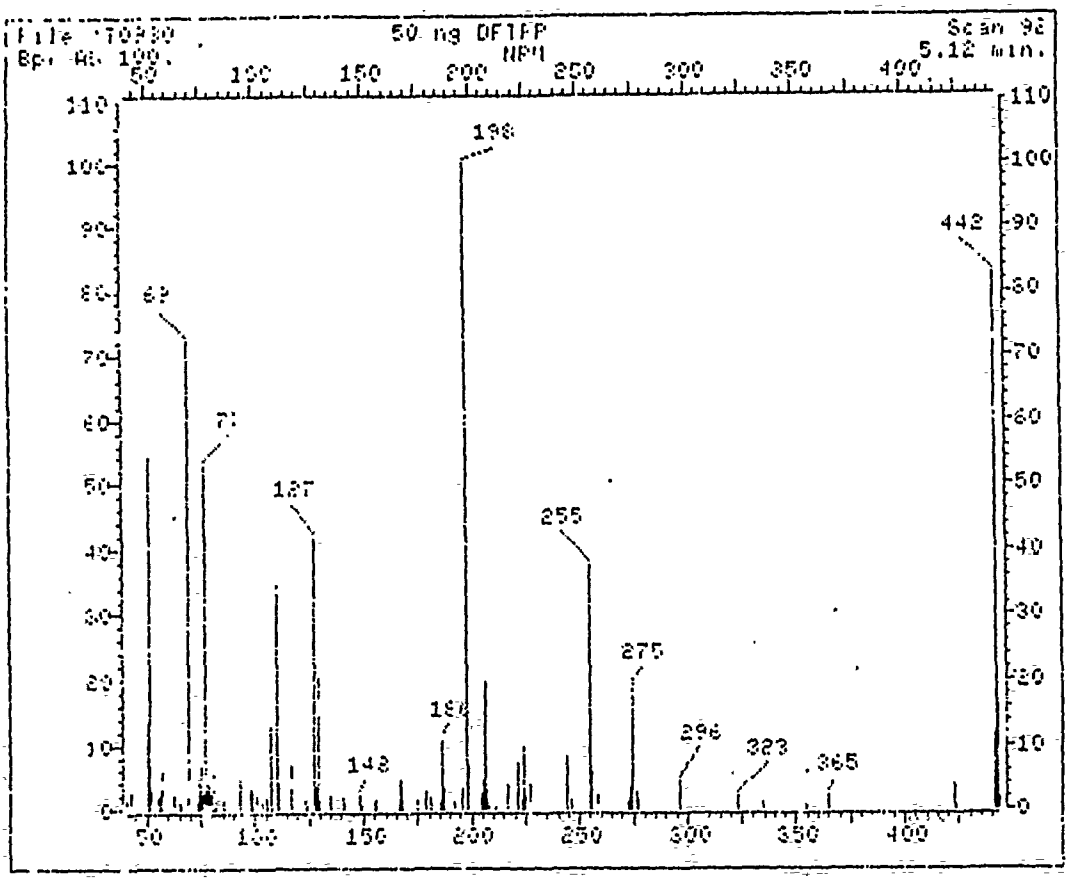
m/z	ION ABUNDANCE CRITERIA	%RELATIVE ABUNDANCE	
51	30.0 - 60.0% of mass 198	54.08 OK	
63	less than 2.0% of mass 69	0.00 OK	(0.00) #1
69	mass 69 relative abundance	72.31	
70	less than 2.0% of mass 69	0.00 OK	(0.00) #1
127	40.0 - 60.0% of mass 198	41.77 OK	
197	less than 1.0% of mass 198	0.00 OK	
198	base peak, 100% relative abundance	100.00 OK	
199	5.0 - 9.0% of mass 198	7.24 OK	
275	10.0 - 30.0% of mass 198	19.20 OK	
365	greater than 1.00% of mass 198	2.22 OK	
441	present, but less than mass 443	11.74 OK	
442	greater than 40.0% of mass 198	82.40 OK	
443	17.0 - 23.0% of mass 442	15.87 OK	(19.26) #2

initial calibration all 5 files 9/30/88.

THIS PERFORMANCE TUNE APPLIES TO THE FOLLOWING SAMPLES, BLANKS AND STANDARDS.

#1 - Value in parenthesis is % mass 69.
#2 - Value in parenthesis is % mass 442.

SAMPLE ID	LAB ID	DATE OF ANALYSIS	TIME OF ANALYSIS
SSTD010	S0121	9-30-88	16:20
SSTD025	S0122		17:20
SSTD060	S0123		18:21
SSTD060	S0124		19:21
SSTD080	S0125		20:21
SSTD120	S0126		21:22
88081883	S0130	10/1/88	01:23
88081884	S0131		02:24
88081885	S0132		03:23



[: >T0930 Scan #: 92 Retn. time: 5.12

m/z	Int.	m/z	Int.	m/z	Int.	m/z	Int.	m/z	Int.
41.00	1.492	79.95	2.305	128.05	5.590	187.00	3.255	254.50	37.483
43.00	2.631	81.05	5.424	128.95	20.857	191.90	1.166	255.90	5.831
50.00	13.453	82.05	1.410	129.95	1.600	196.00	2.983	257.90	2.143
51.00	54.052	83.05	2.061	134.95	2.034	197.90	100.000	272.90	.949
52.00	2.848	85.05	1.302	140.95	1.926	198.90	2.242	273.90	3.526
54.90	1.763	92.95	4.611	141.95	1.085	204.00	2.522	274.90	19.203
56.00	2.197	97.95	3.580	147.95	2.224	205.00	4.394	275.90	2.685
57.00	5.858	98.95	2.929	148.95	.759	206.00	19.855	276.90	1.465
63.05	2.224	100.95	1.986	154.95	1.112	207.00	4.611	295.95	4.421
65.05	1.058	103.95	.949	155.95	1.437	208.00	1.193	322.85	1.980
69.05	72.308	105.05	1.632	165.95	.624	210.90	.841	333.95	1.058
71.05	1.166	106.95	12.992	166.95	4.367	216.90	3.878	353.85	.678
73.05	1.085	110.05	34.391	167.95	1.600	221.00	7.169	364.85	2.224
74.05	4.529	110.95	4.150	174.85	1.383	222.90	1.329	422.90	3.716
75.05	6.977	116.95	6.943	179.00	2.821	224.00	9.574	423.90	.814
76.15	2.922	121.95	.922	180.00	1.654	225.00	2.061	441.00	11.744
77.05	52.807	122.95	1.465	180.90	.976	226.90	3.716	441.90	82.398
78.05	4.123	124.05	.868	185.00	1.221	244.00	8.272	442.90	15.867
79.05	3.878	126.95	41.768	186.00	10.632	245.90	1.492	443.90	1.736

Initial Calibration Data
HSL Compounds

Case No: _____ Instrument ID: 1

Contractor: ENGINEERING SCIENCE Calibration Date: ~~10/04/88~~ 9/30/88 RSD

Contract No: _____

Minimum $\overline{RF}$ for SPCC is _____ Maximum % RSD for CCC is _____ %

Laboratory ID:	>S012I	>S012C	S0125	>S0124	>S0125	>S012e	-				
	RF	RF	RF	RF	RF	RF	RF				
Compound	10.00	25.00	40.00	60.00	80.00	120.00	160.00	RRT	$\overline{RF}$	% RSD	CCC SPCC
N-Nitroso-Dimethylamine	1.16060	1.1443-	1.15942	1.13075	1.17115	1.26594	-	.443	1.17203	4.922	
2-Fluorophenol	1.37844	1.42153	1.24366	1.29362	.94110	1.02748	-	.892	1.23970	15.887	
Bis(2-Chloroethyl)ether	1.53769	1.511??	1.51093	1.45119	1.64385	.90263	-	.944	1.41618	18.522	
Phenol	2.27408	2.17?3?	2.10109	2.05919	1.99477	1.18190	-	.932	1.96356	20.105	*
Phenol-d5	1.85709	1.94?7?	1.87873	1.87594	1.78021	1.13217	-	.929	1.74531	17.488	
Aniline	1.66471	1.2236?	1.14473	.85326	.87594	.14792	-	.921	.83503	51.253	
2-Chlorophenol	1.51936	1.42046	1.40373	1.42712	1.41732	1.31362	-	.955	1.41694	4.823	
1,3-Dichlorobenzene	1.69631	1.5e8?1	1.40246	1.32052	1.17954	1.11518	-	.989	1.33045	16.199	
1,4-Dichlorobenzene	1.68863	1.40e?4	1.27132	1.16500	.99923	.90670	-	1.005	1.23954	22.950	*
Benzyl Chloride	-	-	-	-	-	-	-	-	-	-	
Benzyl Alcohol	.54049	.64173	.39012	.61868	.69628	.18815	-	1.241	.51257	37.294	
1,2-Dichlorobenzene	1.64106	1.46933	1.34764	1.27325	1.17489	1.07610	-	1.056	1.33038	15.339	
2-Methylphenol	1.53914	2.33653	1.31412	1.47241	1.31863	1.15398	-	1.103	1.52247	27.653	
Bis(2-chloroisopropyl)Ether	3.07953	2.97998	2.93699	2.99700	2.91800	2.84172	-	1.097	2.95887	2.718	(Conc=
4-Methylphenol	1.42832	1.28852	1.17223	1.13132	.89487	1.07599	-	1.146	1.16468	15.640	
N-Nitroso-Di-n-Propylamine	1.25314	1.12477	1.11182	1.10992	1.06536	1.09179	-	1.154	1.12579	5.955	**
Hexachloroethane	.78008	.62041	.45004	.50502	.46552	.42257	-	1.145	.54057	25.203	
Bromochloropropane	-	-	-	-	-	-	-	-	-	-	
Nitrobenzene	.58970	.54885	.50701	.51659	.52173	.51244	-	.849	.53273	5.914	
Nitrobenzene-d5	.45283	.44903	.44164	.45545	.44570	.41851	-	.844	.44386	3.013	
2-Nitrophenol	.24151	.23505	.24383	.24165	.23582	.23317	-	.919	.23385	1.852	*
Isophorone	1.00332	.97537	1.02342	1.05086	.96917	1.08113	-	.907	1.01721	4.287	
Bis(2-Chloroethoxy)methane	.61174	.57453	.57360	.57418	.57676	.42545	-	.960	.55604	11.611	
2,4-Dimethylphenol	.24204	.10722	.17389	.30803	.33207	.34694	-	.944	.25170	37.993	
Benzoic Acid	.19061	.26?75	.29273	.29717	.33149	.37259	-	.994	.29189	21.118	
2,4-Dichlorophenol	.32333	.33335	.31972	.28921	.16478	.22364	-	.978	.27567	24.456	*
1,2,4-Trichlorobenzene	.39856	.37462	.33575	.33044	.31775	.30291	-	.991	.34300	10.572	
Naphthalene	1.08889	.9821?	.89205	.83056	.74616	.72029	-	1.005	.87669	16.133	
4-Chloroaniline	.38494	.42119	.41096	.39707	.44234	.53743	-	1.026	.43232	12.760	
Hexachlorobutadiene	.23090	.21444	.19373	.19084	.17246	.17489	-	1.050	.19621	11.599	*

RF - Response Factor (Subscript is amount in mg/L)

$\overline{RRT}$ - Average Relative Retention Time (RT Std/RT Istd)

$\overline{RF}$ - Average Response Factor

%RSD - Percent Relative Standard Deviation

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

2833

Initial Calibration Data
HSL Compounds

Lab No: _____ Instrument ID: 1

Contractor: ENGINEERING-SCIENCE Calibration Date: ~~10/04/88~~ 9/30/88

Contract No: _____

Minimum $\overline{RF}$ for SPCC is _____ Maximum % RSD for CCC is _____ %

Laboratory ID:	>S0121	>S0122	>S0123	>S0124	>S0125	>S0126	-					
Compound	RF 10.00	RF 25.00	RF 40.00	RF 60.00	RF 80.00	RF 120.00	RF 160.00	$\overline{RRT}$	$\overline{RF}$	% RSD	CCC	SPCC
4-Chloro-3-Methylphenol	.34742	.40857	.39718	.45083	.46580	.50350	-	1.159	42389	12.969	*	
2-Methylnaphthalene	.62578	.55e09	52557	.51173	.46983	.48225	-	1.167	.52854	10.733		
Hexachlorocyclopentadiene	.38707	.25053	.39519	.37337	.35841	32627	-	.869	.34842	15.435		**
2,4,6-Trichlorophenol	.32e70	.22635	.25699	.25717	.23095	.25021	-	.872	.25923	13.820	*	
2,4,5-Trichlorophenol	.43511	.45393	.54038	.35775	.28695	.25988	-	.890	39752	28.409		
2-Fluorobiphenyl	1.24009	1.16583	1.16733	1.02631	.93470	.84017	-	.889	1.04574	17.790		
2-Chloronaphthalene	1.29815	1.24158	1.19059	1.10650	1.01767	.96988	-	.902	1.12108	14.086		
2-Nitroaniline	.59158	.62597	.63035	.68208	.66345	.53653	-	.929	.63030	9.145		
Dimethylphthalate	1.50263	1.47336	1.41245	1.24176	1.01037	.86336	-	.969	1.25065	21.066		
2,6-Dinitrotoluene	.39056	.40120	.42033	.41263	.36637	.30807	-	.980	38319	10.792		
Acenaphthylene	2.05134	1.87305	1.81567	1.52257	1.17765	.96822	-	.973	1.56808	27.089		
3-Nitroaniline	.34462	.54379	.59737	.64543	.63156	.51236	-	1.001	.54586	20.325		
2,4-Dinitrophenol	.11077	.19454	.24537	.27566	.26933	.21596	-	1.019	.21861	28.019		**
Acenaphthene	1.29739	1.18581	1.13413	1.03273	.84577	.69299	-	1.006	1.03114	21.837	*	
Dibenzofuran	1.72566	1.61230	1.59196	1.50567	1.30571	1.16090	-	1.033	1.48337	14.240		
2,4-Dinitrotoluene	.33709	.37621	.38610	.36656	.36738	.30801	-	1.046	.36021	8.718		
4-Nitrophenol	-	.14856	.31354	.37117	.36499	.34559	-	1.059	.30575	29.819		**
Fluorene	1.37653	1.15536	1.04600	.97721	.88691	.74283	-	1.092	.02939	21.166		
Diethylphthalate	1 46653	1.21662	1.08264	.84923	.65619	.54021	-	1.094	.98557	33.419		
4-Chlorophenyl-phenylether	.69474	.63747	.60310	.43694	-	.30461	-	1.095	.51533	38.498		
4-Nitroaniline	.19581	.34198	.44052	.49454	.45041	.34883	-	1.111	.39018	29.998		
2,4,6-Tribromophenol	.17612	.26551	.36737	.39185	.01977	.37785	-	1.157	.26641	54.996		
1,2-Diphenylhydrazine	-	-	-	-	-	-	-	-	-	-		
Alpha-BHC	-	-	-	-	-	-	-	-	-	-		
Beta-BHC	-	-	-	-	-	-	-	-	-	-		
Gamma-BHC	-	-	-	-	-	-	-	-	-	-		
Delta BHC	-	-	-	-	-	-	-	-	-	-		
Heptachlor	-	-	-	-	-	-	-	-	-	-		
Aldrin	-	-	-	-	-	-	-	-	-	-		
N-Nitrosodiphenylamine	.53812	.47272	.42715	.32493	.28966	.24809	-	.896	.38344	29.585	*	

RF - Response Factor (Subscript is amount in mg/L)

$\overline{RT}$ - Average Relative Retention Time (RT Std/RT Istd)

$\overline{RF}$ - Average Response Factor

CCC - Percent Relative Standard Deviation

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

Initial Calibration Data
HSL Compounds

Case No: _____ Instrument ID: 1

Contractor: ENGINEERING-SCIENCE Calibration Date: ~~11/04/88~~ 9/30/88

Contract No: _____

Minimum $\overline{RF}$ for SPCC is _____ Maximum % RSD for CCC is _____ %

Laboratory ID: >S0121 >S0122 >S0123 >S0124 >S0125 >S0126 -

Compound	RF 10.00	RF 25.00	RF 40.00	RF 60.00	RF 80.00	RF 120.00	RF 160.00	$\overline{RRT}$	$\overline{RF}$	% RSD	CCC	SPCC
4,6-Dinitro-2-Methylphenol	.12960	.17446	.17033	.15150	.09669	.04540	-	.893	.12806	38.774		
4-Bromophenyl-phenylether	.26110	.24954	.22064	.21312	.19178	.18532	-	.942	.21941	13.974		
Hexachlorobenzene	.38086	.35050	.31987	.31048	.29689	.28190	-	.960	.32348	11.284		
Pentachlorophenol	-	.16788	.19451	.21493	.13102	.19076	-	1.058	.17862	17.147	*	
Phenanthrene	1.14179	1.03883	.91210	.83158	.80272	.80458	-	1.004	.92146	15.190		
Anthracene	1.17790	1.06579	.96647	.86171	.79942	.64734	-	1.010	.91994	20.747		
Di-n-Octylphthalate	1.66770	1.56989	1.38584	1.27551	1.21202	.99572	-	1.097	1.35160	18.122		
4,4'-Dibromobiphenyl	2.53534	1.95843	1.64204	1.53180	1.21641	1.09591	-	1.134	1.63499	33.002		
Fluoranthene	1.25013	1.19507	1.06857	.99408	.91654	.83409	-	1.169	1.03595	15.988	*	
Heptachlor Epoxide	-	-	-	-	-	-	-	-	-	-		
Endosulfan I	-	-	-	-	-	-	-	-	-	-		
4,4'-DDE	-	-	-	-	-	-	-	-	-	-		
Dieldrin	-	-	-	-	-	-	-	-	-	-		
Endrin	-	-	-	-	-	-	-	-	-	-		
4,4'-DDD	-	-	-	-	-	-	-	-	-	-		
Endosulfan II	-	-	-	-	-	-	-	-	-	-		
Endrin Aldehyde	-	-	-	-	-	-	-	-	-	-		
4,4'-DDT	-	-	-	-	-	-	-	-	-	-		
Endosulfan Sulfate	-	-	-	-	-	-	-	-	-	-		
Dibutylchlorendate	-	-	-	-	-	-	-	-	-	-		
Benzidine	.00576	.00853	.03991	.09757	.11251	.10548	-	.883	.06163	80.207		
Pyrene	1.56985	1.36628	1.33014	1.27824	1.24547	1.35121	-	.877	1.35653	8.412		
Terphenyl-d14	1.04794	.97006	.92453	.90832	.86081	.93581	-	.896	.94141	6.720		
Butylbenzylphthalate	.96856	.89682	.84197	.83524	.79665	.84333	-	.951	.86376	7.001		
3,3'-Dichlorobenzidine	.07520	.07751	.13981	.13579	.13868	.19408	-	1.000	.13685	36.781		
Chrysene	1.28007	1.17970	1.15696	1.16358	1.04297	1.02146	-	1.003	1.13112	8.468		
Benzo(a)Anthracene	1.15715	1.12176	1.11766	1.11638	1.13446	1.26643	-	.998	1.15230	5.029		
bis(2-Ethylhexyl)Phthalate	1.16263	1.04995	.99376	.93035	.85589	.91919	-	1.013	.98532	11.101		
Di-n-Octylphthalate	2.27639	2.23598	2.06508	2.04742	1.79251	1.75332	-	.919	2.03183	10.753	*	
Benzo(a)Pyrene	1.08665	1.12882	1.06997	1.13292	1.11357	1.06292	-	.992	1.10247	2.473	*	

RF - Response Factor (Subscript is amount in mg/L)

$\overline{RRT}$ - Average Relative Retention Time (RT Std/RT Istd)

$\overline{RF}$ - Average Response Factor

%RSD - Percent Relative Standard Deviation

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

2335

Initial Calibration Data
HSL Compounds

Case No: _____ Instrument ID: 1

Contractor: ENGINEERING-SCIENCE Calibration Date: ~~10/24/88~~ 9-30-88

Contract No: _____

Minimum $\overline{RF}$ for CCC is _____ Maximum % RSD for CCC is _____

Laboratory ID:	>S0121	>S0122	>S0123	>S0124	>S0125	>S0126	-				
Compound	RF 10.00	RF 20.00	RF 40.00	RF 60.00	RF 80.00	RF 120.00	RF 160.00	$\overline{RRT}$	$\overline{RF}$	% RSD	CCC SPCC
Benzo(b)Fluoranthene	1.22783	1.33779	1.30045	1.57776	1.81610	1.79931	-	.954	1.51795	16.648	
Indeno(1,2,3-cd)Pyrene	.90500	.93897	.98389	1.01423	1.24715	1.25367	-	1.175	1.06415	13.975	
Dibenzo(a,h)Anthracene	1.03847	1.11574	1.10799	1.08268	1.14446	1.15416	-	1.182	1.10725	3.830	
Benzo(k)Fluoranthene	1.19507	1.19487	1.08727	.85158	.57804	.54350	-	.957	.90813	32.691	
Benzo(g,h,i)Perylene	.94905	1.02944	1.01970	.96164	1.07320	1.06195	-	1.228	1.01906	4.630	

RF - Response Factor (Subscript is amount in mg/L)

$\overline{RRT}$ - Average Relative Retention Time (RT Std/RT Istd)

$\overline{RF}$ - Average Response Factor

RSD - Percent Relative Standard Deviation

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

2836

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: Engineering Science Contract: OR01

Lab Code: _____ Case No.: _____ SAS No.: _____ Job No.: _____

Sample No. (Standard): STD025 Date Analyzed: 9/30/88

Lab File ID (Standard): 30122 Time Analyzed: 17:20

Instrument ID: 1

	IS1 (DCB) AREA #	RT	IS2 (NPT) AREA #	RT	IS3 (ANT) AREA #	RT
12 HOUR STD	48324	9.33	179876	12.95	95726	18.46
UPPER LIMIT	96648		359752		191452	
LOWER LIMIT	24162		89938		47863	
EPA SAMPLE NO.						
01 88081883	51005	9.34	209126	12.93	119539	18.44
02 88081884	50644	9.32	197536	12.93	113511	18.44
03 88081885	51350	9.34	212885	12.93	119285	18.44
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22						

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d8

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

page __ of __

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: Engineering Science Contract: OR01

Lab Code: _____ Case No.: _____ SAS No.: _____ Job No.: _____

Sample No. (Standard): SSTD025 Date Analyzed: 9/30/88

Lab File ID (Standard): 50122 Time Analyzed: 17:20

Instrument ID: |

	IS4 (PHN) AREA #	RT	IS5 (CRY) AREA #	RT	IS4 (PRY) AREA #	RT
12 HOUR STD	170247 ~~4788~~	23.10	149176	31.55	123825	37.15
UPPER LIMIT	340494		298352		247650	
LOWER LIMIT	85123		74588		61912	
EPA SAMPLE NO.						
01 SSD81883	198959	23.10	156750	31.55	126239	37.15
02 SSD81884	184718	23.10	155759	31.55	126385	37.13
03 SSD81885	197322	23.08	162966	31.55	132406	3715
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IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

GC/MS TUNING AND MASS CALIBRATION

Decafluorotriphenylphosphine (DFTPP)

Case No. 123456 Contractor Engineering Scien Contract No. 99999999

Instrument ID #1 Date / Time 11/02/88 3:11

Lab ID >T1102::03 Data Release Authorized By:

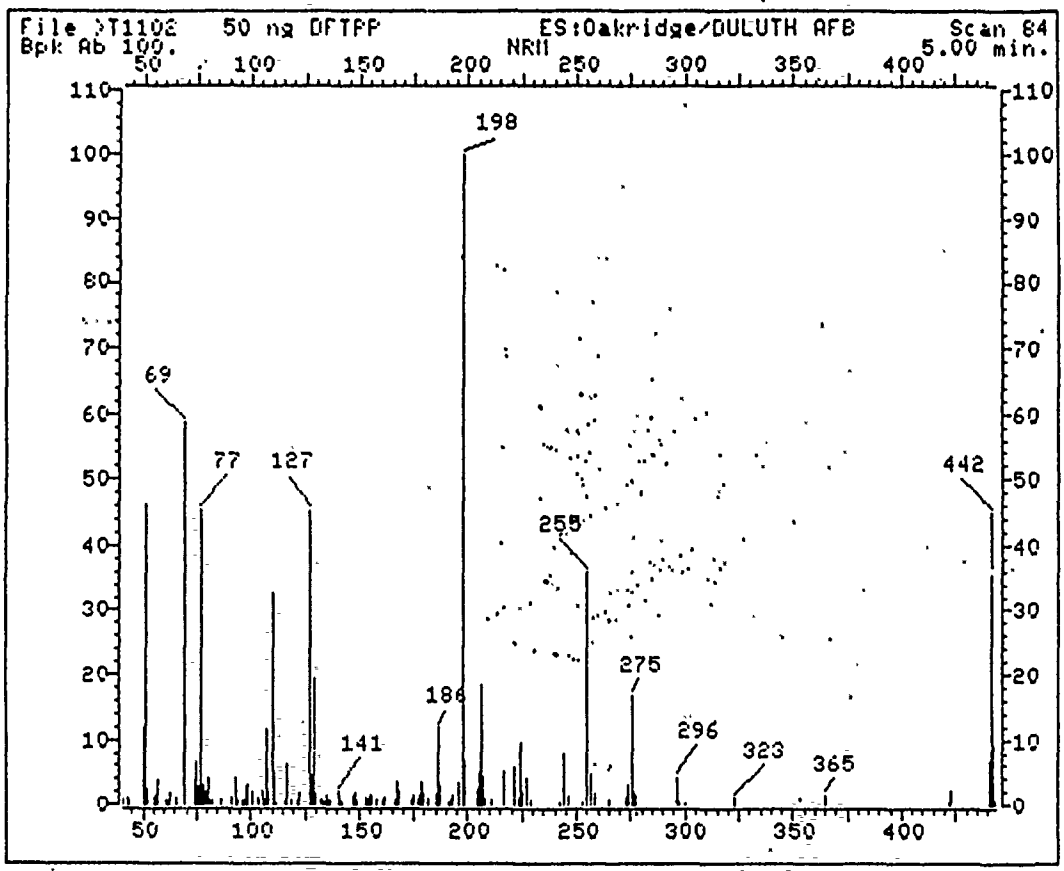
m/z	ION ABUNDANCE CRITERIA	%RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	46.07 OK
68	less than 2.0% of mass 69	0.00 OK (0.00) #1
69	mass 69 relative abundance	58.43
70	less than 2.0% of mass 69	0.00 OK (0.00) #1
127	40.0 - 60.0% of mass 198	45.06 OK
197	less than 1.0% of mass 198	0.00 OK
198	base peak, 100% relative abundance	100.00 OK
199	5.0 - 9.0% of mass 198	6.89 OK
275	10.0 - 30.0% of mass 198	16.76 OK
365	greater than 1.00% of mass 198	1.47 OK
441	present, but less than mass 443	6.71 OK
442	greater than 40.0% of mass 198	44.93 OK
443	17.0 - 23.0% of mass 442	9.27 OK (20.64) #2

10/12/88
Spun

THIS PERFORMANCE TUNE APPLIES TO THE FOLLOWING SAMPLES, BLANKS AND STANDARDS.

#1 - Value in parenthesis is % mass 69.
#2 - Value in parenthesis is % mass 442.

SAMPLE ID	LAB_ID	DATE_OF_ANALYSIS	TIME_OF_ANALYSIS
50 ng DFTPP	>T1102	11/02/88	3:11
SSTD060	SO332		3:38
BLK1304 REV	SO333		4:38
BLK1304 REV	SO334		5:37
BLK1303 REV	SO335		6:37
~~BLK1304 REV~~	~~SO336~~		
BLK1304 REV	SO337		8:36
BLK1226 REV	SO338		9:35
BLK1163 REV	SO339		10:34
BLK1163MS REV	SO340		11:33
BLK1163MSD REV	SO341		12:32
BLK1187 REV	SO342		13:31
BLK1194 REV	SO343		14:32



File: >T1102 Scan #: 84 Retn. time: 5.00

m/z	Int.	m/z	Int.	m/z	Int.	m/z	Int.	m/z	Int.
41.10	.893	91.00	1.157	129.05	19.339	175.15	1.421	227.00	4.215
43.20	1.207	93.10	4.231	130.15	1.785	177.15	.777	229.00	.777
43.90	.926	93.80	.529	132.05	.876	178.15	1.438	242.00	.479
50.10	11.851	94.10	.661	133.15	.826	178.95	3.620	244.10	7.752
51.10	46.066	96.10	.810	133.95	.579	180.05	1.901	246.00	1.355
52.10	2.397	97.10	.678	135.05	1.421	181.05	1.058	252.90	.397
55.20	.959	98.00	2.942	135.85	.628	185.05	1.769	255.10	35.752
56.00	1.438	99.10	3.025	136.05	.628	186.05	11.901	256.10	4.843
57.10	3.769	101.10	1.983	137.05	.843	187.05	3.240	258.00	1.901
60.90	.628	104.00	1.124	141.05	2.116	191.15	.413	265.00	.777
61.10	.628	105.10	1.983	142.05	.760	191.95	.711	273.10	1.256
62.00	.529	105.80	.446	142.95	.413	193.15	1.339	274.05	3.041
63.10	1.702	106.20	.645	147.05	1.438	196.10	3.488	275.15	16.760
65.10	1.008	107.10	11.736	148.05	1.835	198.00	100.000	276.05	2.215
69.10	58.430	108.10	2.165	149.05	.628	199.00	6.893	277.05	1.322
74.10	3.868	110.00	32.678	153.15	1.223	204.00	2.496	296.05	4.149
75.10	6.496	111.00	5.058	154.05	.645	205.10	5.140	297.05	.545
76.20	2.694	112.00	.545	155.15	1.339	206.10	18.198	323.15	.975
77.10	45.339	116.00	.744	156.05	1.570	207.10	4.314	365.00	1.421
78.10	3.256	117.00	6.264	158.05	.711	208.10	1.025	422.20	.413
79.10	3.140	119.05	.711	160.15	.694	211.10	.760	423.10	2.165
80.00	1.950	121.95	.628	161.15	1.124	217.10	5.174	441.15	6.711
81.00	4.198	122.15	.661	166.15	.793	221.10	5.868	442.15	44.926
82.10	.777	123.05	1.868	167.05	3.504	223.20	1.008	443.15	9.273
83.10	.893	127.15	45.058	168.05	1.950	224.10	9.570	444.05	.810
86.90	.595	128.15	4.331	173.95	.793	225.10	2.198		

Continuing Calibration Check
HSL Compounds

Case No: Calibration Date: 11/02/88

Contractor: ENGINEERING-SCIENCE Time: 03:38

Contract No: Laboratory ID: >S0332

Instrument ID: 1 Initial Calibration Date: 10/12/88

Minimum $\overline{RF}$ for SPCC is . Maximum %Diff for CCC is %

Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC
N-Nitroso-Dimethylamine	.90169	.86829	3.71		
2-Fluorophenol	1.15802	1.24487	7.50		
bis(2-Chloroethyl)ether	1.11892	.94229	15.74		
Phenol	1.41657	1.41675	.01	*	
Phenol-d5	1.22488	1.35519	10.64		
Aniline	.54193	.55919	3.19		
2-Chlorophenol	1.23175	1.29899	5.46		
1,3-Dichlorobenzene	1.47535	1.41606	4.02		
1,4-Dichlorobenzene	1.40530	1.41814	.91	*	
Benzyl Chloride	-	-	-		
Benzyl Alcohol	.72906	.35776	50.93		
1,2-Dichlorobenzene	1.32240	1.47223	11.33		
2-Methylphenol	1.17367	1.34088	14.25		
3-&-4-Methylphenol	1.07139	1.36481	27.39		
bis(2-chloroisopropyl)Ether	2.15627	2.39968	11.29		
N-Nitroso-Di-n-Propylamine	.84050	.85968	2.28		**
Hexachloroethane	.53840	.55322	2.75		
Dibromochloropropane	-	-	-		
Nitrobenzene	.40312	.44179	9.59		
Nitrobenzene-d5	.39137	.39411	.70		
2-Nitrophenol	.24657	.26596	7.86	*	
Isophorone	.74170	.77932	5.08		
bis(2-Chloroethoxy)methane	.49386	.51448	4.18		
2,4-Dimethylphenol	.34849	.37602	7.90		
Benzoic Acid	.29725	.26761	9.97		
2,4-Dichlorophenol	.56733	.60488	6.62	*	
1,2,4-Trichlorobenzene	.36913	.35632	3.47		
Naphthalene	.94589	.91410	3.36		
4-Chloroaniline	.36309	.38411	5.79		
Hexachlorobutadiene	.20283	.19102	5.83	*	
4-Chloro-3-Methylphenol	.31360	.33164	5.75	*	
2-Methylnaphthalene	.56397	.59883	6.18		

RF - Response Factor from daily standard file at 60.00 ng/L

$\overline{RF}$ - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

Continuing Calibration Check
HSL Compounds

Case No: _____ Calibration Date: 11/02/88

Contractor: ENGINEERING - SCIENCE Time: 03:38

Contract No: _____ Laboratory ID: >S0332

Instrument ID: 1 Initial Calibration Date: 10/13/88

Minimum $\overline{RF}$ for SPCC is _____ Maximum % Diff for CCC is %

Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC
Hexachlorocyclopentadiene	.29568	.28792	2.62		**
2,4,6-Trichlorophenol	.42280	.39006	7.74	*	
2,4,5-Trichlorophenol	.52897	.51089	3.42		
2-Fluorobiphenyl	1.27220	1.10949	12.79		
2-Chloronaphthalene	1.23784	1.15731	6.51		
2-Nitroaniline	.47288	.46907	.81		
Dimethylphthalate	1.40629	1.28063	8.94		
2,6-Dinitrotoluene	.37415	.36992	1.13		
Acenaphthylene	1.68918	1.59847	5.37		
3-Nitroaniline	.44557	.44053	1.13		
2,4-Dinitrophenol	.11898	.10237	13.96		**
Acenaphthene	1.13011	.98894	12.49	*	
Dibenzofuran	1.64131	1.52393	7.15		
2,4-Dinitrotoluene	.28418	.27512	3.19		
4-Nitrophenol	.28450	.18656	34.42		**
Fluorene	1.12850	.96772	14.25		
Diethylphthalate	1.20939	1.09078	9.81		
4-Chlorophenyl-phenylether	.59183	.53600	9.43		
4-Nitroaniline	.35956	.24005	33.24		
2,4,6-Tribromophenol	.21023	.18667	11.21		
1,2-Diphenylhydrazine	-	-	-		
Alpha-BHC	-	-	-		
Beta-BHC	-	-	-		
Gamma-BHC	-	-	-		
Delta-BHC	-	-	-		
Heptachlor	-	-	-		
Aldrin	-	-	-		
N-Nitrosodiphenylamine	.40286	.48142	19.50	*	
4,6-Dinitro-2-Methylphenol	.10514	-	-		
4-Bromophenyl-phenylether	.21301	.22585	6.02		
Hexachlorobenzene	.26273	.26256	.06		
Pentachlorophenol	.14536	.11651	19.85	*	

RF - Response Factor from daily standard file at 60.00 mg/L

$\overline{RF}$ - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

Continuing Calibration Check
HSL Compounds

Case No:

Calibration Date: 11/02/88

Contractor: ENGINEERING - SCIENCE

Time: 03:38

Contract No:

Laboratory ID: >S0332

Instrument ID: 1

Initial Calibration Date: 10/13/88

Minimum $\overline{RF}$ for SPCC is

Maximum % Diff for CCC is %

Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC
Phenanthrene	1.03431	.99397	3.90		
Anthracene	1.05155	1.08324	3.01		
Di-n-Butylphthalate	1.51956	1.57248	3.48		
4,4'-Dibromobiphenyl	-	-	-		
Fluoranthene	1.19047	1.09563	7.97	*	
Heptachlor Epoxide	-	-	-		
Endosulfan I	-	-	-		
4,4'-DDE	-	-	-		
Dieldrin	-	-	-		
Endrin	-	-	-		
4,4'-DDD	-	-	-		
Endosulfan II	-	-	-		
Endrin Aldehyde	-	-	-		
4,4'-DDT	-	-	-		
Endosulfan Sulfate	-	-	-		
Dibutylchlorendate	-	-	-		
Benzidine	.04023	.10651	164.75		
Pyrene	1.56086	1.70230	9.06		
Terphenyl-d14	1.05835	1.12088	5.91		
Butylbenzylphthalate	1.03390	1.18805	14.91		
3,3'-Dichlorobenzidine	.13689	.22546	64.70		
Chrysene	.99655	1.07935	8.31		
Benzo(a)Anthracene	1.10407	1.12922	2.28		
bis(2-Ethylhexyl)Phthalate	1.21073	1.41995	17.28		
Di-n-octylphthalate	3.40275	3.35609	1.37	*	
Benzo(a)Pyrene	1.32098	1.31300	.60	*	
Benzo(b)Fluoranthene	1.60850	1.29693	19.37		
Indeno(1,2,3-cd)Pyrene	.96800	1.07897	11.46		
Dibenzo(a,h)Anthracene	.87481	1.04007	18.89		
Benzo(k)Fluoranthene	1.44370	1.27546	11.65		
Benzo(g,h,i)Perylene	.89761	1.06755	18.93		

RF - Response Factor from daily standard file at 60.00 ug/L

$\overline{RF}$ - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: Engineering Science Contract: OR$\phi\phi$1

Lab Code: _____ Case No.: _____ SAS No.: _____ Job No.: _____

Sample No. (Standard): SStd 060 Date Analyzed: 11/2/88

Lab File ID (Standard): S0332 Time Analyzed: 0338

Instrument ID: 1

	IS1 (DCB) AREA #	RT	IS2 (NPT) AREA #	RT	IS3 (ANT) AREA #	RT
12 HOUR STD	64746	9.19	217043	12.82	127196	18.30
UPPER LIMIT	129492	9.69	434086	13.32	254392	18.80
LOWER LIMIT	32373	8.69	108522	12.32	63598	17.80
EPA SAMPLE NO.						
S0333 01 SSD81889811REX	65200	9.18	244999	12.73	130426	18.31
S0334 02 SSD81899 1REX	67988	9.14	249777	12.68	133620	18.32
S0335 03 SSD82223REX	66275	9.17	252126	12.73	137935	18.32
S0336 04 SSD82224REX	70289	9.12	258379	12.66	138274	18.31
S0338 05 SSD82226REX	60084	9.24	209478	12.85	118195	18.34
S0339 06 SSD82163REX	71814	9.11	267332	12.66	140121	18.32
S0340 07 SSD82163MSREX	66067	9.20	263302	12.80	132056	18.29
S0341 08 SSD82163MSDREX	59824	9.22	238752	12.82	123902	18.30
S0342 09 SSD81857REX	62566	9.20	237155	12.82	125428	18.33
S0343 10 SSD81935REX	78132	9.21	308938	12.83	164589	18.31
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d8

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asteris

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: Engineering Science Contract: OR01

Lab Code: _____ Case No.: _____ SAS No.: _____ Job No.: _____

Sample No. (Standard): Std 060 Date Analyzed: 11/2/88

Lab File ID (Standard): 50332 Time Analyzed: 03:38

Instrument ID: 1

	IS4 (PHN) AREA #	RT	IS5 (CRY) AREA #	RT	IS4 (PRY) AREA #	RT
12 HOUR STD	187954	22.96	112232	31.43	79141	37.57
UPPER LIMIT	375908	23.46	224464	31.93	159282	38.07
LOWER LIMIT	93977	22.46	56116	30.93	39571	37.07
EPA SAMPLE NO.						
50333 01	178862	23.00	105803	31.44	61911	37.60
50334 02	173199	22.94	117735	31.43	78788	37.56
50335 03	177355	23.02	100187	31.44	57284	37.59
50337 04	182323	22.99	110816	31.43	49552	37.58
50338 05	169188	23.03	93573	31.47	55951	37.61
50339 06	186958	22.99	104037	31.43	61922	37.59
50340 07	185761	22.96	111607	31.45	49021	37.59
50341 08	175088	22.98	102062	31.47	56668	37.62
50342 09	170433	23.00	90356	31.45	50008	37.61
50343 10	218764	22.99	119171	31.44	71774	37.59
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

)TILE CONTINUING CALIBRATION CHECK

lame:_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____

:rument ID:CARBOPAK_____ Calibration Date(s):8/23/88

AB FILE ID:_56,57_____ Init. Calib. Date(s):8/19/88, 8/15/88

MPOUND	RRF	RRF50	%D
nyl chloride	0.08	0.08	-111.57
(2-chloroethoxy) hane	0.04		100.00
(2-chloroisopropyl ier	0.26		100.00
omobenzene	1.21	1.00	8.38
omodichloromethane	3.68	2.72	7.36
omoform	1.45	0.96	22.94
omomethane	0.26	0.31	15.03
bon tetrachloride	3.20	2.83	2.81
oroacetaldehyde			ERR
lorobenzene	1.36	1.21	-4.47
oroethane	0.55	0.52	36.02
oroform	4.50	3.98	4.20
hlorohexane	0.92	0.73	7.10
hloroethyl vinyl ether	0.04		100.00
oromethane	0.34	0.30	-13.85
loromethyl methyl ether	0.17		100.00
m_,& p_Chlorotoluenes	3.99	3.19	12.09
romochloromethane	3.90	2.88	9.20
romomethane	2.98	2.34	18.78
_Dichlorobenzene	2.48	2.00	3.86
_Dichlorobenzene	1.94	2.00	-4.98
_Dichlorobenzene	2.47	1.89	7.75
hlorodifluormethane	0.54		100.00
_Dichloroethane	1.95	1.72	3.45
_Dichloroethane	2.33	1.78	5.04
_Dichloroethylene	2.44	2.03	23.18
ans_1,2_dichloroethylene	1.51	1.31	-7.79
hloromethane	4.21	3.44	9.52
_Dichloropropane	2.70	2.27	-1.01
_Dichloropropylene	4.60	3.36	21.17
,2,2_Tetrachloroethane	6.65	5.76	-1.54
,1,2_Tetrachloroethane	3.61	2.60	20.06
rachloroethylene	6.65	5.76	-1.50
1,1_Trichloroethane	2.20	1.66	3.43
,2_Trichloroethane	4.60	3.36	21.09
chloroethylene	4.40	3.63	19.52
chlorofluoromethane	2.19	1.66	14.94
chloropropene	3.59	2.38	25.04
yl ether	1.08	0.94	25.28

2846

ATILE CONTINUING CALIBRATION CHECK

bName: ENGINEERING SCIENCE Contract:

Code: Case No.: SAS No.: SDG No.:

strument ID.: CARBOPAK Calibration Date(s): 8/23/88

FILE ID: RRF 50 56

Initial calib = 8/19/88

OMPOUND	$\overline{RRF}$	RRF50	%D
nzene	3.10	2.47	-20.23
lorobenzene	5.31	4.55	-13.73
,2_Dichlorobenzene	2.44	2.27	-6.96
3_Dichlorobenzene	2.71	2.31	-14.73
4_Dichorobenzene	2.53	2.23	-11.87
thyl Benzene	3.51	2.47	-29.54
oluene	3.47	3.32	-4.20
lenes	7.63	7.46	-2.24

TILE CONTINUING CALIBRATION CHECK

ame:_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____

rument ID:CARBOPAK_____ Calibration Date(s):8/24/88

B FILE ID:_73,74,_____ Init. Calib. Date(s):8/19/88, 8/15/88

POUND	RRF	RRF50	%D
zyl chloride_____	0.08	0.09	-111.57
(2-chloroethoxy) hane_____	0.04		100.00
(2-chloroisopropyl er_____	0.26		100.00
mobenzene_____	1.21	1.08	8.38
modichloromethane_____	3.68	3.08	7.36
moform_____	1.45	0.99	22.94
momethane_____	0.26	0.21	15.03
bon tetrachloride_____	3.20	2.86	2.81
oroacetaldehyde_____			ERR
orobenzene_____	1.36	1.26	-4.47
oroethane_____	0.55	0.40	36.02
oroform_____	4.50	3.96	4.20
horohexane_____	0.92	0.77	7.10
hloroethyl vinyl ether_	0.04		100.00
oromethane_____	0.34	0.28	-13.85
oromethyl methyl ether_	0.17		100.00
m_,& p_Chlorotoluenes _	3.99	3.22	12.09
romochloromethane_____	3.90	3.25	9.20
romomethane_____	2.98	2.49	18.78
_Dichlorobenzene_____	2.48	2.14	3.86
_Dichlorobenzene_____	1.94	1.81	-4.98
_Dichlorobenzene_____	2.47	2.07	7.75
hlorodifluormethane____	0.54		100.00
_Dichloroethane_____	1.95	1.87	3.45
_Dichloroethane_____	2.33	2.07	5.04
_Dichloroethylene_____	2.44	2.16	23.18
ns_1,2_dichloroethylene	1.51	1.57	-7.79
hloromethane _____	4.21	3.56	9.52
_Dichloropropane_____	2.70	2.49	-1.01
_Dichloropropylene_____	4.60	3.51	21.17
,2,2_Tetrachloroethane_	6.65	6.44	-1.54
,1,2_Tetrachloroethane_	3.61	2.70	20.06
rachloroethylene_____	6.65	6.44	-1.50
,1_Trichloroethane_____	2.20	1.91	3.43
,2_Trichloroethane_____	4.60	3.51	21.09
chloroethylene_____	4.40	3.69	19.52
chlorofluormethane_____	2.19	1.85	14.94
chloropropene_____	3.59	2.60	25.04
[illegible] _____	1.08	0.79	26.28

2848

LATILE CONTINUING CALIBRATION CHECK

Name:ENGINEERING SCIENCE_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____ SDG No.:____

strument ID.:CARBOPAK Calibration Date(s):8/24/88 _____

FILE ID: RRF 50 __73_____ Int cali = 8/19/88

MPOUND	$\overline{RRF}$	RRF50	%D
nzene	3.10	2.59	-16.53
lorobenzene	5.31	4.69	-11.72
,2_Dichlorobenzene	2.44	2.81	15.27
3_Dichlorobenzene	2.71	2.81	3.78
4_Dichorobenzene	2.53	2.81	11.17
thyl Benzene	3.51	2.40	-31.62
oluene	3.47	3.53	1.73
lenes	7.63	7.73	1.25

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DATA PACKAGE #53

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ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001.00

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received by this laboratory on 8-18-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081960	DANGB3-SS-A0	8010	8-16-88		8-26-88	8-25-88
88081960	DANGB3-SS-A0	8020	8-16-88		8-26-88	8-24-88
88081961	DANGB3-SS-B1	8010	8-16-88		8-26-88	8-25-88
88081961	DANGB3-SS-B1	8020	8-16-88		8-26-88	8-24-88
88081962	DANGB3-SS-C2	8010	8-16-88		8-26-88	8-24-88
88081962	DANGB3-SS-C2	8020	8-16-88		8-26-88	8-24-88

* If applicable

A SUBSIDIARY OF THE PARSONS CORPORATION

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88081960-88081962
WORK ORDER NO.: 878

These soil samples were received at the ES Berkeley Laboratory on 8-18-88. They were received cold and intact.

ANALYSIS REPORT

WORK ORDER NUMBER: 870
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/18/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: mg/Kg, GROUP 8010

	DANGB3-SS-A0	DANGB3-SS-B1	DANGB3-SS-C2
TEST COMPOUND	88081960	88081961	88081962
BENZYL CHLORIDE	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND
BROMOBENZENE	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND
BROMOFORM	ND	ND	ND
BROMOETHANE	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND
CHLORAL	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
CHLOROETHANE	ND	ND	ND
CHLOROFORM	0.2B	2.6B	0.2B
1-CHLOROHEXANE	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND
CHLOROMETHANE	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1.4-DICHLOROBENZENE	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND
1.2-DICHLOROETHANE	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND
DICHLOROMETHANE	3.4B	5.7B	12B
1,2-DICHLOROPROPANE	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 878

ST COMPOUND	DANGB3-SS-A0 88081960	DANGB3-SS-B1 88081961	DANGB3-SS-C2 88081962
,3-DICHLOROPROPYLENE	ND	ND	ND
,1,2,2-TETRACHLOROETHANE	ND	ND	ND
,1,1,2-TETRACHLOROETHANE	ND	ND	ND
ETRACHLOROETHYLENE	ND	ND	ND
,1,1-TRICHLOROETHANE	ND	ND	ND
,1,2-TRICHLOROETHANE	ND	ND	ND
RICHLOROETHYLENE	ND	ND	ND
RICHLOROFLUOROMETHANE	ND	ND	ND
RICHLOROPROPANE	ND	ND	ND
INYL CHLORIDE	ND	ND	ND

D - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 878
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/18/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: mg/Kg, GROUP 8020

	DANGB3-SS-A0	DANGB3-SS-B1	DANGB3-SS-C2
TEST COMPOUND	88081960	88081961	88081962
BENZENE	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
ETHYL BENZENE	ND	ND	ND
TOLUENE	17	4.5	5.3
XYLENES	ND	ND	ND

ND - Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88081898-88081900, 88081904-88081906
88081938-88081942, 88081954-88081962

QC Report No: VGC-S-0037-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-18-88
Date Prepared: NA
Date Analyzed: 8-30-88
Date Reported: 9-26-88
Dilution Factor: NA
% Moisture: 15.8

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88081938	1,1-dichloroethane	11.9	ND	11.2	94	9.3	78	19	20	58-124
	Trichloroethene	11.9	ND	10.8	91	10.2	86	6	16	75-110
	Chlorobenzene	11.9	ND	11.2	94	11.4	96	2	21	71-125
	Aromatics: 8020									
88081938	Benzene	11.9	ND	10.2	86	9.9	83	3	26	75-123
	Toluene	11.9	2.1	11.6	80	11.6	80	0	16	79-115
	Chlorobenzene	11.9	ND	10.3	87	9.8	82	5	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: mg/KG
Date Reported: 9-26-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
15	8-26-88	VGC	Carbopack	75-09-2 67-66-3	Dichloromethane Chloroform	3.3 0.2	0.5 0.05	88081898-88081900 88081904-88081906 88081960 8081962

2859

ATILE CONTINUING CALIBRATION CHECK

lame:_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____

/ppoouqrj1..o60 8/24/88

\B FILE ID:_12,13_____ Init. Calib. Date(s):8/14/88 , 8/15/88

MPOUND	RRF	RRF50	%D
nzyl chloride	0.08	0.10	-30.36
s (2-chloroethoxy) chane	0.04		100.00
s (2-chloroisopropyl ner	0.26		100.00
omobenzene	1.21	1.07	11.80
omodichloromethane	3.68	3.08	16.23
omoform	1.45	0.95	34.27
omomethane	0.26	0.21	20.31
bon tetrachloride	3.20	3.00	6.38
oroacetaldehyde			ERR
orobenzene	1.36	.29	4.94
oroethane	0.55	0.39	29.18
oroform	4.50	4.19	6.91
Chlorohexane	0.92	0.73	21.03
Chloroethyl vinyl ether	0.04		100.00
oromethane	0.34	0.29	14.69
oromethyl methyl ether	0.17		100.00
m_,& p_Chlorotoluenes	3.99	3.04	23.77
promochloromethane	3.90	3.19	18.08
promomethane	2.98	2.39	19.74
2_Dichlorobenzene	2.48	2.20	11.11
3_Dichlorobenzene	1.94	1.89	2.39
4_Dichlorobenzene	2.47	2.33	5.55
chlorodifluormethane	0.54		100.00
1_Dichloroethane	1.95	1.90	2.46
2_Dichloroethane	2.33	2.03	12.68
1_Dichloroethylene	2.44	2.19	10.19
ans_1,2_dichloroethylene	1.51	1.59	-5.37
chloromethane	4.21	3.76	10.63
2_Dichloropropane	2.70	2.34	13.29
3_Dichloropropylene	4.60	3.33	27.60
,2,2_Tetrachloroethane	6.65	6.41	3.67
,1,2_Tetrachloroethane	3.61	2.61	27.59
rachloroethylene	6.65	6.41	3.61
,1_Trichloroethane	2.20	1.84	16.37
,2_Trichloroethane	4.60	3.33	27.61
chloroethylene	4.40	3.94	10.35
chlorofluoromethane	2.19	1.80	17.69
chloropropene	3.59	2.40	33.19
yl ether	1.08	0.64	40.91

2860

LATILE CONTINUING CALIBRATION CHECK

Name: ENGINEERING SCIENCE_____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____ SDG No.: ____

strument ID.: CARBOPAK Calibration Date(s): 8/28/88 _____

FILE ID: RRF 50 __12_____ Initial calib 8/19/88

MPOUND	RRF	RRF50	%D
enzene	3.10	2.96	-4.48
lorobenzene	5.31	4.87	-8.28
2_Dichlorobenzene	2.44	2.45	0.60
3_Dichlorobenzene	2.71	2.81	3.51
4_Dichorobenzene	2.53	2.69	6.26
hyl Benzene	3.51	2.57	-26.74
oluene	3.47	3.62	4.42
lenes	7.63	7.83	2.64

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DATA PACKAGE #54

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ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received by this laboratory on 8-18-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081943	DANGB3-SS-D5	AS-F	8-17-88		10-16-88	
88081943	DANGB3-SS-D5	BA-I	8-17-88		9-18-88	
88081943	DANGB3-SS-D5	CD-F	8-17-88		9-16-88	
88081943	DANGB3-SS-D5	CR-F	8-17-88		9-16-88	
88081943	DANGB3-SS-D5	HG-C	8-17-88		9-13-88	
88081943	DANGB3-SS-D5	PB-F	8-17-88		10-12-88	
88081943	DANGB3-SS-D5	418.1	8-17-88	9-14-88	9-14-88	
88081943	DANGB3-SS-D5	MOIS	8-17-88		8-29-88	
88081943	DANGB3-SS-D5	8010	8-17-88		8-30-88	8-29-88
88081943	DANGB3-SS-D5	8020	8-17-88		8-30-88	8-29-88
88081943	DANGB3-SS-D5	8080	8-17-88	8-26-88	9-23-88	
88081944	DANGB3-SS-C5	AS-F	8-17-88		10-16-88	
88081944	DANGB3-SS-C5	BA-I	8-17-88		9-18-88	
88081944	DANGB3-SS-C5	CD-F	8-17-88		9-16-88	
88081944	DANGB3-SS-C5	CR-F	8-17-88		9-16-88	
88081944	DANGB3-SS-C5	HG-C	8-17-88		9-13-88	
88081944	DANGB3-SS-C5	PB-F	8-17-88		10-12-88	
88081944	DANGB3-SS-C5	418.1	8-17-88	9-14-88	9-14-88	
88081944	DANGB3-SS-C5	MOIS	8-17-88		8-29-88	
88081944	DANGB3-SS-C5	8010	8-17-88		8-30-88	8-29-88
88081944	DANGB3-SS-C5	8020	8-17-88		8-30-88	8-29-88
88081944	DANGB3-SS-C5	8080	8-17-88	8-26-88	9-23-88	

* If applicable

ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081945	DANGB3-SS-A4	AS-F	8-17-88		10-16-88	
88081945	DANGB3-SS-A4	BA-I	8-17-88		9-18-88	
88081945	DANGB3-SS-A4	CD-F	8-17-88		9-16-88	
88081945	DANGB3-SS-A4	CR-F	8-17-88		9-16-88	
88081945	DANGB3-SS-A4	HG-C	8-17-88		9-13-88	
88081945	DANGB3-SS-A4	PB-F	8-17-88		10-12-88	
88081945	DANGB3-SS-A4	418.1	8-17-88	9-14-88	9-14-88	
88081945	DANGB3-SS-A4	MOIS	8-17-88		8-29-88	
88081945	DANGB3-SS-A4	8010	8-17-88		8-30-88	8-29-88
88081945	DANGB3-SS-A4	8020	8-17-88		8-30-88	8-29-88
88081945	DANGB3-SS-A4	8080	8-17-88	8-26-88	9-23-88	
88081946	DANGB3-SS-A5	AS-F	8-17-88		10-16-88	
88081946	DANGB3-SS-A5	BA-I	8-17-88		9-18-88	
88081946	DANGB3-SS-A5	CD-F	8-17-88		9-16-88	
88081946	DANGB3-SS-A5	CR-F	8-17-88		9-16-88	
88081946	DANGB3-SS-A5	HG-C	8-17-88		9-13-88	
88081946	DANGB3-SS-A5	PB-F	8-17-88		10-12-88	
88081946	DANGB3-SS-A5	418.1	8-17-88	9-14-88	9-14-88	
88081946	DANGB3-SS-A5	MOIS	8-17-88		8-29-88	
88081946	DANGB3-SS-A5	8010	8-17-88		8-30-88	8-29-88
88081946	DANGB3-SS-A5	8020	8-17-88		8-30-88	8-29-88
88081946	DANGB3-SS-A5	8080	8-17-88	8-26-88	9-23-88	
88081947	DANGB3-SS-Z2	AS-F	8-17-88		10-16-88	
88081947	DANGB3-SS-Z2	BA-I	8-17-88		9-18-88	
88081947	DANGB3-SS-Z2	CD-F	8-17-88		9-16-88	
88081947	DANGB3-SS-Z2	CR-F	8-17-88		9-16-88	
88081947	DANGB3-SS-Z2	HG-C	8-17-88		9-13-88	
88081947	DANGB3-SS-Z2	PB-F	8-17-88		10-12-88	
88081947	DANGB3-SS-Z2	418.1	8-17-88	9-14-88	9-14-88	
88081947	DANGB3-SS-Z2	MOIS	8-17-88		8-29-88	
88081947	DANGB3-SS-Z2	8010	8-17-88		8-30-88	8-30-88
88081947	DANGB3-SS-Z2	8020	8-17-88		8-30-88	8-30-88
88081947	DANGB3-SS-Z2	8080	8-17-88	8-26-88	9-23-88	

* If applicable

ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081948	DANGB3-SS-Y2	AS-F	8-17-88		10-06-88	
88081948	DANGB3-SS-Y2	BA-I	8-17-88		9-18-88	
88081948	DANGB3-SS-Y2	CD-F	8-17-88		9-16-88	
88081948	DANGB3-SS-Y2	CR-F	8-17-88		9-16-88	
88081948	DANGB3-SS-Y2	HG-C	8-17-88		9-13-88	
88081948	DANGB3-SS-Y2	PB-F	8-17-88		10-10-88	
88081948	DANGB3-SS-Y2	418.1	8-17-88	9-14-88	9-14-88	
88081948	DANGB3-SS-Y2	MOIS	8-17-88		8-29-88	
88081948	DANGB3-SS-Y2	8010	8-17-88		8-30-88	
88081948	DANGB3-SS-Y2	8020	8-17-88		8-30-88	
88081948	DANGB3-SS-Y2	8080	8-17-88	8-26-88	9-23-88	
88081949	DANGB3-SS-B2	AS-F	8-17-88		10-06-88	
88081949	DANGB3-SS-B2	BA-I	8-17-88		9-18-88	
88081949	DANGB3-SS-B2	CD-F	8-17-88		9-16-88	
88081949	DANGB3-SS-B2	CR-F	8-17-88		9-16-88	
88081949	DANGB3-SS-B2	HG-C	8-17-88		9-13-88	
88081949	DANGB3-SS-B2	PB-F	8-17-88		10-10-88	
88081949	DANGB3-SS-B2	418.1	8-17-88	9-14-88	9-14-88	
88081949	DANGB3-SS-B2	MOIS	8-17-88		8-29-88	
88081949	DANGB3-SS-B2	8010	8-17-88		8-30-88	
88081949	DANGB3-SS-B2	8020	8-17-88		8-30-88	
88081949	DANGB3-SS-B2	8080	8-17-88	8-26-88	9-23-88	9-26-88
88081950	DANGB3-SS-A2.5	AS-F	8-17-88		10-06-88	
88081950	DANGB3-SS-A2.5	BA-I	8-17-88		9-18-88	
88081950	DANGB3-SS-A2.5	CD-F	8-17-88		9-16-88	
88081950	DANGB3-SS-A2.5	CR-F	8-17-88		9-16-88	
88081950	DANGB3-SS-A2.5	HG-C	8-17-88		9-13-88	
88081950	DANGB3-SS-A2.5	PB-F	8-17-88		10-10-88	
88081950	DANGB3-SS-A2.5	418.1	8-17-88	9-14-88	9-14-88	
88081950	DANGB3-SS-A2.5	MOIS	8-17-88		8-29-88	
88081950	DANGB3-SS-A2.5	8010	8-17-88		8-30-88	8-30-88
88081950	DANGB3-SS-A2.5	8020	8-17-88		8-30-88	8-30-88
88081950	DANGB3-SS-A2.5	8080	8-17-88	8-26-88	9-23-88	

* If applicable

ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081951	DANGB3-SS-A3.5	AS-F	8-17-88		10-06-88	
88081951	DANGB3-SS-A3.5	BA-I	8-17-88		9-18-88	
88081951	DANGB3-SS-A3.5	CD-F	8-17-88		9-16-88	
88081951	DANGB3-SS-A3.5	CR-F	8-17-88		9-16-88	
88081951	DANGB3-SS-A3.5	HG-C	8-17-88		9-13-88	
88081951	DANGB3-SS-A3.5	PB-F	8-17-88		10-10-88	
88081951	DANGB3-SS-A3.5	418.1	8-17-88	9-14-88	9-14-88	
88081951	DANGB3-SS-A3.5	MOIS	8-17-88		8-29-88	
88081951	DANGB3-SS-A3.5	8010	8-17-88		8-30-88	8-30-88
88081951	DANGB3-SS-A3.5	8020	8-17-88		8-30-88	
88081951	DANGB3-SS-A3.5	8080	8-17-88	8-26-88	9-23-88	
88081952	DANGB3-SS-D2	AS-F	8-17-88		10-06-88	
88081952	DANGB3-SS-D2	BA-I	8-17-88		9-18-88	
88081952	DANGB3-SS-D2	CD-F	8-17-88		9-16-88	
88081952	DANGB3-SS-D2	CR-F	8-17-88		9-16-88	
88081952	DANGB3-SS-D2	HG-C	8-17-88		9-13-88	
88081952	DANGB3-SS-D2	PB-F	8-17-88		10-10-88	
88081952	DANGB3-SS-D2	418.1	8-17-88	9-14-88	9-14-88	
88081952	DANGB3-SS-D2	MOIS	8-17-88		8-29-88	
88081952	DANGB3-SS-D2	8010	8-17-88		8-30-88	8-30-88
88081952	DANGB3-SS-D2	8020	8-17-88		8-30-88	
88081952	DANGB3-SS-D2	8080	8-17-88	8-26-88	9-23-88	9-26-88
88081953	DANGB3-SS-D4	AS-F	8-17-88		10-06-88	
88081953	DANGB3-SS-D4	BA-I	8-17-88		9-18-88	
88081953	DANGB3-SS-D4	CD-F	8-17-88		9-16-88	
88081953	DANGB3-SS-D4	CR-F	8-17-88		9-16-88	
88081953	DANGB3-SS-D4	HG-C	8-17-88		9-13-88	
88081953	DANGB3-SS-D4	PB-F	8-17-88		10-12-88	
88081953	DANGB3-SS-D4	418.1	8-17-88	9-14-88	9-14-88	
88081953	DANGB3-SS-D4	MOIS	8-17-88		8-29-88	
88081953	DANGB3-SS-D4	8010	8-17-88		8-30-88	8-30-88
88081953	DANGB3-SS-D4	8020	8-17-88		8-30-88	
88081953	DANGB3-SS-D4	8080	8-17-88	8-26-88	9-23-88	

* If applicable

ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081954	DANGB3-SS-A3	AS-F	8-16-88		10-06-88	
88081954	DANGB3-SS-A3	BA-I	8-16-88		9-18-88	
88081954	DANGB3-SS-A3	CD-F	8-16-88		9-16-88	
88081954	DANGB3-SS-A3	CR-F	8-16-88		9-16-88	
88081954	DANGB3-SS-A3	HG-C	8-16-88		9-13-88	
88081954	DANGB3-SS-A3	PB-F	8-16-88		10-12-88	
88081954	DANGB3-SS-A3	418.1	8-16-88	9-14-88	9-14-88	
88081954	DANGB3-SS-A3	MOIS	8-16-88		8-29-88	
88081954	DANGB3-SS-A3	8010	8-16-88		8-29-88	8-29-88
88081954	DANGB3-SS-A3	8020	8-16-88		8-29-88	8-29-88
88081954	DANGB3-SS-A3	8080	8-16-88	8-26-88	9-23-88	
88081955	DANGB3-SS-A1	AS-F	8-16-88		10-06-88	
88081955	DANGB3-SS-A1	BA-I	8-16-88		9-18-88	
88081955	DANGB3-SS-A1	CD-F	8-16-88		9-16-88	
88081955	DANGB3-SS-A1	CR-F	8-16-88		9-16-88	
88081955	DANGB3-SS-A1	HG-C	8-16-88		9-13-88	
88081955	DANGB3-SS-A1	PB-F	8-16-88		10-12-88	
88081955	DANGB3-SS-A1	418.1	8-16-88	9-14-88	9-14-88	
88081955	DANGB3-SS-A1	MOIS	8-16-88		8-29-88	
88081955	DANGB3-SS-A1	8010	8-16-88		8-30-88	8-29-88
88081955	DANGB3-SS-A1	8020	8-16-88		8-29-88	8-29-88
88081955	DANGB3-SS-A1	8080	8-16-88	8-26-88	9-23-88	
88081956	DANGB3-SS-C0	AS-F	8-16-88		10-06-88	
88081956	DANGB3-SS-C0	BA-I	8-16-88		9-18-88	
88081956	DANGB3-SS-C0	CD-F	8-16-88		9-16-88	
88081956	DANGB3-SS-C0	CR-F	8-16-88		9-16-88	
88081956	DANGB3-SS-C0	HG-C	8-16-88		9-13-88	
88081956	DANGB3-SS-C0	PB-F	8-16-88		10-12-88	
88081956	DANGB3-SS-C0	418.1	8-16-88	9-14-88	9-14-88	
88081956	DANGB3-SS-C0	MOIS	8-16-88		8-29-88	
88081956	DANGB3-SS-C0	8010	8-16-88		8-29-88	8-29-88
88081956	DANGB3-SS-C0	8020	8-16-88		8-29-88	8-29-88
88081956	DANGB3-SS-C0	8080	8-16-88	8-26-88	9-23-88	

* If applicable

ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081957	DANGB3-SS-C1	AS-F	8-16-88		10-06-88	
88081957	DANGB3-SS-C1	BA-I	8-16-88		9-18-88	
88081957	DANGB3-SS-C1	CD-F	8-16-88		9-16-88	
88081957	DANGB3-SS-C1	CR-F	8-16-88		9-16-88	
88081957	DANGB3-SS-C1	HG-C	8-16-88		9-13-88	
88081957	DANGB3-SS-C1	PB-F	8-16-88		10-12-88	
88081957	DANGB3-SS-C1	418.1	8-16-88	9-14-88	9-14-88	
88081957	DANGB3-SS-C1	MOIS	8-16-88		8-29-88	
88081957	DANGB3-SS-C1	8010	8-16-88		8-29-88	8-29-88
88081957	DANGB3-SS-C1	8020	8-16-88		8-29-88	8-29-88
88081957	DANGB3-SS-C1	8080	8-16-88	8-26-88	9-23-88	9-26-88
88081958	DANGB3-SS-C3	AS-F	8-16-88		10-06-88	
88081958	DANGB3-SS-C3	BA-I	8-16-88		9-18-88	
88081958	DANGB3-SS-C3	CD-F	8-16-88		9-16-88	
88081958	DANGB3-SS-C3	CR-F	8-16-88		9-16-88	
88081958	DANGB3-SS-C3	HG-C	8-16-88		9-13-88	
88081958	DANGB3-SS-C3	PB-F	8-16-88		10-12-88	
88081958	DANGB3-SS-C3	418.1	8-16-88	9-14-88	9-14-88	
88081958	DANGB3-SS-C3	MOIS	8-16-88		8-29-88	
88081958	DANGB3-SS-C3	8010	8-16-88		8-29-88	8-29-88
88081958	DANGB3-SS-C3	8020	8-16-88		8-29-88	8-29-88
88081958	DANGB3-SS-C3	8080	8-16-88	8-26-88	9-23-88	
88081959	DANGB3-SS-A2	AS-F	8-16-88		10-06-88	
88081959	DANGB3-SS-A2	BA-I	8-16-88		9-18-88	
88081959	DANGB3-SS-A2	CD-F	8-16-88		9-16-88	
88081959	DANGB3-SS-A2	CR-F	8-16-88		9-16-88	
88081959	DANGB3-SS-A2	HG-C	8-16-88		9-13-88	
88081959	DANGB3-SS-A2	PB-F	8-16-88		10-12-88	
88081959	DANGB3-SS-A2	418.1	8-16-88	9-14-88	9-14-88	
88081959	DANGB3-SS-A2	MOIS	8-16-88		8-29-88	
88081959	DANGB3-SS-A2	8010	8-16-88		8-29-88	8-29-88
88081959	DANGB3-SS-A2	8020	8-16-88		8-29-88	8-29-88
88081959	DANGB3-SS-A2	8080	8-16-88	8-26-88	9-23-88	

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88081943-88081959
WORK ORDER NO.: 877

These soil samples were received at the ES Berkeley Laboratory on 8-18-88. They were received cold and intact.

ANALYSIS REPORT

ORK ORDER NUMBER: 877
OB NUMBER : Z80000000440
ORK ORDER DATE : 08/18/88

APPROVED BY _____
Lab Supervisor

EPORT DATA:
S OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
AK RIDGE, TN 37830
ILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

ONTRACT / PO # : OR001
ONTACT : BILL HAYDEN
(615)-481-3920

ASK: 2, UNITS: mg/Kg

	DANGB3-SS-D5	DANGB3-SS-C5	DANGB3-SS-A4	DANGB3-SS-A5	DANGB3-SS-Z2	DANGB3-SS-Y2
EST COMPOUND	88081943	88081944	88081945	88081946	88081947	88081948
CID DIG SOIL	NA	NA	NA	NA	NA	NA
RSENIC	<5.0E	<5.0E	<5.0E	<5.0E	<5.0E	<5.0E
ARIUM	56.4	109	70.3	114	62.5	110
ADMIUM	10.9N	5.6N	7.8N	6.2N	13.5N	19.4N
ROMIUM	19.2	18.9	24.4	22.8	36.2	44.2
ERCURY	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EAD	9.3	9.9S	8.2	30.3	9.0	12.6

IA - Not Analyzed
) - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

ASK: 2, UNITS: mg/Kg

	DANGB3-SS-B2	DANGB3-SS-A2.5	DANGB3-SS-A3.5	DANGB3-SS-D2	DANGB3-SS-D4	DANGB3-SS-A3
TEST COMPOUND	88081949	88081950	88081951	88081952	88081953	88081954
CID DIG SOIL	NA	NA	NA	NA	NA	NA
RSENIC	<5.0E	<5.0E	<5.0E	<5.0E	<5.0E	<5.0E
BARIUM	85.1	69.0	63.9	38.0	44.8	69.4
CADMIUM	12.5N	10.9N	11.6N	10.6N	12.0N	12.5N
HROMIUM	26.8	28.5	34.8	20.2	30.2	30.5
ERCURY	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
LEAD	13.4	8.0	8.5	17.8	9.1S	12.7S

NA - Not Analyzed

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

ASK: 2, UNITS: mg/Kg

EST COMPOUND	DANGB3-SS-A1 88081955	DANGB3-SS-CO 88081956	DANGB3-SS-C1 88081957	DANGB3-SS-C3 88081958	DANGB3-SS-A2 88081959
CID DIG SOIL	NA	NA	NA	NA	NA
RSENIC	<5.0E	<5.0E	<5.0E	<5.0E	<5.0E
ARIUM	73.7	73.7	73.8	50.8	79.0
ADMIUM	12.9N	9.7N	16.4N	10.3N	12.3N
HROMIUM	38.1	24.6	31.4	30.1	26.9
ERCURY	<0.1	<0.1	<0.1	<0.1	<0.1
EAD	7.7	7.7	12.6	10.8S	3.8

NA - Not Analyzed
D - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 877
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/18/88

APPROVED BY _____
Lab Supervisor

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710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

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OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/Kg

	DANGB3-SS-D5	DANGB3-SS-C5	DANGB3-SS-A4	DANGB3-SS-A5	DANGB3-SS-Z2	DANGB3-SS-Y2
TEST COMPOUND	88081943	88081944	88081945	88081946	88081947	88081948
418.1 PETROLEUM HYDROCARBONS	<100	150	<100	100	<100	<100
% MOISTURE	16.9	28.7	11.2	56.1	13.1	21.2

ND = Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

ISK: 3, UNITS: mg/Kg

	DANGB3-SS-B2	DANGB3-SS-A2.5	DANGB3-SS-A3.5	DANGB3-SS-D2	DANGB3-SS-D4	DANGB3-SS-A3
EST COMPOUND	88081949	88081950	88081951	88081952	88081953	88081954
8.1 PETROLEUM HYDROCARBONS	<100	<100	<100	<100	83	<100
MOISTURE	24.9	14.3	13.8	5.9	12.0	14.4

- Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

ASK: 3, UNITS: mg/Kg

TEST COMPOUND	DANGB3-SS-A1 88081955	DANGB3-SS-CO 88081956	DANGB3-SS-C1 88081957	DANGB3-SS-C3 88081958	DANGB3-SS-A2 88081959
418.1 PETROLEUM HYDROCARBONS	<100	<100	75	<100	<100
% MOISTURE	14.2	14.5	21.1	11.3	17.7

ND - Not Detected

ANALYSIS REPORT

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OB NUMBER : ZB0000000440
ORK ORDER DATE : 08/18/88

APPROVED BY _____
Lab Supervisor

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OF REPORT COPIES: 1

ONTRACT / PO # : OR001
ONTACT : BILL HAYDEN
(615)-481-3920

ASK: 4, UNITS: ug/Kg, GROUP 8010

EST COMPOUND	DANGB3-SS-D5 88081943	DANGB3-SS-C5 88081944	DANGB3-SS-A4 88081945	DANGB3-SS-A5 88081946	DANGB3-SS-Z2 88081947	DANGB3-SS-Y2 88081948
ENZYL CHLORIDE	ND	ND	ND	ND	ND	ND
(2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
S (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
ROMOBENZENE	ND	ND	ND	ND	ND	ND
ROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
ROMOFORM	ND	ND	ND	ND	ND	ND
ROMOETHANE	ND	ND	ND	ND	ND	ND
ARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
HLORACETALDEHYDE	ND	ND	ND	ND	ND	ND
HLORAL	ND	ND	ND	ND	ND	ND
HLOROBENZENE	ND	ND	ND	ND	ND	ND
HLOROETHANE	ND	ND	ND	ND	ND	ND
HLOROFORM	0.5	ND	0.7	0.2	ND	ND
-CHLOROHEXANE	ND	ND	ND	ND	ND	ND
-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
HLOROMETHANE	ND	ND	ND	ND	ND	ND
HLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
HLOROTOLUENE	ND	ND	ND	ND	ND	ND
BROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
BROMOMETHANE	ND	ND	ND	ND	ND	ND
,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
CHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
RANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	5.8B	11B	5.5B	25B	9.1B	ND
2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND

) - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

TEST COMPOUND	DANGB3-SS-D5 88081943	DANGB3-SS-C5 88081944	DANGB3-SS-A4 88081945	DANGB3-SS-A5 88081946	DANGB3-SS-Z2 88081947	DANGB3-SS-Y2 88081948
1,3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

ASK: 4, UNITS: ug/Kg, GROUP 8010

EST COMPOUND	DANGB3-SS-B2 88081949	DANGB3-SS-A2.5 88081950	DANGB3-SS-A3.5 88081951	DANGB3-SS-D2 88081952	DANGB3-SS-D4 88081953	DANGB3-SS-A3 88081954
ENZYL CHLORIDE	ND	ND	ND	ND	ND	ND
S (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
S (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
ROMOBENZENE	ND	ND	ND	ND	ND	ND
ROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
ROMOFORM	ND	ND	ND	ND	ND	ND
ROMOETHANE	ND	ND	ND	ND	ND	ND
ARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
HLORACETALDEHYDE	ND	ND	ND	ND	ND	ND
HLORAL	ND	ND	ND	ND	ND	ND
HLOROBENZENE	ND	ND	ND	ND	ND	ND
HLOROETHANE	ND	ND	ND	ND	ND	ND
HLOROFORM	ND	ND	ND	ND	ND	0.8B
CHLOROHEXANE	ND	ND	ND	ND	ND	ND
-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
HLOROMETHANE	ND	ND	ND	ND	ND	ND
HLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
HLOROTOLUENE	ND	ND	ND	ND	ND	ND
BROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
BROMOMETHANE	ND	ND	ND	ND	ND	ND
2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
CHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
RANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	7.4B	ND	3.4B	6.6B	2.5B
2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND
3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
TRACHLOROETHYLENE	ND	ND	ND	ND	ND	ND
1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
RICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
RICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
RICHLOROPROPANE	ND	ND	ND	ND	ND	ND
NYL CHLORIDE	ND	ND	ND	ND	ND	ND

- Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

TASK: 4, UNITS: ug/Kg, GROUP 8010

TEST COMPOUND	DANGB3-SS-A1 88081955	DANGB3-SS-CO 88081956	DANGB3-SS-C1 88081957	DANGB3-SS-C3 88081958	DANGB3-SS-A2 88081959
BENZYL CHLORIDE	ND	ND	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND	ND
1-CHLOROHEXANE	ND	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND
DICHLOROMETHANE	8.8B	3.9B	1.9B	1.7B	2.0B
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND
1,3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT

)RK ORDER NUMBER: 877
)B NUMBER : ZB0000000440
)RK ORDER DATE : 08/18/88

APPROVED BY _____
Lab Supervisor

:PORT DATA:
; OAK RIDGE/DULUTH ANGB
0 S. ILLINOIS AVE. STE. S103
\K RIDGE, TN 37830
LL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

)NTRACT / PO # : OR001
)NTACT : BILL HAYDEN
(615)-481-3920

\SK: 4, UNITS: ug/Kg, GROUP 8020

	DANGB3-SS-D5	DANGB3-SS-C5	DANGB3-SS-A4	DANGB3-SS-A5	DANGB3-SS-Z2	DANGB3-SS-Y2
'ST COMPOUND	88081943	88081944	88081945	88081946	88081947	88081948
.NZENE	ND	ND	ND	ND	ND	ND
:LOROBENZENE	ND	ND	ND	ND	ND	ND
2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
HYL BENZENE	ND	ND	ND	ND	ND	ND
)LUENE	12	190	ND	39	12	ND
'LENES	ND	ND	ND	ND	ND	ND

- Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

TASK: 4, UNITS: ug/Kg, GROUP 8020

	DANGB3-SS-B2	DANGB3-SS-A2.5	DANGB3-SS-A3.5	DANGB3-SS-D2	DANGB3-SS-D4	DANGB3-SS-A3
TEST COMPOUND	88081949	88081950	88081951	88081952	88081953	88081954
BENZENE	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
ETHYL BENZENE	ND	ND	ND	ND	ND	ND
TOLUENE	ND	11	ND	ND	8.6	12
XYLENES	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

ASK: 4, UNITS: ug/Kg, GROUP 8020

TEST COMPOUND	DANGB3-SS-A1 88081955	DANGB3-SS-CO 88081956	DANGB3-SS-C1 88081957	DANGB3-SS-C3 88081958	DANGB3-SS-A2 88081959
BENZENE	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND
ETHYL BENZENE	ND	ND	ND	ND	ND
TOLUENE	8.5	6.7	8.1	4.2	3.4
XYLENES	ND	ND	ND	ND	ND

- Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 877
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/18/88

APPROVED BY _____
Lab Supervisor

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ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
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BILL HAYDEN

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OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8080

	DANGB3-SS-D5	DANGB3-SS-C5	DANGB3-SS-A4	DANGB3-SS-A5	DANGB3-SS-Z2	DANGB3-SS-Y2
TEST COMPOUND	88081943	88081944	88081945	88081946	88081947	88081948
ALDRIN	ND	ND	ND	ND	ND	ND
ALPHA-BHC	ND	ND	ND	ND	ND	ND
BETA-BHC	ND	ND	ND	ND	ND	ND
DELTA-BHC	ND	ND	ND	ND	ND	ND
GAMMA-BHC	ND	ND	ND	ND	ND	ND
CHLORDANE	ND	ND	ND	ND	ND	ND
4,4'-DDD	ND	ND	ND	ND	ND	ND
4,4'-DDE	ND	ND	ND	ND	ND	ND
4,4'-DDT	ND	ND	ND	ND	ND	ND
DIELDRIN	ND	ND	ND	ND	ND	ND
ENDOSULFAN I	ND	ND	ND	ND	ND	ND
ENDOSULFAN II	ND	ND	ND	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
ENDRIN	ND	ND	ND	ND	ND	ND
ENDRIN ALDEHYDE	NA	NA	NA	NA	NA	NA
HEPTACHLOR	ND	ND	ND	ND	ND	ND
HEPTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
KEPONE	NA	NA	NA	NA	NA	NA
METHOXYCHLOR	ND	ND	ND	ND	ND	ND
TOXAPHENE	ND	ND	ND	ND	ND	ND
PCB-1016	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND	ND

NA - Not Analyzed
ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

ASK: 4, UNITS: ug/Kg, GROUP 8080

EST COMPOUND	DANGB3-SS-B2 88081949	DANGB3-SS-A2.5 88081950	DANGB3-SS-A3.5 88081951	DANGB3-SS-D2 88081952	DANGB3-SS-D4 88081953	DANGB3-SS-A3 88081954
.DRIN	ND	ND	ND	ND	ND	ND
.PHA-BHC	ND	ND	ND	ND	ND	ND
:TA-BHC	ND	ND	ND	ND	ND	ND
:LTA-BHC	ND	ND	ND	ND	ND	ND
:MMA-BHC	ND	ND	ND	ND	ND	ND
:LORDANE	ND	ND	ND	ND	ND	ND
4'-DDD	ND	ND	ND	ND	ND	ND
,4'-DDE	ND	ND	ND	ND	ND	ND
4'-DDT	28	ND	ND	24	ND	ND
.ELDRIN	ND	ND	ND	ND	ND	ND
:DOSULFAN I	ND	ND	ND	ND	ND	ND
:DOSULFAN II	ND	ND	ND	ND	ND	ND
:DOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
:DRIN	ND	ND	ND	ND	ND	ND
:DRIN ALDEHYDE	NA	NA	NA	NA	NA	NA
:PTACHLOR	ND	ND	ND	ND	ND	ND
:PTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
:PONE	NA	NA	NA	NA	NA	NA
:THOXYCHLOR	ND	ND	ND	ND	ND	ND
)XAPHENE	ND	ND	ND	ND	ND	ND
:B-1016	ND	ND	ND	ND	ND	ND
:B-1221	ND	ND	ND	ND	ND	ND
:B-1232	ND	ND	ND	ND	ND	ND
:B-1242	ND	ND	ND	ND	ND	ND
:B-1248	ND	ND	ND	ND	ND	ND
:B-1254	ND	ND	ND	ND	ND	ND
:B-1260	ND	ND	ND	ND	ND	ND

A - Not Analyzed

- Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

TASK: 4, UNITS: ug/Kg, GROUP 8080

TEST COMPOUND	DANGB3-SS-A1 88081955	DANGB3-SS-CO 88081956	DANGB3-SS-C1 88081957	DANGB3-SS-C3 88081958	DANGB3-SS-A2 88081959
ALDRIN	ND	ND	ND	ND	ND
ALPHA-BHC	ND	ND	ND	ND	ND
BETA-BHC	ND	ND	ND	ND	ND
DELTA-BHC	ND	ND	ND	ND	ND
GAMMA-BHC	ND	ND	ND	ND	ND
CHLORDANE	ND	ND	ND	ND	ND
4,4'-DDD	ND	ND	ND	ND	ND
4,4'-DDE	ND	ND	37	ND	ND
4,4'-DDT	ND	ND	63	ND	ND
DIELDRIN	ND	ND	ND	ND	ND
ENDOSULFAN I	ND	ND	ND	ND	ND
ENDOSULFAN II	ND	ND	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND	ND	ND
ENDRIN	ND	ND	ND	ND	ND
ENDRIN ALDEHYDE	NA	NA	NA	NA	NA
HEPTACHLOR	ND	ND	ND	ND	ND
HEPTACHLOR EPOXIDE	ND	ND	ND	ND	ND
KEPONE	NA	NA	NA	NA	NA
METHOXYCHLOR	ND	ND	ND	ND	ND
TOXAPHENE	ND	ND	ND	ND	ND
PCB-1016	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND

NA - Not Analyzed
ND - Not Detected

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88081943-88081959
88082099-88082101

QC Report No: TPH-S-0047-38
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-18-88
Date Prepared: 9-14-88
Date Analyzed: 9-14-88
Date Reported: 9-21-88
Dilution Factor: 7
%Moisture: 13.1

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88081947	418.1	<100	<100	1150	805	70	805	70	0	*

2388

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* Percent recovery (PR) and relative percent difference (RPD) are within ES Laboratory control limits.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88081966-88081977
88081958-88081959

QC Report No.: OCP-S-0031-88
QC Sample No.: 88081967
Level (Low/Med): Low
Date Reported: 11-10-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2830	ND	101	107	46-127
Heptachlor	2830	ND	100	106	35-130
Aldrin	2830	ND	127	135*	34-132
Dieldrin	7070	ND	310	132	31-134
Endrin	7070	ND	288	122	42-139
4,4'-DDT	7070	ND	326	138*	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	110	117	107	9	50	46-127
Heptachlor	109	116	106	9	31	35-130
Aldrin	149	158*	135*	16	43	34-132
Dieldrin	336	143*	132	8	38	31-134
Endrin	306	130	122	6	45	42-139
4,4'-DDT	347	147*	138*	6	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 5 out of 12 outside limits

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88081966-88081977
88081958-88081959

QC Report No.: OCP-S-0031-88B
QC Sample No.: Blank
Level (Low/Med): Low
Date Reported: 11-10-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	ND	94.0	141*	46-127
Heptachlor	2000	ND	107	161*	35-130
Aldrin	2000	ND	162	243*	34-132
Dieldrin	5000	ND	314	188*	31-134
Endrin	5000	ND	267	160*	42-139
4,4'-DDT	5000	ND	266	160*	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	98.0	147*	141*	4	50	46-127
Heptachlor	107	161*	161*	0	31	35-130
Aldrin	125	188*	243*	26	43	34-132
Dieldrin	317	190*	188*	10	38	31-134
Endrin	265	159*	160*	1	45	42-139
4,4'-DDT	293	176*	160*	10	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 12 out of 12 outside limits

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-S-0031-88
QC REPORT NO.: OCP-S-0031-88B

Analysis of matrix spikes resulted in recoveries of aldrin, dieldrin and DDT that were higher than EPA QC limits. Analysis of spiked blanks resulted in excessively high recoveries of all spiked compounds. The data associated with these analyses were closely examined. No analytical errors were found. The results suggest that the blanks were spiked twice.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up used on these samples.

PESTICIDE METHOD BLANK SUMMARY

Job No.:	OR001	Lab Name:	Engineering Science
		Lab Sample No.:	Blank
Client:	ES Oak Ridge		
Attn:	Bill Hayden	Matrix:	Soil
Address:	710 S. Illinois Avenue	Level (low/med):	Low
	Suite F-103	Extraction:	
	Oak Ridge, Tn. 37830	(SepF/Cont/Sonc):	Sonc
		Date Reported:	11-11-88
Project:	Duluth ANGB		
Date Extracted:	8-27-88		
Date Analyzed (1):	9-26-88	Date Analyzed (2):	10-3-88
Time Analyzed (1):	05:47	Time Analyzed (2):	21:50
Instrument ID (1):	5890 #2	Instrument ID (2):	5890 #2
GG Column ID (1):	OV-1	GC Column ID (2):	Mixed

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88081966	9-26-88	88081974	10-03-88
-	88081967	9-26-88	88081975	10-03-88
-	88081968	9-26-88	88081976	10-03-88
-	88081969	9-26-88		
-	88081970	9-26-88		
-	88081971	9-26-88		
-	88081972	9-26-88		
-	88081973	9-26-88		
-	88081974	9-26-88		
-	88081975	9-26-88		
-	88081976	9-26-88		
-	88081977	9-26-88		
-	88081958	9-26-88		
-	88081959	9-26-88		

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88081938-88081957

QC Report No.: OCP-S-0040-88
QC Sample No.: 88081938
Level (Low/Med): Low
Date Reported: 11-10-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2380	ND	109	138*	46-127
Heptachlor	2380	ND	133	168*	35-130
Aldrin	2380	ND	103	130*	34-132
Dieldrin	5940	ND	321	162	31-134
Endrin	5940	ND	256	129	42-139
4,4'-DDT	5940	ND	1780	901*	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	66.6	84	138*	48	50	46-127
Heptachlor	70.0	88	168*	62*	31	35-130
Aldrin	70.4	89	130	38	43	34-132
Dieldrin	212	107	162*	41*	38	31-134
Endrin	188	95	129	31	45	42-139
4,4'-DDT	200	101	901*	160*	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 3 out of 6 outside limits

Spike Recovery: 4 out of 12 outside limits

2893

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88081938-88081957

QC Report No.: OCP-S-0040-88B
QC Sample No.: Blank
Level (Low/Med): Low
Date Reported: 11-10-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	ND	67.6	101	46-127
Heptachlor	2000	ND	83.7	126	35-130
Aldrin	2000	ND	80.0	120	34-132
Dieldrin	5000	ND	245	147*	31-134
Endrin	5000	ND	204	122	42-139
4,4'-DDT	5000	ND	219	131	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	17.0	116	101	13	50	46-127
Heptachlor	87.9	132*	126	5	31	35-130
Aldrin	82.0	123	120	2	43	34-132
Dieldrin	264	158*	147*	7	38	31-134
Endrin	232	139	122	13	45	42-139
4,4'-DDT	252	151*	131	14	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 4 out of 12 outside limits

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-S-0040-88
QC REPORT NO.: OCP-S-0040-88B

Analysis of matrix spikes showed recoveries of lindane, heptachlor, dieldrin and DDT in the MS that were higher than EPA QC guidelines. RPDs were also above EPA QC guidelines for heptachlor, dieldrin and DDT. When spiked blanks were analyzed, the results showed recoveries of heptachlor, dieldrin and DDT that were higher than EPA recommended guidelines. The data associated with these analyses were closely examined. No analytical errors were found.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up used on these samples.

PESTICIDE METHOD BLANK SUMMARY

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Lab Name: Engineering Science
Lab Sample No.: Blank

Matrix: Soil
Level (low/med): Low
Extraction:
(SepF/Cont/Sonc): Sonc
Date Reported: 11-11-88

Date Extracted: 8-26-88
Date Analyzed (1): 9-22-88
Time Analyzed (1): 15:44
Instrument ID (1): 5890 #2
GC Column ID (1): OV-1

Date Analyzed (2): 9-26-88
Time Analyzed (2): 02:56
Instrument ID (2): 5890 #2
GC Column ID (2): Mixed

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88081938	9-23-88	88081944	9-26-88
-	88081943	9-23-88	88081949	9-26-88
-	88081944	9-23-88	88081957	9-26-88
-	88081945	9-23-88	88081952	9-26-88
-	88081946	9-23-88		
-	88081947	9-23-88		
-	88081948	9-23-88		
-	88081949	9-23-88		
-	88081950	9-23-88		
-	88081951	9-23-88		
-	88081952	9-23-88		
-	88081953	9-23-88		
-	88081954	9-24-88		
-	88081955	9-24-88		
-	88081956	9-24-88		
-	88081957	9-24-88		

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88081943-88081953
88081966-88081970

QC Report No: VGC-S-0039-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-19-88
Date Prepared: NA
Date Analyzed: 8-31-88
Date Reported: 9-28-88
Dilution Factor: NA
% Moisture: 29.3

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88081967	1,1-dichloroethane	14.1	ND	13.0	92	12.7	90	2	20	58-124
	Trichloroethene	14.1	ND	14.0	99	12.3	87	13	16	75-110
	Chlorobenzene	14.1	ND	13.0	92	12.4	88	5	21	71-125
	Aromatics: 8020									
88081967	Benzene	14.1	ND	10.9	77	10.6	75	3	26	75-123
	Toluene	14.1	ND	14.0	99	14.2	101	1	16	79-115
	Chlorobenzene	14.1	ND	12.7	90	12.7	90	0	24	82-112

4682 89

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (PR)} = \frac{MS - MSD}{(MS + MSD)/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(MS \text{ or } MSD) - SR}{SA} \times 100$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88081898-88081900, 88081904-88081906
88081938-88081942, 88081954-88081962

QC Report No: VGC-S-0037-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-18-88
Date Prepared: NA
Date Analyzed: 8-30-88
Date Reported: 9-26-88
Dilution Factor: NA
% Moisture: 15.8

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88081938	1,1-dichloroethane	11.9	ND	11.2	94	9.3	78	19	20	58-124
	Trichloroethene	11.9	ND	10.8	91	10.2	86	6	16	75-110
	Chlorobenzene	11.9	ND	11.2	94	11.4	96	2	21	71-125
	Aromatics: 8020									
88081938	Benzene	11.9	ND	10.2	86	9.9	83	3	26	75-123
	Toluene	11.9	2.1	11.6	80	11.6	80	0	16	79-115
	Chlorobenzene	11.9	ND	10.3	87	9.8	82	5	24	82-112

2898

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/KG
Date Reported: 10-07-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
31	8-29-88	VGC	Carbopack	79-09-2	Dichloromethane	2.5	0.25	88081954-88081959
				67-66-3	Chloroform	0.5	0.05	88081938-88081940
6081/6058	8-30-88	VGC	Carbopack	75-09-2	Dichloromethane	3.8	0.25	88081948-88081949
57	8-30-88	VGC	Carbopack	75-09-2	Dichloromethane	4.0	0.25	88081943-88081947
					Trichloroethene	0.35	0.25	88081950-88081953
								88081966-88081971

2899

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/KG
Date Reported: 10-07-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
15	8-26-88	VGC	Carbopack	75-09-2	Dichloromethane	3.3	5	88081898-88081900
				67-66-3	Chloroform	0.2	0.05	88081904-88081906
								88081960-88081962
31	8-29-88	VGC	Carbopack	75-09-2	Dichloromethane	2.5	0.25	88081954-88081959
				67-66-3	Chloroform	0.5	0.05	88081938-88081940

2900

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88081943-88081959
88081966-88081968

QC Report No: CVM-S-0019-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-18-88
Date Reported: 10-25-88
Dilution Factor: NA
%Moisture: 28.7

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	SA	Spike Recovery SR	Spike Recovery SSR	PR	Notes
Mercury	88081944	88081944	9-13-88	9-13-88	7471	<0.1	<0.1	<0.1	NC	1.4	<0.1	1.5	107	

2901

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two
NA = Not Applicable
NC = Not Calculated
ND = Not Detected
SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88081943-88081959
88081966-88081968

QC Report No: ICP-S-0030-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-18-88
Date Reported: 10-25-88
Dilution Factor: NA
%Moisture: 16.9

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Note:
Barium	88081943	88081943	9-16-88	9-11-88	SW6010	<20	56.4	52.2	8	214	56.4	277	103	
Cadmium	88081943	88081943	9-16-88	9-11-88	SW6010	<0.5	10.9	11.3	4	5.35	10.9	14.7	71N	
Chromium	88081943	88081943	9-16-88	9-11-88	SW6010	<1.0	19.2	21.7	12	21.4	19.2	42.6	109	

2902

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88081943-88081959

QC Report No: AAF-S-0031-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-18-88
Date Reported: 10-25-88
Dilution Factor: See Notes
%Moisture: 11.2

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	PR	Notes
Arsenic	88081945	88081945	10-05-88	9-21-88	7060	<0.5	<5.0E	<5.0E	NC	4.35E	0.98E	5.66	108	DF=10
Lead	88081945	88081945	10-10-88	9-21-88	7421	<0.5	8.22	8.90	8	5.63	8.22	14.86	118	DF=NA

2903

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
E See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
Samples No.: 88C81943-88081959

The results obtained for the laboratory control sample (LCS) analyzed with these samples for the analytes Cadmium, Chromium, Mercury and Barium exceeded the recommended EPA recoveries. All data associated with this batch was closely inspected and no analytical problems were found. The initial and continuing calibration verification standards and blanks and precision and accuracy recoveries were within acceptable limits with the following exceptions:

Cadmium spike recoveries and precision exceeded acceptable limits. The spike sample was followed by an analytical spike as required by laboratory standard operating procedure. The results of the analytical spike recovery for Cadmium were within acceptable ranges.

As a result of extreme sample matrix interference, dilution was required for sample analysis. The reporting limit and MDL for the analyte(s) listed have increased as shown.

Analyte	Reporting Limit	MDL
Arsenic	10 mg/Kg	5.0 mg/Kg

ATILE ORGANICS INITIAL CALIBRATION DATA

Name:_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

trument ID.:carbopak_ Calibration Date(s):_8/30/88___ 8/15/88____

LAB FILE ID: RRF10=____52_,40_ RRF20=____53_,41_____
RF 50=____54,42____ RRF100=____55,43__ RRF200=__56,44_____

MPOUND	RRF10	RRF20	RRF50	RRF100	RRF200	RRF	%RSD
enzyl chloride	0.08	0.04	0.09	0.10	0.08	0.08	29.24
is (2-chloroethoxy) methane	0.03	0.03	0.05	0.04	0.06	0.04	31.04
is (2-chloroisopropyl ether	0.24	0.27	0.26	0.24	0.30	0.26	9.50
romobenzene	1.00	1.26	1.31	1.23	1.26	1.21	10.06
romodichloromethane	2.36	2.78	3.04	3.41	3.39	2.99	14.80
romoform	0.37	0.91	0.75	0.83	1.09	0.79	33.74
romomethane	0.26	0.19	0.26	0.21	0.24	0.23	13.40
rbon tetrachloride	2.43	2.92	3.20	3.24	3.08	2.98	11.02
hloroacetaldehyde	0.001	0.002	0.001	0.0005	0.0003	ERR	ERR69
hlorobenzene	1.22	1.43	1.43	1.41	1.45	1.39	6.95
hloroethane	0.59	0.32	0.42	0.37	0.30	0.40	28.48
hloroform	2.71	3.77	3.82	4.17	3.72	3.64	15.08
-Chlorohexane	0.83	0.88	0.95	0.91	1.02	0.92	7.83
-Chloroethyl vinyl ether	0.03	0.03	0.05	0.04	0.06	0.04	31.04
hloromethane	0.31	0.23	0.24	0.20	0.17	0.23	23.10
hloromethyl methyl ether	0.12	0.21	0.22	0.16	0.15	0.17	24.46
,m_,& p_Chlorotoluenes	4.21	4.22	3.93	3.70	3.90	3.99	5.56
bromochloromethane	3.44	3.42	3.46	3.81	3.82	3.59	5.74
ibromomethane	2.98	3.04	3.29	3.04	2.56	2.98	8.87
2_Dichlorobenzene	2.45	2.54	2.44	2.34	2.04	2.36	8.16
3_Dichlorobenzene	2.22	2.11	2.06	2.32	8.21	3.38	79.78
,4_Dichlorobenzene	2.67	2.59	2.49	2.60	2.20	2.51	7.28
ichlorodifluormethane	0.51	0.49	0.50	0.57	0.64	0.54	11.63
1_Dichloroethane	0.75	1.16	1.65	1.86	1.75	1.43	32.62
2_Dichloroethane	0.96	1.61	1.77	2.04	2.09	1.69	26.83
,1_Dichloroethylene	0.80	0.96	1.44	1.37	1.73	1.26	29.78
ans_1,2_dichloroethylene	0.90	1.34	1.55	1.73	1.57	1.42	22.57
chloromethane	6.60	4.34	3.79	3.14	2.66	4.11	37.30
,2_Dichloropropane	1.96	2.21	2.58	1.82	1.08	1.93	28.82
3_Dichloropropylene	4.60	4.56	4.69	4.50	4.66	4.60	1.66
1,2,2_Tetrachloroethane	7.74	7.12	6.75	6.75	6.10	6.89	8.67
,1,1,2_Tetrachloroethane	3.89	3.60	3.41	3.20	3.94	3.61	8.71
etrachloroethylene	7.74	7.12	6.75	6.75	6.10	6.89	8.70
1,1_Trichloroethane	1.35	1.65	1.79	2.03	1.92	1.75	14.93
1,2_Trichloroethane	4.60	4.56	4.69	4.50	4.66	4.60	1.66
richloroethylene	4.73	4.74	4.40	3.92	3.29	4.22	14.67
richlorofluoromethane	2.71	1.35	1.46	1.72	1.54	1.76	31.28
richloropropane	4.47	3.74	3.60	3.29	2.83	3.59	16.87
inyl ether	0.13	0.60	0.59	0.47	0.51	0.46	47.33

2905

ATILE ORGANICS INITIAL CALIBRATION DATA

Name: ENGINEERING SCIENCE_____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID.: carbopak Calibration Date(s): 8/30/88 _____

RRF 50= 54 RRF100= 55 RRF200= 56

COMPOUND	RRF10	RRF20	RRF50	RRF100	RRF200	$\overline{RRF}$	%RSD
Benzene	8.68	4.56	3.53	2.47	2.13	4.27	61.84
Chlorobenzene	5.26	3.09	5.85	3.85	2.88	4.19	31.52
1,2_Dichlorobenzene	2.47	2.01	2.32	2.37	2.03	2.24	9.36
1,3_Dichlorobenzene	2.78	2.71	2.57	2.98	2.62	2.73	5.97
1,4_Dichlorobenzene	3.71	3.82	2.44	3.00	2.46	3.09	21.36
Ethyl Benzene	3.42	1.86	3.34	2.27	1.82	2.54	30.89
Toluene	4.21	2.63	4.08	3.02	2.16	3.22	27.98
Xylenes	9.71	7.19	9.77	7.36	6.24	8.05	19.83

DATA PACKAGE #55

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ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

ENGINEERING SCIENCE, INC.
RECEIVED
JAN 15 89
710 S. ILLINOIS AVE., SUITE F 103
OAK RIDGE, TN 37830

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received by this laboratory on 8-26-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082130	DANGB-3-MW35-SS3A	AS-F	8-25-88		10-10-88	
88082130	DANGB-3-MW35-SS3A	BA-I	8-25-88		9-19-88	
88082130	DANGB-3-MW35-SS3A	CD-F	8-25-88		9-19-88	
88082130	DANGB-3-MW35-SS3A	CR-F	8-25-88		9-19-88	
88082130	DANGB-3-MW35-SS3A	HG-C	8-25-88		9-21-88	
88082130	DANGB-3-MW35-SS3A	PB-F	8-25-88		10-20-88	
88082130	DANGB-3-MW35-SS3A	418.1	8-25-88	9-19-88	9-20-88	
88082130	DANGB-3-MW35-SS3A	MOIS	8-25-88		9-02-88	
88082130	DANGB-3-MW35-SS3A	8010	8-25-88		9-03-88	9-02-88
88082130	DANGB-3-MW35-SS3A	8020	8-25-88		9-03-88	9-06-88
88082130	DANGB-3-MW35-SS3A	8080	8-25-88	9-01-88	9-27-88	
88082130	DANGB-3-MW35-SS3A	8270	8-25-88	9-02-88	10-13-88	

* If applicable

A SUBSIDIARY OF THE PARSONS CORPORATION

ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082131	DANGB-3-MW35-SS2	AS-F	8-25-88		10-07-88	
88082131	DANGB-3-MW35-SS2	BA-I	8-25-88		9-19-88	
88082131	DANGB-3-MW35-SS2	CD-F	8-25-88		9-19-88	
88082131	DANGB-3-MW35-SS2	CR-F	8-25-88		9-19-88	
88082131	DANGB-3-MW35-SS2	HG-C	8-25-88		9-21-88	
88082131	DANGB-3-MW35-SS2	PB-F	8-25-88		10-04-88	
88082131	DANGB-3-MW35-SS2	418.1	8-25-88	9-19-88	9-20-88	
88082131	DANGB-3-MW35-SS2	MOIS	8-25-88		9-02-88	
88082131	DANGB-3-MW35-SS2	8010	8-25-88		9-03-88	9-02-88
88082131	DANGB-3-MW35-SS2	8020	8-25-88		9-03-88	9-06-88
88082131	DANGB-3-MW35-SS2	8080	8-25-88	9-01-88	9-27-88	
88082131	DANGB-3-MW35-SS2	8270	8-25-88	9-02-88	10-13-88	
88082132	DANGB-3-MW35-SS1	AS-F	8-25-88		10-07-88	
88082132	DANGB-3-MW35-SS1	BA-I	8-25-88		9-19-88	
88082132	DANGB-3-MW35-SS1	CD-F	8-25-88		9-19-88	
88082132	DANGB-3-MW35-SS1	CR-F	8-25-88		9-19-88	
88082132	DANGB-3-MW35-SS1	HG-C	8-25-88		9-21-88	
88082132	DANGB-3-MW35-SS1	PB-F	8-25-88		10-04-88	
88082132	DANGB-3-MW35-SS1	418.1	8-25-88	9-19-88	9-20-88	
88082132	DANGB-3-MW35-SS1	MOIS	8-25-88		9-02-88	
88082132	DANGB-3-MW35-SS1	8010	8-25-88		9-03-88	9-03-88
88082132	DANGB-3-MW35-SS1	8020	8-25-88		9-03-88	9-06-88
88082132	DANGB-3-MW35-SS1	8080	8-25-88	9-01-88	9-27-88	
88082132	DANGB-3-MW35-SS1	8270	8-25-88	9-02-88	10-13-88	

* If applicable

ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082133	DANGB-3-MW35-SS3	AS-F	8-25-88		10-07-88	
88082133	DANGB-3-MW35-SS3	BA-I	8-25-88		9-19-88	
88082133	DANGB-3-MW35-SS3	CD-F	8-25-88		9-19-88	
88082133	DANGB-3-MW35-SS3	CR-F	8-25-88		9-19-88	
88082133	DANGB-3-MW35-SS3	HG-C	8-25-88		9-21-88	
88082133	DANGB-3-MW35-SS3	PB-F	8-25-88		10-04-88	
88082133	DANGB-3-MW35-SS3	418.1	8-25-88	9-19-88	9-20-88	
88082133	DANGB-3-MW35-SS3	MOIS	8-25-88		9-02-88	
88082133	DANGB-3-MW35-SS3	8010	8-25-88		9-03-88	9-03-88
88082133	DANGB-3-MW35-SS3	8020	8-25-88		9-03-88	9-06-88
88082133	DANGB-3-MW35-SS3	8080	8-25-88	9-01-88	9-27-88	
88082133	DANGB-3-MW35-SS3	8270	8-25-88	9-02-88	10-13-88	

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082130-88082133
WORK ORDER NO.: 918

These soil samples were received at the ES Berkeley Laboratory on 8-26-88. They were received cold and intact.

The 8270 analysis for these soil samples exceeded the method holding time by one day.

Due to a suspected interelement matrix interference, all cadmium data at levels reportable by ICP analysis ($\geq$1 mg/KG dry wt.) are potentially false positives. This is being investigated and follow-up will be provided when available.

ANALYSIS REPORT

WORK ORDER NUMBER: 918
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/26/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/Kg

TEST COMPOUND	DANGB-3-MW35-SS3A 88082130	DANGB-3-MW35-SS2 88082131	DANGB-3-MW35-SS1 88082132	DANGB-3-MW35-SS3 88082133
ACID DIG SOIL	NA	NA	NA	NA
ARSENIC	<5.0E	<5.0WE	<5.0E	<5.0E
BARIUM	40.4	50.1	54.8	43.7
CADMIUM	10.9N E	9.7N E	14.3NE	10.7NE
CHROMIUM	26.5	35.4	43.7	27.3
MERCURY	<0.1	<0.1	<0.1	<0.1
LEAD	6.0N	5.0*	22.5S*	2.8*

ND - Not Detected

NA - Not Applicable

ANALYSIS REPORT

)RK ORDER NUMBER: 918
)B NUMBER : ZB0000000440
)RK ORDER DATE : 08/26/88

APPROVED BY _____
Lab Supervisor

.PORT DATA:
; OAK RIDGE/DULUTH ANGB
0 S. ILLINOIS AVE. STE. S103
.K RIDGE, TN 37830
LL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

)NTRACT / PO # : OR001
)NTACT : BILL HAYDEN
(615)-481-3920

.SK: 3, UNITS: mg/Kg

:ST COMPOUND	DANGB-3-MW35-SS3A 88082130	DANGB-3-MW35-SS2 88082131	DANGB-3-MW35-SS1 88082132	DANGB-3-MW35-SS3 88082133
8.1 PETROLEUM HYDROCARBONS	<100	<100	130	600
MOISTURE	8.4	10.4	7.5	7.8

, - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 918
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/26/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/KG, GROUP 8010

TEST COMPOUND	DANGB-3-MW35-SS3A 88082130	DANGB-3-MW35-SS2 88082131	DANGB-3-MW35-SS1 88082132	DANGB-3-MW35-SS3 88082133
BENZYL CHLORIDE	ND	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND
CHLOROFORM	0.11B	ND	ND	0.09B
1-CHLOROHEXANE	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	0.25
1,2-DICHLOROETHANE	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND
DICHLOROMETHANE	5.2B	8.1B	9.2B	8.6B
1,2-DICHLOROPROPANE	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 918

.ST COMPOUND	DANGB-3-MW35-SS3A 88082130	DANGB-3-MW35-SS2 88082131	DANGB-3-MW35-SS1 88082132	DANGB-3-MW35-SS3 88082133
3-DICHLOROPROPYLENE	ND	ND	ND	ND
.1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND
1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND
:TRACHLOROETHYLENE	ND	ND	ND	ND
1,1-TRICHLOROETHANE	ND	ND	ND	ND
,1,2-TRICHLOROETHANE	ND	ND	ND	ND
:ICHLOROETHYLENE	ND	ND	ND	ND
:ICHLOROFLUOROMETHANE	ND	ND	ND	ND
:ICHLOROPROPANE	ND	ND	ND	ND
.NYL CHLORIDE	ND	ND	ND	ND

) - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 918
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/26/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/KG, GROUP 8020

TEST COMPOUND	DANGB-3-MW35-SS3A 88082130	DANGB-3-MW35-SS2 88082131	DANGB-3-MW35-SS1 88082132	DANGB-3-MW35-SS3 88082133
BENZENE	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND
ETHYL BENZENE	ND	ND	ND	ND
TOLUENE	2.0	13	18	7.9
XYLENES	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT

RK ORDER NUMBER: 913
B NUMBER : ZB0000000440
RK ORDER DATE : 08/26/88

APPROVED BY _____
Lab Supervisor

PORT DATA:
OAK RIDGE/DULUTH ANGB
0 S. ILLINOIS AVE. STE. S103
K RIDGE, TN 37830
LL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

NTRACT / PO # : OR001
NTACT : BILL HAYDEN
(615)-481-3920

SK: 4, UNITS: ug/Kg, GROUP 8080

ST COMPOUND	DANGB-3-MW35-SS3A 88082130	DANGB-3-MW35-SS2 88082131	DANGB-3-MW35-SS1 88082132	DANGB-3-MW35-SS3 88082133
DRIN	ND	ND	ND	ND
PHA-BHC	ND	ND	ND	ND
TA-BHC	ND	ND	ND	ND
LTA-BHC	ND	ND	ND	ND
MMA-BHC	ND	ND	ND	ND
LORDANE	ND	ND	ND	ND
4'-DDD	ND	ND	ND	ND
4'-DDE	ND	ND	ND	ND
4'-DDT	ND	ND	ND	ND
ELDRIN	ND	ND	ND	ND
DOSULFAN I	ND	ND	ND	ND
DOSULFAN II	ND	ND	ND	ND
DOSULFAN SULFATE	ND	ND	ND	ND
DRIN	ND	ND	ND	ND
DRIN ALDEHYDE	NA	NA	NA	NA
PTACHLOR	ND	ND	ND	ND
PTACHLOR EPOXIDE	ND	ND	ND	ND
PONE	NA	NA	NA	NA
THOXYCHLOR	ND	ND	ND	ND
XAPHENE	ND	ND	ND	ND
B-1016	ND	ND	ND	ND
B-1221	ND	ND	ND	ND
B-1232	ND	ND	ND	ND
B-1242	ND	ND	ND	ND
B-1248	ND	ND	ND	ND
B-1254	ND	ND	ND	ND
B-1260	ND	ND	ND	ND

- Not Detected

A - Not Analyzed

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

Date Received: August 26, 1988
Date Reported: December 6, 1988

Work Order: 918
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082130	88082131
Sample No.:	DANGB-3-MW35-SS3A	DANGB-3-MW35-SS2
Date Sampled:	8-25-88	8-25-88
Time Sampled:	10:15	08:53
Date Extracted:	9-02-88	9-02-88
Date Analyzed:	11-30-88	10-13-88
Percent Moisture:	8	10

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

B = Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

ate Received: August 26, 1988 Work Order: 918
ate Reported: December 6, 1988 Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB ATTN: Mr. Bill Hayden
ddress: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ab Number:	88082130	88082131
ample No.:	DANGB-3-MW35-SS3A	DANGB-3-MW35-SS2
ate Sampled:	8-25-88	8-25-88
me Sampled:	10:15	08:53
ate Extracted:	9-02-88	9-02-88
ate Analyzed:	11-30-88	10-13-88
ercent Moisture:	8	10

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
henanthrene	330	ND	ND
nthracene	330	ND	ND
-butyl phthalate	330	ND	ND
luoranthene	330	ND	ND
-Chlorophenyl phenyl ether	330	ND	ND
yrene	330	ND	ND
utyl Benzyl phthalate	330	ND	ND
s(2-ethylhexyl) phthalate	330	ND	ND
rysene	330	ND	ND
-Bromophenyl phenyl ether	330	ND	ND
enzo(a)anthracene	330	ND	ND
-n-octylphthalate	330	ND	ND
enzo(b)fluoranthene	330	ND	ND
enzo(k)fluoranthene	330	ND	ND
enzidine	2000	ND	ND
,3'-Dichlorobenzidine	660	ND	ND
enzo(a)pyrene	330	ND	ND
ideno(1,2,3-cd)pyrene	330	ND	ND
benzo(a,h)anthracene	330	ND	ND
enzo(ghi)perylene	330	ND	ND
enzyl Alcohol	660	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 26, 1988
Date Reported: December 6, 1988

Work Order: 918
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082130	88082131
Sample No.:	DANGB-3-MW35-SS3A	DANGB-3-MW35-SS2
Date Sampled:	8-25-88	8-25-88
Time Sampled:	10:15	08:53
Date Extracted:	9-02-88	9-02-88
Date Analyzed:	11-30-88	10-13-88
Percent Moisture:	8	10

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
2-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

ate Received: August 26, 1988 Work Order: 918
ate Reported: December 6, 1988 Job Number: OR001

)R: ES:Oak Ridge/Duluth ANGB ATTN: Mr. Bill Hayden
ldress: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ab Number:	88082130	88082131
ample No.:	DANGB-3-MW35-SS3A	DANGB-3-MW35-SS2
ate Sampled:	8-25-88	8-25-88
ime Sampled:	10:15	08:53
ate Extracted:	9-02-88	9-02-88
ate Analyzed:	11-30-88	10-13-88
ercent Moisture:	8	10

ompound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
lpha-BHC	--*	ND	ND
amma-BHC	--*	ND	ND
eta-BHC	660	ND	ND
eptachlor	330	ND	ND
elta-BHC	500	ND	ND
ldrin	330	ND	ND
eptachlor epoxide	330	ND	ND
ndosulfan I	--*	ND	ND
eldrin	500	ND	ND
,4'-DDE	1000	ND	ND
ndrin	--*	ND	ND
ndosulfan II	--*	ND	ND
,4'-DDD	500	ND	ND
,4'-DDT	830	ND	ND
ndosulfan Sulfate	1000	ND	ND
ndrin aldehyde	--*	ND	ND
ndrin Ketone	--*	ND	ND
nlordane	2000	ND	ND
ethoxychlor	--*	ND	ND
oxaphene	2000	ND	ND
roclor-1016	2000	ND	ND
roclor-1221	2000	ND	ND
roclor-1232	2000	ND	ND
roclor-1242	2000	ND	ND
roclor-1248	2000	ND	ND
roclor-1254	2000	ND	ND
roclor-1260	2000	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

Date Received: August 26, 1988
Date Reported: December 6, 1988

Work Order: 918
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address:710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082130	88082131
Sample No.:	DANGB-3-MW35-SS3A	DANGB-3-MW35-SS2
Date Sampled:	8-25-88	8-25-88
Time Sampled:	10:15	08:53
Date Extracted:	9-02-88	9-02-88
Date Analyzed:	11-30-88	10-13-88
Percent Moisture:	8	10

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
4-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

ıte Received: August 26, 1988
ıte Reported: December 6, 1988

Work Order: 918
Job Number: OR001

)R: ES:Oak Ridge/Duluth ANGB
ldress: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

ıb Number:	88082132	88082133
ımple No.:	DANGB-3-MW35-SS1	DANGB-3-MW35-SS3
ıte Sampled:	8-25-88	8-25-88
.me Sampled:	10:15	08:53
ıte Extracted:	9-02-88	9-02-88
ıte Analyzed:	10-27-88	11-30-88
ercent Moisture:	8	8

ɔmpound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
,3-Dichlorobenzene	330	ND	ND
,4-Dichlorobenzene	330	ND	ND
exachloroethane	330	ND	ND
is(2-chloroethyl)ether	330	ND	ND
,2-Dichlorobenzene	330	ND	ND
-Nitrosodimethylamine	330	ND	ND
is(2-chloroisopropyl)ether	330	ND	ND
-Nitrosodi-n-propylamine	330	ND	ND
exachlorobutadiene	330	ND	ND
,2,4-Trichlorobenzene	330	ND	ND
itrobenzene	330	ND	ND
sophorone	330	ND	ND
aphthalene	330	ND	ND
is(2-chloroethoxy)methane	330	ND	ND
-Chloronaphthalene	330	ND	ND
exachlorocyclopentadiene	330	ND	ND
cenaphthylene	330	ND	ND
cenaphthene	330	ND	ND
imethyl phthalate	330	ND	ND
,6-Dinitrotoluene	330	ND	ND
luorene	330	ND	ND
,4-Dinitrotoluene	330	ND	ND
iethyl phthalate	330	ND	ND
-Nitrosodiphenylamine	330	ND	ND
exachlorobenzene	330	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 26, 1988
Date Reported: December 6, 1988

Work Order: 918
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082132	88082133
Sample No.:	DANGB-3-MW35-SS1	DANGB-3-MW35-SS3
Date Sampled:	8-25-88	8-25-88
Time Sampled:	10:15	08:53
Date Extracted:	9-02-88	9-02-88
Date Analyzed:	10-27-88	11-30-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

B = Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

ıte Received: August 26, 1988
ate Reported: December 6, 1988

Work Order: 918
Job Number: OR001

ɔr: ES:Oak Ridge/Duluth ANGB
ıdress: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

ıb Number:	88082132	88082133
ample No.:	DANGB-3-MW35-SS1	DANGB-3-MW35-SS3
ate Sampled:	8-25-88	8-25-88
ıme Sampled:	10:15	08:53
ate Extracted:	9-02-88	9-02-88
ate Analyzed:	10-27-88	11-30-88
ercent Moisture:	8	8

ɔmpound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
cetophenone	--*	ND	ND
ıiline	--*	ND	ND
-Aminobiphenyl	--*	ND	ND
-Chloroaniline	660	ND	ND
-Chloronaphthalene	--*	ND	ND
ibenzofuran	330	ND	ND
-Dimethylaminoazobenzene	--*	ND	ND
,12-Dimethylbenz(a)anthracene	--*	ND	ND
-,a-Dimethylphenethylamine	--*	ND	ND
iphenylamine	--*	ND	ND
,2-Diphenylhydrazine	--*	ND	ND
thyl methanesulfonate	--*	ND	ND
-Methylcholanthrene	--*	ND	ND
ethyl methanesulfonate	--*	ND	ND
-Methylnaphthalene	330	ND	ND
-Naphthylamine	--*	ND	ND
-Naphthylamine	--*	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroso-di-n-butylamine	--*	ND	ND
-Nitrosopiperidine	--*	ND	ND
entachlorobenzene	--*	ND	ND
entachloronitrobenzene	--*	ND	ND
ıenacetin	--*	ND	ND
-Picoline	--*	ND	ND
conamide	--*	ND	ND
,2,4,5-Tetrachlorobenzene	--*	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

Date Received: August 26, 1988
Date Reported: December 6, 1988

Work Order: 918
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082132	88082133
Sample No.:	DANGB-3-MW35-SS1	DANGB-3-MW35-SS3
Date Sampled:	8-25-88	8-25-88
Time Sampled:	10:15	08:53
Date Extracted:	9-02-88	9-02-88
Date Analyzed:	10-27-88	11-30-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

ıte Received: August 26, 1988
ıte Reported: December 6, 1988

Work Order: 918
Job Number: OR001

)R: ES:Oak Ridge/Duluth ANGB
ldress:710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

ıb Number:	88082132	88082133
ımple No.:	DANGB-3-MW35-SS1	DANGB-3-MW35-SS3
ıte Sampled:	8-25-88	8-25-88
.me Sampled:	10:15	08:53
ıte Extracted:	9-02-88	9-02-88
ıte Analyzed:	10-27-88	11-30-88
ercent Moisture:	8	8

ɔmpound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
-Chlorophenol	330	ND	ND
-Nitrophenol	330	ND	ND
ıenol	330	ND	ND
,4-Dimethylphenol	330	ND	ND
,4-Dichlorophenol	330	ND	ND
,4,6-Trichlorophenol	330	ND	ND
-Chloro-3-methylphenol	660	ND	ND
,4-Dinitrophenol	1600	ND	ND
,6-Dichlorophenol	--*	ND	ND
-Methyl-4,6-Dinitrophenol	1600	ND	ND
ɜntachlorophenol	1600	ND	ND
-Nitrophenol	1600	ND	ND
ɜnzoic Acid	1600	ND	ND
-Methylphenol	330	ND	ND
- & 4-Methylphenol	330	ND	ND
,3,4,6-Tetrachlorophenol	--*	ND	ND
,4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

)TE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

CHAIN OF CUSTODY RECORD 918

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature) Mike Roddy

SHIP TO: ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA. 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SOILS ANALYSES REQUIRED: SW8010, 8020	SW8080	SW8270	EPA 418.1	SW8010, 7181	SW7131, 7421	SW7060	SW7471	REMARKS
8/25/88	10:15	DANGB-3-MW35 553A	1		X	X	X	X	X	X	X	882130
8/25/88	8:53	DANGB-3-MW35 552	1		X	X	X	X	X	X	X	882131
8/25/88	8:50	DANGB-3-MW35 551	1		X	X	X	X	X	X	X	882132
8/25/88	10:25	DANGB-3-MW35-553	1		X	X	X	X	X	X	X	882133
8/25/88	10:25	DANGB-3-MW35-553	1	X								
8/25/88	10:15	DANGB-3-MW35-553A	1	X								882130
8/25/88	8:53	DANGB-3-MW35-552	1	X								882131
8/25/88	8:50	DANGB-3-MW35-551	1	X								882132

2928

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Jo Ann Sherwin	8/25/88 5:30p				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
		Bill Friedman	8-26-88 12:10	recd cold & intact

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: ORCJ1

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No( ):
88082133, 88082099-88082104
88082146-88082148, 88082130-88082132

QC Report No: ICP-S-0028-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-26-88
Date Reported: 10-13-88
Dilution Factor: NA
%Moisture: 7.8

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	SR	SSR	PR	Notes
Barium	88082133	88082133	9-10-88	9-15-88	6010	<20	43.7	43.9	<1	217	43.7	275	107	
Cadmium	88082133	88082133	9-10-88	9-15-88	6010	<0.5	10.7	10.7	0	5.42	10.7	13.9	59N	A
Chromium	88082133	88082133	9-10-88	9-15-88	6010	<1.0	27.3	30.4	11	21.7	27.3	50.3	106	

2930

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
N See Legend attached.
A See Case Narrative attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

CASE NARRATIVE

QUALITY CONTROL RESULTS SUMMARY

SAMPLE NO(S).: 88081969-88081976, 88082043-88082049

SAMPLE NO(S).: 88082099-88082101, 88082102-88082104

SAMPLE NO(S).: 88082130-88082133, 88082146-88082148

QC REPORT NO.: ICP-S-0028-88

QC REPORT NO.: ICP-S-0031-88

Due to a suspected interelement matrix interference, all cadmium data at levels reportable by ICP analysis ($\geq$1 mg/KG dry weight) are potentially false positives. This is being investigated and follow-up will be provided when available.

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082131-88082133, 88082043-88082049
88082100-88082104, 88082146-88082148

QC Report No: AAF-S-0028-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-26-88
Date Reported: 10-13-88
Dilution Factor: See Notes
%Moisture: 7.8

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Arsenic	88082133	88082133	10-06-88	9-23-88	7060	<0.5	<5.0E	<5.0E	NC	4.34	2.71E	4.99E	53N	DF=10
Lead	88082133	88082133	10-04-88	9-23-88	7421	<0.5	2.82	3.53	22*	5.42	2.82	8.59	106	DF=NA

2932

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Case Narrative attached.
E See Legend attached.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: AAF-S-0033-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-31-88
Date Reported: 10-28-88
Dilution Factor: See Notes
%Moisture: 7.8

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082192-88082205, 88082099, 88082101
88082130

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	SR	SSR	PR	Notes
Arsenic	88082192	88082192	10-10-88	9-29-88	7060	<0.5	<5.0E	<5.0E	NC	4.34	0.76E	9.0	190N	DF=10
Lead	88082192	88082192	10-20-88	9-29-88	7421	<0.5	4.3	4.3	0	5.42	4.3	15.7	210N	DF=NA

2933

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082043-88082049, 88082100
SAMPLE NO(S).: 88082102, 88082104
SAMPLE NO(S).: 88082130-88082133
SAMPLE NO(S).: 88082146-88082148

As a result of extreme sample matrix interference, dilution was required for sample analysis. The reporting limit and MDL for the analyte(s) listed have increased as shown.

Analyte	Reporting Limit	MDL
Arsenic	10 mg/Kg	5.0 mg/Kg

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082130-88082133, 88082146-88082152
88082156-88082163

QC Report No: CVM-S-0014-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-26-88
Date Reported: 10-13-88
Dilution Factor: NA
%Moisture: 8.4

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	Duplicate RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Mercury	88082130	88082130	9-21-88	9-21-88	7471	<0.1	<0.1	<0.1	NC	1.09	<0.1	1.14	105	

2935

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (P") = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two
SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
Samples No.: 88082130-88082133
Samples No.: 88082146-88082152

The results obtained for the laboratory control sample (LCS) analyzed with these samples for the analyte Mercury exceeded the recommended EPA recoveries. All data associated with this batch was closely inspected and no analytical problems were found. The initial and continuing calibration verification standards and blanks and precision and accuracy recoveries were within acceptable limits. The Mercury LCS was prepared at a concentration exceeding the linear range of the test.

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082130-88082133, 88082146-88082151
88082156-88082163

QC Report No: TPH-S-0055-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-26-88
Date Prepared: 9-19-88
Date Analyzed: 9-20-88
Date Reported: 9-27-88
Dilution Factor: 6
%Moisture: 7.5

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88082132	418.1	<100	130	1100	710	65	770	70	8	*

2937

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* Percent recovery and relative percent difference are within ES Laboratory control limits.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082043-88082049
88082099-88082104
88082130-88082133

QC Report No: VGC-S-0042-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-26-88
Date Prepared: NA
Date Analyzed: 9-07-88
Date Reported: 10-10-88
Dilution Factor: NA
% Moisture: 8.4

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88082130	1,1-dichloroethane	10.9	ND	11.2	103	11.7	107	4	20	58-124
	Trichloroethene	10.9	ND	9.0	83	8.7	80	3	16	75-110
	Chlorobenzene	10.9	ND	9.0	83	9.3	85	3	21	71-125
	Aromatics: 8020									
88082130	Benzene	10.9	ND	9.7	89	9.3	85	4	26	75-123
	Toluene	10.9	0.7	9.8	83	9.7	83	1	16	79-115
	Chlorobenzene	10.9	ND	9.6	88	9.2	84	4	24	82-112

2938

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* The QC analysis was performed on the confirmatory column. Therefore, the sample result (SR) value for toluene is not the same as the one appearing on the final result form for the sample.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/KG
Date Reported: 10-10-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
15	9-01-88	VGC	Carbopack	75-09-2	Dichloromethane	3.6	0.25	88082099-88082104
50	9-03-88	VGC	Carbopack	75-09-2	Dichloromethane	0.6	0.25	88082130-88082133
				67-66-3	Chloroform	0.8	0.05	
				71-55-6	1,1,1-Trichloromethane	1.9	0.03	

2939

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082102-88082104
88082130-88082133
88082146-88082148

QC Report No.: OCP-S-0030-88
QC Sample No.: 88082104
Level (Low/Med): Low
Date Reported: 11-10-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2190	ND	103	141*	46-127
Heptachlor	2190	ND	109	150*	35-130
Aldrin	2190	ND	118	162*	34-132
Dieldrin	5460	ND	320	176*	31-134
Endrin	5460	ND	286	157*	42-139
4,4'-DDT	5460	ND	299	164*	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	77.3	106	141*	29	50	46-127
Heptachlor	84.4	116	150*	25	31	35-130
Aldrin	99.1	136*	162*	17	43	34-132
Dieldrin	256	141*	176*	22	38	31-134
Endrin	225	124	157*	24	45	42-139
4,4'-DDT	219	120	164*	31	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 8 out of 12 outside limits

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082102-88082104
88082130-88082133
88082146-88082148

QC Report No.: OCP-S-0030-88B
QC Sample No.: Blank
Level (Low/Med): Low
Date Reported: 11-10-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	ND	63.0	95	46-127
Heptachlor	2000	ND	67.8	102	35-130
Aldrin	2000	ND	78.6	118	34-132
Dieldrin	5000	ND	190	114	31-134
Endrin	5000	ND	149	89	42-139
4,4'-DDT	5000	ND	187	112	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	43.5	65	95	37	50	46-127
Heptachlor	58.3	87	102	15	31	35-130
Aldrin	64.9	97	118	19	43	34-132
Dieldrin	171	103	114	11	38	31-134
Endrin	149	89	89	0	45	42-139
4,4'-DDT	154	92	112	19	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

PESTICIDE METHOD BLANK SUMMARY

Job No.:	OR001	Lab Name:	Engineering Science
		Lab Sample No.:	Blank
Client:	ES Oak Ridge		
Attn:	Bill Hayden	Matrix:	Soil
Address:	710 S. Illinois Avenue	Level (low/med):	Low
	Suite F-103	Extraction:	
	Oak Ridge, Tn. 37830	(SepF/Cont/Sonc):	Sonc
		Date Reported:	11-11-88
Project:	Duluth ANGB		
Date Extracted:	9-01-88		
Date Analyzed (1):	9-27-88	Date Analyzed (2):	
Time Analyzed (1):	10:21	Time Analyzed (2):	
Instrument ID (1):	5890 #2	Instrument ID (2):	
GC Column ID (1):	OV-1	GC Column ID (2):	

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88082102	9-27-88		
-	88082103	9-27-88		
-	88082104	9-27-88		
-	88082130	9-27-88		
-	88082131	9-27-88		
-	88082132	9-27-88		
-	88082133	9-27-88		
-	88082146	9-27-88		
-	88082147	9-27-88		
-	88082148	9-27-88		

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-S-0030-88
QC REPORT NO.: OCP-S-0030-88B

Percent recovery for some of the matrix spike and duplicate exceed EPA QC guidelines. Analysis of spiked blanks shows the laboratory to be in control.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up used on these samples.

Heptachor epoxide was accidently substituted for Heptachlor in the matrix spiking solution.

QUALITY CONTROL RESULTS SUMMARY
EPA METHOD 8270

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082130-88082133, 88082102-88082104
88082146-88082148

QC Report No: BNA-S-0027-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-20-88
Date Prepared: 8-31-88
Date Analyzed: 9-22-88
Date Reported: 12-13-88
Dilution Factor: NA
%Moisture: 5.5

Laboratory Supervisor Approval:

2944

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD	EPA QC Limit %Recovery
B/N Laboratory Sample # 88082005	1,2,4-Trichlorobenzene	3550	ND	2090	59	2280	64	9	23	38-107
	Acenaphthene	3550	ND	2470	70	2820	79	13	19	31-137
	2,4-Dinitrotoluene	3550	ND	2430	68	2560	72	5	47	28-89
	Pyrene	3550	ND	2970	84	2720	77	9	36	35-142
	N-Nitroso-di-n-Propylamine	3550	ND	2420	68	2350	66	3	38	41-126
	1,4-Dichlorobenzene	3550	ND	1550	44	1440	41	7	27	28-104
ACID Laboratory Sample # 88082005	Pentachlorophenol	7090	ND	4850	68	6000	85	21	47	17-109
	Phenol	7090	ND	4750	67	5180	73	9	35	26-90
	2-Chlorophenol	7090	ND	4050	57	4580	65	12	50	25-102
	4-Chloro-3-Methylphenol	7090	ND	5130	72	5950	84	15	33	26-103
	4-Nitrophenol	7090	ND	2940	42	3000	42	5	50	11-114

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
The quality control sample for this batch is from a different project.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
EPA METHOD 8270

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082130Re, 88082133Re, 88082162Re-88082163Re
88082186Re, 88082198Re, 88092223Re-88092224Re
88092203Re, 88092226Re

QC Report No: BNA-S-0058-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 08-29-88
Date Prepared: 10-29-88
Date Analyzed: 12-21-88
Date Reported: 01-09-89
Dilution Factor: NA
%Moisture: 10

Laboratory Supervisor Approval:

2945

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD	EPA QC Limit %Recovery
B/N Laboratory Sample # 88082163Re	1,2,4-Trichlorobenzene	3700	ND	1630	44	2040	55	22	23	38-107
	Acenaphthene	3700	ND	2690	73	2240	61	18	19	31-137
	2,4-Dinitrotoluene	3700	ND	2570	69	1990	54	25	47	28-89
	Pyrene	3700	ND	3060	62	2570	69	17	36	35-142
	N-Nitroso-di-n-Propylamine	3700	ND	3182	86	2610	70	20	38	41-126
	1,4-Dichlorobenzene	3700	ND	2170	58	1890	51	14	27	28-104
ACID Laboratory Sample # 88082163Re	Pentachlorophenol	7410	ND	6830	97	4790	65	35	47	17-109
	Phenol	7410	ND	5720	77	5290	71	7	35	26-90
	2-Chlorophenol	7410	ND	4760	64	4370	59	8	50	25-102
	4-Chloro-3-Methylphenol	7410	ND	5720	77	4530	61	23	33	26-103
	4-Nitrophenol	7410	ND	6440	87	4640	63	32	50	11-114

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/KG
Date Reported: 12-12-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
E5863	10-13-88	BNA	2	-	None Detected	-	-	88082102-88082104 88082130-88082133 88082146-88082148

2946

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO.: 88082130-88082133
WORK ORDER NO.: 918

The initial analysis of the samples in this work order were performed one day out of holding time. Results of the first analysis of samples 88082130 and 88082132 showed low area counts for one or more internal standards. The original extracts were re-analyzed with similar results. This indicates that the cause of the low internal standard area counts was an effect of the sample, rather than an equipment problem. Similarly, when sample 88082133 was first analyzed, some of the surrogate spike recoveries were below EPA QC limits. The sample extract was re-analyzed. This time, the surrogate spike recoveries were within limits, but the area counts of the latest eluting internal standards were low. Examination of the chromatograms of these three samples shows a pattern that might be obtained from a high-boiling hydrocarbon distillation cut. This interference could cause all of the above phenomenon.

418.1 INITIAL & CONTINUING CALIBRATION DATA

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Laboratory Sample No(s).:
88082130-88082133

Calibration Date: 9-20-88
Instrument I.D.: Perkin Elmer 257
Grating Infrared Spectrophotometer

Unit: mg/L
Date Reported: 11-09-88
R= 0.9996

Laboratory Supervisor Approval:

Standard	Concentration	Absorbance	/Continuous RF /Calibration /Verification
No. 1	0.59	0.097	
No. 2	1.2	0.174	RF = 7.63
No. 3	1.8	0.259	
No. 4	2.4	0.332	
Cont. Cal. No. 2 (88082130-88082133)	1.11	0.165	93%

SEMIVOLATILE METHOD BLANK SUMMARY

4B

Job No.:

Client:
Attn:
Address:

Work Order No.:
Lab Sample No.: 04-17
Lab File ID: E6734
Matrix: Soil
Level (low/med):
Date Analyzed: 2-23-89
Time Analyzed: 13:22
Instrument ID:
Date Reported:

Project: Duluth

This Method Blank applies to the following samples, MS and MSD.

Sample Number	Lab Sample ID	Lab File ID	Date of Analysis
DANGB-3-MW35 SS3A	88082130 Rex	Not Needed	—
DANGB-3-MW35-SS3	88082133 Rex	Not Needed	—
DANGB-3-MW33 SS2 11-12'	88082162 Rex	Not Needed	—
DANGB-3-MW33 SS3 20-21'	88082163 Rex	S0339	11-2-88
DANGB-BG MW32 SS-1 2-3'	88082186 Rex	Not Needed	—
DANGB-3MW29 SS-3	88082198 Rex	Not Needed	—
DANGB-3SG-E3 SS1A	88092203 Rex	Not Needed	—
DANGB-2BH1-SS6-15-17'	88092223 Rex	S0335	11-2-88
DANGB-2BH1-SS7-22-24'	88092224 Rex	S0337	11-2-88
DANGB-2BH2-SS5 20-22'	88092226 Rex	S0338	11-2-88

.TILE CONTINUING CALIBRATION CHECK

lame:_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____

.rument ID:carbopak_____ Calibration Date(s):9/3/88

.B FILE ID:47,48_____ Init. Calib. Date(s):9/2/88, 9/2/88

iPOUND	RRF	RRF50	%D
.zyl chloride	0.08		100.00
(2-choroethoxy) hane	0.04		100.00
(2-choroisopropyl er	0.26		100.00
mobenzene	1.32	1.31	0.57
modichloromethane	4.54	4.72	-4.08
moform	3.48	4.33	-24.50
momethane	0.38	0.44	-15.07
bon tetrachloride	4.58	4.59	-0.37
oroacetaldehyde			ERR
orobenzene	1.48	1.60	-7.82
oroethane	0.58	0.71	-21.56
oroform	4.89	5.23	-6.90
horohexane	1.02	1.05	-2.44
hloroethyl vinyl ether			ERR
oromethane	0.49	0.58	-16.76
oromethyl methyl ether	0.17	0.00	97.39
m_,& p_Chlorotoluenes	4.06	4.26	-4.81
romochloromethane	5.29	5.37	-1.54
romomethane	3.56	3.89	-9.25
_Dichlorobenzene	2.72	2.91	-6.81
_Dichlorobenzene	2.42	2.60	-7.71
_Dichlorobenzene	2.36	2.56	-8.47
hlorodifluormethane	0.54	0.00	99.17
_Dichloroethane	2.58	2.71	-5.09
_Dichloroethane	3.23	3.45	-7.07
_Dichloroethylene	2.79	3.41	-22.40
ns_1,2_dichloroethylene	2.99	3.15	-5.15
hloromethane	3.07	2.72	11.27
_Dichloropropane	2.67	2.74	-2.88
_Dichloropropylene	5.98	5.85	2.21
,2,2_Tetrachloroethane	9.09	9.22	-1.34
,1,2_Tetrachloroethane	4.51	4.57	-1.42
rachloroethylene	9.10	9.22	-1.36
,1_Trichloroethane	3.43	2.89	15.72
,2_Trichloroethane	5.98	5.85	2.17
chloroethylene	4.32	4.39	-1.52
chlorofluoromethane	2.76	2.84	-2.71
chloropropene	3.33	3.27	1.86
[illegible]	1.43	1.48	-3.73

2950

LATILE CONTINUING CALIBRATION CHECK

Name: ENGINEERING SCIENCE_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____ SDG No.:____

strument ID.: carbopak Calibration Date(s): 9/3/88 _____

FILE ID: RRF 50 __47_____ Init. Calib. Date(s) 9/2/88

MPOUND	$\overline{RRF}$	RRF50	%D
nzene	5.93	5.89	-0.66
lorobenzene	4.90	4.85	-0.93
,2_Dichlorobenzene	3.97	4.15	4.42
3_Dichlorobenzene	3.57	4.80	34.45
4_Dichorobenzene	3.83	4.09	6.81
thyl Benzene	3.32	3.33	0.22
luene	3.79	3.71	-2.13
lenes	12.16	11.95	-1.76

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DATA PACKAGE #56

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ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001.02

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received by this laboratory on 9-29-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092734	DANGB-8-SL27-SD-1	BA-I	9-24-88		10-17-88	
88092734	DANGB-8-SL27-SD-1	CD-F	9-24-88		10-18-88	
88092734	DANGB-8-SL27-SD-1	CR-F	9-24-88		10-18-88	
88092734	DANGB-8-SL27-SD-1	PB-F	9-24-88		10-18-88	
88092734	DANGB-8-SL27-SD-1	418.1	9-24-88	10-13-88	10-22-88	
88092734	DANGB-8-SL27-SD-1	MOIS	9-24-88		10-10-88	
88092734	DANGB-8-SL27-SD-1	8010	9-24-88		10-06-88	10-04-88
88092734	DANGB-8-SL27-SD-1	8020	9-24-88		10-06-88	10-04-88
88092734	DANGB-8-SL27-SD-1	8080	9-24-88	10-07-88	10-25-88	
88092735	DANGB-8-SL17-SD-1	BA-I	9-24-88		10-17-88	
88092735	DANGB-8-SL17-SD-1	CD-F	9-24-88		10-19-88	
88092735	DANGB-8-SL17-SD-1	CR-F	9-24-88		10-18-88	
88092735	DANGB-8-SL17-SD-1	PB-F	9-24-88		10-18-88	
88092735	DANGB-8-SL17-SD-1	418.1	9-24-88	10-13-88	10-22-88	
88092735	DANGB-8-SL17-SD-1	MOIS	9-24-88		10-10-88	
88092735	DANGB-8-SL17-SD-1	8010	9-24-88		10-05-88	10-04-88
88092735	DANGB-8-SL17-SD-1	8020	9-24-88		10-05-88	10-04-88
88092735	DANGB-8-SL17-SD-1	8080	9-24-88	10-07-88	10-25-88	

* If applicable

ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001.02

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
38092736	DANGB-8-SL18-SD-1	BA-I	9-24-88		10-17-88	
38092736	DANGB-8-SL18-SD-1	CD-F	9-24-88		10-19-88	
38092736	DANGB-8-SL18-SD-1	CR-F	9-24-88		10-18-88	
38092736	DANGB-8-SL18-SD-1	PB-F	9-24-88		10-25-88	
38092736	DANGB-8-SL18-SD-1	418.1	9-24-88	10-13-88	10-22-88	
38092736	DANGB-8-SL18-SD-1	MOIS	9-24-88		10-10-88	
38092736	DANGB-8-SL18-SD-1	8010	9-24-88		10-06-88	10-04-88
38092736	DANGB-8-SL18-SD-1	8020	9-24-88		10-06-88	10-04-88
38092736	DANGB-8-SL18-SD-1	8080	9-24-88	10-07-88	10-25-88	
38092737	DANGB-8-SL19-SD-1	BA-I	9-24-88		10-17-88	
38092737	DANGB-8-SL19-SD-1	CD-F	9-24-88		10-19-88	
38092737	DANGB-8-SL19-SD-1	CR-F	9-24-88		10-19-88	
38092737	DANGB-8-SL19-SD-1	PB-F	9-24-88		10-20-88	
38092737	DANGB-8-SL19-SD-1	418.	9-24-88	10-13-88	10-22-88	
38092737	DANGB-8-SL19-SD-1	MOIS	9-24-88		10-10-88	
38092737	DANGB-8-SL19-SD-1	8010	9-24-88		10-06-88	10-04-88
38092737	DANGB-8-SL19-SD-1	8020	9-24-88		10-06-88	10-04-88
38092737	DANGB-8-SL19-SD-1	8080	9-24-88	10-07-88	10-25-88	
38092738	DANGB-4-SL13-SD-1	BA-I	9-24-88		10-17-88	
38092738	DANGB-4-SL13-SD-1	CD-F	9-24-88		10-27-88	
38092738	DANGB-4-SL13-SD-1	CR-F	9-24-88		10-18-88	
38092738	DANGB-4-SL13-SD-1	PB-F	9-24-88		10-18-88	
38092738	DANGB-4-SL13-SD-1	418.1	9-24-88	10-13-88	10-22-88	
38092738	DANGB-4-SL13-SD-1	MOIS	9-24-88		10-10-88	
38092738	DANGB-4-SL13-SD-1	8010	9-24-88		10-05/09-88	10-07-88
38092738	DANGB-4-SL13-SD-1	8020	9-24-88		10-07-88	10-07-88

* If applicable

ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001.02

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092739	DANGB-4-SL15-SD-1	BA-I	9-24-88		10-17-88	
88092739	DANGB-4-SL15-SD-1	CD-F	9-24-88		10-19-88	
88092739	DANGB-4-SL15-SD-1	CR-F	9-24-88		10-18-88	
88092739	DANGB-4-SL15-SD-1	PB-F	9-24-88		10-18-88	
88092739	DANGB-4-SL15-SD-1	418.1	9-24-88	10-13-88	10-22-88	
88092739	DANGB-4-SL15-SD-1	MOIS	9-24-88		10-10-88	
88092739	DANGB-4-SL15-SD-1	8010	9-24-88		10-05/06-88	10-06/07-88
88092739	DANGB-4-SL15-SD-1	8020	9-24-88		10-06-88	10-06/07-88
88092740	DANGB-4-SL14-SD-1	BA-I	9-24-88		10-17-88	
88092740	DANGB-4-SL14-SD-1	CD-F	9-24-88		10-19-88	
88092740	DANGB-4-SL14-SD-1	CR-F	9-24-88		10-18-88	
88092740	DANGB-4-SL14-SD-1	PB-F	9-24-88		10-18-88	
88092740	DANGB-4-SL14-SD-1	418.1	9-24-88	10-13-88	10-22-88	
88092740	DANGB-4-SL14-SD-1	MOIS	9-24-88		10-10-88	
88092740	DANGB-4-SL14-SD-1	8010	9-24-88		10-05-88	10-06-88
88092740	DANGB-4-SL14-SD-1	8020	9-24-88		10-06-88	
88092741	DANGB-4-SL26-SD-1	BA-I	9-24-88		10-17-88	
88092741	DANGB-4-SL26-SD-1	CD-F	9-24-88		10-19-88	
88092741	DANGB-4-SL26-SD-1	CR-F	9-24-88		10-18-88	
88092741	DANGB-4-SL26-SD-1	PB-F	9-24-88		10-18-88	
88092741	DANGB-4-SL26-SD-1	418.1	9-24-88	10-13-88	10-22-88	
88092741	DANGB-4-SL26-SD-1	MOIS	9-24-88		10-10-88	
88092741	DANGB-4-SL26-SD-1	8010	9-24-88		10-05/07-88	10-06/07-88
88092741	DANGB-4-SL26-SD-1	8020	9-24-88		10-05/07-88	10-06/07-88

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092734-88092741
WORK ORDER NO.: 1049

These soil samples were received at the ES Berkeley Laboratory on 9-29-88. They were received cold and intact.

ANALYSIS REPORT

ORK ORDER NUMBER: 1049
JOB NUMBER : ZB0000000440
ORK ORDER DATE : 09/27/88

APPROVED BY
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
AK RIDGE, TN 37830
BILL HAYDEN

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
ONTACT : BILL HAYDEN
(615)-481-3920

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

ASK: 2, UNITS: MG/KG

EST COMPOUND	DANGB-8-SL27-SD1 88092734	DANGB-8-SL17-SD1 88092735	DANGB-8-SL18-SD1 88092736	DANGB-8-SL19-SD1 88092737	DANGB-4-SL13-SD1 88092738	DANGB-4-SL15-SD1 88092739
ACID DIG SOIL	NA	NA	NA	NA	NA	NA
ARIUM	83.6	75.3	45.5	84.8 B	62.3	74.1
ADMIUM	<2.1	<0.92	<0.61	<2.5	<0.89	<1.6
CHROMIUM	14.2SN	14.8 N	26.8 N	13.2*S	15.6SN	23.4 N
EAD	19.4	6.5	5.7	11.5	15.8	23.1

ANALYSIS REPORT FOR WORK ORDER NUMBER 1049

SK: 2, UNITS: MG/KG

ST COMPOUND	DANGB-4-SL14-SD1 88092740	DANGB-4-SL26-SD1 88092741
ID DIG SOIL	NA	NA
RIUM	48.0	83.7
DMIUM	<0.82	<1.1
ROMIUM	5.9 N	15.1 N
AD	12.9	14.9

ANALYSIS REPORT

RK ORDER NUMBER: 1049
JOB NUMBER : ZB0000000440
ORK ORDER DATE : 09/27/88

APPROVED BY
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
0 S. ILLINOIS AVE. STE. S103
K RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
ONTACT : BILL HAYDEN
(615)-481-3920

SK: 3, UNITS: mg/Kg

EST COMPOUND	DANGB-8-SL27-SD1 88092734	DANGB-8-SL17-SD1 88092735	DANGB-8-SL18-SD1 88092736	DANGB-8-SL19-SD1 88092737	DANGB-4-SL13-SD1 88092738	DANGB-4-SL15-SD1 88092739
418.1 PETROLEUM HYDROCARBONS	3300	<100	<100	200	7000	640
MOISTURE	72.5	21.9	11.6	63.1	32.6	NT

ANALYSIS REPORT FOR WORK ORDER NUMBER 1049

SK: 3, UNITS: mg/Kg

ST COMPOUND	DANGB-4-SL14-SD1 88092740	DANGB-4-SL26-SD1 88092741
8.1 PETROLEUM HYDROCARBONS	190	12000
MOISTURE	33.2	27.2

ANALYSIS REPORT

ORK ORDER NUMBER: 1049
JOB NUMBER : ZB0000000440
ORK ORDER DATE : 09/27/88

APPROVED BY
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
AK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

F REPORT COPIES: 1

CONTRACT / PO # : OR001
ONTACT : BILL HAYDEN
(615)-481-3920

ASK: 4, UNITS: ug/Kg, GROUP 8010

EST COMPOUND	DANGB-8-SL27-SD1 88092734	DANGB-8-SL17-SD1 88092735	DANGB-8-SL18-SD1 88092736	DANGB-8-SL19-SD1 88092737	DANGB-4-SL13-SD1 88092738	DANGB-4-SL15-SD1 88092739
BENZYL CHLORIDE	ND	ND	ND	ND	ND	ND.
IS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
IS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND	ND	ND
ROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
ROMOFORM	ND	ND	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
HLORACETALDEHYDE	ND	ND	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
HLOROETHANE	ND	ND	ND	ND	ND	ND
HLOROFORM	ND	14B	14B	27B	14B	ND
1-CHLOROHEXANE	ND	ND	ND	ND	ND	ND
-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
HLOROMETHANE	ND	ND	ND	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND	ND	ND
IBROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
ICHLOROMETHANE	84B	36B	34B	98B	46B	40B
,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND

ANALYSIS REPORT FOR WORK ORDER NUMBER 1049

ST COMPOUND	DANGB-8-SL27-SD1 88092734	DANGB-8-SL17-SD1 88092735	DANGB-8-SL18-SD1 88092736	DANGB-8-SL19-SD1 88092737	DANGB-4-SL13-SD1 88092738	DANGB-4-SL15-SD1 88092739
3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
TRACHLOROETHYLENE	ND	ND	ND	ND	ND	ND
1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
ICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
ICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
ICHLOROPROPANE	ND	ND	ND	ND	ND	ND
NYL CHLORIDE	ND	ND	ND	ND	ND	ND

ANALYSIS REPORT FOR WORK ORDER NUMBER 1049

TASK: 4, UNITS: ug/Kg, GROUP 8010

TEST COMPOUND	DANGB-4-SL14-SD1 88092740	DANGB-4-SL26-SD1 88092741
ENZYL CHLORIDE	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND
IS (2-CHLOROISOPROPYL)ETHER	ND	ND
ROMOBENZENE	ND	ND
BROMODICHLOROMETHANE	ND	ND
BROMOFORM	ND	ND
ROMOETHANE	ND	ND
ARBON TETRACHLORIDE	ND	ND
CHLORACETALDEHYDE	ND	ND
HLORAL	ND	ND
HLOROBENZENE	ND	ND
CHLOROETHANE	ND	ND
CHLOROFORM	ND	7.3B
-CHLOROHEXANE	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND
CHLOROMETHANE	ND	ND
HLOROMETHYL METHYL ETHER	ND	ND
HLOROTOLUENE	ND	ND
DIBROMOCHLOROMETHANE	ND	ND
IBROMOMETHANE	ND	ND
,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
ICHLORODIFLUOROMETHANE	ND	ND
,1-DICHLOROETHANE	ND	ND
1,2-DICHLOROETHANE	ND	ND
,1-DICHLOROETHYLENE	ND	ND
RANS-1,2-DICHLOROETHYLENE	ND	ND
DICHLOROMETHANE	59B	62B
,2-DICHLOROPROPANE	ND	ND
,3-DICHLOROPROPYLENE	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND
ETRACHLOROETHYLENE	ND	ND
,1,1-TRICHLOROETHANE	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND
RICHLOROETHYLENE	ND	ND
RICHLOROFLUOROMETHANE	ND	ND
TRICHLOROPROPANE	ND	ND
INYL CHLORIDE	ND	ND

ANALYSIS REPORT

)RK ORDER NUMBER: 1049
)B NUMBER : ZB0000000440
)RK ORDER DATE : 09/27/88

APPROVED BY
Lab Supervisor

'PORT DATA:
; OAK RIDGE/DULUTH ANGB
.0 S. ILLINOIS AVE. STE. S103
.K RIDGE, TN 37830
LL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

)NTRACT / PO # : OR001
)NTACT : BILL HAYDEN
(615)-481-3920

.SK: 4, UNITS: ug/Kg, GROUP 8020

:ST COMPOUND	DANGB-8-SL27-SD1 88092734	DANGB-8-SL17-SD1 88092735	DANGB-8-SL18-SD1 88092736	DANGB-8-SL19-SD1 88092737	DANGB-4-SL13-SD1 88092738	DANGB-4-SL15-SD1 88092739
:NZENE	ND	ND	ND	ND	ND	2.3
:LOROBENZENE	ND	ND	ND	ND	ND	ND
.2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
'HYL BENZENE	ND	ND	ND	ND	44000	ND
)LUENE	ND	ND	ND	ND	54000	5.5
'LENES	ND	ND	ND	ND	690000	2.8

ANALYSIS REPORT FOR WORK ORDER NUMBER 1049

TASK: 4, UNITS: ug/Kg, GROUP 8020

TEST COMPOUND	DANGB-4-SL14-SD1 88092740	DANGB-4-SL26-SD1 88092741
BENZENE	ND	ND
CHLOROBENZENE	ND	ND
1,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
ETHYL BENZENE	ND	55000
TOLUENE	ND	26000
XYLENES	ND	250000

ANALYSIS REPORT

)RK ORDER NUMBER: 1049
)B NUMBER : ZB0000000440
)RK ORDER DATE : 09/27/88

APPROVED BY
Lab Supervisor

PORT DATA:
. OAK RIDGE/DULUTH ANGB
0 S. ILLINOIS AVE. STE. S103
K RIDGE, TN 37830
LL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

)NTRACT / PO # : OR001
)NTACT : BILL HAYDEN
(615)-481-3920

SK: 4, UNITS: ug/Kg, GROUP 8080

ST COMPOUND	DANGB-8-SL27-SD1 88092734	DANGB-8-SL17-SD1 88092735	DANGB-8-SL18-SD1 88092736	DANGB-8-SL19-SD1 88092737
DRIN	ND	ND	ND	ND
PHA-BHC	ND	ND	ND	ND
TA-BHC	ND	ND	ND	ND
LTA-BHC	ND	ND	ND	ND
MMA-BHC	ND	ND	ND	ND
LORDANE	ND	ND	ND	ND
4'-DDD	ND	ND	ND	ND
4'-DDE	ND	ND	ND	ND
4'-DDT	ND	ND	ND	ND
ELDRIN	ND	ND	ND	ND
DOSULFAN I	ND	ND	ND	ND
DOSULFAN II	ND	ND	ND	ND
DOSULFAN SULFATE	ND	ND	ND	ND
DRIN	ND	ND	ND	ND
DRIN ALDEHYDE	NA	NA	NA	NA
PTACHLOR	ND	ND	ND	ND
PTACHLOR EPOXIDE	ND	ND	ND	ND
PONE	NA	NA	NA	NA
THOXYCHLOR	ND	ND	ND	ND
XAPHENE	ND	ND	ND	ND
B-1016	ND	ND	ND	ND
B-1221	ND	ND	ND	ND
B-1232	ND	ND	ND	ND
B-1242	ND	ND	ND	ND
B-1248	ND	ND	ND	ND
B-1254	ND	ND	ND	ND
B-1260	ND	ND	ND	ND

ENGINEERING-SCIENCE

1099

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature) Kimberly L. Dan

SHIP TO:
ENGINEERING-SCIENCE LABORATORY, INC.
600 Bancroft Way
Berkeley, CA. 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SOILS ANALYSES REQUIRED: SW8010, 8020	SW8080	SW8270	EPA 418.1 Tc	SW8010, 7940, 7191	SW7131, 7421, 7441	Pb	Zn	REMARKS
9-21-88	1630	DANGB-8-SL27-GW-1	2	X	X		X	X	X			882731
9-21-88	0900	DANGB-4-SL13-GW-1	2	X			X	X	X			882738
9-21-88	1450	DANGB-8-SL17-GW-1	2	X	X		X	X	X			882735
9-21-88	1200	DANGB-4-SL15-GW-1	2	X			X	X	X			882739
9-21-88	1100	DANGB-4-SL14-GW-1	2	X			X	X	X			882740
9-21-88	1530	DANGB-8-SL18-GW-1	2	X	X		X	X	X			882736
9-21-88	1600	DANGB-8-SL19-GW-1	2	X	X		X	X	X			882737
9-21-88	0920	DANGB-4-SL26-GW-1	2	X			X	X	X			882741

*GW-1 should be SD-1 for all samples on this COC. as per LZ DN 9/21/88

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Kimberly L. Dan	9-21-88 2100	Pat Hand Delivered A.F. Air Cargo			Floyd Abers 9/22/88 0900 hrs.

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
				Samples received Cold and Intact

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

6962

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001.02

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092801-88092805, 88092737

QC Report No: AAF-S-0052-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 9-28-88
Date Reported: 1-31-89
Dilution Factor: NA
%Moisture: 43.2

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Arsenic	88092801	88092801	10-18-88	NA	7060	<1.0	<1.42	<1.42	NC	14.1	<1.42	11.9	84	
Cadmium	88092801	88092801	10-20-88	NA	7131	<0.50	<0.88	<0.88	NC	3.52	<0.88	3.87	110	
Chromium	88092801	88092801	10-20-88	NA	6010	<1.0	21.9	16.9	26*	7.04	21.9	30.2	118	
Lead	88092801	88092801	10-25-88	NA	7421	<0.50	6.76S	7.88	15	7.04	6.76S	12.7	85	

0137

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Legend attached.
S See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092737, 88092801-88092805

The detection limit for the analyte(s); arsenic, cadmium, chromium, lead, barium and mercury are provided by the sub-contract laboratory and based on a dry-weight of the sample.

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001.02

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092672-88092676, 88092731-88092741
88092781-88092783, 88092799-88092800

QC Report No: AAF-S-0051-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 9-24-88
Date Reported: 1-31-89
Dilution Factor: NA
%Moisture: 19.3

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Arsenic	88092672	88092672	10-16-88	NA	7060	<1.0	<1.24	<1.24	NC	9.91	<1.24	7.96	80	
Cadmium	88092672	88092672	10-17-88	NA	7131	<0.50	<0.62	<0.62	NC	2.48	<0.62	2.73	110	
Chromium	88092672	88092672	10-18-88	NA	6010	<1.0	14.2	12.5	13	4.96	14.2	25.8	234N	
Lead	88092672	88092672	10-16-88	NA	7421	<0.50	3.97	3.44	1	4.96	3.97	7.68	75	

2372

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001.02

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092801-88092805, 88092737

QC Report No: ICP-S-0048-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 9-28-88
Date Reported: 1-31-89
Dilution Factor: NA
%Moisture: 43.2

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Barium	88092801	88092801	10-17-88	NA	6010	<20	52.2	60.2	1	704	52.2	732	97	

2393

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two
NA = Not Applicable
NC = Not Calculated
ND = Not Detected
SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001.02

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092801-88092805, 88092737

QC Report No: CVM-S-0028-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 9-28-88
Date Reported: 1-31-89
Dilution Factor: NA
%Moisture: 43.2

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal.	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Mercury	88092801	88092801	10-17-88	NA	7471	<0.10	<0.18	<0.18	NC	0.88	<0.18	0.88	100	

7463

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

[redacted] METALS

Job No.: OR001.02

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092672-88092676, 88092731-88092741
88092781-88092783, 88092799-88092800

QC Report No: CVM-S-0027-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 9-24-88
Date Reported: 1-31-89
Dilution Factor: NA
%Moisture: 19.3

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	Duplicate RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Mercury	88092672	88092672	10-17-88	NA	7471	<0.10	<0.12	<0.12	NC	0.620	<0.12	0.680	110	

5963

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two
NA = Not Applicable
NC = Not Calculated
ND = Not Detected
SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092672-88092676, 88092731-88092741
SAMPLE NO(S).: 88092781-88092783, 88092799-88092800

The detection limit for the analyte(s); arsenic, cadmium, chromium, lead, barium and mercury are provided by the sub-contract laboratory and based on a dry-weight of the sample.

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092672-88092676
88092731-88092741

QC Report No: TPH-S-0063-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 9-24-88
Date Prepared: 10-13-88
Date Analyzed: 10-22-88
Date Reported: 11-01-88
Dilution Factor: 7
%Moisture: 24.3

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88092672	418.1	<100	<100	1320	1250	106	1290	98	3	
Blank	418.1	<100	<100	1000	1100	110	1000	100	10	

4463

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate

SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88092672-88092676, 88092731-88092741
88092781-88092783, 88082255

QC Report No: VGC-S-0060-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 9-27-88
Date Prepared: NA
Date Analyzed: 10-10-88
Date Reported: 11-03-88
Dilution Factor: NA
% Moisture: NT

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88092739	1,1-dichloroethane	10	ND	8.32	83	5.50	55*	41*	20	58-124
	Trichloroethene	10	ND	7.90	79	6.34	63*	22*	16	75-118
	Chlorobenzene	10	ND	6.06	61*	5.21	52*	15	21	71-125
	Aromatics: 8020									
88092739 8762	Benzene	10	2.3	13.8	115	8.33	60*	49*	26	75-123
	Toluene	10	5.5	16.6	111	11.3	58*	38*	16	79-115
	Chlorobenzene	10	ND	9.40	94	8.21	82	14	24	82-117

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Case Narrative attached.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected
NT = Not Tested

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88092672-88092676, 88092731-88092741
88092781-88092783, 88082255

QC Report No: VGC-S-0060-88B
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: NA
Date Prepared: NA
Date Analyzed: 10-10-88
Date Reported: 11-03-88
Dilution Factor: NA
% Moisture: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
Blank	1,1-dichloroethane	10	ND	9.46	95	10.4	104	9	20	58-124
	Trichloroethene	10	ND	9.33	93	9.61	96	3	16	75-110
	Chlorobenzene	10	ND	8.78	88	9.11	91	4	21	71-125
	Aromatics: 8020									
Blank 6763	Benzene	10	ND	9.24	92	10.0	100	8	26	75-123
	Toluene	10	ND	9.38	94	9.53	95	2	16	79-115
	Chlorobenzene	10	ND	9.10	91	9.25	92	2	24	82-117

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO(S).: VGC-S-0060-88
QC REPORT NO(S).: VGC-S-0060-88B

Percent recovery and relative percent difference for some of the matrix spiking compounds are outside ES Laboratory acceptance limits. A blank spike analysis shows the laboratory to be in control.

Results for Sample No. 88092739 are reported on a wet weight basis, since percentage moisture was not performed.

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/Kg
Date Reported: 11-04-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
60	10-05-88	VGC	Porasil	75-09-2 67-66-3	Dichloromethane Chloroform	1.9 0.35	0.25 0.05	88092731-88092733, 88092735-88092737, 88092740
69	10-06-88	VGC	Carbopack	75-09-2 107-06-2	Dichloromethane 1,2-Dichloroethane	11 0.37	0.25 0.03	88092734, 88092739
88	10-07-88	VGC	Carbopack	75-09-2 67-66-3	Dichloromethane Chloroform	2.2 0.20	0.25 0.05	88092738, 88092741

T863

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Lab #: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report No.: OCP-S-07-88B
QC Sample No.: Blank
Level (Low/Med): Low
Date Reported: 11-03-88

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s).:
88092672-88092674, 88092731-88092737
88092782-88092783

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	ND	37.0	56	46-127
Heptachlor	2000	ND	42.5	64	35-130
Aldrin	2000	ND	37.5	56	34-132
Dieldrin	5000	ND	115	69	31-134
Endrin	5000	ND	88.8	53	42-139
4,4'-DDT	5000	ND	99.0	60	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	50.7	76	56	31	50	46-127
Heptachlor	49.0	74	64	14	31	35-130
Aldrin	39.8	60	56	6	43	34-132
Dieldrin	130	78	69	12	38	31-134
Endrin	108	65	53	20	45	42-139
4,4'-DDT	211	127	60	72*	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 1 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: OCP-S-0037-88
QC Sample No.: 88092674
Level (Low/Med): Low
Date Reported: 11-03-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s).:
88092672-88092674, 88092731-88092737
88092782-88092783

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2360	ND	49.2	62	46-127
Heptachlor	2360	ND	49.8	63	35-130
Aldrin	2360	ND	ND	NC*	34-132
Dieldrin	5910	ND	144	73	31-134
Endrin	5910	ND	122	62	42-139
4,4'-DDT	5910	ND	160	81	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	59.5	76	62	19	50	46-127
Heptachlor	66.7	85	63	29	31	35-130
Aldrin	49.5	63	NC*	NC*	43	34-132
Dieldrin	151	92	73	23	38	31-134
Endrin	152	77	62	22	45	42-139
4,4'-DDT	145	74	81	9	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 1 out of 6 outside limits

Spike Recovery: 1 out of 12 outside limits

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-S-0037-88
QC REPORT NO.: OCP-S-0037-88B

Matrix spike concentration is not detected for aldrin, therefore, spike recovery and relative percent difference are not calculated. A blank spike analysis shows the laboratory to be in control.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up required by these samples.

PESTICIDE METHOD BLANK SUMMARY

Job No.:	OR001	Lab Name:	Engineering Science
		Lab Sample No.:	Blank
Client:	ES Oak Ridge		
Attn:	Bill Hayden	Matrix:	Soil
Address:	710 S. Illinois Avenue	Level (low/med):	Low
	Suite F-103	Extraction:	
	Oak Ridge, Tn. 37830	(SepF/Cont/Sonc):	Sonc
		Date Reported:	11-03-88
Project:	Duluth ANGB		
Date Extracted:	10-07-88.		
Date Analyzed (1):	10-25-88	Date Analyzed (2):	10-26-88
Time Analyzed (1):	11:47	Time Analyzed (2):	09:23
Instrument ID (1):	5890 #2	Instrument ID (2):	5880
GG Column ID (1):	OV-1	GC Column ID (2):	Mixed

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88092731	10-25-88	88092731	10-26-88
-	88092732	10-25-88	88092732	10-26-88
-	88092733	10-25-88	88092734	10-26-88
-	88092734	10-25-88	88092735	10-26-88
-	88092735	10-25-88	88092736	10-26-88
-	88092736	10-25-88	88092737	10-26-88
-	88092737	10-25-88	88092782	10-26-88
-	88092782	10-25-88	88092783	10-26-88
-	88092783	10-25-88		

file: CONTCHL
24 Oct 88.

VOLATILE CONTINUING CALIBRATION CHECK

LabName:_____ Contract:_____

Lab Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID.: Carlogah Calibration Date(s): 10/6/88 _____

LAB FILE ID: 66;67 Init. Calib. Date(s): 10/4/88 _____

COMPOUND	$\overline{RRF}$	RRF50	%D
Benzyl chloride	0.32	0.19	40
bis (2-chloroethoxy methane			
bis (2-chloroisopropyl ether			
Bromobenzene	1.4	1.0	28
Bromodichloromethane	3.9	3.8	2
Bromoform	1.9	1.9	0
Bromomethane		0.20	
Carbon tetrachloride	4.5	4.2	7
Chloroacetaldehyde			
Chlorobenzene	1.4	1.5	7
Chloroethane	0.44	0.58	14
Chloroform	4.4	4.5	2
1-Chorohexane	1.2	0.93	
2-Chloroethyl vinyl ether			
Chloromethane	0.55	0.63	27
Chloromethyl methyl ether		~~3.8~~	
o_,m_,& p_Chlorotoluenes	4.6	3.8	80
Dibromochloromethane	3.8	3.8	0
Dibromomethane	3.2	2.3	66
1,2_Dichlorobenzene	2.6	2.2	15
1,3_Dichlorobenzene	2.3	1.9	17
1,4_Dichlorobenzene	2.3	1.9	17
Dichlorodifluormethane			
1,1_Dichloroethane	2.3	2.3	0
1,2_Dichloroethane	3.3	2.7	18
1,1_Dichloroethylene	2.7	2.4	11
trans_1,2_dichloroethylene	2.6	2.3	12
Dichloromethane	11	6.8	38
1,2_Dichloropropane	2.4	2.2	8
1,3_Dichloropropylene	1.9	~~1.9~~ 1.9	0
1,1,2,2_Tetrachloroethane	7.7	6.8	12
1,1,1,2_Tetrachloroethane	5.2	4.1	21
Tetrachloroethylene	7.7	6.8	12
1,1,1_Trichloroethane	3.2	3.0	6
1,1,2_Trichloroethane	5.9	4.5	24
Trichloroethylene	3.8	3.8	0
Trichlorofluormethane	2.5	2.0	20
Trichloropropane	2.1	1.2	43
Vinyl chloride	0.7	0.82	5

file: 8020CONT
3 Nov 88

VOLATILE CONTINUING CALIBRATION CHECK

LabName:_____ Contract:_____

Lab Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID.: Carbograf Calibration Date(s): 10/6/88 _____

LAB FILE ID: 66 Init. Calib. Date(s): 10/4/88

COMPOUND	$\overline{RRF}$	RRF50	%D
Benzene	4.3	4.5	5
Chlorobenzene	5.0	5.2	4
1,2_Dichlorobenzene	3.8	3.6	5
1,3_Dichlorobenzene	4.4	4.4	0
1,4_Dichorobenzene	3.6	3.6	0
Ethyl Bezene	3.4	3.2	6
Toluene	3.8	3.9	2
Xylenes	12	12	0

File: CONTENT
24 Oct 88

VOLATILE CONTINUING CALIBRATION CHECK

LabName:_____ Contract:_____

Lab Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID.:_____ Calibration Date(s): 10/7/88 _____

LAB FILE ID: #89, 790 Init. Calib. Date(s): 9/19/88 9/23/88

COMPOUND	$\overline{RRF}$	RRF50	%D
Benzyl chloride	0.32	0.34	6
bis (2-chloroethoxy methane	—	—	—
bis (2-chloroisopropyl ether	—	—	—
Bromobenzene	1.4	1.0	29
Bromodichloromethane	3.7	4.1	11
Bromoform	1.7	1.7	0
Bromomethane	0.20	0.22	10
Carbon tetrachloride	4.2	4.5	7
Chloroacetaldehyde	—	—	
Chlorobenzene	1.4	1.4	0
Chloroethane	0.72	0.45	38
Chloroform	3.9	4.7	21
1-Chorohexane	1.2	0.96	20
2-Chloroethyl vinyl ether	—	—	—
Chloromethane	0.46	0.58	26
Chloromethyl methyl ether	—	—	—
o_,m_,& p_Chlorotoluenes	4.6	3.9	15
Dibromochloromethane	3.7	3.8	3
Dibromomethane	3.2	3.3	3
1,2_Dichlorobenzene	2.5	2.5	0
1,3_Dichlorobenzene	2.1	2.2	5
1,4_Dichlorobenzene	2.3	2.2	4
Dichlorodifluormethane	—	—	—
1,1_Dichloroethane	2.4	2.6	8
1,2_Dichloroethane	2.6	3.0	15
1,1_Dichloroethylene	2.6	2.8	8
trans_1,2_dichloroethylene	2.4	2.7	13
Dichloromethane	4.1	4.2	2
1,2_Dichloropropane	2.5	2.3	8
1,3_Dichloropropylene	5.9	4.5	24
1,1,2,2_Tetrachloroethane	7.5	7.2	4
1,1,1,2_Tetrachloroethane	5.2	4.1	21
Tetrachloroethylene	7.5	7.2	4
1,1,1_Trichloroethane	3.0	3.3	10
1,1,2_Trichloroethane	5.9	4.5	24
Trichloroethylene	4.0	3.9	3
Trichlorofluormethane	2.3	2.5	9
Trichloropropane	2.1	1.4	33
Vinyl chloride	0.90	0.88	6

file: 8020CONT
3 Nov 88

VOLATILE CONTINUING CALIBRATION CHECK

LabName:_____ Contract:_____

Lab Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID.:_____ Calibration Date(s): 10/7/88 _____

LAB FILE ID: #89 Init. Calib. Date(s): 9/19/88 9/23/88

COMPOUND	$\overline{RRF}$	RRF50	%D
Benzene	4.9	4.2	14
Chlorobenzene	5.3	5.3	0
1,2_Dichlorobenzene	4.4	3.3	25
1,3_Dichlorobenzene	5.0	3.9	22
1,4_Dichorobenzene	4.1	3.3	20
Ethyl Bezene	4.4	3.7	16
Toluene	3.9	3.6	8
Xylenes	13	10	23

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DATA PACKAGE #57

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ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the water samples received by this laboratory on 9-19-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092509	DANGB-4-GW4C-GW1	BA-I	9-16-88		10-13-88	
88092509	DANGB-4-GW4C-GW1	CD-F	9-16-88		10-20-88	
88092509	DANGB-4-GW4C-GW1	CR-F	9-16-88		10-16-88	
88092509	DANGB-4-GW4C-GW1	PB-F	9-16-88		10-16-88	
88092509	DANGB-4-GW4C-GW1	418.1	9-16-88	9-28-88	10-05-88	
88092509	DANGB-4-GW4C-GW1	8010	9-16-88		9-21-88	
88092509	DANGB-4-~~MW52~~-GW1	8020	9-16-88		9-21-88	
88092510	DANGB-4-MW52-GW1	BA-I	9-16-88		10-13-88	
88092510	DANGB-4-MW52-GW1	CD-F	9-16-88		10-26-88	
88092510	DANGB-4-MW52-GW1	CR-F	9-16-88		10-16-88	
88092510	DANGB-4-MW52-GW1	PB-F	9-16-88		10-16-88	
88092510	DANGB-4-MW52-GW1	418.1	9-16-88	9-28-88	10-05-88	
88092510	DANGB-4-MW52-GW1	8010	9-16-88		9-21-88	
88092510	DANGB-4-MW52-GW1	8020	9-16-88		9-21-88	

* If applicable

A SUBSIDIARY OF THE PARSONS CORPORATION

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092509-88092510
WORK ORDER NO.: 1005

These water samples were received at the ES Berkeley Laboratory on 9-19-88. They were received cold and intact.

ENGINEERING-SCIENCE INC.
11/29/88

ANALYSIS REPORT

WORK ORDER NUMBER: 1005
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/19/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/L

TEST COMPOUND	DANGB-4-GW4C-GW-1 88092509	DANGB-4-MW52-GW-1 88092510
ACID DIG FLAME	NA	NA
ACID DIG FURNACE	NA	NA
BARIUM	<0.2	<0.2
CADMIUM	<0.005	<0.005
CHROMIUM	<0.1	<0.01
LEAD	<0.005	<0.005

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 1005
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/19/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/L

TEST COMPOUND	DANGB-4-GW4C-GW-1 88092509	DANGB-4-MW52-GW-1 88092510
418.1 PETROLEUM HYDROCARBONS	<1.5	<1.5

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 1005
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/19/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/L, GROUP 8010

TEST COMPOUND	DANGB-4-GW4C-GW-1 88092509	DANGB-4-MW52-GW-1 88092510
BENZYL CHLORIDE	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND
BROMOBENZENE	ND	ND
BROMODICHLOROMETHANE	ND	ND
BROMOFORM	ND	ND
BROMOETHANE	ND	ND
CARBON TETRACHLORIDE	ND	ND
CHLORACETALDEHYDE	ND	ND
CHLORAL	ND	ND
CHLOROBENZENE	ND	ND
CHLOROETHANE	ND	ND
CHLOROFORM	ND	ND
1-CHLOROHEXANE	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND
CHLOROMETHANE	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND
CHLOROTOLUENE	ND	ND
DIBROMOCHLOROMETHANE	ND	ND
DIBROMOMETHANE	ND	ND
1,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND
1,1-DICHLOROETHANE	ND	ND
1,2-DICHLOROETHANE	ND	ND
1,1-DICHLOROETHYLENE	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND
DICHLOROMETHANE	ND	ND
1,2-DICHLOROPROPANE	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 1005

TEST COMPOUND	DANGB-4-GW4C-GW-1 88092509	DANGB-4-MW52-GW-1 88092510
1,3-DICHLOROPROPYLENE	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND
TETRACHLOROETHYLENE	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND
TRICHLOROETHYLENE	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND
TRICHLOROPROPANE	ND	ND
VINYL CHLORIDE	ND	ND

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 1005
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/19/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/L, GROUP 8020

TEST COMPOUND	DANGB-4-GW4C-GW-1 88092509	DANGB-4-MW52-GW-1 88092510
BENZENE	ND	ND
CHLOROBENZENE	ND	ND
1,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
ETHYL BENZENE	ND	ND
TOLUENE	ND	ND
XYLENES	ND	ND

ND - Not Detected

1005

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature)

SHIP TO:
ENGINEERING-SCIENCE LABORATORY, INC.
600 Bancroft Way
Berkeley, CA 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED: SW8010, 8020	EPA 608	EPA 625	EPA 418.1	SW 8010, 7000, 7131	SW7421, 7470	SW9310, 9315	SM429	REMARKS
	YCD	~~DANGB-TB-8~~	~~3~~	X								
9-16-88	0945	DANGB-4-GW4C-GW-1	9	X			X	X	X			RESAMPLE 882509
9-16-88	1015	DANGB-1-MW52-GW-1	9	X			X	X	X			RESAMPLE 882510

3000

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	9-16-88 1800	Fed Ex Airbill #: 949031 0045			

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
			9/19/88	

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001.02

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092487-88092488, 88092492, 88092494-88092495
88092509-88092511, 88092513-88092516
88092523-88092528, 88092546-88092547

QC Report No: AAF-W-0053-88
Sample Matrix: Water
Conc. Unit: mg/L
Date Received: 9-17-88
Date Reported: 2-27-89
Dilution Factor: NA

Laboratory Supervisor Approval:

3001

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	PR	Notes
Arsenic	88092487	88092487	10-15-88	NA	7060	<0.01	<0.01	<0.01	NC	0.040	<0.01	0.041	102	
Cadmium	88092487	88092487	10-20-88	NA	6010	<0.005	<0.05	<0.05	NC	0.010	<0.05	0.0114	114	
Chromium	88092487	88092487	10-16-88	NA	6010	<0.01	<0.01	<0.01	NC	0.020	<0.01	0.0216	108	
Lead	88092487	88092487	10-16-88	NA	7421	<0.005	<0.05	<0.005	NC	0.020	<0.05	0.0222	111	

$$\text{Relative Percent Difference (RPD)} = \frac{C1 - C2}{(C1 + C2)/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{SSR - SR}{SA} \times 100$$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001.02

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: ICP-W-0060-88
Sample Matrix: Water
Conc. Unit: mg/L
Date Received: 9-17-88
Date Reported: 2-27-89
Dilution Factor: NA

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092487-88092488, 88092492, 88092494-88092495
88092509-88092511, 88092513-88092516
88092523-88092528, 88092546-88092547

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	SA	Spike Recovery SR	Spike Recovery SSR	PR	Notes
Barium	88092487	88092487	10-13-88	NA	6010	<0.2	<0.2	<0.2	NC	2.0	<0.2	0.198	99	

3002

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two
NA = Not Applicable
NC = Not Calculated
ND = Not Detected
SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001.02

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092487-88092488, 88092492, 88092494-88092495
88092509-88092511, 88092513-88092516
88092523-88092528, 88092546-88092547

QC Report No: CVM-W-0031-88
Sample Matrix: Water
Conc. Unit: mg/L
Date Received: 9-17-88
Date Reported: 2-27-89
Dilution Factor: NA

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	PR	Notes
Mercury	88092487	88092487	10-14-88	NA	254.1	<0.0002	<0.0002	<0.0002	NC	0.0010	<0.0002	0.00091	91	

3003

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092422, 88092424-88092427, 88092433
88092509-88092511, 88092513, 88092515-88092516
88092346, 88092348, 88092350, 88092494-88092495

QC Report No: TPH-W-0070-88
Sample Matrix: Water
Conc. Unit: mg/L
Date Received: NA
Date Prepared: 9-28-88
Date Analyzed: 10-05-88
Date Reported: 11-01-88
Dilution Factor: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88092516	418.1	<1.5	<1.5	39.5	29.6	75	30.4	77	3	*

3004

* Reporting limit for the samples in this batch is provided by the sub-contract laboratory.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate

SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092487-88092495
88092509-88092516
88092523-88092526

QC Report No: VGC-W-0048-88
Sample Matrix: Water
Conc. Unit: ug/L
Date Received: NA
Date Prepared: NA
Date Analyzed: 10-03-88
Date Reported: 10-25-88
Dilution Factor: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88092525	1,1-Dichloroethane	10	ND	9.26	93	9.54	95	3	26	70-130
	Trichloroethene	10	ND	9.89	99	10.3	103	4	19	65-131
	Chlorobenzene	10	ND	10.4	104	10.3	103	1	40	59-137
	Aromatics: 8020									
88092525	Benzene	10	ND	8.84	88	10.6	106	18	20	56-146
	Toluene	10	ND	10.1	101	10.1	101	0	41	42-150
	Chlorobenzene	10	ND	10.1	101	10.1	101	0	36	76-133

3005

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Water
Conc. Unit: ug/L
Date Reported: 11-01-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
64	9-21-88	VGC	Vocol	75-09-2	Dichloromethane	3.1	0.25	88092501-88092511
				67-66-3	Chloroform	0.37	0.05	

3006

File: CONTCHL
24 Oct 88

check 50.d
9/21/88

VOLATILE CONTINUING CALIBRATION CHECK

LabName:_____ Contract:_____

Lab Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID.: CARbopak Calibration Date(s): 9/21/89 _____

LAB FILE ID: 12/13 Init. Calib. Date(s): 9/19/89 9/14/89

COMPOUND	$\overline{RRF}$	RRF50	%D
Benzyl chloride	0.32	0.17	47
bis (2-chloroethoxy methane	-		
bis (2-chloroisopropyl ether			
Bromobenzene	1.0	1.2	20
Bromodichloromethane	3.7	3.7	0
Bromoform	1.9	2.2	16
Bromomethane	0.20	0.15	25
Carbon tetrachloride	4.2	4.4	5
Chloroacetaldehyde	-		
Chlorobenzene	1.4	1.5	7
Chloroethane	0.72	0.48	33
Chloroform	5.4	4.3	20
1-Chorohexane	0.87	0.96	10
2-Chloroethyl vinyl ether			
Chloromethane	0.47	0.42	11
Chloromethyl methyl ether	-		
o_,m_,& p_Chlorotoluenes	3.5	3.8	9
Dibromochloromethane	3.7	3.9	5
Dibromomethane	2.4	2.4	0
1,2_Dichlorobenzene	2.5	2.7	8
1,3_Dichlorobenzene	2.1	1.6	24
1,4_Dichlorobenzene	2.1	1.9	10
Dichlorodifluormethane	-		
1,1_Dichloroethane	2.41	2.3	4
1,2_Dichloroethane	2.6	2.3	10
1,1_Dichloroethylene	2.6	2.5	4
trans_1,2_dichloroethylene	2.4	2.3	4
Dichloromethane	17.1	2.6	37
1,2_Dichloropropane	2.4	2.5	4
1,3_Dichloropropylene	4.5	4.7	4
1,1,2,2_Tetrachloroethane	7.5	7.5	0
1,1,1,2_Tetrachloroethane	4.1	4.2	2
Tetrachloroethylene	7.5	7.5	0
1,1,1_Trichloroethane	3.0	3.0	0
1,1,2_Trichloroethane	4.5	4.7	4
Trichloroethylene	4.0	4.0	0
Trichlorofluormethane	2.3	2.1	9
Trichloropropane	2.0	2.0	0
Vinyl chloride	0.94	0.77	18

2426

file: 8020CONT
3 Nov 88

VOLATILE CONTINUING CALIBRATION CHECK

LabName:_____ Contract:_____

Lab Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID.: CARLOAK Calibration Date(s): 9/21/89 _____

LAB FILE ID: 12 Init. Calib. Date(s): 9/12/89 _____

COMPOUND	$\overline{RRF}$	RRF50	%D
Benzene	4.9	5.6	14
Chlorobenzene	5.3	5.8	9
1,2_Dichlorobenzene	4.7	4.8	2
1,3_Dichlorobenzene	4.7	5.1	9
1,4_Dichorobenzene	4.0	4.1	3
Ethyl Bezene	4.0	4.2	5
Toluene	3.9	4.6	18
Xylenes	.3	14	8

DATA PACKAGE #58

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ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received by this laboratory on 8-27-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082146	DANGB-3-MW25-SS1,0-1'	AS-F	8-26-88		10-07-88	
88082146	DANGB-3-MW25-SS1,0-1'	BA-I	8-26-88		9-19-88	
88082146	DANGB-3-MW25-SS1,0-1'	CD-F	8-26-88		9-19-88	
88082146	DANGB-3-MW25-SS1,0-1'	CR-F	8-26-88		9-19-88	
88082146	DANGB-3-MW25-SS1,0-1'	HG-C	8-26-88		9-21-88	
88082146	DANGB-3-MW25-SS1,0-1'	PB-F	8-26-88		10-04-88/10-05-88	
88082146	DANGB-3-MW25-SS1,0-1'	418.1	8-26-88	9-21-88	9-22-88	
88082146	DANGB-3-MW25-SS1,0-1'	MOIS	8-26-88		9-02-88	
88082146	DANGB-3-MW25-SS1,0-1'	8010	8-26-88		9-06-88	9-08-88
88082146	DANGB-3-MW25-SS1,0-1'	8020	8-26-88		9-06-88	9-08-88
88082146	DANGB-3-MW25-SS1,0-1'	8080	8-26-88	9-01-88	9-27-88	
88082146	DANGB-3-MW25-SS1,0-1'	8270	8-26-88	10-28-88	11-02-88	

* If applicable

ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082147	DANGB-3-MW25-SS2,2-3'	AS-F	8-26-88		10-07-88	
88082147	DANGB-3-MW25-SS2,2-3'	BA-I	8-26-88		9-19-88	
88082147	DANGB-3-MW25-SS2,2-3'	CD-F	8-26-88		9-19-88	
88082147	DANGB-3-MW25-SS2,2-3'	CR-F	8-26-88		9-19-88	
88082147	DANGB-3-MW25-SS2,2-3'	HG-C	8-26-88		9-21-88	
88082147	DANGB-3-MW25-SS2,2-3'	PB-F	8-26-88		10-04-88/10-05-88	
88082147	DANGB-3-MW25-SS2,2-3'	418.1	8-26-88	9-21-88	9-22-88	
88082147	DANGB-3-MW25-SS2,2-3'	MOIS	8-26-88		9-02-88	
88082147	DANGB-3-MW25-SS2,2-3'	8010	8-26-88		9-06-88	9-08-88
88082147	DANGB-3-MW25-SS2,2-3'	8020	8-26-88		9-06-88	9-08-88
88082147	DANGB-3-MW25-SS2,2-3'	8080	8-26-88	9-01-88	9-27-88	
88082147	DANGB-3-MW25-SS2,2-3'	8270	8-26-88	10-28-88	11-02-88	
88082148	DANGB-3-MW25-SS3,14-15'	AS-F	8-26-88		10-07-88	
88082148	DANGB-3-MW25-SS3,14-15'	BA-I	8-26-88		9-19-88	
88082148	DANGB-3-MW25-SS3,14-15'	CD-F	8-26-88		9-19-88	
88082148	DANGB-3-MW25-SS3,14-15'	CR-F	8-26-88		9-19-88	
88082148	DANGB-3-MW25-SS3,14-15'	HG-C	8-26-88		9-21-88	
88082148	DANGB-3-MW25-SS3,14-15'	PB-F	8-26-88		10-04-88/10-05-88	
88082148	DANGB-3-MW25-SS3,14-15'	418.1	8-26-88	9-21-88	9-22-88	
88082148	DANGB-3-MW25-SS3,14-15'	MOIS	8-26-88		9-02-88	
88082148	DANGB-3-MW25-SS3,14-15'	8010	8-26-88		9-06-88	9-08-88
88082148	DANGB-3-MW25-SS3,14-15'	8020	8-26-88		9-06-88	9-08-88
88082148	DANGB-3-MW25-SS3,14-15'	8080	8-26-88	9-01-88	9-27-88	
88082148	DANGB-3-MW25-SS3,14-15'	8270	8-26-88	10-28-88	11-02-88	

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082146-88082148
WORK ORDER NO.: 921

These soil samples were received at the ES Berkeley Laboratory on 8-27-88. They were received cold and intact.

Due to a suspected interelement matrix interference, all cadmium data at levels reportable by ICP analysis ($\geq$1 mg/KG dry wt.) are potentially false positives. This is being investigated and follow-up will be provided when available.

The original 8270 analysis exceeded the method holding time by one day. The surrogate spike recoveries were out of control. The samples were then re-extracted and rerun and the surrogate spike recoveries were in control.

ANALYSIS REPORT

'ORK ORDER NUMBER: 921
'OB NUMBER : ZB0000000440
'ORK ORDER DATE : 08/27/88

APPROVED BY _____
Lab Supervisor

'EPORT DATA:
'S OAK RIDGE/DULUTH ANGB
'10 S. ILLINOIS AVE. STE. S103
)AK RIDGE, TN 37830
3ILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

: OF REPORT COPIES: 1

'ONTRACT / PO # : OR001
'ONTACT : BILL HAYDEN
(615)-481-3920

'ASK: 2, UNITS: mg/Kg

'EST COMPOUND	DANGB-3-MW25-SS1-0-1' 88082146	DANGB-3-MW25-SS2-2-3' 88082147	DANGB-3-MW25-SS3-14-15' 88082148
\CID DIG SOIL	NA	NA	NA
\RSENIC	<5.0WE	<5.0E	<5.0E
3ARIUM	62.5	55.4	41.4
'ADMIUM	11.9N	9.7N	11.1N
'HROMIUM	40.7	27.3	34.0
'ERCURY	<0.1	<0.1	<0.1
LEAD	3.9*	6.5S*	3.1*

NA - Not Analyzed

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 921
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/27/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/Kg

TEST COMPOUND	DANGB3,MW25, SS1,0-1' 88082146	DANGB3,MW25, SS2,2-3' 88082147	DANGB3,MW25, SS3,14-15' 88082148
418.1 PETROLEUM HYDROCARBONS	<100	<100	<100
% MOISTURE	11.7	13.4	13.2

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 921
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/27/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8010

TEST COMPOUND	DANGB3,MW25, SS1,0-1' 88082146	DANGB3,MW25, SS2,2-3' 88082147	DANGB3,MW25, SS3,14-15' 88082148
BENZYL CHLORIDE	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND
BROMOBENZENE	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND
BROMOFORM	ND	ND	ND
BROMOETHANE	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND
CHLORAL	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
CHLOROETHANE	ND	ND	ND
CHLOROFORM	ND	ND	ND
1-CHLOROHEXANE	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND
CHLOROMETHANE	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND
DICHLOROMETHANE	2.5B	ND	ND
1,2-DICHLOROPROPANE	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 921

TEST COMPOUND	DANGB3,MW25, SS1,0-1' 88082146	DANGB3,MW25, SS2,2-3' 88082147	DANGB3,MW25, SS3,14-15' 88082148
1,3-DICHLOROPROPYLENE	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	4.4
TRICHLOROFLUOROMETHANE	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND

ND - Not Detected

ENGINEERING-SCIENCE INC.
11/14/88

ANALYSIS REPORT

/ORK ORDER NUMBER: 921
'OB NUMBER : ZB0000000440
/ORK ORDER DATE : 08/27/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
'10 S. ILLINOIS AVE. STE. S103
)AK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8020

TEST COMPOUND	DANGB3,MW25, SS1,0-1' 88082146	DANGB3,MW25, SS2,2-3' 88082147	DANGB3,MW25, SS3,14-15' 88082148
BENZENE	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
ETHYL BENZENE	ND	ND	ND
TOLUENE	ND	ND	ND
XYLENES	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 921
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/27/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8080

TEST COMPOUND	DANGB3,MW25, SS1,0-1' 88082146	DANGB3,MW25, SS2,2-3' 88082147	DANGB3,MW25, SS3,14-15' 88082148
ALDRIN	ND	ND	ND
ALPHA-BHC	ND	ND	ND
BETA-BHC	ND	ND	ND
DELTA-BHC	ND	ND	ND
GAMMA-BHC	ND	ND	ND
CHLORDANE	ND	ND	ND
4,4'-DDD	ND	ND	ND
4,4'-DDE	ND	ND	ND
4,4'-DDT	ND	ND	ND
DIELDRIN	ND	ND	ND
ENDOSULFAN I	ND	ND	ND
ENDOSULFAN II	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND
ENDRIN	ND	ND	ND
ENDRIN ALDEHYDE	NA	NA	NA
HEPTACHLOR	ND	ND	ND
HEPTACHLOR EPOXIDE	ND	ND	ND
KEPONE	NA	NA	NA
METHOXYCHLOR	ND	ND	ND
TOXAPHENE	ND	ND	ND
PCB-1016	ND	ND	ND
PCB-1221	ND	ND	ND
PCB-1232	ND	ND	ND
PCB-1242	ND	ND	ND
PCB-1248	ND	ND	ND
PCB-1254	ND	ND	ND
PCB-1260	ND	ND	ND

ND - Not Detected
NA - Not Analyzed

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082146	88082147
Sample No.:	DANGB3-MW25-SS1- 0-1'	DANGB3-MW25-SS2- 2-3'
Date Sampled:	8-26-88	8-26-88
Time Sampled:	08:16	08:20
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	12	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082146	88082147
Sample No.:	DANGB3-MW25-SS1- 0-1'	DANGB3-MW25-SS2- 2-3'
Date Sampled:	8-26-88	8-26-88
Time Sampled:	08:16	08:20
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	12	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082146	88082147
Sample No.:	DANGB3-MW25-SS1- 0-1'	DANGB3-MW25-SS2- 2-3'
Date Sampled:	8-26-88	8-26-88
Time Sampled:	08:16	08:20
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	12	13

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

3022

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88082146	88082147
Sample No.:	DANGB3-MW25-SS1- 0-1'	DANGB3-MW25-SS2- 2-3'
Date Sampled:	8-26-88	8-26-88
Time Sampled:	08:16	08:20
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	12	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND.
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

3023

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082146	88082147
Sample No.:	DANGB3-MW25-SS1- 0-1'	DANGB3-MW25-SS2- 2-3'
Date Sampled:	8-26-88	8-26-88
Time Sampled:	08:16	08:20
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	12	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082148
Sample No.:	DANGB3-MW25-SS3- 14-15'
Date Sampled:	8-26-88
Time Sampled:	08:52
Date Extracted:	10-28-88
Date Analyzed:	11-02-88
Percent Moisture:	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg
1,3-Dichlorobenzene	330	ND
1,4-Dichlorobenzene	330	ND
Hexachloroethane	330	ND
Bis(2-chloroethyl)ether	330	ND
1,2-Dichlorobenzene	330	ND
N-Nitrosodimethylamine	330	ND
Bis(2-chloroisopropyl)ether	330	ND
N-Nitrosodi-n-propylamine	330	ND
Hexachlorobutadiene	330	ND
1,2,4-Trichlorobenzene	330	ND
Nitrobenzene	330	ND
Isophorone	330	ND
Naphthalene	330	ND
Bis(2-chloroethoxy)methane	330	ND
2-Chloronaphthalene	330	ND
Hexachlorocyclopentadiene	330	ND
Acenaphthylene	330	ND
Acenaphthene	330	ND
Dimethyl phthalate	330	ND
2,6-Dinitrotoluene	330	ND
Fluorene	330	ND
2,4-Dinitrotoluene	330	ND
Diethyl phthalate	330	ND
N-Nitrosodiphenylamine	330	ND
Hexachlorobenzene	330	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082148
Sample No.:	DANGB3-MW25-SS3- 14-15'
Date Sampled:	8-26-88
Time Sampled:	08:52
Date Extracted:	10-28-88
Date Analyzed:	11-02-88
Percent Moisture:	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg
Phenanthrene	330	ND
Anthracene	330	ND
Dibutyl phthalate	330	ND
Fluoranthene	330	ND
4-Chlorophenyl phenyl ether	330	ND
Pyrene	330	ND
Butyl Benzyl phthalate	330	ND
Bis(2-ethylhexyl) phthalate	330	530
Chrysene	330	ND
4-Bromophenyl phenyl ether	330	ND
Benzo(a)anthracene	330	ND
Di-n-octylphthalate	330	ND
Benzo(b)fluoranthene	330	ND
Benzo(k)fluoranthene	330	ND
Benzidine	2000	ND
3,3'-Dichlorobenzidine	660	ND
Benzo(a)pyrene	330	ND
Indeno(1,2,3-cd)pyrene	330	ND
Dibenzo(a,h)anthracene	330	ND
Benzo(ghi)perylene	330	ND
Benzyl Alcohol	660	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082148
Sample No.:	DANGB3-MW25-SS3- 14-15'
Date Sampled:	8-26-88
Time Sampled:	08:52
Date Extracted:	10-28-88
Date Analyzed:	11-02-88
Percent Moisture:	13

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg
Acetophenone	--*	ND
Aniline	--*	ND
4-Aminobiphenyl	--*	ND
4-Chloroaniline	660	ND
1-Chloronaphthalene	--*	ND
Dibenzofuran	330	ND
p-Dimethylaminoazobenzene	--*	ND
7,12-Dimethylbenz(a)anthracene	--*	ND
a-,a-Dimethylphenethylamine	--*	ND
Diphenylamine	--*	ND
1,2-Diphenylhydrazine	--*	ND
Ethyl methanesulfonate	--*	ND
3-Methylcholanthrene	--*	ND
Methyl methanesulfonate	--*	ND
2-Methylnaphthalene	330	ND
1-Naphthylamine	--*	ND
2-Naphthylamine	--*	ND
2-Nitroaniline	1600	ND
3-Nitroaniline	1600	ND
4-Nitroaniline	1600	ND
N-Nitroso-di-n-butylamine	--*	ND
N-Nitrosopiperidine	--*	ND
Pentachlorobenzene	--*	ND
Pentachloronitrobenzene	--*	ND
Phenacetin	--*	ND
2-Picoline	--*	ND
Pronamide	--*	ND
1,2,4,5-Tetrachlorobenzene	--*	ND

3027

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88082148
Sample No.:	DANGB3-MW25-SS3- 14-15'
Date Sampled:	8-26-88
Time Sampled:	08:52
Date Extracted:	10-28-88
Date Analyzed:	11-02-88
Percent Moisture:	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg
Alpha-BHC	--*	ND
Gamma-BHC	--*	ND
Beta-BHC	660	ND
Heptachlor	330	ND
Delta-BHC	500	ND
Aldrin	330	ND
Heptachlor epoxide	330	ND
Endosulfan I	--*	ND
Dieldrin	500	ND
4,4'-DDE	1000	ND
Endrin	--*	ND
Endosulfan II	--*	ND
4,4'-DDD	500	ND
4,4'-DDT	830	ND
Endosulfan Sulfate	1000	ND
Endrin aldehyde	--*	ND
Endrin Ketone	--*	ND
Chlordane	2000	ND
Methoxychlor	--*	ND
Toxaphene	2000	ND
Aroclor-1016	2000	ND
Aroclor-1221	2000	ND
Aroclor-1232	2000	ND
Aroclor-1242	2000	ND
Aroclor-1248	2000	ND
Aroclor-1254	2000	ND
Aroclor-1260	2000	ND

3028

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address:710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082148
Sample No.:	DANGB3-MW25-SS3- 14-15'
Date Sampled:	8-26-88
Time Sampled:	08:52
Date Extracted:	10-28-88
Date Analyzed:	11-02-88
Percent Moisture:	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
2-Chlorophenol	330	ND	
2-Nitrophenol	330	ND	
Phenol	330	ND	
2,4-Dimethylphenol	330	ND	
2,4-Dichlorophenol	330	ND	
2,4,6-Trichlorophenol	330	ND	
4-Chloro-3-methylphenol	660	ND	
2,4-Dinitrophenol	1600	ND	
2,6-Dichlorophenol	--*	ND	
2-Methyl-4,6-Dinitrophenol	1600	ND	
Pentachlorophenol	1600	ND	
4-Nitrophenol	1600	ND	
Benzoic Acid	1600	ND	
2-Methylphenol	330	ND	
3- & 4-Methylphenol	330	ND	
2,3,4,6-Tetrachlorophenol	--*	ND	
2,4,5-Trichlorophenol	330	ND	

Analyst

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD 921

ES JOB NO.: OR001

PROJECT NAME/LOCATION: Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature) J. Hayden — Mike Ford

SHIP TO: ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkley, CA. 94710 8/26/88

SOILS ANALYSES REQUIRED: SW8010, 8020 | SW8080 | [illegible] | EPA 418.1 | SW6010, 7060, 7191 | SW7131, 7421, 7471

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SW8010, 8020	SW8080	[illegible]	EPA 418.1	SW6010, 7060, 7191	SW7131, 7421, 7471	REMARKS
8/26/88	0816	DANGB, 3MW25, SS1, 0-1'	1	X						Arsenic - SW7060 382146
8/26/88	0816	DANGB, 3MW25, SS1, 0-1'	1		X		X	X	X	Barium - SW6010
8/26/88	0820	DANGB, 3MW25, SS2, 2-3'	1	X						Cadmium - SW7131 382147
8/26/88	0820	DANGB, 3MW25, SS2, 2-3'	1		X		X	X	X	Chromium - SW7191
8/26/88	0852	DANGB, 3MW25, SS3, 14-15'	1	X						Lead - SW7421 382148
8/26/88	0852	DANGB, 3MW25, SS3, 14-15'	1		X		X	X	X	Mercury - SW7471

3030

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
J. Hayden	8/26/88 1800				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
		Bill [illegible]	8-27-88 12:00	rec'd cold & intact

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082131-88082133, 88082043-88082049
88082100-88082104, 88082146-88082148

QC Report No: AAF-S-0028-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-26-88
Date Reported: 10-13-88
Dilution Factor: See Notes
%Moisture: 7.8

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Arsenic	88082133	88082133	10-06-88	9-23-88	7060	<0.5	<5.0E	<5.0E	NC	4.34	2.71E	4.99E	53N	DF=10
Lead	88082133	88082133	10-04-88	9-23-88	7421	<0.5	2.82	3.53	22*	5.42	2.82	8.59	106	DF=NA

3031

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Case Narrative attached.
E See Legend attached.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (P.) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two
NA = Not Applicable
NC = Not Calculated
ND = Not Detected
SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082043-88082049, 88082100
SAMPLE NO(S).: 88082102, 88082104
SAMPLE NO(S).: 88082130-88082133
SAMPLE NO(S).: 88082146-88082148

As a result of extreme sample matrix interference, dilution was required for sample analysis. The reporting limit and MDL for the analyte(s) listed have increased as shown.

Analyte	Reporting Limit	MDL
Arsenic	10 mg/Kg	5.0 mg/Kg

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082133, 88082099-88082104
88082146-88082148, 88082130-88082132

QC Report No: ICP-S-0028-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-26-88
Date Reported: 10-13-88
Dilution Factor: NA
%Moisture: 7.8

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	RPD	SA	Spike Recovery SR	Spike Recovery SSR	PR	Notes
Barium	88082133	88082133	9-10-88	9-15-88	6010	<20	43.7	43.9	<1	217	43.7	275	107	
Cadmium	88082133	88082133	9-10-88	9-15-88	6010	<0.5	10.7	10.7	0	5.42	10.7	13.9	59N	A
Chromium	88082133	88082133	9-10-88	9-15-88	6010	<1.0	27.3	30.4	11	21.7	27.3	50.3	106	

30.33

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
N See Legend attached.
A See Case Narrative attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88081969-88081976, 88082043-88082049
SAMPLE NO(S).: 88082099-88082101, 88082102-88082104
SAMPLE NO(S).: 88082130-88082133, 88082146-88082148
QC REPORT NO.: ICP-S-0028-88
QC REPORT NO.: ICP-S-0031-88

Due to a suspected interelement matrix interference, all cadmium data at levels reportable by ICP analysis (≥1 mg/KG dry weight) are potentially false positives. This is being investigated and follow-up will be provided when available.

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082130-88082133, 88082146-88082152
88082156-88082163

QC Report No: CVM-S-0014-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-26-88
Date Reported: 10-13-88
Dilution Factor: NA
%Moisture: 8.4

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate C1	Duplicate C2	Duplicate RPD	Spike Recovery SA	Spike Recovery SR	Spike Recovery SSR	Spike Recovery PR	Notes
Mercury	88082130	88082130	9-21-88	9-21-88	7471	<0.1	<0.1	<0.1	NC	1.09	<0.1	1.14	105	

30.35

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

C1 = Concentration One
C2 = Concentration Two

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
Samples No.: 88081959-88081977
Samples No.: 88082043-88082049
Samples No.: 88082099-88082104
Samples No.: 88082130-88082133
Samples No.: 88082146-88082148

The results obtained for the laboratory control sample (LCS) analyzed with these samples for the analyte Mercury exceeded the recommended EPA recoveries. All data associated with this batch was closely inspected and no analytical problems were found. The initial and continuing calibration verification standards and blanks and precision and accuracy recoveries were within acceptable limits. The Mercury LCS was prepared at a concentration exceeding the linear range of the test.

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082130-88082133, 88082146-88082151
88082156-88082163

QC Report No: TPH-S-0055-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-26-88
Date Prepared: 9-19-88
Date Analyzed: 9-20-88
Date Reported: 9-27-88
Dilution Factor: 6
%Moisture: 7.5

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88082132	418.1	<100	130	1100	710	65	770	70	8	*

3037

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* Percent recovery and relative percent difference are within ES Laboratory control limits.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-1103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082146-88082148
88082156-88082163

QC Report No: VGC-S-0040-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 9-02-88
Date Prepared: NA
Date Analyzed: 9-09-88
Date Reported: 10-06-88
Dilution Factor: NA
% Moisture: 34.6

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88082158	1,1-dichloroethane	15.3	ND	18.7	122	17.3	113	8	20	58-124
	Trichloroethene	15.3	ND	12.6	82	11.3	74*	11	16	75-110
	Chlorobenzene	15.3	ND	12.8	84	11.6	76	10	21	71-125
	Aromatics: 8020									
88082158	Benzene	15.3	ND	13.2	86	11.7	76	12	26	75-123
	Toluene	15.3	ND	13.2	86	12.0	78*	10	16	79-115
	Chlorobenzene	15.3	ND	12.8	84	11.7	76*	9	24	82-112

3028

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* Asterisked values are outside of laboratory QC limits. Analysis of spiked blanks shows the laboratory to be in control.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082146-88082148
88082156-88082163

QC Report No: VGC-S-0040-88B
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: NA
Date Prepared: NA
Date Analyzed: 9-09-88
Date Reported: 10-06-88
Dilution Factor: NA
% Moisture: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
Blank	1,1-dichloroethane	10	ND	10.7	107	9.2	92	15	20	58-124
	Trichloroethene	10	ND	10.0	100	10.0	100	0	16	75-110
	Chlorobenzene	10	ND	9.5	95	10.6	106	11	21	71-125
	Aromatics: 8020									
Blank	Benzene	10	ND	10.2	102	9.7	97	5	26	75-123
	Toluene	10	ND	10.2	102	9.7	97	5	16	79-115
	Chlorobenzene	10	ND	10.1	101	9.9	99	2	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

88-A1-DULU0098 1

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/KG
Date Reported: 10-06-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
59	9-06-88	VGC	Carbopack	75-09-2	Dichloromethane	1.7	0.5	88082146-88082149
				67-66-3	Chloroform	0.2	0.05	

0740 3010

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY

QC REPORT NO.: VGC-S-0040-88
QC REPORT NO.: VGC-S-0040-88B

The quality control sample for this batch is from a different Martin Marietta project. Asterisked values are outside ES Laboratory QC limits. Analysis of s ike blanks showed the laboratory to be in control.

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082102-88082104
88082130-88082133
88082146-88082148

QC Report No.: OCP-S-0030-88
QC Sample No.: 88082104
Level (Low/Med): Low
Date Reported: 11-10-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2190	ND	103	141*	46-127
Heptachlor	2190	ND	109	150*	35-130
Aldrin	2190	ND	118	162*	34-132
Dieldrin	5460	ND	320	176*	31-134
Endrin	5460	ND	286	157*	42-139
4,4'-DDT	5460	ND	299	164*	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	77.3	106	141*	29	50	46-127
Heptachlor	84.4	116	150*	25	31	35-130
Aldrin	99.1	136*	162*	17	43	34-132
Dieldrin	256	141*	176*	22	38	31-134
Endrin	225	124	157*	24	45	42-139
4,4'-DDT	219	120	164*	31	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 8 out of 12 outside limits

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).:
88082102-88082104
88082130-88082133
88082146-88082148

QC Report No.: OCP-S-0030-88B
QC Sample No.: Blank
Level (Low/Med): Low
Date Reported: 11-10-88

Laboratory Supervisor Approval:

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	ND	63.0	95	46-127
Heptachlor	2000	ND	67.8	102	35-130
Aldrin	2000	ND	78.6	118	34-132
Dieldrin	5000	ND	190	114	31-134
Endrin	5000	ND	149	89	42-139
4,4'-DDT	5000	ND	187	112	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD	QC Limits REC
Lindane	43.5	65	95	37	50	46-127
Heptachlor	58.3	87	102	15	31	35-130
Aldrin	64.9	97	118	19	43	34-132
Dieldrin	171	103	114	11	38	31-134
Endrin	149	89	89	0	45	42-139
4,4'-DDT	154	92	112	19	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

PESTICIDE METHOD BLANK SUMMARY

Job No.:	OR001	Lab Name:	Engineering Science
		Lab Sample No.:	Blank
Client:	ES Oak Ridge		
Attn:	Bill Hayden	Matrix:	Soil
Address:	710 S. Illinois Avenue	Level (low/med):	Low
	Suite F-103	Extraction:	
	Oak Ridge, Tn. 37830	(SepF/Cont/Sonc):	Sonc
		Date Reported:	11-11-88
Project:	Duluth ANGB		
Date Extracted:	9-01-88		
Date Analyzed (1):	9-27-88	Date Analyzed (2):	
Time Analyzed (1):	10:21	Time Analyzed (2):	
Instrument ID (1):	5890 #2	Instrument ID (2):	
GC Column ID (1):	OV-1	GC Column ID (2):	

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88082102	9-27-88		
-	88082103	9-27-88		
-	88082104	9-27-88		
-	88082130	9-27-88		
-	88082131	9-27-88		
-	88082132	9-27-88		
-	88082133	9-27-88		
-	88082146	9-27-88		
-	88082147	9-27-88		
-	88082148	9-27-88		

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-S-0030-88
QC REPORT NO.: OCP-S-0030-88B

Percent recovery for some of the matrix spike and duplicate exceed EPA QC guidelines. Analysis of spiked blanks shows the laboratory to be in control.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up used on these samples.

Heptachor epoxide was accidently substituted for Heptachlor in the matrix spiking solution.

QUALITY CONTROL RESULTS SUMMARY
EPA METHOD 8270

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report No: BNA-S-0045-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-18-88
Date Prepared: 10-28-88
Date Analyzed: 11-02-88
Date Reported: 12-08-88
Dilution Factor: NA
%Moisture: 8

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88081887Re, 88081889, 88081939Re,
88081941Re-88081942Re, 88081955Re-88081956
88092146-88092147Re, 88092148, 88081879, 88081693Re-88081694Re

3046

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD	%Recovery
B/N Laboratory Sample # 88081942Re	1,2,4-Trichlorobenzene	4060	ND	2370	58	2840	70	18	23	38-107
	Acenaphthene	4060	ND	3660	90	3980	98	8	19	31-137
	2,4-Dinitrotoluene	4060	ND	5040	124*	5980	147*	17	47	28-89
	Pyrene	4060	ND	4880	120	5370	132	10	36	35-142
	N-Nitroso-di-n-Propylamine	4060	ND	5410	133*	5930	146*	9	38	41-126
	1,4-Dichlorobenzene	4060	ND	1460	36	1580	39	8	27	28-104
ACID Laboratory Sample # 88081942Re	Pentachlorophenol	8130	ND	10600	130*	11300	139*	6	47	17-109
	Phenol	8130	ND	6140	76	6910	85	12	35	26-90
	2-Chlorophenol	8130	ND	5840	72	6580	81	12	50	25-102
	4-Chloro-3-Methylphenol	8130	ND	10400	128*	11800	145*	13	33	26-103
	4-Nitrophenol	8130	ND	7320	90	5120	63	35	50	11-114

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Case Narrative attached.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
EPA METHOD 8270

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88081887Re, 88081889, 88081939Re, 88081941Re
88081942Re, 88091955Re-88091956, 88092146
88092147Re, 88092148, 88081879, 88081693Re-88081694Re

30447

QC Report No: BNA-S-0045-88B
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: NA
Date Prepared: 10-28-88
Date Analyzed: 11-02-88
Date Reported: 12-08-88
Dilution Factor: NA
%Moisture: NA

Laboratory Supervisor Approval:

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD	EPA QC Limit %Recovery
B/N Laboratory Sample # Blank	1,2,4-Trichlorobenzene	3330	ND	2600	78	2300	69	12	23	38-107
	Acenaphthene	3330	ND	2630	79	2200	66	18	19	31-137
	2,4-Dinitrotoluene	3330	ND	2870	86	2900	87	1	47	28-89
	Pyrene	3330	ND	3130	94	2930	88	7	36	35-142
	N-Nitroso-di-n-Propylamine	3330	ND	3430	103	2830	85	19	38	41-126
	1,4-Dichlorobenzene	3330	ND	2130	64	1800	54	17	27	28-104
ACID Laboratory Sample # Blank	Pentachlorophenol	6670	ND	6520	98	6070	91	7	47	17-109
	Phenol	6670	ND	3870	58	3240	48	18	35	26-90
	2-Chlorophenol	6670	ND	4200	63	3800	57	10	50	25-102
	4-Chloro-3-Methylphenol	6670	ND	6100	91	6170	92	1	33	26-103
	4-Nitrophenol	6670	ND	1590	24	.990	15	46	50	11-114

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082146-88082148
QC REPORT NO.: BNA-S-0045-88
QC REPORT NO.: BNA-S-0045-88B
WORK ORDER NO.: 921

The extracts of these samples were first analyzed one day out of holding time. There were two or more surrogate spikes for each sample that did not meet EPA QC limits. The samples were re-extracted out of holding time. Analysis showed good recoveries of surrogate spikes. The only target compound found was a small amount of bis(2ethylhexyl)phthalate in sample 88082148. Results of the second analysis of each sample are presented in this report.

Analysis of matrix spikes associated with the first extraction of these samples resulted in recoveries and RPD's for many of the spiked compounds that were outside EPA QC limits. Spiked blanks were analyzed with similar results. The data associated with these analyses were closely examined; no errors or problems were found.

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/KG
Date Reported: 12-12-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
S0564	11-21-88	BNA	1	-	None Detected	-	-	88081939Re 88081941Re, 88081942Re 88081955-88081956 88081887, 88081889 88092146Re-88092148Re

3049

418.1 INITIAL & CONTINUING CALIBRATION DATA

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Laboratory Sample No(s).:
88082146-88082151
88082156-88082163

Calibration Date: 9-22-88
Instrument I.D.: Perkin Elmer 257
Grating Infrared Spectrophotometer

Unit: mg/L
Date Reported: 11-09-88
R= 0.9982

Laboratory Supervisor Approval:

Standard	Concentration	Absorbance	/Continuous RF /Calibration /Verification
No. 1	0.59	0.105	
No. 2	1.2	0.187	RF = 6.63
No. 3	1.8	0.274	
No. 4	2.4	0.378	
Cont. Cal. No. 2 (88082146-88082151) (88082156-88082159)	1.04	0.184	87%
Cont. Cal. No. 2 (88082160-88082163)	1.04	0.189	87%

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082130-88082133, 88082146-88082151
88082156-88082163

QC Report No: TPH-S-0055-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-26-88
Date Prepared: 9-19-88
Date Analyzed: 9-20-88
Date Reported: 9-27-88
Dilution Factor: 6
%Moisture: 7.5

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88082132	418.1	<100	130	1100	710	65	770	70	8	*

3051

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* Percent recovery and relative percent difference are within ES Laboratory control limits.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082130-88082133, 88082146-88082151
88082156-88082163

QC Report No: TPH-S-0055-88B
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: NA
Date Prepared: 9-19-88
Date Analyzed: 9-20-88
Date Reported: 11-15-88
Dilution Factor: NA
%Moisture: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
Blank	418.1	<100	<100	1000	860	86	760	76	12	

2502 3052

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate

SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

GC/MS TUNING AND MASS CALIBRATION

Decafluorotriphenylphosphine (DFTPP)

Case No. 123456 Contractor Engineering Scien Contract No. 99999999

Instrument ID #1 Date / Time 10/13/88 9:35

Lab ID >11013::02 Data Release Authorized By:

m/z	ION ABUNDANCE CRITERIA	%RELATIVE ABUNDANCE	
51	30.0 - 60.0% of mass 198	39.03 OK	
68	less than 2.0% of mass 69	0.00 OK	(0.00) #1
69	mass 69 relative abundance	51.49	
70	less than 2.0% of mass 69	0.00 OK	(0.00) #1
127	40.0 - 60.0% of mass 198	43.10 OK	
197	less than 1.0% of mass 198	0.00 OK	
198	base peak, 100% relative abundance	100.00 OK	
199	5.0 - 9.0% of mass 198	5.68 OK	
275	10.0 - 30.0% of mass 198	18.74 OK	
365	greater than 1.00% of mass 198	1.94 OK	
441	present, but less than mass 443	8.13 OK	
442	greater than 40.0% of mass 198	56.52 OK	
443	17.0 - 23.0% of mass 442	10.28 OK	(18.19) #2

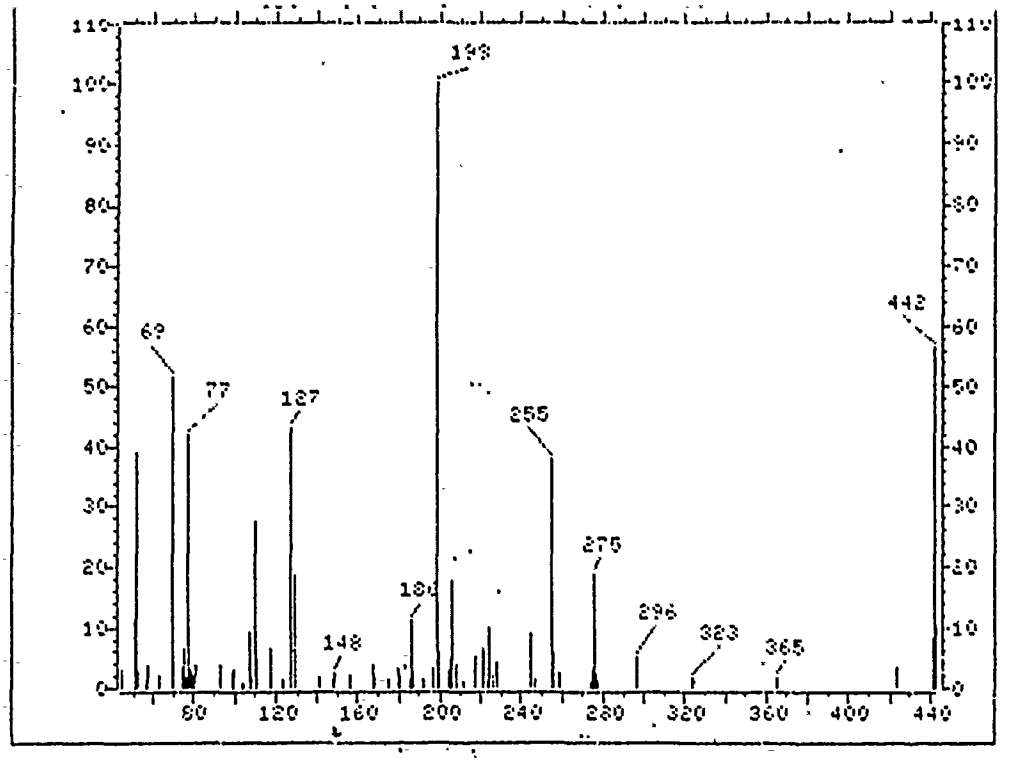
Spoint 10/12/88

THIS PERFORMANCE TUNE APPLIES TO THE FOLLOWING SAMPLES, BLANKS AND STANDARDS.

#1 - Value in parenthesis is % mass 69.
#2 - Value in parenthesis is % mass 442.

SAMPLE ID	LAB ID	DATE OF ANALYSIS	TIME OF ANALYSIS
		FORM V 7/85	
SSTD060	50155	10/13/88	9:55
8808 2146	50156		11:18
8808 2147	50157		12:18
8808 2148	50158		13:18
8808 2188 BN	50159		14:25
8808 1982 AC	50160		15:29
8808 2122 AC	50161		16:29
8808 2256 AC	50162		17:29
8808 1981 BN	50163		18:29
8808 1983 BN	50164 (d24:1)		19:27
8808 2189 AC	50165		20:26

another project



File:)I1013 Scan #: 90 Retn. time: 5.09

m/z	Int.	m/z	Int.	m/z	Int.	m/z	Int.	m/z	Int.
44.10	3.138	91.00	3.885	140.95	1.853	199.10	5.678	255.10	37.866
50.10	11.327	93.10	3.915	147.15	1.345	204.10	2.720	256.10	5.899
51.10	39.032	98.10	2.660	148.05	2.481	205.10	4.812	258.10	2.361
52.10	2.690	99.10	3.078	156.15	2.062	206.10	17.633	273.10	1.106
56.10	1.405	103.00	.867	167.15	3.736	207.20	3.736	274.15	3.078
57.00	3.706	104.00	.867	167.95	1.763	208.10	1.195	275.15	18.739
63.10	2.032	107.10	9.295	175.05	1.285	211.10	1.136	276.15	2.540
69.10	51.494	108.10	1.793	179.05	2.989	217.00	5.051	277.05	1.345
74.10	3.497	110.00	27.316	180.05	2.122	221.10	6.426	296.15	5.140
75.10	6.455	111.10	4.931	185.05	1.464	223.10	1.195	323.15	1.733
76.20	1.763	117.00	6.396	186.05	11.088	224.10	9.952	365.10	1.943
77.10	41.961	123.15	1.375	187.05	2.899	225.10	2.241	423.10	3.467
78.20	3.108	127.15	43.096	192.05	1.315	227.10	4.124	441.25	8.129
79.10	2.959	128.15	3.736	196.10	3.168	244.10	8.876	442.15	56.515
80.00	2.062	129.05	18.769	198.10	100.000	246.00	1.554	443.25	10.281

Continuing Calibration Check
HSL Compounds

Case No: ---------- Calibration Date: 10/13/88

Contractor: ENGINEERING - SCIENCE Time: 06:05

Contract No: ---------- Laboratory ID: >S0155

Instrument ID: 1 Initial Calibration Date: 10/12/88

Minimum $\overline{RF}$ for SPCC is Maximum % Diff for CCC is %

Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC
N-Nitroso-Dimethylamine	.90169	.93881	4.12		
2-Fluorophenol	1.15802	1.22425	5.72		
bis(2-Chloroethyl)ether	1.11892	1.14351	2.20		
Phenol	1.41657	1.56895	10.76	*	
Phenol-d5	1.22488	1.22828	.28		
Aniline	.54193	1.34709	148.57		
2-Chlorophenol	1.25175	1.28808	4.57		
1,3-Dichlorobenzene	1.47535	1.44848	1.82		
1,4-Dichlorobenzene	1.40530	1.38794	1.23	*	
Benzyl Chloride	-	-	-		
Benzyl Alcohol	.72906	.60516	16.99		
1,2-Dichlorobenzene	1.32240	1.29136	2.35		
2-Methylphenol	1.17367	1.30115	10.86		
3-&-4-Methylphenol	1.07139	1.07660	.49		
is(2-chloroisopropyl)Ether	2.15627	2.22471	3.17		
N-Nitroso-Di-n-Propylamine	.84050	.81297	3.28		**
Hexachloroethane	.53840	.46704	13.25		
Dibromochloropropane	-	-	-		
Nitrobenzene	.40312	.41786	3.66		
Nitrobenzene-d5	.39137	.40291	2.95		
2-Nitrophenol	.24657	.26490	7.43	*	
Isophorone	.74170	.80349	8.33		
bis(2-Chloroethoxy)methane	.49386	.51855	5.00		
2,4-Dimethylphenol	.34849	.37183	6.70		
Benzoic Acid	.29725	.33261	11.90		
2,4-Dichlorophenol	.56733	.57850	1.97	*	
1,2,4-Trichlorobenzene	.36913	.36949	.10		
Naphthalene	.94589	.95208	.65		
4-Chloroaniline	.36309	.46515	28.11		
Hexachlorobutadiene	.20283	.20604	1.58	*	
4-Chloro-3-Methylphenol	.31360	.32550	3.80	*	
2-Methylnaphthalene	.56397	.55809	1.04		

RF - Response Factor from daily standard file at 60.00 mg/L

$\overline{RF}$ - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

Continuing Calibration Check
HSL Compounds

Case No: _____ Calibration Date: 10/13/88

Contractor: ENGINEERING-SCIENCE Time: 06:05

Contract No: _____ Laboratory ID: >S0155

Instrument ID: 1 Initial Calibration Date: 10/[illegible]/88

Minimum $\overline{RF}$ for SPCC is _____ Maximum % Diff for CCC is _____%

Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC
Hexachlorocyclopentadiene	.29568	.42010	42.08		**
2,4,6-Trichlorophenol	.42280	.41720	1.32	*	
2,4,5-Trichlorophenol	.52897	.59048	11.63		
2-Fluorobiphenyl	1.27220	1.33877	5.23		
2-Chloronaphthalene	1.23784	1.29558	4.66		
2-Nitroaniline	.47288	.49676	5.05		
Dimethylphthalate	1.40629	1.41067	.31		
2,6-Dinitrotoluene	.37415	.38201	2.10		
Acenaphthylene	1.68918	1.75904	4.14		
3-Nitroaniline	.44557	.47985	7.69		
2,4-Dinitrophenol	.11898	.14319	20.34		**
Acenaphthene	1.13011	1.11299	1.52	*	
Dibenzofuran	1.64131	1.68601	2.72		
?,4-Dinitrotoluene	.28418	.28483	.23		
.-Nitrophenol	.28450	.31568	10.96		**
Fluorene	1.12850	1.05815	6.23		
Diethylphthalate	1.20939	1.12889	6.66		
4-Chlorophenyl-phenylether	.59183	.59889	1.19		
4-Nitroaniline	.35956	.38579	7.30		
2,4,6-Tribromophenol	.21023	.20195	3.94		
1,2-Diphenylhydrazine	-	-	-		
Alpha-BHC	-	-	-		
Beta-BHC	-	-	-		
Gamma-BHC	-	-	-		
Delta-BHC	-	-	-		
Heptachlor	-	-	-		
Aldrin	-	-	-		
N-Nitrosodiphenylamine	.40286	.48518	20.43	*	
4,6-Dinitro-2-Methylphenol	.10514	-	-		
4-Bromophenyl-phenylether	.21301	.21807	2.37		
Hexachlorobenzene	.26273	.26583	1.18		
Pentachlorophenol	.14536	.14829	2.02	*	

RF - Response Factor from daily standard file at 60.00 mg/L

$\overline{RF}$ - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

Continuing Calibration Check
HSL Compounds

Case No: _____ Calibration Date: 10/13/88

Contractor: ENGINEERING - SCIENCE Time: 06:05

Contract No: _____ Laboratory ID: >S0155

Instrument ID: 1 Initial Calibration Date: 10/[illegible]/88

Minimum $\overline{RF}$ for SPCC is _____ Maximum % Diff for CCC is _____ %

Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC
Phenanthrene	1.03431	1.02118	1.27		
Anthracene	1.05155	1.07180	1.93		
Di-n-Butylphthalate	1.51956	1.48606	2.20		
4,4'-Dibromobiphenyl	-	-	-		
Fluoranthene	1.19047	1.15840	2.69	*	
Heptachlor Epoxide	-	-	-		
Endosulfan I	-	-	-		
4,4'-DDE	-	-	-		
Dieldrin	-	-	-		
Endrin	-	-	-		
4,4'-DDD	-	-	-		
Endosulfa II	-	-	-		
Endrin Aldehyde	-	-	-		
4,4'-DDT	-	-	-		
adosulfan Sulfate	-	-	-		
Dibutylchlorendate	-	-	-		
Benzidine	.04023	.05956	48.05		
Pyrene	1.56086	1.47234	5.67		
Terphenyl-d14	1.05835	1.01204	4.38		
Butylbenzylphthalate	1.03390	1.00414	2.88		
3,3'-Dichlorobenzidine	.13689	.15815	15.53		
Chrysene	.99655	1.01219	1.57		
Benzo(a)Anthracene	1.10407	1.12933	2.29		
bis(2-Ethylhexyl)Phthalate	1.21073	1.17348	3.08		
Di-n-octylphthalate	3.40275	3.05709	10.16	*	
Benzo(a)Pyrene	1.32098	1.30916	.90	*	
Benzo(b)Fluoranthene	1.60850	1.56000	3.02		
Indeno(1,2,3-cd)Pyrene	.96800	.91524	5.45		
Dibenzo(a,h)Anthracene	.87481	.83034	5.08		
Benzo(k)Fluoranthene	1.44370	1.42801	1.09		
Benzo(g,h,i)Perylene	.89761	.85549	4.69		

RF - Response Factor from daily standard file at 60.00 mg/L

$\overline{RF}$ - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: Engineering Science Contract: OR$\phi\phi$1

Lab Code: _____ Case No.: _____ SAS No.: _____ Job No.: _____

Sample No.(Standard): SSTDϕ60 Date Analyzed: 10/13/88

Lab File ID (Standard): 50155 Time Analyzed: 9:55

Instrument ID: 1

	IS1(DCB) AREA #	RT	IS2(NPT) AREA #	RT	IS3(ANT) AREA #	RT
12 HOUR STD	37123	9.28	119972	12.89	60112	18.38
UPPER LIMIT	74246	9.78	239944	13.39	120224	18.88
LOWER LIMIT	18562	8.78	59986	12.39	30056	17.88
EPA SAMPLE NO.						
50156 01 8808210G	42372	9.26	160372	12.85	88076	18.35
57 02 8808214J	38328	9.26	139059	12.86	75325	18.36
58 03 8808214K	41627	9.27	153688	12.85	82307	18.35
59 04 8808213J BN	45302	9.28	153888	12.87	89367	18.37
60 05 8808198Z AC	39162	9.29	123200	12.97	75628	18.39
61 06 8808213J AC	63771	9.29	223185	12.89	127896*	18.38
62 07 8808#256 AC	43597	9.27	153920	12.87	83059	18.37
63 08 8808198I BN	62452*	9.41	71611	13.23	41522	18.30
64 09 8808198J BN Rwl	39732	9.28	139683	12.88	76586	18.37
65 10 8808218J AC	36200	9.27	129654	12.86	67654	18.36
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d8

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk.

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: Engineering Science Contract: OR00/1

Lab Code: _____ Case No.: _____ SAS No.: _____ Job No.: _____

Sample No.(Standard): SSTD062 Date Analyzed: 10/13/86

Lab File ID (Standard): SQ155 Time Analyzed: 9:55

Instrument ID: 1

	IS4(PHN) AREA #	RT	IS5(CRY) AREA #	RT	IS4(PRY) AREA #	RT
12 HOUR STD	98492	23.01	74816	31.49	46848	37.56
UPPER LIMIT	196984	23.51	149692	31.99	93696	38.06
LOWER LIMIT	49246	22.51	37423	30.99	23424	37.06
EPA SAMPLE NO.						
SQ1560 01 8808 2146	124131	23.00	88978	31.47	52346	37.55
02 8808 2147	118133	23.00	87536	31.46	46049	37.55
03 8808 2148	129816	23.00	100134	31.47	55340	37.55
04 8808 2127 BN	149197	23.01	103378	31.47	66186	37.57
05 8808 1982 AC	120158	23.03	84299	31.47	41785	37.57
06 8808 2128 AC	207161 *	23.04	151618 *	31.49	89182	37.62
07 8808 2250 AC	130211	23.01	86564	31.45	47388	37.55
08 8808 1981 BN	82447	22.98	69082	31.45	38268	37.54
09 8808 1983 BN Dil	114815	23.01	79868	31.47	48531	37.57
10 8808 2189 AC	104488	23.00	68082	31.45	35158	37.52
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

IS4 (PHN = Phenanthrene-d10
IS5 (CRY = Chrysene-d12
IS6 (PRY = Perylene-d12

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

\# Column used to flag internal standard area values with an asterisk

page __ of __

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DATA PACKAGE #59

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ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received by this laboratory on 7-13-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88071380	DANG-8-SS-F3	418.1	7-11-88	7-18-88	7-19-88	
88071380	DANG-8-SS-F3	MOIS	7-11-88		7-18-88	
88071380	DANG-8-SS-F3	8080	7-11-88	7-14-88	7-29-88	8-11-88
88071381	DANG-8-SS-B3	418.1	7-10-88	7-18-88	7-19-88	
88071381	DANG-8-SS-B3	MOIS	7-10-88		7-18-88	
88071381	DANG-8-SS-B3	8080	7-10-88	7-14-88	7-29-88	
88071382	DANG-8-SS-D2	418.1	7-11-88	7-18-88	7-19-88	
88071382	DANG-8-SS-D2	MOIS	7-11-88		7-18-88	
88071382	DANG-8-SS-D2	8080	7-11-88	7-14-88	7-29-88	
88071383	DANG-8-SS-D3	418.1	7-11-88	7-18-88	7-19-88	
88071383	DANG-8-SS-D3	MOIS	7-11-88		7-18-88	
88071383	DANG-8-SS-D3	8080	7-11-88	7-14-88	7-29-88	
88071384	DANG-8-SS-A3	418.1	7-11-88	7-18-88	7-19-88	
88071384	DANG-8-SS-A3	MOIS	7-11-88		7-18-88	
88071384	DANG-8-SS-A3	8080	7-11-88	7-14-88	7-29-88	8-11-88
88071385	DANG-8-SS-B2	418.1	7-11-88	7-18-88	7-19-88	
88071385	DANG-8-SS-B2	MOIS	7-11-88		7-18-88	
88071385	DANG-8-SS-B2	8080	7-11-88	7-14-88	7-29-88	8-11-88
88071386	DANG-8-SS-E3	418.1	7-11-88	7-18-88	7-19-88	
88071386	DANG-8-SS-E3	MOIS	7-11-88		7-18-88	
88071386	DANG-8-SS-E3	8080	7-11-88	7-14-88	7-29-88	
88071387	DANG-8-SS-A2	418.1	7-11-88	7-18-88	7-19-88	
88071387	DANG-8-SS-A2	MOIS	7-11-88		7-18-88	
88071387	DANG-8-SS-A2	8080	7-11-88	7-14-88	7-29-88	8-11-88
88071388	DANG-8-SS-G2	418.1	7-11-88	7-18-88	7-19-88	
88071388	DANG-8-SS-G2	MOIS	7-11-88		7-18-88	
88071388	DANG-8-SS-G2	8080	7-11-88	7-14-88	7-29-88	

ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88071389	DANG-8-SS-C3	418.1	7-11-88	7-18-88	7-19-88	
88071389	DANG-8-SS-C3	MOIS	7-11-88		7-18-88	
88071389	DANG-8-SS-C3	8080	7-11-88	7-14-88	7-19-88	
88071390	DANG-8-SS-C2	418.1	7-11-88	7-18-88	7-19-88	
88071390	DANG-8-SS-C2	MOIS	7-11-88		7-18-88	
88071390	DANG-8-SS-C2	8080	7-11-88	7-14-88	7-29-88	8-17-88
88071391	DANG-8-SS-D1	418.1	7-12-88	7-18-88	7-19-88	
88071391	DANG-8-SS-D1	MOIS	7-12-88		7-18-88	
88071391	DANG-8-SS-D1	8080	7-12-88	7-15-88	7-29-88	8-11-88
88071392	DANG-8-SS-G1	418.1	7-12-88	7-18-88	7-19-88	
88071392	DANG-8-SS-G1	MOIS	7-12-88		7-18-88	
88071392	DANG-8-SS-G1	8080	7-12-88	7-15-88	7-29-88	8-11-88
88071393	DANG-8-SS-E2	418.1	7-12-88	7-18-88	7-19-88	
88071393	DANG-8-SS-E2	MOIS	7-12-88		7-18-88	
88071393	DANG-8-SS-E2	8080	7-12-88	7-15-88	7-29-88	
88071394	DANG-8-SS-G0	418.1	7-12-88	7-18-88	7-19-88	
88071394	DANG-8-SS-G0	MOIS	7-12-88		7-18-88	
88071394	DANG-8-SS-G0	8080	7-12-88	7-15-88	7-29-88	8-11-88
88071395	DANG-8-SS-C0	418.1	7-12-88	7-18-88	7-20-88	
88071395	DANG-8-SS-C0	MOIS	7-12-88		7-18-88	
88071395	DANG-8-SS-C0	8080	7-12-88	7-15-88	7-30-88	
88071396	DANG-8-SS-C1	418.1	7-12-88	7-18-88	7-20-88	
88071396	DANG-8-SS-C1	MOIS	7-12-88		7-18-88	
88071396	DANG-8-SS-C1	8080	7-12-88	7-15-88	7-30-88	8-17-88
88071397	DANG-8-SS-B0	418.1	7-12-88	7-18-88	7-20-88	
88071397	DANG-8-SS-B0	MOIS	7-12-88		7-18-88	
88071397	DANG-8-SS-B0	8080	7-12-88	7-15-88	7-30-88	8-11-88
88071398	DANG-8-SS-F1	418.1	7-12-88	7-18-88	7-20-88	
88071398	DANG-8-SS-F1	MOIS	7-12-88		7-18-88	
88071398	DANG-8-SS-F1	8080	7-12-88	7-15-88	7-30-88	8-11-88
88071399	DANG-8-SS-A1	418.1	7-12-88	7-18-88	7-20-88	
88071399	DANG-8-SS-A1	MOIS	7-12-88		7-18-88	
88071399	DANG-8-SS-A1	8080	7-12-88	7-15-88	7-30-88	8-11-88
88071400	DANG-8-SS-E1	418.1	7-12-88	7-18-88	7-20-88	
88071400	DANG-8-SS-E1	MOIS	7-12-88		7-18-88	
88071400	DANG-8-SS-E1	8080	7-12-88	7-15-88	7-30-88	
88071401	DANG-8-SS-F0	418.1	7-12-88	7-18-88	7-20-88	
88071401	DANG-8-SS-F0	MOIS	7-12-88		7-18-88	
88071401	DANG-8-SS-F0	8080	7-12-88	7-15-88	7-30-88	

ES
ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col
88071402	DANG-8-SS-F2	418.1	7-12-88	7-18-88	7-20-88	
88071402	DANG-8-SS-F2	MOIS	7-12-88		7-18-88	
88071402	DANG-8-SS-F2	8080	7-12-88	7-15-88	7-30-88	
88071403	DANG-8-SS-B1	418.1	7-12-88	7-18-88	7-20-88	
88071403	DANG-8-SS-B1	MOIS	7-12-88		7-18-88	
88071403	DANG-8-SS-B1	8080	7-12-88	7-15-88	7-30-88	8-11-8
88071404	DANG-8-SS-A0	418.1	7-12-88	7-18-88	7-20-88	
88071404	DANG-8-SS-A0	MOIS	7-12-88		7-18-88	
88071404	DANG-8-SS-A0	8080	7-12-88	7-15-88	7-30-88	8-11-8
88071405	DANG-8-SS-D0	418.1	7-12-88	7-18-88	7-20-88	
88071405	DANG-8-SS-D0	MOIS	7-12-88		7-18-88	
88071405	DANG-8-SS-D0	8080	7-12-88	7-15-88	7-30-88	
88071406	DANG-8-SS-E0	418.1	7-12-88	7-18-88	7-20-88	
88071406	DANG-8-SS-E0	MOIS	7-12-88		7-18-88	
88071406	DANG-8-SS-E0	8080	7-12-88	7-15-88	7-30-88	

* If applicable

ANALYSIS REPORT

ORK ORDER NUMBER: 745
OB NUMBER : ZB0000000440
ORK ORDER DATE : 07/13/88

APPROVED BY _____
Lab Supervisor

EPORT DATA:
S OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
AK RIDGE, TN 37830
ILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (1341
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

ONTRACT / PO # : OR001
ONTACT : BILL HAYDEN

ASK: 5, UNITS: mg/Kg

EST COMPOUND	DANG-8-SS-F3 7-11-88 88071380	DANG-8-SS-B3 7-10-88 88071381	DANG-8-SS-D2 7-11-88 88071382	DANG-8-SS-D3 7-11-88 88071383	DANG-8-SS-A3 7-11-88 88071384	DANG-8-SS-B2 7-11-88 88071385
418.1 PETROLEUM HYDROCARBONS	<100	<100	<100	<100	<100	<100
MOISTURE	7.2	13.3	5.8	7.3	8.5	14.3

ID - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 743

TASK: 3, UNITS: mg/Kg

TEST COMPOUND	DANG-8-SS-E3 7-11-88 88071386	DANG-8-SS-A2 7-11-88 88071387	DANG-8-SS-G2 7-11-88 88071388	DANG-8-SS-C3 7-11-88 88071389	DANG-8-SS-C2 7-11-88 88071390	DANG-8-SS-D1 7-12-88 88071391
418.1 PETROLEUM HYDROCARBONS	<100	100	<100	<100	<100	<100
% MOISTURE	38.3	5.6	5.6	10.5	6.3	4.8

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 743

ASK: 3, UNITS: mg/Kg

EST COMPOUND	DANG-8-SS-G1 7-12-88 88071392	DANG-8-SS-E2 7-12-88 88071393	DANG-8-SS-G0 7-12-88 88071394	DANG-8-SS-C0 7-12-89 88071395	DANG-8-SS-C1 7-12-88 88071396	DANG-8-SS-B0 7-12-88 88071397
18.1 PETROLEUM HYDROCARBONS	<100	<100	3040	<100	<100	<100
MOISTURE	5.0	3.8	19.1	5.6	4.8	6.0

- Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 743

TASK: 5, UNITS: mg/Kg

TEST COMPOUND	DANG-8-SS-F1 7-12-88 88071398	DANG-8-SS-A1 7-12-88 88071399	DANG-8-SS-E1 7-12-88 88071400	DANG-8-SS-F0 7-12-88 88071401	DANG-8-SS-F2 7-12-88 88071402	DANG-8-SS-B1 7-12-88 88071403
418.1 PETROLEUM HYDROCARBONS	<100	740	<100	480	<100	<100
% MOISTURE	4.4	5.5	3.3	8.7	5.9	5.7

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 743

ASK: 3, UNITS: mg/Kg

TEST COMPOUND	DANG-8-SS-A0 7-12-88 88071404	DANG-8-SS-D0 7-12-88 88071405	DANG-8-SS-E0 7-12-88 88071406
418.1 PETROLEUM HYDROCARBONS	1540	<100	<100
MOISTURE	17.7	5.3	4.6

0 - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 745
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 07/15/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (154)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN

TASK: 4, UNITS: ug/KG, GROUP 8080

TEST COMPOUND	DANG-8-SS-F3 7-11-88 88071380	DANG-8-SS-B3 7-10-88 88071381	DANG-8-SS-D2 7-11-88 88071382	DANG-8-SS-D3 7-11-88 88071383	DANG-8-SS-A3 7-11-88 88071384	DANG-8-SS-B2 7-11-88 88071385
ALDRIN	ND	ND	ND	ND	ND	ND
ALPHA-BHC	ND	ND	ND	ND	ND	ND
BETA-BHC	ND	ND	ND	ND	ND	ND
DELTA-BHC	ND	ND	ND	ND	ND	ND
GAMMA-BHC	ND	ND	ND	ND	ND	ND
CHLORDANE	ND	ND	ND	ND	ND	ND
4,4'-DDD	29	ND	ND	ND	180	ND
4,4'-DDE	33	ND	ND	ND	130	ND
4,4'-DDT	77	ND	ND	ND	1500	ND
DIELDRIN	ND	ND	ND	ND	ND	ND
ENDOSULFAN I	ND	ND	ND	ND	ND	ND
ENDOSULFAN II	ND	ND	ND	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
ENDRIN	ND	ND	ND	ND	ND	ND
ENDRIN ALDEHYDE	NA	NA	NA	NA	NA	NA
HEPTACHLOR	ND	ND	ND	ND	ND	ND
HEPTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
KEPONE	NA	NA	NA	NA	NA	NA
METHOXYCHLOR	ND	ND	ND	ND	ND	ND
TOXAPHENE	ND	ND	ND	ND	ND	ND
PCB-1016	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 743

ASK: 4, UNITS: ug/KG, GROUP 8080

EST COMPOUND	DANG-8-SS-E3 7-11-88 88071386	DANG-8-SS-A2 7-11-88 88071387	DANG-8-SS-G2 7-11-88 88071388	DANG-8-SS-C3 7-11-88 88071389	DANG-8-SS-C2 7-11-88 88071390	DANG-8-SS-D1 7-12-88 88071391
LORIN	ND	ND	ND	ND	ND	ND
LPHA-BHC	ND	ND	ND	ND	ND	ND
ETA-BHC	ND	ND	ND	ND	ND	ND
ELTA-BHC	ND	ND	ND	ND	ND	ND
AMMA-BHC	ND	ND	ND	ND	ND	ND
HLORDANE	ND	ND	ND	ND	ND	ND
,4'-DDD	ND	ND	ND	ND	ND	ND
,4'-DDE	ND	ND	ND	ND	ND	ND
,4'-DDT	ND	74	ND	ND	ND	ND
IELDRIN	ND	ND	ND	ND	ND	ND
NDOSULFAN I	ND	ND	ND	ND	ND	ND
NDOSULFAN II	ND	ND	ND	ND	ND	ND
NDOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
NDRIN	ND	ND	ND	ND	ND	ND
NDRIN ALDEHYDE	NA	NA	NA	NA	NA	NA
EPTACHLOR	ND	ND	ND	ND	ND	ND
EPTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
EPONE	NA	NA	NA	NA	NA	NA
ETHOXYCHLOR	ND	ND	ND	ND	ND	ND
OXAPHENE	ND	ND	ND	ND	ND	ND
CB-1016	ND	ND	ND	ND	ND	ND
CB-1221	ND	ND	ND	ND	ND	ND
CB-1232	ND	ND	ND	ND	ND	ND
CB-1242	ND	ND	ND	ND	ND	ND
CB-1248	ND	ND	ND	ND	ND	ND
CB-1254	ND	ND	ND	ND	ND	330
CB-1260	ND	ND	ND	ND	ND	ND

D - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 743

TASK: 4. UNITS: ug/KG. GROUP 8080

TEST COMPOUND	DANG-8-SS-G1 7-12-88 88071392	DANG-8-SS-E2 7-12-88 88071393	DANG-8-SS-G0 7-12-88 88071394	DANG-8-SS-C0 7-12-88 88071395	DANG-8-SS-C1 7-12-88 88071396	DANG-8-SS-B0 7-12-88 88071397
ALDRIN	ND	ND	ND	ND	ND	ND
ALPHA-BHC	ND	ND	ND	ND	ND	ND
BETA-BHC	ND	ND	ND	ND	ND	ND
DELTA-BHC	ND	ND	ND	ND	ND	ND
GAMMA-BHC	ND	ND	ND	ND	ND	ND
CHLORDANE	ND	ND	ND	ND	ND	ND
4,4'-DDD	ND	ND	ND	ND	ND	21
4,4'-DDE	ND	ND	ND	ND	ND	18
4,4'-DDT	95	ND	ND	ND	ND	ND
DIELDRIN	ND	ND	ND	ND	33	ND
ENDOSULFAN I	ND	ND	ND	ND	ND	ND
ENDOSULFAN II	ND	ND	ND	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
ENDRIN	ND	ND	ND	ND	ND	ND
ENDRIN ALDEHYDE	NA	NA	NA	NA	NA	NA
HEPTACHLOR	ND	ND	ND	ND	ND	ND
HEPTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
KEPONE	NA	NA	NA	NA	NA	NA
METHOXYCHLOR	ND	ND	ND	ND	ND	ND
TOXAPHENE	ND	ND	ND	ND	ND	ND
PCB-1016	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 743

ASK: 4, UNITS: ug/KG, GROUP 8080

EST COMPOUND	DANG-8-SS-F1 7-12-88 88071398	DANG-8-SS-A1 7-12-88 88071399	DANG-8-SS-E1 7-12-88 88071400	DANG-8-SS-F0 7-12-88 88071401	DANG-8-SS-F2 7-12-88 88071402	DANG-8-SS-B1 7-12-88 88071403
LORIN	ND	ND	ND	ND	ND	ND
LPHA-BHC	ND	ND	ND	ND	ND	ND
ETA-BHC	ND	ND	ND	ND	ND	ND
ELTA-BHC	ND	ND	ND	ND	ND	ND
AMMA-BHC	ND	ND	ND	ND	ND	ND
HLORDANE	ND	ND	ND	ND	ND	ND
,4'-DDD	ND	25	ND	ND	ND	31
,4'-DDE	ND	27	ND	ND	ND	ND
,4'-DDT	20	110	ND	ND	24	71
IELDRIN	ND	ND	ND	ND	ND	ND
NDOSULFAN I	ND	ND	ND	ND	ND	ND
NDOSULFAN II	ND	ND	ND	ND	ND	ND
NDOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
NDRIN	ND	ND	ND	ND	ND	ND
NDRIN ALDEHYDE	NA	NA	NA	NA	NA	NA
EPTACHLOR	ND	ND	ND	ND	ND	ND
EPTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
EPONE	NA	NA	NA	NA	NA	NA
ETHOXYCHLOR	ND	ND	ND	ND	ND	ND
OXAPHENE	ND	ND	ND	ND	ND	ND
CB-1016	ND	ND	ND	ND	ND	ND
CB-1221	ND	ND	ND	ND	ND	ND
CB-1232	ND	ND	ND	ND	ND	ND
CB-1242	ND	ND	ND	ND	ND	ND
CB-1248	ND	ND	ND	ND	ND	ND
CB-1254	ND	ND	ND	ND	ND	ND
CB-1260	ND	ND	ND	ND	ND	ND

D - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 743

TASK: 4, UNITS: ug/KG, GROUP 8080

TEST COMPOUND	DANG-8-SS-A0 7-12-88 88071404	DANG-8-SS-D0 7-12-88 88071405	DANG-8-SS-E0 7-12-88 88071406
ALDRIN	ND	ND	ND
ALPHA-BHC	ND	ND	ND
BETA-BHC	ND	ND	ND
DELTA-BHC	ND	ND	ND
GAMMA-BHC	ND	ND	ND
CHLORDANE	ND	ND	ND
4,4'-DDD	ND	ND	ND
4,4'-DDE	ND	ND	ND
4,4'-DDT	ND	ND	ND
DIELDRIN	ND	ND	ND
ENDOSULFAN I	ND	ND	ND
ENDOSULFAN II	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND
ENDRIN	ND	ND	ND
ENDRIN ALDEHYDE	NA	NA	NA
HEPTACHLOR	ND	ND	ND
HEPTACHLOR EPOXIDE	ND	ND	ND
KEPONE	NA	NA	NA
METHOXYCHLOR	ND	ND	ND
TOXAPHENE	ND	ND	ND
PCB-1016	ND	ND	ND
PCB-1221	ND	ND	ND
PCB-1232	ND	ND	ND
PCB-1242	ND	ND	ND
PCB-1248	ND	ND	ND
PCB-1254	ND	ND	ND
PCB-1260	ND	ND	ND

ND - Not Detected

DRAFT

ENGINEERING-SCIENCE

Shipped 7/12/88

CHAIN OF CUSTODY RECORD CC-1

ES JOB NO.	PROJECT NAME/LOCATION
OR-001	DULUTH ANG BASE

SAMPLER(S): (Signature) [signature] Peter E. Thomson

SHIP TO: ENGINEERING-SCIENCE, INC
LABORATORY SERVICES DIVISION
800 BANCROFT WAY
BERKELEY, CALIFORNIA 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	ANALYSES REQUIRED: VOA - SW8010, SW8020	PEST/PCB - SW8080	SEMI-VOA - SW8270	PETHYDRO - EPA418.1	METALS - SW1310, SW7420, SW7130, SW7421, SW7471	REMARKS
7-11-88	1700	DANG-8-SS-F3	1	X		X			
7-10-88	1700	DANG-8-SS-B3	1	X		X			
7-11-88	1733	DANG-8-SS-D2	1	X		X			
7-11-88	1647	DANG-8-SS-D3	1	X		X			
7-11-88	1606	DANG-8-SS-A3	1	X		X			
7-11-88	1719	DANG-8-SS-B2	1	X		X			
7-11-88	1651	DANG-8-SS-E3	1	X		X			
7-11-88	1705	DANG-8-SS-A2	1	X		X			
7-11-88	1733	DANG-8-SS-G2	1	X		X			
7-11-88	1620	DANG-8-SS-C3	1	X		X			
7-11-88	1725	DANG-8-SS-C2	1	X		X			

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature]	7/12/88 1700				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

3076

FIGURE 5.1

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ENGINEERING SCIENCE

Shipped 7/12/88

CHAIN OF CUSTODY RECORD CC-2

ES JOB NO.	PROJECT NAME/LOCATION
OR-001	DULUTH ANG BASE

SAMPLER(S): (Signature)

SHIP TO:
ENGINEERING-SCIENCE, INC
LABORATORY SERVICES DIVISION
800 BANCROFT WAY
BERKELEY, CALIFORNIA 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	ANALYSES REQUIRED: VOA - SW8010, SW8020	PEST/PCB - SW8080	SEMI-VOA - SW8270	PETHYDRO - EPA418.1	METALS - SW6010, SW7060, SW7421, SW7841, SW7951	REMARKS
7-12-88	1049	DANG-8-SS-D1	1		X		X		
7-12-88	1005	DANG-8-SS-G1	1		X		X		
7-12-88	0932	DANG-8-SS-E2	1		X		X		
7-12-88	1335	DANG-8-SS-G0	1		X		X		
7-12-88	1353	DANG-8-SS-C0	1		X		X		
7-12-88	1104	DANG-8-SS-C1	1		X		X		
7-12-88	1345	DANG-8-SS-B0	1		X		X		
7-12-88	0955	DANG-8-SS-F1	1		X		X		
7-12-88	1131	DANG-8-SS-A1	1		X		X		
7-12-88	1021	DANG-8-SS-E1	1		X		X		
7-12-88	1405	DANG-8-SS-F0							

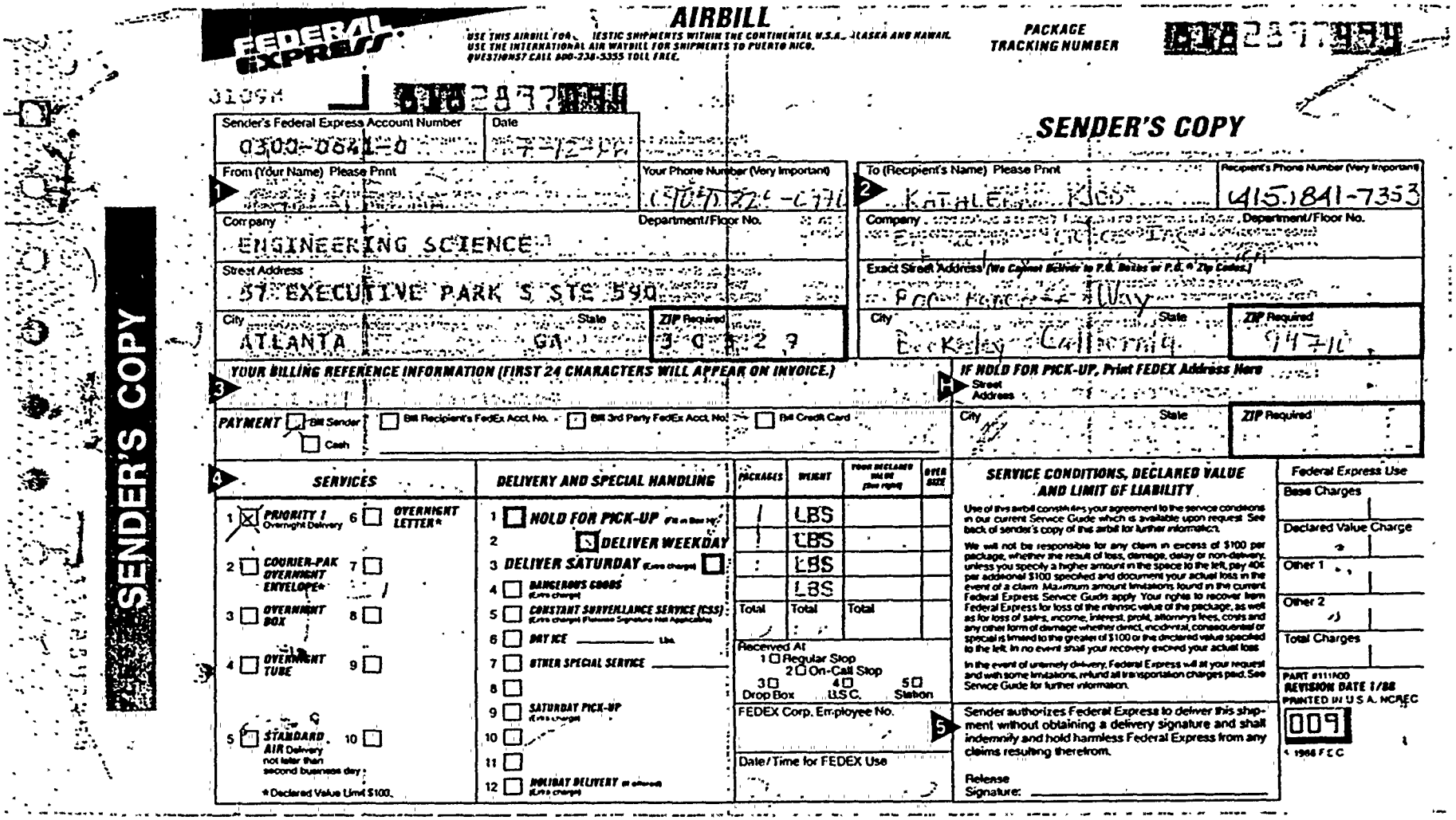
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	7/12/88 1700				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

FIGURE 5.1

DRAFT



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Street Address: 57 EXECUTIVE PARK S STE 590

City: ATLANTA | State: GA | ZIP Required: 3[illegible]

2 To (Recipient's Name) Please Print: KATHLEEN KISS | Recipient's Phone Number (Very Important): 415 841-7353

Company: [illegible] | Department/Floor No.

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes): [illegible] WAY

City: Berkeley | State: California | ZIP Required: 94710

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PAYMENT: Bill Sender; Cash; Bill Recipient's FedEx Acct. No.; Bill 3rd Party FedEx Acct. No.; Bill Credit Card

4 IF HOLD FOR PICK-UP, Print FEDEX Address Here

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4 SERVICES	DELIVERY AND SPECIAL HANDLING	PACKAGES	WEIGHT	YOUR DECLARED VALUE (See right)	OVER SIZE
1 ☒ PRIORITY 1 Overnight Delivery	1 ☐ HOLD FOR PICK-UP (Fill in Box 4)	1	LBS		
2 ☐ COURIER-PAK OVERNIGHT ENVELOPE*	2 ☒ DELIVER WEEKDAY	1	LBS		
3 ☐ OVERNIGHT BOX	3 DELIVER SATURDAY (Extra charges) ☐	:	LBS		
4 ☐ OVERNIGHT TUBE	4 ☐ DANGEROUS GOODS (Extra charge)		LBS		
5 ☐ STANDARD AIR Delivery not later than second business day	5 ☐ CONSTANT SURVEILLANCE SERVICE (CSS) (Extra charge) (Requires Signature Not Applicable)	Total	Total	Total	
6 ☐ OVERNIGHT LETTER*	6 ☐ DRY ICE ____ Lbs.				
7 ☐	7 ☐ OTHER SPECIAL SERVICE ____				
8 ☐	8 ☐				
9 ☐	9 ☐ SATURDAY PICK-UP (Extra charge)				
10 ☐	10 ☐				
	11 ☐				
	12 ☐ HOLIDAY DELIVERY (Extra charge)				

*Declared Value Limit $100.

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M-7

3078

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88071380-88071392

QC Report No: TPH-S-0032-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 7-13-88
Date Prepared: 7-18-88
Date Analyzed: 7-19-88
Date Reported: 7-26-88
Dilution Factor: NA
%Moisture: 7

Laboratory Supervisor Approval:

Laboratory Duplicates	Sample Nos. Spike	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88071380	88071380	418.1	<100	<100	1077	670	62	650	60	3	*

3079

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* = Percent recoveries are within the ES Laboratory QC limits.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate

SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88071393-88071406

QC Report No: TPH-S-0033-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 7-13-88
Date Prepared: 7-13-88
Date Analyzed: 7-20-88
Date Reported: 7-26-88
Dilution Factor: NA
%Moisture: 4

Laboratory Supervisor Approval:

M.W. Buxton

Laboratory Duplicates	Sample Nos. Spike	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88071393	88071393	418.1	<100	<100	1040	790	76	850	82	7	

3080

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
ORGANOCHLORINE PESTICIDES AND PCB'S
SW METHOD 8080

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88071380-88071399

QC Report No: OCP-S-0016-88B
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: NA
Date Prepared: 7-14-88
Date Analyzed: 7-29-88
Date Reported: 8-24-88
Dilution Factor: NA
%Moisture: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA RPD	QC Limits %Recovery
Blank	Aldrin	6.67	ND	6.17	92	6.90	103	11	43	34-132
	q-BHC(Lindane)	6.67	ND	5.83	87	6.63	99	13	50	46-127
3081	Dieldrin	16.7	ND	17.7	106	19.4	116	9	38	31-134
	Endrin	16.7	ND	18.3	110	20.0	120	9	45	42-139
	Heptachlor	6.67	ND	7.50	112	8.13	122	8	31	35-130
	4,4'-DDT	16.7	ND	20.8	125	21.5	129	3	50	23-134
	PCB-1260	----	--	----	---	-----	---	-	--	------

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (RPD)} = \frac{MS - MSD}{(MS + MSD)/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(MS \text{ or } MSD) - SR}{SA} \times 100$$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
ORGANOCHLORINE PESTICIDES AND PCB'S
SW METHOD 8080

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88071400-88071406

QC Report No: OCP-S-0017-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 7-13-88
Date Prepared: 7-15-88
Date Analyzed: 7-30-88
Date Reported: 8-24-88
Dilution Factor: 10
%Moisture: 3.3

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA RPD	QC Limits %Recovery
88071400	Aldrin	6.67	ND	4.0	60	4.3	64	7	43	34-132
03082	q-BHC(Lindane)	6.67	ND	4.0	60	3.2	48	22	50	46-127
	Dieldrin	16.7	ND	15.0	90	15.7	94	5	38	31-134
	Endrin	16.7	ND	11.7	70	12.0	72	3	45	42-139
	Heptachlor	6.67	ND	5.0	75	5.7	85	13	31	35-130
	4,4'-DDT	16.7	ND	15.7	94	18.0	108	14	50	23-134
	PCB-1260	----	--	----	--	----	---	--	--	------

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (RPD)} = \frac{MS - MSD}{(MS + MSD)/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(MS \text{ or } MSD) - SR}{SA} \times 100$$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/KG
Date Reported: 8-24-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
C728A14A	7-29-88	OCP	Mixed Phase	--	None Found	--	--	88071380-88071399
C728A44A	7-30-88	OCP	Mixed Phase	--	None Found	--	--	88071400-88071406

3083

QUALITY CONTROL RESULTS SUMMARY
ORGANOCHLORINE PESTICIDES AND PCB'S
SW METHOD 8080

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88071380-88071399

QC Report No: OCP-S-0016-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 7-13-88
Date Prepared: 7-14-88
Date Analyzed: 7-29-88
Date Reported: 8-24-88
Dilution Factor: 10
%Moisture: 7

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA RPD	QC Limits %Recovery
88071380	Aldrin	7.20	ND	5.08	70	5.94	82	16	43	34-132
	q-BHC(Lindane)	7.20	ND	1.92	27*	6.41	89	108*	50	46-127
	Dieldrin	18.0	ND	ND*	NC*	ND*	NC*	NC*	38	31-134
	Endrin	18.0	ND	13.8	77	14.4	80	4	45	42-139
	Heptachlor	7.20	ND	10.5	145*	11.3	157*	7	31	35-130
	4,4'-DDT	18.0	77	97.6	114	94.0	94	4	50	23-134
	PCB-1260	----	--	---	--	---	--	-	--	------

3084

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* = See Case Narrative attached.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
Samples No.: 88071380-88071399
QC REPORT NO.: OCP-S-0016-88

The matrix spiking compounds were added to samples 88071380 MS and MSD at levels lower than normal CLP spiking levels. In addition, there were interferences with Lindane and Dieldrin. The Lindane results are not very accurate, and the Dieldrin could not be calculated. Note that spiked blanks produced acceptable QC results.

418.1 INITIAL & CONTINUING CALIBRATION DATA

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Laboratory Sample No(s).:
88071380-88071392

Calibration Date: 7-19-88
Instrument I.D.: Perkin Elmer 257
Grating Infrared Spectrophotometer

Unit: mg/L
Date Reported: 11-09-88
R= 0.9975

Laboratory Supervisor Approval:

Standard	Concentration	Absorbance	/Continuous RF /Calibration /Verification
No. 1	0.59	0.148	
No. 2	1.2	0.251	RF = 5.65
No. 3	1.8	0.376	
No. 4	2.4	0.460	
Cont. Cal. No. 2 (88071380-88071384+QC)	1.17	0.251	98%
Cont. Cal. No. 2 (88071385-88071392)	1.17	0.251	98%

418.1 INITIAL & CONTINUING CALIBRATION DATA

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Laboratory Sample No(s).:
88071393-88071406

Calibration Date: 7-20-88
Instrument I.D.: Perkin Elmer 257
Grating Infrared Spectrophotometer

Unit: mg/L
Date Reported: 11-09-88
R= 0.9978

Laboratory Supervisor Approval:

Standard	Concentration	Absorbance	/Continuous RF /Calibration /Verification
No. 1	0.59	0.123	
No. 2	1.2	0.227	RF = 5.43
No. 3	1.8	0.327	
No. 4	2.4	0.458	
Cont. Cal. No. 2 (88071393-88071395)	1.19	0.227	99%
Cont. Cal. No. 2 (88071396-88071404)	1.23	0.235	102%
Cont. Cal. No. 2 (88071405-88071406)	1.32	0.252	110%

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88071380-88071392

QC Report No: TPH-S-0032-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 7-13-88
Date Prepared: 7-18-88
Date Analyzed: 7-19-88
Date Reported: 7-26-88
Dilution Factor: NA
%Moisture: 7

Laboratory Supervisor Approval:

Laboratory Duplicates	Sample Nos. Spike	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88071380	88071380	418.1	<100	<100	1077	670	62	650	60	3	*

3088

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* = Percent recoveries are within the ES Laboratory QC limits.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate

SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88071380-88071392

QC Report No: TPH-S-0032-88B
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: NA
Date Prepared: 7-18-88
Date Analyzed: 7-19-88
Date Reported: 11-15-88
Dilution Factor: NA
%Moisture: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
Blank	418.1	<100	<100	1000	780	78	770	77	1	

3089

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate

SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88071393-88071406

QC Report No: TPH-S-0033-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 7-13-88
Date Prepared: 7-13-88
Date Analyzed: 7-20-88
Date Reported: 7-26-88
Dilution Factor: NA
%Moisture: 4

Laboratory Supervisor Approval:

M.B. Burton

Laboratory Duplicates	Sample Nos. Spike	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88071393	88071393	418.1	<100	<100	1040	790	76	850	82	7	

3090

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate

SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

DATA PACKAGE #60

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ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082192	88082193
Sample No.:	DANGB-3-MW30-SS1	DANGB-3-MW30-SS1A
ate Sampled:	08-30-88	08-30-88
ime Sampled:	11:10	11:12
Date Extracted:	09-10-88	09-10-88
ate Analyzed:	10-19-88	11-30-88
ercent Moisture:	8	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
,3-Dichlorobenzene	330	ND	ND
,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
-Nitrosodi-n-propylamine	330	ND	ND
exachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
itrobenzene	330	ND	ND
sophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
-Chloronaphthalene	330	ND	ND
exachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
cenaphthene	330	ND	ND
imethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
exachlorobenzene	330	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

)R: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082192	88082193
ample No.:	DANGB-3-MW30-SS1	DANGB-3-MW30-SS1A
ate Sampled:	08-30-88	08-30-88
ime Sampled:	11:10	11:12
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	10-19-88	11-30-88
ercent Moisture:	8	8

ompound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
nenanthrene	330	ND	ND
nthracene	330	ND	ND
ibutyl phthalate	330	ND	ND
luoranthene	330	ND	ND
-Chlorophenyl phenyl ether	330	ND	ND
yrene	330	ND	ND
utyl Benzyl phthalate	330	ND	ND
is(2-ethylhexyl) phthalate	330	ND	ND
nrysene	330	ND	ND
-Bromophenyl phenyl ether	330	ND	ND
enzo(a)anthracene	330	ND	ND
i-n-octylphthalate	330	ND	ND
enzo(b)fluoranthene	330	ND	ND
enzo(k)fluoranthene	330	ND	ND
enzidine	2000	ND	ND
,3'-Dichlorobenzidine	660	ND	ND
enzo(a)pyrene	330	ND	ND
deno(1,2,3-cd)pyrene	330	ND	ND
ibenzo(a,h)anthracene	330	ND	ND
enzo(ghi)perylene	330	ND	ND
enzyl Alcohol	660	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082192	88082193
Sample No.:	DANGB-3-MW30-SS1	DANGB-3-MW30-SS1A
Date Sampled:	08-30-88	08-30-88
Time Sampled:	11:10	11:12
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	11-30-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
2-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

)R: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082192	88082193
ample No.:	DANGB-3-MW30-SS1	DANGB-3-MW30-SS1A
ate Sampled:	08-30-88	08-30-88
ime Sampled:	11:10	11:12
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	10-19-88	11-30-88
ercent Moisture:	8	8

ompound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
lpha-BHC	--*	ND	ND
amma-BHC	--*	ND	ND
eta-BHC	660	ND	ND
eptachlor	330	ND	ND
elta-BHC	500	ND	ND
ldrin	330	ND	ND
eptachlor epoxide	330	ND	ND
ndosulfan I	--*	ND	ND
ieldrin	500	ND	ND
,4'-DDE	1000	ND	ND
ndrin	--*	ND	ND
ndosulfan II	--*	ND	ND
,4'-DDD	500	ND	ND
,4'-DDT	830	ND	ND
ndosulfan Sulfate	1000	ND	ND
ndrin aldehyde	--*	ND	ND
ndrin Ketone	--*	ND	ND
lordane	2000	ND	ND
ethoxychlor	--*	ND	ND
oxaphene	2000	ND	ND
roclor-1016	2000	ND	ND
roclor-1221	2000	ND	ND
roclor-1232	2000	ND	ND
roclor-1242	2000	ND	ND
roclor-1248	2000	ND	ND
roclor-1254	2000	ND	ND
roclor-1260	2000	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082192	88082193
Sample No.:	DANGB-3-MW30-SS1	DANGB-3-MW30-SS1A
Date Sampled:	08-30-88	08-30-88
Time Sampled:	11:10	11:12
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	11-30-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
4-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
4-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082194	88082195
ample No.:	DANGB-3-MW30-SS2	DANGB-3-MW30-SS3
ate Sampled:	08-30-88	08-30-88
ime Sampled:	11:24	11:30
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	10-18-88	10-18-88
ercent Moisture:	8	11

ompound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
,3-Dichlorobenzene	330	ND	ND
,4-Dichlorobenzene	330	ND	ND
exachloroethane	330	ND	ND
is(2-chloroethyl)ether	330	ND	ND
,2-Dichlorobenzene	330	ND	ND
-Nitrosodimethylamine	330	ND	ND
is(2-chloroisopropyl)ether	330	ND	ND
-Nitrosodi-n-propylamine	330	ND	ND
exachlorobutadiene	330	ND	ND
,2,4-Trichlorobenzene	330	ND	ND
itrobenzene	330	ND	ND
sophorone	330	ND	ND
aphthalene	330	ND	ND
is(2-chloroethoxy)methane	330	ND	ND
-Chloronaphthalene	330	ND	ND
exachlorocyclopentadiene	330	ND	ND
cenaphthylene	330	ND	ND
cenaphthene	330	ND	ND
imethyl phthalate	330	ND	ND
,6-Dinitrotoluene	330	ND	ND
luorene	330	ND	ND
,4-Dinitrotoluene	330	ND	ND
iethyl phthalate	330	ND	ND
-Nitrosodiphenylamine	330	ND	ND
exachlorobenzene	330	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082194	88082195
Sample No.:	DANGB-3-MW30-SS2	DANGB-3-MW30-SS3
Date Sampled:	08-30-88	08-30-88
Time Sampled:	11:24	11:30
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-18-88	10-18-88
Percent Moisture:	8	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

B = Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

or: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082194	88082195
ample No.:	DANGB-3-MW30-SS2	DANGB-3-MW30-SS3
ate Sampled:	08-30-88	08-30-88
ime Sampled:	11:24	11:30
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	10-18-88	10-18-88
ercent Moisture:	8	11

ompound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
cetophenone	--*	ND	ND
niline	--*	ND	ND
-Aminobiphenyl	--*	ND	ND
-Chloroaniline	660	ND	ND
-Chloronaphthalene	--*	ND	ND
ibenzofuran	330	ND	ND
-Dimethylaminoazobenzene	--*	ND	ND
,12-Dimethylbenz(a)anthracene	--*	ND	ND
-,a-Dimethylphenethylamine	--*	ND	ND
iphenylamine	--*	ND	ND
,2-Diphenylhydrazine	--*	ND	ND
thyl methanesulfonate	--*	ND	ND
-Methylcholanthrene	--*	ND	ND
ethyl methanesulfonate	--*	ND	ND
-Methylnaphthalene	330	ND	ND
-Naphthylamine	--*	ND	ND
-Naphthylamine	--*	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroso-di-n-butylamine	--*	ND	ND
-Nitrosopiperidine	--*	ND	ND
entachlorobenzene	--*	ND	ND
entachloronitrobenzene	--*	ND	ND
henacetin	--*	ND	ND
-Picoline	--*	ND	ND
ronamide	--*	ND	ND
,2,4,5-Tetrachlorobenzene	--*	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082194	88082195
Sample No.:	DANGB-3-MW30-SS2	DANGB-3-MW30-SS3
Date Sampled:	08-30-88	08-30-88
Time Sampled:	11:24	11:30
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-18-88	10-18-88
Percent Moisture:	8	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

DR: ES:Oak Ridge/Duluth ANGB
ddress:710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082194	88082195
ample No.:	DANGB-3-MW30-SS2	DANGB-3-MW30-SS3
ate Sampled:	08-30-88	08-30-88
ime Sampled:	11:24	11:30
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	10-18-88	10-18-88
ercent Moisture:	8	11

ompound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
-Chlorophenol	330	ND	ND
-Nitrophenol	330	ND	ND
nenol	330	ND	ND
,4-Dimethylphenol	330	ND	ND
,4-Dichlorophenol	330	ND	ND
,4,6-Trichlorophenol	330	ND	ND
-Chloro-3-methylphenol	660	ND	ND
,4-Dinitrophenol	1600	ND	ND
,6-Dichlorophenol	--*	ND	ND
-Methyl-4,6-Dinitrophenol	1600	ND	ND
entachlorophenol	1600	ND	ND
-Nitrophenol	1600	ND	ND
enzoic Acid	1600	ND	ND
-Methylphenol	330	ND	ND
- & 4-Methylphenol	330	ND	ND
,3,4,6-Tetrachlorophenol	--*	ND	ND
,4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

OTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082196	88082197
Sample No.:	DANGB-3-MW29-SS1	DANGB-3-MW29-SS2
Date Sampled:	08-30-88	08-30-88
Time Sampled:	09:40	09:55
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-20-88	10-20-88
Percent Moisture:	10	10

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

B = Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082196	88082197
ample No.:	DANGB-3-MW29-SS1	DANGB-3-MW29-SS2
ate Sampled:	08-30-88	08-30-88
ime Sampled:	09:40	09:55
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	10-20-88	10-20-88
ercent Moisture:	10	10

ompound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
henanthrene	330	ND	ND
nthracene	330	ND	ND
ibutyl phthalate	330	ND	ND
luoranthene	330	ND	ND
-Chlorophenyl phenyl ether	330	ND	ND
yrene	330	ND	ND
utyl Benzyl phthalate	330	ND	ND
is(2-ethylhexyl) phthalate	330	ND	ND
hrysene	330	ND	ND
-Bromophenyl phenyl ether	330	ND	ND
enzo(a)anthracene	330	ND	ND
i-n-octylphthalate	330	ND	ND
enzo(b)fluoranthene	330	ND	ND
enzo(k)fluoranthene	330	ND	ND
enzidine	2000	ND	ND
,3'-Dichlorobenzidine	660	ND	ND
enzo(a)pyrene	330	ND	ND
ndeno(1,2,3-cd)pyrene	330	ND	ND
ibenzo(a,h)anthracene	330	ND	ND
enzo(ghi)perylene	330	ND	ND
enzyl Alcohol	660	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 31, 1988 Work Order: 932
Date Reported: December 7, 1988 Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB ATTN: Mr. Bill Hayden
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

Lab Number:	88082196	88082197
Sample No.:	DANGB-3-MW29-SS1	DANGB-3-MW29-SS2
Date Sampled:	08-30-88	08-30-88
Time Sampled:	09:40	09:55
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-20-88	10-20-88
Percent Moisture:	10	10

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
2-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

)R: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082196	88082197
ample No.:	DANGB-3-MW29-SS1	DANGB-3-MW29-SS2
ate Sampled:	08-30-88	08-30-88
ime Sampled:	09:40	09:55
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	10-20-88	10-20-88
ercent Moisture:	10	10

ompound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
lpha-BHC	--*	ND	ND
amma-BHC	--*	ND	ND
eta-BHC	660	ND	ND
eptachlor	330	ND	ND
elta-BHC	500	ND	ND
ldrin	330	ND	ND
eptachlor epoxide	330	ND	ND
ndosulfan I	--*	ND	ND
ieldrin	500	ND	ND
,4'-DDE	1000	ND	ND
ndrin	--*	ND	ND
ndosulfan II	--*	ND	ND
,4'-DDD	500	ND	ND
,4'-DDT	830	ND	ND
ndosulfan Sulfate	1000	ND	ND
ndrin aldehyde	--*	ND	ND
ndrin Ketone	--*	ND	ND
nlordane	2000	ND	ND
ethoxychlor	--*	ND	ND
oxaphene	2000	ND	ND
roclor-1016	2000	ND	ND
roclor-1221	2000	ND	ND
roclor-1232	2000	ND	ND
roclor-1242	2000	ND	ND
roclor-1248	2000	ND	ND
roclor-1254	2000	ND	ND
roclor-1260	2000	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address:710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082196	88082197
Sample No.:	DANGB-3-MW29-SS1	DANGB-3-MW29-SS2
Date Sampled:	08-30-88	08-30-88
Time Sampled:	09:40	09:55
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-20-88	10-20-88
Percent Moisture:	10	10

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
4-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082198	88082199
ample No.:	DANGB-3-MW29-SS3	DANGB-3-MW29-SS3A
ate Sampled:	08-30-88	08-30-88
ime Sampled:	10:00	10:07
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	11-30-88	10-18-88
ercent Moisture:	11	13

ompound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
,3-Dichlorobenzene	330	ND	ND
,4-Dichlorobenzene	330	ND	ND
exachloroethane	330	ND	ND
is(2-chloroethyl)ether	330	ND	ND
,2-Dichlorobenzene	330	ND	ND
-Nitrosodimethylamine	330	ND	ND
is(2-chloroisopropyl)ether	330	ND	ND
-Nitrosodi-n-propylamine	330	ND	ND
exachlorobutadiene	330	ND	ND
,2,4-Trichlorobenzene	330	ND	ND
itrobenzene	330	ND	ND
sophorone	330	ND	ND
aphthalene	330	ND	ND
is(2-chloroethoxy)methane	330	ND	ND
-Chloronaphthalene	330	ND	ND
exachlorocyclopentadiene	330	ND	ND
cenaphthylene	330	ND	ND
cenaphthene	330	ND	ND
imethyl phthalate	330	ND	ND
,6-Dinitrotoluene	330	ND	ND
luorene	330	ND	ND
,4-Dinitrotoluene	330	ND	ND
iethyl phthalate	330	ND	ND
-Nitrosodiphenylamine	330	ND	ND
exachlorobenzene	330	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 31, 1988 Work Order: 932
Date Reported: December 7, 1988 Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB ATTN: Mr. Bill Hayden
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

Lab Number:	88082198	88082199
Sample No.:	DANGB-3-MW29-SS3	DANGB-3-MW29-SS3A
Date Sampled:	08-30-88	08-30-88
Time Sampled:	10:00	10:07
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	11-30-88	10-18-88
Percent Moisture:	11	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

or: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082198	88082199
mple No.:	DANGB-3-MW29-SS3	DANGB-3-MW29-SS3A
ate Sampled:	08-30-88	08-30-88
me Sampled:	10:00	10:07
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	11-30-88	10-18-88
ercent Moisture:	11	13

ompound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
cetophenone	--*	ND	ND
niline	--*	ND	ND
-Aminobiphenyl	--*	ND	ND
-Chloroaniline	660	ND	ND
-Chloronaphthalene	--*	ND	ND
ibenzofuran	330	ND	ND
-Dimethylaminoazobenzene	--*	ND	ND
,12-Dimethylbenz(a)anthracene	--*	ND	ND
-,a-Dimethylphenethylamine	--*	ND	ND
iphenylamine	--*	ND	ND
,2-Diphenylhydrazine	--*	ND	ND
thyl methanesulfonate	--*	ND	ND
-Methylcholanthrene	--*	ND	ND
ethyl methanesulfonate	--*	ND	ND
-Methylnaphthalene	330	ND	ND
-Naphthylamine	--*	ND	ND
-Naphthylamine	--*	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroso-di-n-butylamine	--*	ND	ND
-Nitrosopiperidine	--*	ND	ND
entachlorobenzene	--*	ND	ND
entachloronitrobenzene	--*	ND	ND
henacetin	--*	ND	ND
-Picoline	--*	ND	ND
ronamide	--*	ND	ND
,2,4,5-Tetrachlorobenzene	--*	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082198	88082199
Sample No.:	DANGB-3-MW29-SS3	DANGB-3-MW29-SS3A
Date Sampled:	08-30-88	08-30-88
Time Sampled:	10:00	10:07
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	11-30-88	10-18-88
Percent Moisture:	11	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
ddress:710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082198	88082199
ample No.:	DANGB-3-MW29-SS3	DANGB-3-MW29-SS3A
ate Sampled:	08-30-88	08-30-88
ime Sampled:	10:00	10:07
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	11-30-88	10-18-88
ercent Moisture:	11	13

ompound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
-Chlorophenol	330	ND	ND
-Nitrophenol	330	ND	ND
henol	330	ND	ND
,4-Dimethylphenol	330	ND	ND
,4-Dichlorophenol	330	ND	ND
,4,6-Trichlorophenol	330	ND	ND
-Chloro-3-methylphenol	660	ND	ND
,4-Dinitrophenol	1600	ND	ND
,6-Dichlorophenol	--*	ND	ND
-Methyl-4,6-Dinitrophenol	1600	ND	ND
entachlorophenol	1600	ND	ND
-Nitrophenol	1600	ND	ND
enzoic Acid	1600	ND	ND
-Methylphenol	330	ND	ND
- & 4-Methylphenol	330	ND	ND
,3,4,6-Tetrachlorophenol	--*	ND	ND
,4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

OTE: Samples are discarded 30 days after results are rep[illegible]ness other arrangements are made. Hazardous samples wil[illegible]sturned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082200	88082201
Sample No.:	DANGB-3SG-D3-SS1	DANGB-3SG-D3-SS1A
Date Sampled:	08-31-88	08-31-88
Time Sampled:	11:55	11:58
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	10-19-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	540
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

B = Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

DR: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082200	88082201
ample No.:	DANGB-3SG-D3-SS1	DANGB-3SG-D3-SS1A
ate Sampled:	08-31-88	08-31-88
ime Sampled:	11:55	11:58
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	10-19-88	10-19-88
ercent Moisture:	8	8

ompound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
henanthrene	330	ND	ND
nthracene	330	ND	ND
ibutyl phthalate	330	ND	ND
luoranthene	330	ND	ND
-Chlorophenyl phenyl ether	330	ND	ND
yrene	330	ND	ND
utyl Benzyl phthalate	330	ND	ND
is(2-ethylhexyl) phthalate	330	ND	ND
hrysene	330	ND	ND
-Bromophenyl phenyl ether	330	ND	ND
enzo(a)anthracene	330	ND	ND
i-n-octylphthalate	330	ND	ND
enzo(b)fluoranthene	330	ND	ND
enzo(k)fluoranthene	330	ND	ND
enzidine	2000	ND	ND
,3'-Dichlorobenzidine	660	ND	ND
enzo(a)pyrene	330	ND	ND
ndeno(1,2,3-cd)pyrene	330	ND	ND
ibenzo(a,h)anthracene	330	ND	ND
enzo(ghi)perylene	330	ND	ND
enzyl Alcohol	660	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082200	88082201
Sample No.:	DANGB-3SG-D3-SS1	DANGB-3SG-D3-SS1A
Date Sampled:	08-31-88	08-31-88
Time Sampled:	11:55	11:58
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	10-19-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
2-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
4-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

-- EPA has not yet determined detection limits for these compounds.

* = Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

)R: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082200	88082201
ample No.:	DANGB-3SG-D3-SS1	DANGB-3SG-D3-SS1A
ate Sampled:	08-31-88	08-31-88
ime Sampled:	11:55	11:58
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	10-19-88	10-19-88
ercent Moisture:	8	8

ompound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
lpha-BHC	--*	ND	ND
amma-BHC	--*	ND	ND
eta-BHC	660	ND	ND
eptachlor	330	ND	ND
elta-BHC	500	ND	ND
ldrin	330	ND	ND
eptachlor epoxide	330	ND	ND
ndosulfan I	--*	ND	ND
ieldrin	500	ND	ND
,4'-DDE	1000	ND	ND
ndrin	--*	ND	ND
ndosulfan II	--*	ND	ND
,4'-DDD	500	ND	ND
,4'-DDT	830	ND	ND
ndosulfan Sulfate	1000	ND	ND
ndrin aldehyde	--*	ND	ND
ndrin Ketone	--*	ND	ND
lordane	2000	ND	ND
ethoxychlor	--*	ND	ND
oxaphene	2000	ND	ND
roclor-1016	2000	ND	ND
roclor-1221	2000	ND	ND
roclor-1232	2000	ND	ND
roclor-1242	2000	ND	ND
roclor-1248	2000	ND	ND
roclor-1254	2000	ND	ND
roclor-1260	2000	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082200	88082201
Sample No.:	DANGB-3SG-D3-SS1	DANGB-3SG-D3-SS1A
Date Sampled:	08-31-88	08-31-88
Time Sampled:	11:55	11:58
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	10-19-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
4-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

)R: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082202	88082203
ample No.:	DANGB-3SG-E3-SS1	DANGB-3SG-E3-SS1A
ate Sampled:	08-31-88	08-31-88
ime Sampled:	12:00	12:00
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	10-19-88	11-23-88
ercent Moisture:	10	9

ompound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
,3-Dichlorobenzene	330	ND	ND
,4-Dichlorobenzene	330	ND	ND
exachloroethane	330	ND	ND
is(2-chloroethyl)ether	330	ND	ND
,2-Dichlorobenzene	330	ND	ND
-Nitrosodimethylamine	330	ND	ND
is(2-chloroisopropyl)ether	330	ND	ND
-Nitrosodi-n-propylamine	330	ND	ND
exachlorobutadiene	330	ND	ND
,2,4-Trichlorobenzene	330	ND	ND
itrobenzene	330	ND	ND
sophorone	330	ND	ND
aphthalene	330	ND	ND
is(2-chloroethoxy)methane	330	ND	ND
-Chloronaphthalene	330	ND	ND
exachlorocyclopentadiene	330	ND	ND
cenaphthylene	330	ND	ND
cenaphthene	330	ND	ND
imethyl phthalate	330	ND	ND
,6-Dinitrotoluene	330	ND	ND
luorene	330	ND	ND
,4-Dinitrotoluene	330	ND	ND
iethyl phthalate	330	ND	1500
-Nitrosodiphenylamine	330	ND	ND
exachlorobenzene	330	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082202	88082203
Sample No.:	DANGB-3SG-E3-SS1	DANGB-3SG-E3-SS1A
Date Sampled:	08-31-88	08-31-88
Time Sampled:	12:00	12:00
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	11-23-88
Percent Moisture:	10	9

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

or: ES:Oak Ridge/Duluth ANGB
ddress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082202	88082203
ample No.:	DANGB-3SG-E3-SS1	DANGB-3SG-E3-SS1A
ate Sampled:	08-31-88	08-31-88
ime Sampled:	12:00	12:00
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	10-19-88	11-23-88
ercent Moisture:	10	9

ompound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
cetophenone	--*	ND	ND
niline	--*	ND	ND
-Aminobiphenyl	--*	ND	ND
-Chloroaniline	660	ND	ND
-Chloronaphthalene	--*	ND	ND
ibenzofuran	330	ND	ND
-Dimethylaminoazobenzene	--*	ND	ND
,12-Dimethylbenz(a)anthracene	--*	ND	ND
-,a-Dimethylphenethylamine	--*	ND	ND
iphenylamine	--*	ND	ND
,2-Diphenylhydrazine	--*	ND	ND
thyl methanesulfonate	--*	ND	ND
-Methylcholanthrene	--*	ND	ND
ethyl methanesulfonate	--*	ND	ND
-Methylnaphthalene	330	ND	ND
-Naphthylamine	--*	ND	ND
-Naphthylamine	--*	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroso-di-n-butylamine	--*	ND	ND
-Nitrosopiperidine	--*	ND	ND
entachlorobenzene	--*	ND	ND
entachloronitrobenzene	--*	ND	ND
henacetin	--*	ND	ND
-Picoline	--*	ND	ND
ronamide	--*	ND	ND
,2,4,5-Tetrachlorobenzene	--*	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

Date Received: August 31, 1988 Work Order: 932
Date Reported: December 7, 1988 Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB ATTN: Mr. Bill Hayden
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

Lab Number:	88082202	88082203
Sample No.:	DANGB-3SG-E3-SS1	DANGB-3SG-E3-SS1A
Date Sampled:	08-31-88	08-31-88
Time Sampled:	12:00	12:00
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	11-23-88
Percent Moisture:	10	9

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

)R: ES:Oak Ridge/Duluth ANGB
ldress:710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082202	88082203
ample No.:	DANGB-3SG-E3-SS1	DANGB-3SG-E3-SS1A
ate Sampled:	08-31-88	08-31-88
ime Sampled:	12:00	12:00
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	10-19-88	11-23-88
ercent Moisture:	10	9

ompound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
-Chlorophenol	330	ND	ND
-Nitrophenol	330	ND	ND
nenol	330	ND	ND
,4-Dimethylphenol	330	ND	ND
,4-Dichlorophenol	330	ND	ND
,4,6-Trichlorophenol	330	ND	ND
-Chloro-3-methylphenol	660	ND	ND
,4-Dinitrophenol	1600	ND	ND
,6-Dichlorophenol	--*	ND	ND
-Methyl-4,6-Dinitrophenol	1600	ND	ND
entachlorophenol	1600	ND	ND
-Nitrophenol	1600	ND	ND
enzoic Acid	1600	ND	ND
-Methylphenol	330	ND	ND
- & 4-Methylphenol	330	ND	ND
,3,4,6-Tetrachlorophenol	--*	ND	ND
,4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

)TE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

BLANK

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88082192-2203 B

Sample wt/vol: 30 (g/mL) g Lab File ID: E5923

Level: (low/med) low Date Received: —

% Moisture: not dec. 0 dec. _____ Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/20/88

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1

Number TICs found: 8 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	4.55	530	
2.			5.04	13000	
3.			6.24	230	
4.			23.96	600	
5.			28.70	1300	
6.			28.78	770	
7.			33.14	710	
8.			35.41	900	
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EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

DANGB-3-MW3C
SS1

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88082192

Sample wt/vol: 30 (g/mL) g Lab File ID: E5913

Level: (low/med) low Date Received: 8-31-88

% Moisture: not dec. ~~21~~ 8 dec. _____ Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/19/88

GPC Cleanup: (Y/N) N pH: ___ Dilution Factor: 1

Number TICs found: 22 CONCENTRATION UNITS: (ug/L or ug/Kg) ~~ug~~/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	4.21	800	
2.			4.61	870	
3.			5.08	18000	
4.			6.16	220	
5.			6.31	510	
6.			6.49	140	
7.			6.86	140	
8.			24.09	4000	
9.			26.18	180	
10.			26.45	720	
11.			26.68	250	
12.			28.77	4000	
13.			29.00	940	
14.			30.55	180	
15.			30.63	360	
16.			30.89	250	
17.			32.86	250	
18.			35.25	5800	
19.			35.74	22000	
20.			37.22	180	
21.			39.24	220	
22.			42.04	180	
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EPA SAMPLE NO.

DANGB-3-MW30
SB1A

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88092193 REANAL

Sample wt/vol: 30 (g/mL) gm Lab File ID: E6353

Level: (low/med) low Date Received: 8-31-88

% Moisture: not dec. DRD 7/7 8/02/88 dec. _____ Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 11/30/88

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1

Number TICs found: _____ CONCENTRATION UNITS: (ug/L or ug/Kg): ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	3.23	500	
2.			3.36	610	
3.			4.08	8300	
4.			4.19	830	
5.			4.73	4300	
6.			5.65	180	
7.	79-34-5	1,1,2,2-tetrachloroethane	5.88	180	
8.	57-10-3	hexadecanoic acid	23.60	1500	
9.		unknown phthalate	28.16	150	
10.		unknown	28.24	1400	
11.		unknown phthalate	30.13	310	
12.		unknown	30.19	180	
13.			31.22	180	
14.			32.53	140	
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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.: DANGB-3-MW30-SS2

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 8808219A

Sample wt/vol: 30 (g/mL) g Lab File ID: E5901

Level: (low/med) low Date Received: 8-31-88

% Moisture: not dec. 8 (DRY WEIGHT BASIS) dec. _____ Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/18/88

GPC Cleanup: (Y/N) N pH: ___ Dilution Factor: 1

Number TICs found: 8 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	127-18-4	tetrachloroethene	4.44	210	
2.		unknown	4.60	180	
3.			4.75	1400	
4.			4.85	1300	
5.			5.24	13000	
6.			6.36	510	
7.			28.72	400	
8.			35.69	8000	
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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

DANGB-3-m 130-553

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 8808219E5

Sample wt/vol: 30 (g/mL) g Lab File ID: E5902

Level: (low/med) low Date Received: 8-31-88

% Moisture: not dec. 11 g 8/30 dec. _____ Date Extracted: 9-10-88
8/31/88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/18/88

GPC Cleanup: (Y/N) N pH: ___ Dilution Factor: 1

Number TICs found: 11 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	4.47	180	
2.			4.68	420	
3.			5.13	11,000	
4.			6.35	280	
5.			6.89	180	
6.	57-10-3	hexadecanoic acid	24.05	1300.	
7.		unknown	26.45	420	
8.			29.16	640	
9.			31.09	280	
10.			33.19	1200	
11.			35.71	10,000	
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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.: DAN6B-3 - MW29-551

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88082196

Sample wt/vol: 30 (g/mL) g Lab File ID: E5918

Level: (low/med) low Date Received: 8-31-88

% Moisture: not dec. 9.6 10 dec. 8/28/88 dec. _____ Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/20/88

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1

Number TICs found: 16 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	4.36	18,000	
2.			4.42	280	
3.			4.49	260	
4.			4.85	11,000	
5.			4.91	1900	
6.			5.18	16,000	
7.	79-34-5	1,1,2,2-tetrachloroethane	6.24	3400	
8.		unknown	6.33	400	
9.			6.53	460	
10.			6.62	180	
11.			8.99	330	
12.			24.09	3000	
13.			26.46	370	
14.			28.78	1900	
15.			30.70	740	
16.			35.68	150	
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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

DANGB-3-MW29-552

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88082197

Sample wt/vol: 30 (g/mL) g Lab File ID: E5917

Level: (low/med) low Date Received: 8-31-88

% Moisture: not dec. ~~9.8~~ 10 ~~9/28/88~~ dec. _____ Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/20/88

GPC Cleanup: (Y/N) N pH: ___ Dilution Factor: 1

Number TICs found: 18 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	4.37	8500	
2.			4.85	4800	
3.			4.94	1800	
4.			5.19	11000	
5.			6.23	1000	
6.			6.33	180	
7.			6.54	700	
8.			12.63	180	
9.			18.86	150	
10.			24.06	2800	
11.			26.19	150	
12.			26.45	520	
13.			26.68	150	
14.			28.76	3000	
15.			28.99	300	
16.			33.24	150	
17.			35.56	1200	
18.			39.24	150	
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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

DANCB-3-MW29-553

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88092198 REANA

Sample wt/vol: 30 (g/mL) gm Lab File ID: S0607

Level: (low/med) low Date Received: 8-31-88

% Moisture: not dec. 11.4 DPO 9/26/88 dec. _____ Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 11/30/88

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1.

Number TICs found: 13 CONCENTRATION UNITS: (ug/L or ug/Kg): ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	3.32	230	
2.		↓	3.74	1000	
3.		↓	4.69	380	
4.	127-18-4	tetrachloroethene	5.09	260	
5.		unknown	5.35	2200	
6.		↓	5.75	12,000	
7.		↓	7.16	380	
8.	57-10-3	hexadecanoic acid	25.88	2600	
9.	57-11-4	octadecanoic acid	27.43	230	
10.		↓	29.74	1400	
11.		↓	31.94	230	
12.		↓	33.51	190	
13.		↓	34.65	380	
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FORM I SV-TIC 1/87 Rev.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

DANGB-3-MW29-553A

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88082199

Sample wt/vol: 30 (g/mL) g Lab File ID: E5904

Level: (low/med) low Date Received: 8-31-88

% Moisture: not dec. ~~12.7~~ 13 dec. _____ Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/18/88

GPC Cleanup: (Y/N) N pH: ___ Dilution Factor: 1

Number TICs found: 12 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	4.71	380	
2.			5.13	11,000	
3.			5.16	150	
4.			6.31	500	
5.			6.86	230	
6.			6.91	150	
7.	57-10-3	hexadecanoic acid	24.05	1300	
8.		unknown decanoic acid - mw wt. 284	26.45	380	
9.		unknown	26.68	150	
10.			28.74	2200	
11.			29.14	230	
12.			33.21	690	
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1F

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

DAN60-356-D3-551

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88082200

Sample wt/vol: 30 (g/mL) g Lab File ID: E5908

Level: (low/med) low Date Received: 8-31-88

% Moisture: not dec. 8 dec. _____ Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/19/88

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1

Number TICs found: 20 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	4.27	6500	
2.			4.46	870	
3.			4.64	690	
4.			4.72	250	
5.			5.12	21,000	
6.			6.19	1000	
7.			6.31	360	
8.			~~6.50~~ 7.20	440	
9.			12.47	180	
10.			18.66	250	
11.			24.10	3600	
12.			24.45	580	
13.			26.69	180	
14.			28.78	3300	
15.			28.84	2100	
16			28.99	290	
17.			30.32	470	
18.			33.25	290	
19.			35.80	1600	
20.			36.10	160	
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

1F

EPA SAMPLE NO.

DAN6B-356-D3-551A

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88082201

Sample wt/vol: 30 (g/mL) g Lab File ID: E5910

Level: (low/med) low Date Received: 8-31-88

% Moisture: not dec. 29 dec. _____ Date Extracted: 9-10-88

DD 2/28/88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/19/88

GPC Cleanup: (Y/N) N pH: ___ Dilution Factor: 1

Number TICs found: 21 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	4.29	6200	
2.			4.32	320	
3.			4.64	360	
4.			4.74	1200	
5.			5.18	26,000	
6.			5.24	650	
7.			6.20	870	
8.			6.33	1200	
9.			6.53	830	
10.			24.07	2800	
11.			26.45	580	
12.			26.68	250	
13.			28.78	4000	
14.			28.83	2700	
15.			29.00	500	
16.			30.46	290	
17.			32.85	190	
18.			33.25	4500	
19.			35.77	18000	
20.			36.09	250	
21.			39.26	180	
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

1F

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

DANGB 356-
E3-551

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88082202

Sample wt/vol: 30 (g/mL) g Lab File ID: E5911

Level: (low/med) low Date Received: 8-31-88

% Moisture: not dec. 95 10 dec. _____ Date Extracted: 9-10-88
DRO 9/21/88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/19/88

GPC Cleanup: (Y/N) N pH: ___ Dilution Factor: 1

Number TICs found: 17 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	4.33	290	
2.			4.62	480	
3.			5.11	8500	
4.			6.30	220	
5.			16.87	150	
6.			24.86	2500.	
7.			26.45	520	
8.			26.69	220	
9.			28.78	4000	
10.			28.84	2300	
11.			28.99	590	
12.			30.44	480	
13.			30.89	260	
14.			33.25	4300	
15.		unknown saturated hydrocarbon	34.71	160	
16.		unknown	~~42.05~~ 35.83	670	
17.		unknown	42.05	210	
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA Sample No. DANGB-356-E3-SS1A

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88092203

Sample wt/vol: 30 (g/mL) g Lab File ID: S0584

Level: (low/med) low Date Received: 8-31-88

% Moisture: not dec. 9 dec. _____ Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 11-23-88

GPC Cleanup: (Y/N) N pH: ___ Dilution Factor: 1

Number TICs found: _____ CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	3.37	950	
2.			3.48	620	
3.			3.59	170	
4.			3.85	270	
5.			4.60	480	
6.			4.86	2100	
7.			5.38	1400	
8.			5.97	8500	
9.					
10.		unknown alkyl benzene	20.56	300	
11.	57-10-3	hexadecanoic acid	25.03	2600	
12.		unknown carboxylic acid	27.45	150	
13.		unknown	29.79	3000	
14.			34.71	1500	
15.			37.81	3100	
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

QUALITY CONTROL RESULTS SUMMARY
EPA METHOD 8270

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082192-88082203
88082223-88082227

QC Report No: BNA-S-0048-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-31-88
Date Prepared: 9-10-88
Date Analyzed: 10-19-88
Date Reported: 12-13-88
Dilution Factor: NA
%Moisture: 8

Laboratory Supervisor Approval:

31.26

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD	EPA QC Limit %Recovery
B/N Laboratory Sample # 88082200	1,2,4-Trichlorobenzene	3620	ND	1740	48	1630	45	6.4	23	38-107
	Acenaphthene	3620	ND	2500	69	1590	44	44*	19	31-137
	2,4-Dinitrotoluene	3620	ND	3910	108*	2320	64	51*	47	28-89
	Pyrene	3620	ND	2170	60	1340	37	47*	36	35-142
	N-Nitroso-di-n-Propylamine	3620	ND	3370	93	2100	58	46*	38	41-126
	1,4-Dichlorobenzene	3620	ND	1230	34	1010	28	19	27	28-104
ACID Laboratory Sample # 88082200	Pentachlorophenol	7250	ND	9780	135*	5620	78	53*	47	17-109
	Phenol	7250	ND	6810	94*	4200	58	47*	35	26-90
	2-Chlorophenol	7250	ND	5250	72	3590	50	36	50	25-102
	4-Chloro-3-Methylphenol	7250	ND	8510	117*	6120	84	32	33	26-103
	4-Nitrophenol	7250	ND	7570	104	7570	104	0	50	11-114

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
EPA METHOD 8270

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082192-88082203
88082223-88082227

QC Report No: BNA-S-0048-88B
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: NA
Date Prepared: 9-10-88
Date Analyzed: 10-20-88
Date Reported: 12-13-88
Dilution Factor: NA
%Moisture: NA

Laboratory Supervisor Approval:

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD	EPA QC Limit %Recovery
B/N Laboratory Sample # Blank 31827	1,2,4-Trichlorobenzene	3330	ND	1260	38	23	1*	200*	23	38-107
	Acenaphthene	3330	ND	1710	51	1010	30*	51*	19	31-137
	2,4-Dinitrotoluene	3330	ND	2230	67	3370	101	41	47	28-89
	Pyrene	3330	ND	2250	68	3250	98	36	36	35-142
	N-Nitroso-di-n-Propylamine	3330	ND	2150	65	2030	61	6	38	41-126
	1,4-Dichlorobenzene	3330	ND	753	23*	ND	NC*	NC*	27	28-104
ACID Laboratory Sample # Blank	Pentachlorophenol	6670	ND	3700	55	8770	131*	81*	47	17-109
	Phenol	6670	ND	3470	52	2610	39	28	35	26-90
	2-Chlorophenol	6670	ND	2990	45	1210	18*	85*	50	25-102
	4-Chloro-3-Methylphenol	6670	ND	4900	73	6000	90	20	33	26-103
	4-Nitrophenol	6670	ND	5530	83	9470	142*	52*	50	11-114

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Case Narrative attached.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: BNA-S-0048-88
QC REPORT NO.: BNA-S-0048-88B
WORK ORDER NO.: 932

The first analysis of samples 88082193, 88082199 and 88082203 resulted in slightly low recoveries of surrogate spikes. These extracts were re-analyzed out of the extract holding time period. Acceptable surrogate recoveries were obtained from these second analyses. The data from the second analysis are reported.

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/KG
Date Reported: 12-12-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
E5923	10-20-88	BNA	2	-	None Detected	-	-	88082192-88082203 88082223-88082227

3129

SEMIVOLATILE METHOD BLANK SUMMARY
4B

Job No.:

Client:
Attn:
Address:

Work Order No.:
Lab Sample No.: 03-71
Lab File ID: ES923
Matrix: soil
Level (low/med):
Date Analyzed: 10-20-88
Time Analyzed: 14:59
Instrument ID:
Date Reported:

Project: Duluth

This Method Blank applies to the following samples, MS and MSD.

Sample Number	Lab Sample ID	Lab File ID	Date of Analysis
ANGB-3-MW30-SS1	88082192	ES913	10-19-88
MW30-SS1A	88082193	ES900, E6353	10-18-88, 11-30-88
MW30-SS2	88082194	ES901	10-18-88
MW30-SS3	88082195	ES902	10 18-88
MW29-SS1	88082196	ES918	10-20-88
MW29-SS2	88082197	ES917	10-20-88
MW29-SS3	88082198	ES903, S0607	10-18-88, 11-30-88
MW29-SS3A	88082199	ES904	10-18-88
ANGB-3SG-D3 SS1	88082200	ES908	10-19-88
	88082200MS	ES931, ES907	10-20-88, 10-19-88
	88082200MSD	ES932, ES909	10-20-88, 10-19-88
-D3 SS1A	88082201	ES910	10-19-88
-E3 SS1	88082202	ES911	10-19-88
-E3 SS1A	88082203	ES912	10-19-88
ANGB-2BH1-SS6 15-17	88082223	ES926	10-20-88
-2BH1-SS7 20-24	88082224	ES927, ES947	10-20-88, 10-22-88
-2BH2-SS4 14-15	88082225	ES928	10-20-88
-2BH2-SS5 20-22	88082226	ES929	10-20-88
-2BH2-SS6 24-25	88082227	ES930, ES948	10-20-88, 10-22-88
	BLANK. MS	ES924	10-24-88

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn.

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082192-88082203, 88082186-88082188

QC Report No: TPH-S-0081-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-31-88
Date Prepared: 9-26-88
Date Analyzed: 9-27-88
Date Reported: 11-22-88
Dilution Factor: 8
%Moisture: 7.8

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88082192	418.1	<100	<100	1100	760	69	730	66	4	*
Blank	418.1	<100	<100	1000	700	70	800	80	13	*

3141

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* Percent recovery and relative percent difference are within ES Laboratory limits for matrix spike and blank spike.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate

SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn.

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082192-88082203, 88082186-88082188

QC Report No: TPH-S-0081-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-31-88
Date Prepared: 9-26-88
Date Analyzed: 9-27-88
Date Reported: 11-22-88
Dilution Factor: 8
%Moisture: 7.8

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88082192	418.1	<100	<100	1100	760	69	730	66	4	*
Blank	418.1	<100	<100	1000	700	70	800	80	13	*

3142

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* Percent recovery and relative percent difference are within ES Laboratory limits for matrix spike and blank spike.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate

SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

DATA PACKAGE #61

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Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

Date Received: August 16, 1988 Work Order: 856
Date Reported: October 25, 1988 Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB ATTN: Mr. Bill Hayden
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 16, 1988 Work Order: 856
Date Reported: October 25, 1988 Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB ATTN: Mr. Bill Hayden
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: October 2[illegible], 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address:710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND

Laura Kirk
Analyst

[illegible]
Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 16, 1988 Work Order: 856
Date Reported: October 25, 1988 Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB ATTN: Mr. Bill Hayden
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 16, 1988 Work Order 856
Date Reported: October 25, 1988 Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB ATTN: Mr. Bill Hayden
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address:710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND

Laura Kuck
Analyst

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081887	88081888
Sample No.:	DANGB2-MW37-SS5	DANGB2-MW39-SS1
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:24
Date Extracted:	10-28-88	08-25-88
Date Analyzed:	11-02-88	10-03-88
Percent Moisture:	10	12

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

B = Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

.e Received: August 16, 1988
e Reported: December 9, 1988

Work Order: 856
Job Number: OR001

:: ES:Oak Ridge/Duluth ANGB
lress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

) Number:	88081887	88081888
ıple No.:	DANGB2-MW37-SS5	DANGB2-MW39-SS1
:e Sampled:	8-15-88	8-15-88
ıe Sampled:	13:28	16:24
:e Extracted:	10-28-88	08-25-88
:e Analyzed:	11-02-88	10-03-88
·cent Moisture:	10	12

ıpound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
ənanthrene	330	ND	ND
:hracene	330	ND	ND
)utyl phthalate	330	ND	ND
ıoranthene	330	ND	ND
Chlorophenyl phenyl ether	330	ND	ND
:ene	330	ND	ND
:yl Benzyl phthalate	330	ND	ND
s(2-ethylhexyl) phthalate	330	ND	ND
:ysene	330	ND	ND
Bromophenyl phenyl ether	330	ND	ND
ızo(a)anthracene	330	ND	ND
-n-octylphthalate	330	ND	ND
ızo(b)fluoranthene	330	ND	ND
ızo(k)fluoranthene	330	ND	ND
ızidine	2000	ND	ND
;'-Dichlorobenzidine	660	ND	ND
ızo(a)pyrene	330	ND	ND
ieno(1,2,3-cd)pyrene	330	ND	ND
)enzo(a,h)anthracene	330	ND	ND
ızo(ghi)perylene	330	ND	ND
ızyl Alcohol	660	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081887	88081888
Sample No.:	DANGB2-MW37-SS5	DANGB2-MW39-SS1
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:24
Date Extracted:	10-28-88	08-25-88
Date Analyzed:	11-02-88	10-03-88
Percent Moisture:	10	12

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
2-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
4-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

:e Received: August 16, 1988
:e Reported: December 9, 1988

Work Order: 856
Job Number: OR001

:: ES:Oak Ridge/Duluth ANGB
dress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

) Number:	88081887	88081888
mple No.:	DANGB2-MW37-SS5	DANGB2-MW39-SS1
:e Sampled:	8-15-88	8-15-88
ne Sampled:	13:28	16:24
:e Extracted:	10-28-88	08-25-88
:e Analyzed:	11-02-88	10-03-88
:cent Moisture:	10	12

mpound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
)ha-BHC	--*	ND	ND
mma-BHC	--*	ND	ND
:a-BHC	660	ND	ND
)tachlor	330	ND	ND
lta-BHC	500	ND	ND
drin	330	ND	ND
)tachlor epoxide	330	ND	ND
dosulfan I	--*	ND	ND
eldrin	500	ND	ND
4'-DDE	1000	ND	ND
drin	--*	ND	ND
dosulfan II	--*	ND	ND
4'-DDD	500	ND	ND
4'-DDT	830	ND	ND
dosulfan Sulfate	1000	ND	ND
drin aldehyde	--*	ND	ND
drin Ketone	--*	ND	ND
lordane	2000	ND	ND
choxychlor	--*	ND	ND
xaphene	2000	ND	ND
)clor-1016	2000	ND	ND
)clor-1221	2000	ND	ND
)clor-1232	2000	ND	ND
)clor-1242	2000	ND	ND
)clor-1248	2000	ND	ND
)clor-1254	2000	ND	ND
)clor-1260	2000	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081887	88081888
Sample No.:	DANGB2-MW37-SS5	DANGB2-MW39-SS1
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:24
Date Extracted:	10-28-88	08-25-88
Date Analyzed:	11-02-88	10-03-88
Percent Moisture:	10	12

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
4-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

:e Received: August 16, 1988
:e Reported: December 9, 1988

Work Order: 856
Job Number: OR001

:: ES:Oak Ridge/Duluth ANGB
lress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

) Number:	88081889	88081890
ıple No.:	DANGB2-MW39-SS2	DANGB2-MW39-SS3
:e Sampled:	8-15-88	8-15-88
ne Sampled:	16:42	17:05
:e Extracted:	10-28-88	8-25-88
:e Analyzed:	11-02-88	10-03-88
:cent Moisture:	13	8

npound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
3-Dichlorobenzene	330	ND	ND
4-Dichlorobenzene	330	ND	ND
:achloroethane	330	ND	ND
s(2-chloroethyl)ether	330	ND	ND
2-Dichlorobenzene	330	ND	ND
Nitrosodimethylamine	330	ND	ND
s(2-chloroisopropyl)ether	330	ND	ND
Nitrosodi-n-propylamine	330	ND	ND
:achlorobutadiene	330	ND	ND
:,4-Trichlorobenzene	330	ND	ND
:robenzene	330	ND	ND
ophorone	330	ND	ND
phthalene	330	ND	ND
s(2-chloroethoxy)methane	330	ND	ND
Chloronaphthalene	330	ND	ND
:achlorocyclopentadiene	330	ND	ND
enaphthylene	330	ND	ND
enaphthene	330	ND	ND
nethyl phthalate	330	ND	ND
6-Dinitrotoluene	330	ND	ND
orene	330	ND	ND
4-Dinitrotoluene	330	ND	ND
ethyl phthalate	330	ND	ND
Nitrosodiphenylamine	330	ND	ND
:achlorobenzene	330	ND	ND

: Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081889	88081890
Sample No.:	DANGB2-MW39-SS2	DANGB2-MW39-SS3
Date Sampled:	8-15-88	8-15-88
Time Sampled:	16:42	17:05
Date Extracted:	10-28-88	8-25-88
Date Analyzed:	11-02-88	10-03-88
Percent Moisture:	13	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

B = Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

:e Received: August 16, 1988
:e Reported: December 9, 1988

Work Order: 856
Job Number: OR001

':: ES:Oak Ridge/Duluth ANGB
ıress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

› Number:	88081889	88081890
ıple No.:	DANGB2-MW39-SS2	DANGB2-MW39-SS3
:e Sampled:	8-15-88	8-15-88
ne Sampled:	16:42	17:05
:e Extracted:	10-28-88	8-25-88
:e Analyzed:	11-02-88	10-03-88
:cent Moisture:	13	8

npound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	ug/kg
etophenone	--*	ND	ND
iline	--*	ND	ND
Aminobiphenyl	--*	ND	ND
Chloroaniline	660	ND	ND
Chloronaphthalene	--*	ND	ND
benzofuran	330	ND	ND
Dimethylaminoazobenzene	--*	ND	ND
12-Dimethylbenz(a)anthracene	--*	ND	ND
,a-Dimethylphenethylamine	--*	ND	ND
phenylamine	--*	ND	ND
2-Diphenylhydrazine	--*	ND	ND
nyl methanesulfonate	--*	ND	ND
Methylcholanthrene	--*	ND	ND
thyl methanesulfonate	--*	ND	ND
Methylnaphthalene	330	ND	ND
Naphthylamine	--*	ND	ND
Naphthylamine	--*	ND	ND
Nitroaniline	1600	ND	ND
Nitroaniline	1600	ND	ND
Nitroaniline	1600	ND	ND
Nitroso-di-n-butylamine	--*	ND	ND
Nitrosopiperidine	--*	ND	ND
ntachlorobenzene	--*	ND	ND
ntachloronitrobenzene	--*	ND	ND
enacetin	--*	ND	ND
Picoline	--*	ND	ND
namide	--*	ND	ND
2,4,5-Tetrachlorobenzene	--*	ND	ND

EPA has not yet determined detection limits for these compounds.

* Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081889	88081890
Sample No.:	DANGB2-MW39-SS2	DANGB2-MW39-SS3
Date Sampled:	8-15-88	8-15-88
Time Sampled:	16:42	17:05
Date Extracted:	10-28-88	8-25-88
Date Analyzed:	11-02-88	10-03-88
Percent Moisture:	13	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

:e Received: August 16, 1988
:e Reported: December 9, 1988

Work Order: 856
Job Number: OR001

:: ES:Oak Ridge/Duluth ANGB
dress: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

) Number:	88081889	88081890
ıple No.:	DANGB2-MW39-SS2	DANGB2-MW39-SS3
:e Sampled:	8-15-88	8-15-88
ıe Sampled:	16:42	17:05
:e Extracted:	10-28-88	8-25-88
:e Analyzed:	11-02-88	10-03-88
:cent Moisture:	13	8

ıpound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	ug/kg
Chlorophenol	330	ND	ND
Nitrophenol	330	ND	ND
enol	330	ND	ND
4-Dimethylphenol	330	ND	ND
4-Dichlorophenol	330	ND	ND
4,6-Trichlorophenol	330	ND	ND
Chloro-3-methylphenol	660	ND	ND
4-Dinitrophenol	1600	ND	ND
5-Dichlorophenol	--*	ND	ND
Methyl-4,6-Dinitrophenol	1600	ND	ND
ıtachlorophenol	1600	ND	ND
Nitrophenol	1600	ND	ND
ızoic Acid	1600	ND	ND
Methylphenol	330	ND	ND
& 4-Methylphenol	330	ND	ND
,4,6-Tetrachlorophenol	--*	ND	ND
4,5-Trichlorophenol	330	ND	ND

Analyst

Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

TE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Job No.:

Client:
Attn:
Address:

Project: DULUTH

TICs Found: 11

Sample BLANK
Project No: ~~[illegible]~~
Sample Matrix: SOIL
Conc. Unit: µg/kg
Work Order No: 856
Lab Sample ID: CLMBK
Lab File ID: E5797
Date Received: —
Date Extracted: 9/25/88
Date Analyzed: 10/3/88
Date Reported:
Dilution Factor: 1
% Moisture: —

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
	Unknown	4.42	530	
	Unknown	4.55	1200	
	Unknown	4.89	200	
	Unknown	5.09	2300	
	Unknown	5.30	16000	
	Unknown	6.39	330	
	Unknown	6.93	430	
	Unknown	6.99	170	
	Unknown	21.73	470	
	Unknown	28.83	400	
	Unknown	39.04	400	

OB134

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Job No.:

Client:
Attn:
Address:

Project: DULUTH

TICs Found: 7

Sample
~~Project~~ No: REX BLANK
Sample Matrix: SOIL
Conc. Unit: UG/KG
Work Order No: 856
Lab Sample ID: BLANK-REX
Lab File ID: 50333
Date Received: —
Date Extracted: 10/28/88
Date Analyzed: 11/2/88
Date Reported:
Dilution Factor: 1
% Moisture: —

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
	Unknown	4.98	330	
	Unknown	5.51	1700	
	Unknown	5.99	18,000	
	Unknown	7.29	170	
57-10-3	Hexadecanoic Acid	25.11	330	
	Unknown	29.89	1900	
	Unknown	34.85	170	

1F

EPA SAMPLE NO.

DAN682-MW37-551

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 856 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88081883

Sample wt/vol: 30 (g/mL) gm Lab File ID: 50130

Level: (low/med) low Date Received: 8/16/88

% Moisture: not dec. 14.0 dec. _____ Date Extracted: 8/25/88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/1/88

GPC Cleanup: (Y/N) N pH: ___ Dilution Factor: 1

Number TICs found: 13 CONCENTRATION UNITS: (ug/L or ug/Kg): ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	2.08	500	
2.			4.02	620	
3.			5.22	970	
4.			5.34	190	
5.			5.55	1000	
6.			6.07	15,000	
7.			7.33	460	
8.			25.08	230	
9.	57-10-3	hexadecanoic acid	25.29	2100	
10.	57-11-4	octadecanoic acid	27.68	~~500~~ 310	
11.		unknown	30.03	~~7500~~ 890	
12.			30.34	1200	
13.			37.36	700	
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

1F

EPA SAMPLE NO.

DAN682-MW37-SS2

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 8516 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88081884

Sample wt/vol: 30 (g/mL) gm Lab File ID: S0131

Level: (low/med) low Date Received: 8/16/88

% Moisture: not dec. 10.8 11 dec. _____ Date Extracted: 8/25/88
200 3/1/89

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/1/88

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1

Number TICs found: 16 CONCENTRATION UNITS: (ug/L or ug/Kg): ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	4.07	560	
2.			4.41	560	
3.			5.22	900	
4.			5.34	670	
5.			5.54	1000	
6.			6.05	15,000	
7.			7.33	410	
8.			19.68	190	
9.	57-10-3	hexadecanoic acid	25.28	2000	
10.		unknown	27.23	190	
11.	57-11-4	octadecanoic acid	27.68	220	
12.		unknown	30.82	820	
13.			30.40	1000	
14.			32.46	220	
15.			34.72	260	
16.			37.32	710	
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
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EPA SAMPLE NO.

DAN682-mw37-553

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 856 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88081885

Sample wt/vol: 30 (g/mL) gm Lab File ID: S0132

Level: (low/med) low Date Received: 8/16/88

% Moisture: not dec. ~~14~~ 15 dec. _____ Date Extracted: 8/25/88

DRO 3/1/89

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/1/88

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1

Number TICs found: 30 CONCENTRATION UNITS: (ug/L or ug/Kg): ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	4.42	700	
2.		↓	5.29	470	
3.		↓	5.60	1200	
4.		↓	6.08	17000	
5.	57-10-3	hexadecanoic acid	25.28	1800	
6.	57-11-4	octadecanoic acid	27.68	310	
7.		unknown	29.23	310	
8.		↓	30.04	1000	
9.		↓	30.39	2900	
10.		↓	30.68	430	
11.		↓	32.40	860	
12.		unknown phthalate	32.90	310	
13.		unknown phthalate	33.09	450	
14.		unknown	33.55	780	
15.		↓	34.73	230	
16.		↓	34.87	620	
17.		↓	36.38	590	
18.		↓	37.30	550	
19.		↓	38.27	470	
20.		↓	40.36	310	
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

1F

EPA SAMPLE NO.

DAN6B2-
mw37-554

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 856 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88081886

Sample wt/vol: 30 (g/mL) gm Lab File ID: E5790

Level: (low/med) low Date Received: 8/16/88

% Moisture: not dec. 8.4 8 dec. _____ Date Extracted: 8/25/88
DAD 3/1/89

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/3/88

GPC Cleanup: (Y/N) N pH: ___ Dilution Factor: 1

Number TICs found: 12 CONCENTRATION UNITS: (ug/L or ug/Kg): ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown alkene - C_7H_{14}	4.35	290	
2.		unknown	4.45	870	
3.			4.59	730	
4.			4.81	620	
5.			5.26	16,000	
6.			6.43	360	
7.			24.03	250	
8.	57-10-3	hexadecanoic acid	24.15	1400	
9.		unknown	28.84	540	
10.			29.20	840	
11.			31.01	290	
12.			35.42	21,000	
13.					
14.					
15.					
16.					
17.					
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23.					
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25.					
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27.					
28.					
29.					
30.					

37.04

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Job No.:

Client:
Attn:
Address:

Project: DULUTH

TICs Found: 10

Sample
~~Project~~ No: DAN6B2-MW37-555
Sample Matrix: SOIL
Conc. Unit: MG/KG
Work Order No: 956
Lab Sample ID: ES02187 REX
Lab File ID: SO342
Date Received: 8/16/88
Date Extracted: 10/28/88
Date Analyzed: 11/2/88
Date Reported:
Dilution Factor: 1
% Moisture: 10

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
	Unknown	4.27	370	
	Unknown	4.57	180	
	Unknown	4.97	1400	
	Unknown	5.21	740	
	Unknown	5.47	1400	
	Unknown	5.97	20,000	
	~~1,1,2,2-tetrachloroethane~~			
	Unknown	7.42	180	
	Unknown	29.89	1700	
	Unknown hydrocarbon	30.15	220	
	Unknown	34.87	180	

1F

EPA SAMPLE NO.

DAN6B9-
mw39-551

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 856 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88081888

Sample wt/vol: 30 (g/mL) gm Lab File ID: E5792

Level: (low/med) low 12 Date Received: 8/16/88

% Moisture: not dec. 11.7 dec. _____ Date Extracted: 8/25/88
DAD 3/1/89

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/3/88

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1

Number TICs found: 18 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	4.36	490	
2.			4.44	760	
3.			4.52	190	
4.			4.57	360	
5.			4.84	910	
6.			5.29	17000	
7.			6.45	420	
8.			19.70	260	
9.			23.98	530	
10.	57-10-3	hexadecanoic acid	24.18	2100	
11.		unknown	25.94	230	
12.			26.56	190	
13.			28.84	380	
14.			29.16	920	
15.	117-81-7	bis(2-ethylhexyl) phthalate	30.77	110	
16.		unknown	30.87	230	
17.			35.14	1700	
18.			35.44	18000	
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Job No.:

Client:
Attn:
Address:

Project: Duluth

TICs Found: 7

~~Project~~ Sample No: DAN6B2-MW39-552
Sample Matrix: SOIL
Conc. Unit: ug/kg
Work Order No: 856
Lab Sample ID: 38081889 REX
Lab File ID: 50334
Date Received: 8/16/88
Date Extracted: 10/28/88
Date Analyzed: 11/2/88
Date Reported:
Dilution Factor: 1
% Moisture: 13

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
	Unknown	5.50	2400	
	Unknown	5.98	29,000	
	Unknown	7.20	230	
57-10-3	Hexadecanoic Acid	25.14	1000	
	Unknown	29.89	1600	
	Unknown	30.15	190	
	Unknown	34.86	340	

1F

EPA SAMPLE NO.

DAN682-
MW34-553

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 856 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88081890

Sample wt/vol: 30 (g/mL) gm Lab File ID: E5794

Level: (low/med) low Rec'd 3/1/89 Date Received: 8/16/88

% Moisture: not dec. 8.4 dec. _____ Date Extracted: 8/25/88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/3/88

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1

Number TICs found: 16 CONCENTRATION UNITS: (ug/L or ug/Kg): ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	4.44	690	
2.			4.56	470	
3.			4.81	510	
4.			5.25	16,000	
5.			6.44	250	
6.			24.02	180	
7.	~~57-10~~ 57-10-3	hexadecanoic acid	24.17	1500	
8.		unknown	26.57	180	
9.			28.84	910	
10.			29.17	990	
11.			29.32	620	
12.			32.87	290	
13.			33.16	340	
14.			35.31	20,000	
15.			35.74	340	
16.			38.45	170	
17.					
18.					
19.					
20.					
21.					
22.					
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30.					

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO.: 88081887, 88081889
WORK ORDER NO.: 856

Analysis of samples 88081887 and 88081889 resulted in low surrogate spike recoveries of two of the three base neutral surrogates. The samples were re-extracted out of holding time. Results of the second analysis showed good surrogate recoveries. No target compounds were found in either analysis of these samples.

QUALITY CONTROL RESULTS SUMMARY
EPA METHOD 8270

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88081883-88081890
88081593, 88081591

QC Report No: BNA-S-0035-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-14-88
Date Prepared: 8-25-88
Date Analyzed: 9-30-88
Date Reported: 11-04-88
Dilution Factor: NA
%Moisture: 17

Laboratory Supervisor Approval:

3176

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD	EPA QC Limit %Recovery
	1,2,4-Trichlorobenzene	4020	ND	2100	52	1990	50	4	23	38-107
B/N	Acenaphthene	4020	ND	1910	48	1910	48	0	19	31-137
Laboratory	2,4-Dinitrotoluene	4020	ND	2020	50	1980	49	2	47	28-89
Sample #	Pyrene	4020	ND	2220	55	2280	57	4	36	35-142
88081869*	N-Nitroso-di-n-Propylamine	4020	ND	3170	79	2910	72	9	38	41-126
	1,4-Dichlorobenzene	4020	ND	1590	40	1350	34	16	27	28-104
	Pentachlorophenol	8030	ND	5540	69	5700	71	3	47	17-109
ACID	Phenol	8030	ND	3480	43	3310	41	5	35	26-90
Laboratory	2-Chlorophenol	8030	ND	3940	49	3600	44	8	50	25-102
Sample #	4-Chloro-3-Methylphenol	8030	ND	4100	51	3880	48	6	33	26-103
88081869*	4-Nitrophenol	8030	ND	8840	110	8920	111	1	50	11-114

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* The quality control sample is from a different project.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Soil
Conc. Unit: ug/Kg
Date Reported: 11-04-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
E5500	8-24-88	BNA	2	-	None Found	-	-	88081883-88081890, 88081593, 88081591

3177

VOLATILE CONTINUING CALIBRATION CHECK

LabName:_____ Contract:_____

Lab Code:_____ Case No.:_____ SAS No.:_____

Instrument IDVOCAL_____ Calibration Date(s):10/1/85

LAB FILE ID:45,46_____ Init. Calib. Date(s):_9/[illegible]

COMPOUND	$\overline{RRF}$	RRF50	%D
Benzyl chloride	4.43	7.60	-71.56
bis (2-choroethoxy) methane	0.12		100.00
bis (2-choroisopropyl ether	0.12		100.00
Bromobenzene	3.08	4.20	-36.36
Bromodichloromethane	4.91	3.80	22.61
Bromoform	3.32	2.60	21.69
Bromomethane	0.43	0.00	100.00
Carbon tetrachloride	5.00	3.90	22.00
Chloroacetaldehyde	0.07		100.00
Chlorobenzene	1.38	1.10	20.29
Chloroethane	0.73	0.00	100.00
Chloroform	4.22	3.40	19.43
1-Chorohexane	0.82	1.10	-34.15
2-Chloroethyl vinyl ether	0.12		100.00
Chloromethane	1.84	0.00	100.00
Chloromethyl methyl ether	0.02		100.00
o_,m_,& p_Chlorotoluenes	3.34	4.50	-34.73
Dibromochloromethane	4.68	3.60	23.08
Dibromomethane	3.06	4.30	-40.52
1,2_Dichlorobenzene	2.22	1.70	23.42
1,3_Dichlorobenzene	1.79	1.40	21.79
1,4_Dichlorobenzene	1.83	1.40	23.50
Dichlorodifluormethane	0.54		100.00
1,1_Dichloroethane	2.74	2.10	23.36
1,2_Dichloroethane	3.74	2.70	27.81
1,1_Dichloroethylene	1.32	1.20	9.09
trans_1,2_dichloroethylene	2.96	2.20	25.68
Dichloromethane	4.72	4.30	8.90
1,2_Dichloropropane	3.18	2.50	21.38
1,3_Dichloropropylene	0.47	0.68	-44.68
1,1,2,2_Tetrachloroethane	4.04	2.70	33.17
1,1,1,2_Tetrachloroethane	4.83	6.20	-28.36
Tetrachloroethylene	5.06	3.60	28.85
1,1,1_Trichloroethane	2.77	2.10	24.19
1,1,2_Trichloroethane	4.42	6.40	-44.80
Trichloroethylene	4.06	3.10	23.65
Trichlorofluormethane	0.78	0.56	28.21
Trichloropropane	3.08	4.20	-36.36
Vinyl chloride	1.84	0.00	100.00

VOLATILE CONTINUING CALIBRATION CHECK

Instrument ID.: 1.cal Calibration Date(s): 10/1/88

LAB FILE ID: RRF 50 46

Initial cal = 9/22/88

COMPOUND	$\overline{RRF}$	RRF50	%D
Benzene	4.45	3.30	-25.84
Chlorobenzene	4.74	3.80	-19.83
1,2_Dichlorobenzene	3.79	3.00	-20.84
1,3_Dichlorobenzene	4.18	3.30	-21.05
1,4_Dichorobenzene	3.35	2.60	-22.39
Ethyl Benzene	3.10	2.50	-19.35
Toluene	3.55	3.00	-15.49
Xylenes	10.40	8.20	-21.15

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DATA PACKAGE #62

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ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001
954

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the water sample received by this laboratory on 9-08-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092294	DANGB-BG-MW50-GW-1	8010	9-07-88		9-14-88	9-16-88
88092294	DANGB-BG-MW50-GW-1	8020	9-07-88		9-14-88	9-16-88

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092294
WORK ORDER NO.: 954

This water sample was received at the ES Berkeley Laboratory on 9-08-88. It was received cold and intact.

ANALYSIS REPORT

WORK ORDER NUMBER: [illegible]
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/08/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (1341)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/L, GROUP 8010

TEST COMPOUND	RANGE-B'-MW50-GW-1 8801021A
BENZYL CHLORIDE	ND
BIS (2-CHLOROETHOXY)METHANE	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND
BROMOBENZENE	ND
BROMODICHLOROMETHANE	ND
BROMOFORM	ND
BROMOETHANE	ND
CARBON TETRACHLORIDE	ND
CHLORACETALDEHYDE	ND
CHLORAL	ND
CHLOROBENZENE	ND
CHLOROETHANE	ND
CHLOROFORM	14
1-CHLOROHEXANE	ND
2-CHLOROETHYL VINYL ETHER	ND
CHLOROMETHANE	ND
CHLOROMETHYL METHYL ETHER	ND
CHLOROTOLUENE	ND
DIBROMOCHLOROMETHANE	ND
DIBROMOMETHANE	ND
1,2-DICHLOROBENZENE	ND
1,3-DICHLOROBENZENE	ND
1,4-DICHLOROBENZENE	ND
DICHLORODIFLUOROMETHANE	ND
1,1-DICHLOROETHANE	ND
1,2-DICHLOROETHANE	ND
1,1-DICHLOROETHYLENE	ND
TRANS-1,2-DICHLOROETHYLENE	ND
DICHLOROMETHANE	1.7B
1,2-DICHLOROPROPANE	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 954

TEST COMPOUND	DANGB-RG-MW50-GW-1 88092294
1,3-DICHLOROPROPYLENE	ND
1,1,2,2-TETRACHLOROETHANE	ND
1,1,1,2-TETRACHLOROETHANE	ND
TETRACHLOROETHYLENE	ND
1,1,1-TRICHLOROETHANE	ND
1,1,2-TRICHLOROETHANE	ND
TRICHLOROETHYLENE	ND
TRICHLOROFLUOROMETHANE	ND
TRICHLOROPROPANE	ND
VINYL CHLORIDE	ND

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 954
JOB NUMBER : Z80000000440
WORK ORDER DATE : 09/06/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (341)
710 S. ILLINOIS AVE STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4. UNITS: ug/L. GROUP 8020

TEST COMPOUND	DANGB-FB-1 8809294
BENZENE	ND
CHLOROBENZENE	ND
1,2-DICHLOROBENZENE	ND
1,3-DICHLOROBENZENE	ND
1,4-DICHLOROBENZENE	ND
ETHYL BENZENE	ND
TOLUENE	ND
XYLENES	ND

ND - Not Detected

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD

ES JOB NO:	PROJECT NAME/LOCATION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED	SHIP TO:
OR001	Duluth ANGB/Duluth, Mn.			ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA 94710

SAMPLER(S): (Signature)

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SW8010, 8020	EPA 601	EPA 625	EPA 418.1	SW 8010, 7060, 7131	SW7421, 7470, 7191	SW9310, 9315	SM426	REMARKS
9-7-88	1435	DANGB-BG-MW43-GW-1	5	X								~~882294~~ 882293
9-7-88	1505	DANGB-BG-MW50-GW-1	5	X								~~882295~~ 882292
9-7-88	1330	DANGB-FB-1	2	X								~~882296~~ 882294
9-7-88	0900	DANGB-BR1	5	X								~~882297~~ 882291

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	9-7-88 1800				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
			090888 1030	Samples received cold and intact.

3188

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082256, 88092291-88092294
88092303-88092309, 88092312-88092317
88092321, 88082189

QC Report No: VGC-W-0047-88
Sample Matrix: Water
Conc. Unit: ug/L
Date Received: 9-12-88
Date Prepared: NA
Date Analyzed: 9-22-88
Date Reported: 10-25-88
Dilution Factor: NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88092321	1,1-Dichloroethane	10	ND	9.59	96	9.28	93	3	26	70-130
88092321	Trichloroethene	10	ND	10.2	102	10.3	103	1	19	65-131
88092321	Chlorobenzene	10	ND	10.5	105	10.7	107	2	40	59-137
	Aromatics: 8020									
8897092321	Benzene	10	20	30.8	108	30.8	108	0	20	56-146
	Toluene	10	ND	10.7	107	9.72	97	10	41	42-150
	Chlorobenzene	10	ND	10.1	101	9.37	94	7	36	76-133

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Water
Conc. Unit: ug/L
Date Reported: 10-25-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
19	9-14-88	VGC	Carbopack	75-09-2	Dichloromethane	1.5	0.25	88092291-88092294

3190

DATA PACKAGE #63

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ANALYSIS REPORT FOR WORK ORDER NUMBER 962

TASK: 4, UNITS: ug/L, GROUP 8020

TEST COMPOUND	DANG8-FB6 88092328	DANG8-TB3 88092329
BENZENE	ND	ND
CHLOROBENZENE	ND	ND
1,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
ETHYL BENZENE	ND	ND
TOLUENE	ND	ND
XYLENES	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 962

TASK: 4, UNITS: ug/L, GROUP 8010

TEST COMPOUND	DANGB-FB6 88092328	DANGB-TB3 88092329
BENZYL CHLORIDE	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND
BROMOBENZENE	ND	ND
BROMODICHLOROMETHANE	ND	ND
BROMOFORM	ND	ND
BROMOETHANE	ND	ND
CARBON TETRACHLORIDE	ND	ND
CHLORACETALDEHYDE	ND	ND
CHLORAL	ND	ND
CHLOROBENZENE	ND	ND
CHLOROETHANE	ND	ND
CHLOROFORM	16	ND
1-CHLOROHEXANE	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND
CHLOROMETHANE	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND
CHLOROTOLUENE	ND	ND
DIBROMOCHLOROMETHANE	ND	ND
DIBROMOMETHANE	ND	ND
1,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND
1,1-DICHLOROETHANE	ND	ND
1,2-DICHLOROETHANE	ND	ND
1,1-DICHLOROETHYLENE	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND
DICHLOROMETHANE	1.4B	1.4B
1,2-DICHLOROPROPANE	ND	ND
1,3-DICHLOROPROPYLENE	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND
TETRACHLOROETHYLENE	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND
TRICHLOROETHYLENE	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND
TRICHLOROPROPANE	ND	ND
VINYL CHLORIDE	ND	ND

ND - Not Detected

ENGINEERING-SCIENCE, INC.

000 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001
954

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the water sample received by this laboratory on 9-08-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
0[illegible]294	DANGB-BG-MW50-GW-1	8010	9-07-88		9-14-88	9-16-88
0[illegible]294	DANGB-BG-MW50-GW-1	8020	9-07-88		9-14-88	9-16-88

[illegible]pplicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092294
WORK ORDER NO.: 954

This water sample was received at the ES Berkeley Laboratory on 9-08-88. It was received cold and intact.

DETECTION LIMITS
HALOGENATED VOLATILE ORGANICS
EPA METHOD 8010
SAMPLE NO.: 88092294

Compound	Detection Limits
Benzyl chloride	0.50 ug/L
bis(2-chloroethoxy)methane	5.0 ug/L
bis(2-chloroisopropyl)ether	5.0 ug/L
Bromobenzene	0.50 ug/L
Bromodichloromethane	0.10 ug/L
Bromoform	0.20 ug/L
Bromomethane	1.2 ug/L
Carbon Tetrachloride	0.12 ug/L
Chloroacetaldehyde	50.0 ug/L
Chloral	50.0 ug/L
Clorobenzene	0.25 ug/L
Chloroethane	0.52 ug/L
Cloroform	0.05 ug/L
1-Chlorohexane	0.50 ug/L
2-Chloroethyl vinyl ether	0.13 ug/L
Cloromethane	0.08 ug/L
Chloromethyl methyl ether	5.0 ug/L
O-,m-,& p-Chlorotoluenes	0.50 ug/L
Dibromochloromethane	0.09 ug/L
Dibromomethane	0.50 ug/L
1,2-Dichlorobenzene	0.15 ug/L
1,3-Dichlorobenzene	0.32 ug/L
1,4-Dichlorobenzene	0.24 ug/L
Dichlorodifluoromethane	1.8 ug/L
1,1-Dichloroethane	0.07 ug/L
1,2-Dichloroethane	0.03 ug/L
1,1-Dichloroethylene	0.13 ug/L
trans-1,2-Dichloroethylene	0.10 ug/L
Dichloromethane	0.25 ug/L
1,2-Dichloropropane	0.04 ug/L
trans-1,3-Dichloropropylene	0.34 ug/L
1,1,2,2-Tetrachloroethane	0.03 ug/L
1,1,1,2-Tetrachloroethane	0.50 ug/L
Tetrachloroethylene	0.03 ug/L
1,1,1-Trichloroethane	0.03 ug/L
1,1,2-Trichloroethane	0.02 ug/L
Trichloroethylene	0.12 ug/L
Trichlorofluoromethane	0.50 ug/L
Trichloropropane	0.50 ug/L
Vinyl chloride	0.18 ug/L

The method detection limits listed are based upon the EPA method listed. Dilution or other deviations from the normal procedures, required due to characteristics of a sample, will influence these values. These changes are described in the report narrative if applicable.

DETECTION LIMITS
AROMATIC VOLATILE ORGANICS
EPA METHOD 8020
SAMPLE NO.: 88092294

Compound	Detection Limits	
Benzene	0.2	ug/L
Chlorobenzene	0.2	ug/L
1,2-Dichlorobenzene	0.4	ug/L
1,3-Dichlorobenzene	0.4	ug/L
1,4-Dichlorobenzene	0.3	ug/L
Ethylbenzene	0.2	ug/L
Toluene	0.2	ug/L
Xylenes (Dimethyl benzene)	0.4	ug/L

The method detection limits listed are based upon the EPA method listed. Dilution or other deviations from the normal procedures, required due to characteristics of a sample, will influence these values. These changes are described in the report narrative if applicable.

ENGINEERING-SCIENCE INC
In 7A/88

PAGE 1

ANALYSIS REPORT

ORF ORDER NUMBER: 9[illegible]
JOB NUMBER : 2E000000440
WORK ORDER DATE : 09/08/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE STE 5103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (154)
710 S. ILLINOIS AVE. STE 5103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3970

ASK: 4. UNITS: ug/L. GROUP 8010

PRT COMPOUND	FAGE-PZ-MW50-FD-1 8809[illegible]01
BENZYL CHLORIDE	ND
BIS (2-CHLOROETHOXY)METHANE	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND
BROMOBENZENE	ND
BROMODICHLOROMETHANE	ND
BROMOFORM	ND
BROMOETHANE	ND
CARBON TETRACHLORIDE	ND
CHLORACETALDEHYDE	ND
CHLORAL	ND
CHLOROBENZENE	ND
CHLOROETHANE	ND
CHLOROFORM	14
2-CHLOROHEXANE	ND
2-CHLOROETHYL VINYL ETHER	ND
CHLOROMETHANE	ND
CHLOROMETHYL METHYL ETHER	ND
CHLOROTOLUENE	ND
DIBROMOCHLOROMETHANE	ND
DIBROMOMETHANE	ND
1,2-DICHLOROBENZENE	ND
1,3-DICHLOROBENZENE	ND
1,4-DICHLOROBENZENE	ND
DICHLORODIFLUOROMETHANE	ND
1,1-DICHLOROETHANE	ND
1,2-DICHLOROETHANE	ND
1,1-DICHLOROETHYLENE	ND
TRANS-1,2-DICHLOROETHYLENE	ND
DICHLOROMETHANE	1.73
1,2-DICHLOROPROPANE	ND

ND = Not Detected

ENGINEERING-SCIENCE INC
10/26/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 954

TEST COMPOUND	DANGER-DE-MW20-GW-1 88092294
,3-DICHLOROPROPYLENE	ND
,1,2,2-TETRACHLOROETHANE	ND
,1,1,2-TETRACHLOROETHANE	ND
ETRACHLOROETHYLENE	ND
,1,1-TRICHLOROETHANE	ND
,1,2-TRICHLOROETHANE	ND
RICHLOROETHYLENE	ND
RICHLOROFLUOROMETHANE	ND
RICHLOROPROPANE	ND
INYL CHLORIDE	ND

ENGINEERING-SCIENCE INC
10/2e/88

ANALYSIS REPORT

WORK ORDER NUMBER: 954
JOB NUMBER : 280000000440
WORK ORDER DATE : 09/08/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB [illegible]
710 S. ILLINOIS AVE STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/L, GROUP 8030

	DONGR-FS-1
TEST COMPOUND	88097794
BENZENE	ND
CHLOROBENZENE	ND
1,2-DICHLOROBENZENE	ND
1,3-DICHLOROBENZENE	ND
1,4-DICHLOROBENZENE	ND
ETHYL BENZENE	ND
TOLUENE	ND
XYLENES	ND

ND - Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082256, 88092291-88092294
88092303-88092309, 88092312-88092317
88092321, 88082189

QC Report No: VGC-W-0047-88
Sample Matrix: Water
Conc. Unit: ug/L
Date Received: 9-12-88
Date Prepared: NA
Date Analyzed: 9-22-88
Date Reported: 10-25-88
Dilution Factor: NA

Laboratory Supervisor Approval:

3194h

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
	Halocarbons: 8010									
88092321	1,1-Dichloroethane	10	ND	9.59	96	9.28	93	3	26	70-130
	Trichloroethene	10	ND	10.2	102	10.3	103	1	19	65-131
	Chlorobenzene	10	ND	10.5	105	10.7	107	2	40	59-137
	Aromatics: 8020									
8897092321	Benzene	10	20	30.8	108	30.8	108	0	20	56-146
	Toluene	10	ND	10.7	107	9.72	97	10	41	42-150
	Chlorobenzene	10	ND	10.1	101	9.37	94	7	36	75-133

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Water
Conc. Unit: ug/L
Date Reported: 10-25-88

Laboratory Supervisor Approval:

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
19	9-14-88	VGC	Carbopack	75-09-2	Dichloromethane	1.5	0.25	88092291-88092294

3194i

CHAIN OF CUSTODY RECORD

2S JOB NO:	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature)

SHIP TO:
ENGINEERING-SCIENCE LABORATORY, INC.
600 Bancroft Way
Berkeley, CA 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED: SW1030, 8020	EPA 608	EPA 625	EPA 418.1	SW 8010, 7840, 7131	SW7421, 7470, 7191	SW3510, 3510	SM429	REMARKS
9-7-88	1435	DANGB-BG-MW43-GW-1	5	X								~~882294~~ 882293
9-7-88	1505	DANGB-BG-MW50-GW-1	5	X								~~882295~~ 882292
9-7-88	1330	DANGB-FB-1	2	X								~~882296~~ 882294
9-7-88	0900	DANGB-BR1	5	X								~~882297~~ 882291

3194J

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	9-7-88 1800				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
			090888 1630	Samples received cold and intact.

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

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NUS CORPORATION

Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275

412-788-1080

LAB ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S.ILLINOIS AVE.,SUITE F103
OAK RIDGE, TN 37830

REPORT DATE: 09/28/88

ATTENTION: MR. BILL HAYDEN

NUS CLIENT NO: 901206
VENDOR NO:
WORK ORDER NO: 5583
DATE RECEIVED: 09/08/88

SAMPLE IDENTIFICATION			NUS SAMPLE NO	RESULTS	UNITS
DANGB-DIWI		08/31	18090381		
R800	Gross Alpha			< 3	pCi/l
R801	Gross Beta			< 6	pCi/l
R804	Radium-226			< 0.3	pCi/l
DANGB-B6-MW43-GW-1		09/07	18090382		
R800	Gross Alpha			4.6+/-2.7	pCi/l
R801	Gross Beta			11 +/- 4	pCi/l
R804	Radium-226			< 0.3	pCi/l
DANGB-B6-MW50-GW-1		09/07	18090383		
R800	Gross Alpha			4.2+/-2.6	pCi/l
R801	Gross Beta			8.5+/-3.7	pCi/l
R804	Radium-226			0.3+/-0.2	pCi/l
DANGB-BR1		09/07	18090384		
R800	Gross Alpha			< 3	pCi/l
R801	Gross Beta			< 6	pCi/l
R804	Radium-226			< 0.2	pCi/l

COMMENTS:

3197

Reviewed and Approved by: Joanne C. Simanic

NUS CORPORATION

Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275

412-788-1080

LAB ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S.ILLINOIS AVE.,SUITE F103
OAK RIDGE, TN 37830

ATTENTION: MR. BILL HAYDEN

REPORT DATE: 09/26/88

NUS CLIENT NO: 901206
VENDOR NO:
WORK ORDER NO: 5583
DATE RECEIVED: 09/09/88

SAMPLE IDENTIFICATION			NUS SAMPLE NO	RESULTS	UNITS
DANGB-BG-MW42-GW-1		09/08	18090490		
R800	Gross Alpha			< 3	pCi/l
R801	Gross Beta			< 6	pCi/l
R804	Radium-226			< 0.2	pCi/l
DANGB-BG-MW32-GW-1		09/08	18090491		
R800	Gross Alpha			5.5+/-2.9	pCi/l
R801	Gross Beta			11+/-4	pCi/l
R804	Radium-226			0.4+/-0.2	pCi/l

COMMENTS:

3198

Reviewed and Approved by: Joanne C. Simanic

NUS CORPORATION
LABORATORY SERVICES GROUP
PARK WEST TWO
CLIFF MINE ROAD
PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/24/88
Sample ID No.: Dang B-BG-SL1-SW1
NUS Sample No.: P101521

Determination	Result	Units
Gross Alpha	<4	pCi/L
Gross Beta	<6	pCi/L
Radium -226	<0.3	pCi/L

NUS CORPORATION
LABORATORY SERVICES GROUP
PARK WEST TWO
CLIFF MINE ROAD
PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/24/88
Sample ID No.: Dang B-BG-SL2-SW1
NUS Sample No.: P101519

Determination	Result	Units
Gross Alpha	<4	pCi/L
Gross Beta	<6	pCi/L
Radium -226	<0.3	pCi/L

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LABORATORY SERVICES GROUP
PARK WEST TWO
CLIFF MINE ROAD
PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/24/88
Sample ID No.: Dang B-BG-SL3-SW1
NUS Sample No.: P101520

Determination	Result	Units
Gross Alpha	<4	pCi/L
Gross Beta	<6	pCi/L
Radium -226	<0.3	pCi/L

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PITTSBURGH, PA 15275-1071
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Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/23/88
Sample ID No.: Dang B-B6-SL4-SW1
NUS Sample No.: P101427

Determination	Result	Units
Gross Alpha	<4	pCi/L
Gross Beta	<6	pCi/L
Radium -226	<0.2	pCi/L

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LABORATORY SERVICES GROUP
PARK WEST TWO
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PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/23/88
Sample ID No.: Dang B-B6-SL5-SW1
NUS Sample No.: P101433

Determination	Result	Units
Gross Alpha	<4	pCi/L
Gross Beta	<6	pCi/L
Radium -226	0.2 ± 0.2	pCi/L

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PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/23/88
Sample ID No.: Dang B-10-GW10-D-GW1
NUS Sample No.: P101432

Determination	Result	Units
Gross Alpha	<20	pCi/L
Gross Beta	34 ± 14	pCi/L
Radium -226	2.4 ± 0.4	pCi/L

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PARK WEST TWO
CLIFF MINE ROAD
PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/23/88
Sample ID No.: Dang B-B6-SL25-SW1
NUS Sample No.: P101429

Determination	Result	Units
Gross Alpha	<4	pCi/L
Gross Beta	<6	pCi/L
Radium -226	0.4 ± 0.2	pCi/L

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LABORATORY SERVICES GROUP

PARK WEST TWO
CLIFF MINE ROAD
PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/23/88
Sample ID No.: Dang B-B6-GW10-A-GW1
NUS Sample No.: P101428

Determination	Result	Units
Gross Alpha	33 ± 10	pCi/L
Gross Beta	150 ± 30	pCi/L
Radium -226	4.4 ± 0.6	pCi/L

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CLIFF MINE ROAD
PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/23/88
Sample ID No.: Dang B-10-GW10-B-GW1
NUS Sample No.: P101431

Determination	Result	Units
Gross Alpha	10 ± 5	pCi/L
Gross Beta	78 ± 9	pCi/L
Radium -226	1.4 ± 0.3	pCi/L

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LABORATORY SERVICES GROUP
PARK WEST TWO
CLIFF MINE ROAD
PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Peport Date: 11/17/88
Date of Receipt: 9/23/88
Sample ID No.: Dang B-10-GW10-C-GW1
NUS Sample No.: P101430

Determination	Result	Units
Gross Alpha	7.0 ± 3	pCi/L
Gross Beta	11 ± 4	pCi/L
Radium -226	0.3 ± 0.2	pCi/L

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED	SHIP TO:
OR001	Duluth ANGB/Duluth, Mn.			ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA 94710

SAMPLER(S): (Signature) Kimberly L. Davis

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SW8010, 8020	EPA 602	EPA 625	EPA 418.1	SW 8010, 7060, 7131	SW7421, 7470	SW9310, 9315	CM429	REMARKS
8-31-88	1500	DANGB-DIWI	1						X			
9-7-88	1435	DANGB-BG-MW43-GW-1	1						X			
9-7-88	1505	DANGB-BG-MW50-GW-1	1						X			
9-7-88	0900	DANGB-BR1	1						X			

3209

Kimberly L. Davis

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Kimberly L. Davis	9-7-88 1800				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
		M. Stefanosky	9/8 1200	

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ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED	SHIP TO:
OR001	Duluth ANGB/Duluth, Mn.		SW8010, 8020 / EPA 601 / EPA 625 / EPA 420.1 / SW 8010, 7060, 7131 / SW7421, 7470 / SW9310, 9315 / SM429	ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA 94710
SAMPLER(S): (Signature) Kimberly Z. Davis				

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SW8010, 8020	EPA 601	EPA 625	EPA 420.1	SW 8010, 7060, 7131	SW7421, 7470	SW9310, 9315	SM429	REMARKS
9-8-88	0845	DANGB-BG-MW42-GW-1	1						X			
9-8-88	1100	DANGB-BG-MW32-GW-1	1						X			

9-8-88

Kimberly Z. Davis

Kimberly Z. Davis

3210

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Kimberly Z. Davis	9-8-88 1800	Fed Ex Airbill # 949031428 2			

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
		M. Stefanowicz	9/9 1000	

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ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature) Johanna Beeler

SHIP TO: NUS Corporation, 5350 Cambells Run Rd, Pittsburgh PA 15205

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED: SW8080, 8020	EPA 601	EPA 625	EPA 418.1	SW 6010, 7060, 7131	SW7421, 7470	SW9310, 9315	SM423	REMARKS
9-23-88	0945	DANGB-BG-SL9-SW1	1						1			
9-23-88	1145	DANGB-BG-GW10-A-GW1	1						1			
9-23-88	1015	DANGB-BG-SL25-SW1	1						1			
9-23-88	1050	DANGB-10-GW10-C-GW1	1						1			
9-23-88	0940	DANGB-10-GW10-B-GW1	1						1			
9-23-88	0915	DANGB-10-GW10-D-GW1	1						1			
9-23-88	0900	DANGB-BG-SL5-SW1	1						1			

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Johanna Beeler	9-23-88 1730	FEC AirBill # 949031421Z			

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
		M. Stamosky	9/24 0845	

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CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature)

SHIP TO:
NUS Corporation
5350 Campbells Run Rd
Pittsburgh, PA 15205
Attn: Donna Del Prete

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED: SW8010, 8020	EPA 601	EPA 625	EPA 418.1	SW 6010, 7060, 7131	SW 7421, 7470	SW 9310, 9315	SM429	REMARKS
9/24	10:45	DANGB-BG-SL2-SW1	1						X			
9/24	14:05	DANGB-BG-SL3-SW1	1						X			
9/24	9.15	DANGB-BG-SL1-SW1	1						X			

9/24

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	9/24 16:30				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
			9/27 0930	

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Street Address: 710 S. Illinois Ave.

City: Oak Ridge | State: TN | ZIP Required: 37830

2 To (Recipient's Name) Please Print: Dick Delphic | Recipient's Phone Number (Very Important): ( )

Company: VSS Corporation | Department/Floor No.:

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 5350 Campbells Run Rd.

City: Pittsburgh | State: PA | ZIP Required: 15205

3 YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE.): OR-1011

4 IF HOLD FOR PICK-UP, Print FEDEX Address Here
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8 ☐
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10 ☐
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8 ☐
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10 ☐
11 ☐
12 ☐ HOLIDAY DELIVERY (If offered) (Extra charges)

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3123

NUS CORPORATION

LABORATORY SERVICES GROUP
5350 CAMPBELLS RUN ROAD
PITTSBURGH, PA 15205
(412) 747-2500
FAX (412) 747-2559

November 29, 1988

Mr. William Hayden
Engineering-Science, Inc.
710 South Illinois Avenue
Suite F-103
Oak Ridge, Tennessee 37830

SUBJECT: Quality control data and chain-of-custody forms for sample numbers; 18090381-384, 18090490-491, P101427-433 and P101519-521.

Dear Mr. Hayden:

The quality control data summaries for samples; 18090381-384, 18090490-491, P101427-433 and P101519-521 are enclosed. The original chain-of-custody forms for samples P101427-433 and P101519-521 are included, and copies for samples 18090381-384 and 18090490-491 are enclosed since the originals were sent to Engineering-Science, Inc. at an earlier date.

The quality control data summaries include duplicate, spike and blank data for the gross alpha, gross beta and Radium-226 analyses.

Please contact me if you have any questions or comments concerning this information.

Yours very truly,

Greg Malzone
Quality Assurance Representative
Laboratory Services Group

GAM/ckh

Enclosures

QUALITY CONTROL DATA FOR RADIOCHEMICAL ANALYSES

As part of the Laboratory Services Group's quality assurance program for radiochemical analyses, duplicate and method spike analyses and background and performance checks are performed. For every ten samples analyzed, one sample is analyzed in duplicate and a method spike is analyzed. A minimum of one background check and one performance check standard are run during each 24-hour period that the instrument is in use.

The precision of each duplicate analysis is calculated as the range (R) of the two results or the relative percent difference (RPD), depending on the method performed and the level of activity in the sample analyzed in duplicate.

$$\text{Range} = R = |R1 - R2|$$

$$\text{Precision} = \text{RPD} = \left| \frac{R1 - R2}{(R1+R2)/2} \right| \times 100$$

R1 = First Result
R2 = Second Result

The accuracy of each method spike analysis is calculated as the percent recovery.

$$\text{Accuracy} = \text{Percent Recovery} = \frac{AR}{TR} \times 100$$

AR = Actual Result
TR = Theoretical Result

Control limits and advisory control limits are established by initially calculating the average ($\overline{X}$) and the standard deviation (Θ) of the most recent range, RPD, percent recovery, background check, and performance check values:

$$\overline{X} = \frac{1}{n} \sum_{i=1}^{n} Xi$$

$$\Theta = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (\overline{X} - Xi)^2}$$

X = Range, RPD, percent recovery, background check, or performance check value.

Control limits are established for n = 26 to 51 values; advisory control limits are established for n = 10 to 25 values.

The limits for precision are the range from zero to three times the standard deviation. The limits for accuracy are the range of the average percent recovery plus and minus two times the standard deviation. The limits for the background and performance checks are the average background/performance check value plus and minus three times the standard deviation.

When precision or accuracy exceeds the control limits, corrective action must be taken prior to release of the data. (This may consist of reanalysis of the sample in question, or of all the samples in the set, if there is no evidence that the cause of the poor precision or accuracy was limited to the QC sample.)

When a background or performance check exceeds the limits, sample analysis is suspended until a conforming check is run and all samples counted after the last acceptable check are rerun.

GROSS ALPHA/BETA
QUALITY CONTROL DATA SHEET

Sample Number(s): 18090490 - 0491

Book and Page Number(s): GAB-04-104

Instrument Identification: Tennelec LB5100

Date(s) of Analysis: 9/16-17/88

	ALPHA				BETA			
Blank Planchet (CPM):	0.03	0.14	0.11		0.97	0.96	0.94	
Performance Check:	0.282	0.280			0.475	0.477		
Matrix Duplicates:								
Sample Number	18090490				18090490			
Original Result*	<3 pCi/L				<6 pCi/L			
Duplicate Result*	<3 pCi/L				5.41 pCi/L			
RPD/Range	-				-			
Standard (Spike):								
Solution Number/ Volume	#2AB/4mL				#2AB/4mL			
Actual Result*	0.83 pCi/mL				4.62 pCi/mL			
Theoretical Result*	0.69 pCi/mL				4.48 pCi/mL			
% Recovery	120.3				103.1			
Method Blank:								
Volume (mL)	0.5 L				0.5 L			
Result*	<0.5 pCi/L				<1 pCi/L			

GROSS ALPHA/BETA
QUALITY CONTROL DATA SHEET

Sample Number(s): 18090289-0291; 18090381-0384
18090421-0422; 18090394

Book and Page Number(s): GAB-04; 98-103

Date(s) of Analysis: 9/12/, 14-15/88

Instrument Identification: Tennelec LB5100

	ALPHA				BETA			
Blank Planchet (CPM):	0.11	0.10	0.04		1.02	1.19	0.91	
Performance Check:	0.273	0.285	0.283		0.473	0.480	0.483	
Matrix Duplicates:								
Sample Number	18090290	18090422			18090290	18090422		
Original Result*	5.11 pCi/L	<6 pCi/L			ALPHA	179 pCi/L		
Duplicate Result*	5.87 pCi/L	5.7 pCi/L			Analysis	166 pCi/L		
RPD/Range	0.76 pCi/L (Range)	-			Only	7.54% (RPD)		
Standard (Spike):			(Matrix Spike) 18090291+				(Matrix Spike) 18090291+	
Solution Number/ Volume	#2AB/3mL		#2AB/1mL		#2AB/3mL		#2AB/1mL	
Actual Result*	0.72 pCi/mL		0.48 pCi/mL		4.66 pCi/mL		4.46 pCi/mL	
Theoretical Result*	0.69 pCi/mL		0.69 pCi/mL		4.48 pCi/mL		4.48 pCi/mL	
% Recovery	104.3		104.0		104.0		99.5	
Method Blank:								
Volume (mL)	0.5L				0.5L			
Result*	<0.5 pCi/L				<1 pCi/L			

GROSS ALPHA/BETA
QUALITY CONTROL DATA SHEET

Sample Number(s): P101427-1433, P101519-1521

Book and Page Number(s): 60-86, p. 26

Instrument Identification: Tennelec LB5100

Date(s) of Analysis: 10/3-4/88

	ALPHA				BETA			
Blank Planchet (CPM):	0.15	0.13	0.13		0.96	1.21	1.07	
Performance Check:	0.282	0.287	0.279		0.479	0.473	0.476	
Matrix Duplicates:								
Sample Number	P101427				P101427			
Original Result*	<4 pCi/L				<6 pCi/L			
Duplicate Result*	<4 pCi/L				<6 pCi/L			
~~RPD~~/Range	-				-			
Standard (Spike):								
Solution Number/ Volume	#2AB/5mL				#2AB/5mL			
Actual Result*	0.70 pCi/mL				4.55 pCi/mL			
Theoretical Result*	0.69 pCi/mL				4.48 pCi/mL			
% Recovery	101.4				101.6			
Method Blank:								
Volume (mL)	0.5 L				0.5 L			
Result*	<0.6 pCi/L				<1 p Ci/L			

RADIUM-226 (PLANCHET METHOD)

QUALITY CONTROL DATA SHEET

Sample Number(s): P101519-1521, P101849-1850

Book and Page Number(s): 60-86, p. 29

Date(s) of Analysis: 10/11-12/88

Instrument Identification: Tennelec LB5100

Background (CPM):	0.04	0.04	0.02	0.03				
Performance Check:	0.282	0.284	0.280					
Matrix Duplicates:								
Sample Number	P101849							
Original Result*	0.21 pCi/L							
Duplicate Result*	<0.3 pCi/L							
RPD/~~Range~~	--							
Standard (Spike):								
Solution Number/ Volume	#1A1B/5 mL							
Actual Result*	7.27 pCi/mL							
Theoretical Result*	6.81 pCi/mL							
% Recovery	106.7							
Method Blank:								
Volume (mL)	1 L							
Result*	<0.2 pCi/L							

Specify Units

RADIUM-226 (PLANCHET METHOD)

QUALITY CONTROL DATA SHEET

Sample Number(s): P101427 - 1433

Book and Page Number(s): 60-86; p. 27

Date(s) of Analysis: 10/5/88

Instrument Identification: Tennelec LB 5100

Background (CPM):	0.04	0.02							
Performance Check:	0.279	0.279							
Matrix Duplicates:									
Sample Number	P101427								
Original Result*	<0.2 pCi/L								
Duplicate Result*	<0.2 pCi/L								
RPD/~~Range~~	-								
Standard (Spike):									
Solution Number/ Volume	#1A1B/3mL								
Actual Result*	5.87 pCi/mL								
Theoretical Result*	6.81 pCi/mL								
% Recovery	86.2								
Method Blank:									
Volume (mL)	1 L								
Result*	<0.1 pCi/L								

* Specify Units

RADIUM-226 (PLANCHET METHOD)

QUALITY CONTROL DATA SHEET

Sample Number(s): 18090490-0491, 18090421-04?~, 18090381-0384, 18090394

Instrument Identification: Tennelec LB5100

Book and Page Number(s): RAD - 08; 140-143, 146

Date(s) of Analysis: 9/20-21/88

Background (CPM):	0.03	0.05	0.10	0.03				
Performance Check:	0.286	0.289	0.284					
Matrix Duplicates:								
Sample Number	18090394							
Original Result*	<0.1 pCi/L							
Duplicate Result*	<0.1 pCi/L							
RPD/~~Range~~	-							
Standard (Spike):								
Solution Number/ Volume	#1A1B/2mL							
Actual Result*	4.75 pCi/mL							
Theoretical Result*	6.81 pCi/mL							
% Recovery	69.7							
Method Blank:								
Volume (mL)	1 L							
Result*	<0.2 pCi/L							

* Specify Units

NUS CORPORATION

Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275
412-788-1080

LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE., SUITE F103
OAK RIDGE, TN 37830-0000

NUS CLIENT NO: 0734 0001
VENDOR NO: 00795506
REPORT DATE: 01/25/89
WORK ORDER NO: 55830

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION: DANGB-BG-SL2-SW1 (Pi01519)
NUS SAMPLE NO: P0108289
DATE SAMPLED : 9/23/88
DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date
APPROVED BY: Joanne C. Simanic

TEST	DETERMINATION	RESULT	UNIT
R50	Tritium	< 2000	pCi/L

COMMENTS:

NUS CORPORATION

Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275

412-788-1080

LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE.,SUITE F103
OAK RIDGE, TN 37830-0000

NUS CLIENT NO: 0734 0001
VENDOR NO: 00795506
REPORT DATE: 01/25/89
WORK ORDER NO: 55830

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION: DANGB-BG-SL3-SW1 (P101520)
NUS SAMPLE NO: P0108290
DATE SAMPLED : 9/23/88
DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date
APPROVED BY: Joanne C. Simanic

TEST	DETERMINATION	RESULT	UNIT
R50	Tritium	< 2000	pCi/L

COMMENTS:

NUS CORPORATION

Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275
412-788-1080

LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE.,SUITE F103
OAK RIDGE, TN 37830-0000

NUS CLIENT NO: 0734 0001
VENDOR NO: 00795506
WORK ORDER NO: 55830

REPORT DATE: 01/25/89

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION: DANGB-BG-SL1-SW1 (P101521)
NUS SAMPLE NO: P0108291
DATE SAMPLED : 9/23/88
DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date
APPROVED BY: Joanne C. Simanic

TEST	DETERMINATION	RESULT	UNIT
R50	Tritium	< 2000	pCi/L

COMMENTS:

NUS CORPORATION

Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275

412-788-1080

LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE.,SUITE F103
OAK RIDGE, TN 37830-0000

NUS CLIENT NO: 0734 0001
VENDOR NO: 00795506
REPORT DATE: 01/25/89
WORK ORDER NO: 55830

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION: DANGB-BG-SL4-SW1 (P101427)
NUS SAMPLE NO: P0108292
DATE SAMPLED : 9/23/88
DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date
APPROVED BY: Joanne C. Simanic

TEST	DETERMINATION	RESULT	UNIT
R50	Tritium	< 2000	pCi/L

COMMENTS:

NUS CORPORATION

Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275

412-788-1080

LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE.,SUITE F103
OAK RIDGE. TN 37830-0000

NUS CLIENT NO: 0734 0001
VENDOR NO: 00795506
REPORT DATE: 01/25/89
WORK ORDER NO: 55830

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION: DANGB-10GW10-A-GW1 (P101428)
NUS SAMPLE NO: P0108293
DATE SAMPLED : 9/23/88
DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date
APPROVED BY: Joanne C. Simanic

TEST	DETERMINATION	RESULT	UNIT
R50	Tritium	< 2000	pCi/L

COMMENTS:

NUS CORPORATION

Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275

412-788-1080

LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE.,SUITE F103
OAK RIDGE, TN 37830-0000

NUS CLIENT NO: 0734 0001
VENDOR NO: 00795506
WORK ORDER NO: 55830

REPORT DATE: 01/25/89

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION: DANGB-BG-SL25-SW-1 (P101429)
NUS SAMPLE NO: P0108294
DATE SAMPLED : 9/23/88
DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date
APPROVED BY: Joanne C. Simanic

TEST	DETERMINATION	RESULT	UNIT
R50	Tritium	< 2000	pCi/L

COMMENTS:

NUS CORPORATION

Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275
412-788-1080

LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE., SUITE F103
OAK RIDGE, TN 37830-0000

NUS CLIENT NO: 0734 0001
VENDOR NO: 00795506
REPORT DATE: 01/25/89
WORK ORDER NO: 55830

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION: DANGB-10GW10-GW1 (P101430)
NUS SAMPLE NO: P0108295
DATE SAMPLED : 9/23/88
DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date
APPROVED BY: Joanne C. Simanic

TEST	DETERMINATION	RESULT	UNIT
R50	Tritium	< 2000	pCi/L

COMMENTS:

NUS CORPORATION

Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275

412-788-1080

LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE.,SUITE F103
OAK RIDGE, TN 37830-0000

NUS CLIENT NO: 0734 0001
VENDOR NO: 00795506
REPORT DATE: 01/25/89
WORK ORDER NO: 55830

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION: DANGB-10GW10-B-GW1 (P101431)
NUS SAMPLE NO: P0108296
DATE SAMPLED : 9/23/88
DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date
APPROVED BY: Joanne C. Simatic

TEST	DETERMINATION	RESULT	UNIT
R50	Tritium	< 2000	pCi/L

COMMENTS:

NUS CORPORATION

Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275

412-788-1080

LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE., SUITE F103
OAK RIDGE, TN 37830-0000

NUS CLIENT NO: 0734 0001
VENDOR NO: 00795506
REPORT DATE: 01/25/89
WORK ORDER NO: 55830

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION: DANGB-10GW10-D-GW1 (P101432)
NUS SAMPLE NO: P0108297
DATE SAMPLED : 9/23/88
DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date
APPROVED BY: Joanne C. Simanic

TEST	DETERMINATION	RESULT	UNIT
R50	Tritium	< 2000	pCi/L

COMMENTS:

NUS CORPORATION

Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275
412-788-1080

LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE.,SUITE F103
OAK RIDGE, TN 37830-0000

NUS CLIENT NO: 0734 0001
VENDOR NO: 00795506
WORK ORDER NO: 55830

REPORT DATE: 01/25/89

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION: DANGB-BG-SL5-SW1 (P101433)
NUS SAMPLE NO: P0108298
DATE SAMPLED : 9/23/88
DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date
APPROVED BY: Joanne C. Simanic

TEST	DETERMINATION	RESULT	UNIT
R50	Tritium	< 2000	pCi/L

COMMENTS:

DATA PACKAGE #67

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Received: 03/01/89 ITRSL Oak Ridge REPORT 03/31/89 16:59:51 Work Order # R9-03-013

REPORT TO: ENGINEERING SCIENCE, INC.
710 S. ILLINOIS AVE, STE. F 103
OAK RIDGE, TN 37830

ATTEN: JO ANN SHERWIN

CLIENT: ENGSCI SAMPLES: 4
COMPANY: ENGINEERING SCIENCE, INC.
FACILITY:

PREPARED BY: IT/RADIOLOGICAL SCIENCES LAB.
1550 BEAR CREEK ROAD
OAK RIDGE, TN 37831

ATTEN: ERS
PHONE: 615-482-9707

James T. Harvey
CERTIFIED BY

CONTACT: J HARVEY

WORK ID: WATER SAMPLES
TAKEN:
TRANS:
TYPE:
P.O. #:
INVOICE: under separate cover

	SAMPLE IDENTIFICATION
01	DANGB-10-GW10-C-GW2
02	DANGB-10-GW10-B-GW2
03	DANGB-10-GW10-A-GW2
04	DANGB-10-GW10-D-GW2

TEST CODES and NAMES used on this report

GALPHW	GROSS ALPHA
GBETA	GROSS BETA
RA226	RA-226
RA228	RA-228
TRI	TRITIUM

TEST CODE default units	Sample 01 (entered units)	Sample 02 (entered units)	Sample 03 (entered units)	Sample 04 (entered units)
GALPHW pCi/l	72 +/- 41	85 +/- 50	382+/-154	154+/- 65
GBETA pCi/l	92 +/- 45	211+/- 67	253+/-104	155+/- 57
RA226 pCi/l	<0.6	<0.6	<0.6	<0.6
RA228 pCi/l	<2.9	<2.4	<2.5	<2.5
TRI pCi/l	<339	<339	<339	<339

DATA PACKAGE #68

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CERTIFICATE OF ANALYSIS

PREPARED FOR: ENGINEERING-SCIENCE LABORATORY, INC. PN 135-04
600 BANCROFT WAY
BERKELEY, CA 94710

metaTRACE SAMPLE NUMBER: LISTED BELOW
DATE RECEIVED: LISTED BELOW
DATE ANALYZED: 9/20/88
METHOD: EPA 353.2
SAMPLING LOCATION: DULUTH ANGB

LAB NUMBER	SAMPLE IDENTITY	DATE RECEIVED	MATRIX	NITRATES	UNITS
AA17479	BG-MW43-GW-1	09/08/88	WATER	< 0.02	MG/L
AA17480	BG-MW50-GW-1	09/08/88	WATER	< 0.02	MG/L
AA17481	BR1	09/08/88	WATER	< 0.02	MG/L
AA17662	BG-MW42-GW-1	09/09/88	WATER	< 0.02	MG/L
AA17663	BG-MW32-GW-1	09/09/88	WATER	< 0.02	MG/L
AA18300	DANGB-2-MW2-GW-1	09/20/88	WATER	< 0.02	MG/L
AA18301	DANGB-2-MW1-GW-1	09/20/88	WATER	< 0.02	MG/L

metaTRACE, Inc.

SAMPLE ARRIVAL NOTIFICATION/LABORATORY CHAIN OF CUSTODY

(REVISED 5/88)

PAGE 1 OF 1

DATE 9/8/88

PROJECT NO. 135-04

SAMPLE ARRIVAL DATE 9/8/88

EXPECTED NO. OF SAMPLES 3

EXPECTED MATRIX Water

CLIENT Engineering Science

PROJ. MGR. Walter

SHIPPER

DUE DATE 9/26/88

DISTRIBUTION
AUTO ✓
ICAP
I-PREP
O-PREP
GC
GCMS
RAD
PROJ. MGR. ✓
OTHER ✓

ORIGINAL ✓

REVISION

STORAGE/LOCATION S15

SAMPLE NO.	AA17479	AA17480	AA17481							
SAMP ID &	BG-MW43	BG-MW	BR1							
DESCRIPTION	GW-1	50-GW-1	—							
SAMPLE DATE	9-7-88	9-7-88	9-7-88							
MATRIX	WATER	WATER	WATER							

ANAL CODE	SPECIFIC METHOD	CONTAINER/ PRESERVATIVE	LOT #								
353.2	Nitrate/Nitrite Cadmium Reduction	QT pl NIm		✓	✓	✓					

0523

DISPOSAL

NORMAL

HAZARDOUS

DATE TO DISPOSE

PM SIGNATURE

COMMENTS

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED	SHIP TO:
OR001	Duluth ANGB/Duluth, Mn.			ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA 94710
SAMPLER(S): (Signature)				

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SW8010, 8020	EPA 601	EPA 625	EPA 418.1	SW 8010, 7060, 7131	SW7421, 7470	SW9310, 9315	SM424C NITRATE	REMARKS
9-7-88	1435	DANGB-BG-MW43-GW-1	1								X	Nitrate analysis is colorimetric
9-7-88	1505	DANGB-BG-MW50-GW-1	1								X	"
9-7-88	0100	DANGB-BR1	1								X	"

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	9-7-88 1900				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks

3241

metaTRACE, Inc.

SAMPLE ARRIVAL NOTIFICATION/LABORATORY CHAIN OF CUSTODY

Duluth ANGB

PAGE 1 OF 1

DATE 9/9/88

PROJECT NO. 135-04

SAMPLE ARRIVAL DATE 9/9/88

EXPECTED NO. OF SAMPLES —

EXPECTED MATRIX Water

CLIENT Engineering Science Lab

PROJ. MGR. Baker

SHIPPER Fed Ex

DUE DATE 9/22/88

DISTRIBUTION
AUTO ✓
ICAP
I-PREP
O-PREP
GC
GCMS
RAD
PROJ. MGR. ✓
OTHER ✓

(REVISED 5/88)
ORIGINAL ✓
REVISION
STORAGE/LOCATION 5 5B

SAMPLE NO.	AA17666Z	AA17666 3								
SAMP ID & DESCRIPTION	BG-MW 42-GW1	BG-MW 32-GW1								
SAMPLE DATE	9/6/88	→								
MATRIX	Water	→								
ANAL CODE	SPECIFIC METHOD	CONTAINER/ PRESERVATIVE	LOT #							
H353.2	Nitrate/Nitrite Cadmium Reduction	QT plas		X	X					

3242

DISPOSAL

NORMAL

HAZARDOUS

DATE TO DISPOSE

PM SIGNATURE

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature)

Kimberly Z. Dan

SHIP TO:
ENGINEERING-SCIENCE LABORATORY, INC.
600 Bancroft Way
Berkeley, CA 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED: SW8010, 8020	EPA 608	EPA 625	EPA 418.1	SW 6010, 7060, 7131	SW7421, 7470	SW8310, 9315	SM423 NITRATE	REMARKS
9-8-88	0845	DANGB-BG-MW42-GW-1	1								X	Nitrate analysis is colorimetric.
9-8-88	1100	DANGB-BG-MW32-GW-1	1								X	" "

9-8-87

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Kimberly Z. Dan	9-8-88 1800	Fed Ex Airbill # 949031427 1			

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks

3243

metaTRACE, Inc.

SAMPLE ARRIVAL NOTIFICATION/LABORATORY CHAIN OF CUSTODY

PAGE 1 OF 1
DATE 9-20-88
PROJECT NO. 135-04
SAMPLE ARRIVAL DATE 9-26-88
EXPECTED NO. OF SAMPLES
EXPECTED MATRIX Water

CLIENT Engineering Science Lab
PROJ. MGR. DeAver
SHIPPER Fed Ex
DUE DATE 9-22-88

DISTRIBUTION
AUTO ✓
ICAP
I-PREP
O-PREP
GC
GCMS
RAD
PROJ. MGR. ✓
OTHER ✓

(REVISED 5/88)
ORIGINAL ✓
REVISION
STORAGE/LOC

ANAL CODE	SPECIFIC METHOD	CONTAINER/ PRESERVATIVE	LOT #	SAMPLE NO.	SAMP ID & DESCRIPTION	SAMPLE DATE	MATRIX
				AA18300	DANGB-2-MW2-GW-1	9/19/88	WATER
				AA18301	DANGB-2-MW1-GW-1	—	—
H353.2	Nitrate/Nitrite Cadmium Reduction	QT. PLASTIC		✓	✓		

DISPOSAL
NORMAL
HAZARDOUS
DATE TO DISPOSE
PM SIGNATURE

COMMENTS

3214

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED	SHIP TO:
OR001	Duluth ANGB/Duluth, Mn.		SW8010, 8020 / EPA 608 / EPA 625 / EPA 418.1 / SW 8010, 7060, 7131 / SW7421, 7470 / SW9310, 9315 / SM429	~~ENGINEERING-SCIENCE LABORATORY, INC.~~ ~~600 Bancroft Way Berkeley, CA 94710~~ Metc Trace - Earth City, MO
SAMPLER(S): (Signature) Richard L. Dan				

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	REMARKS
9-19-88	1530	DANGB-2-MW2-GW-1	1	ANALYZE COLORIMETRICALLY FOR NITRATES
9-19-88	1605	DANGB-2-MW1-GW-1	1	" "

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Richard L. Dan	9-19-88 1800	Fed Ex Airbill # 949031422 3			

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
		Walter Hotz	9/20/88 08:5?	

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

3245

metaTRACE, Inc.

SAMPLE ARRIVAL NOTIFICATION/LABORATORY CHAIN OF CUSTODY

(REVISED 5/88)

PAGE 1 OF 1

DATE 9/8/88

PROJECT NO. 135-04

SAMPLE ARRIVAL DATE 9/8/88

EXPECTED NO. OF SAMPLES 3

EXPECTED MATRIX Water

CLIENT Engineering Science

PROJ. MGR. Ashley

SHIPPER

DUE DATE 9/26/88

DISTRIBUTION
AUTO ✓
ICAP
I-PREP
O-PREP
GC
GCMS
RAD
PROJ. MGR.
OTHER ✓

ORIGINAL ✓

REVISION

STORAGE/LOCATION S151

SAMPLE NO.	AA17479	AA17480	AA17481						
SAMP ID & DESCRIPTION	BG-HW43 GW-1	BG-HW1 50-GW-1	BR1 —						
SAMPLE DATE	9-7-88	9-7-88	9-7-88						
MATRIX	WATER	WATER	WATER						

ANAL CODE	SPECIFIC METHOD	CONTAINER/ PRESERVATIVE	LOT #								
H353.2	Nitrate/Nitrite Cadmium Reduction	QT pl N/M		✓	✓	✓					

DISPOSAL

NORMAL

HAZARDOUS

DATE TO DISPOSE

PM SIGNATURE

3246

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature)

Richard L. Dan

SHIP TO:
ENGINEERING-SCIENCE LABORATORY, INC.
600 Bancroft Way
Berkeley, CA 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED: SW8010, 8020	EPA 608	EPA 625	EPA 418.1	SW 8010, 7060, 7131	SW7421, 7470	SW9310, 9315	SM424C NITRATE	REMARKS
9-7-88	1435	DANGB-BG-MW43-GW-1	1								X	Nitrate analysis is colorimetric
9-7-88	1505	DANGB-BG-MW50-GW-1	1								X	"
9-7-88	0100	DANGB-BR2 1	1								X	"

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Richard L. Dan	9-7-88 1900				

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks

3247

metaTRACE, Inc.

SAMPLE ARRIVAL NOTIFICATION/LABORATORY CHAIN OF CUSTODY

Duluth ANGIS

PAGE 1 OF 1

DATE 9/9/88

PROJECT NO. 135-04

SAMPLE ARRIVAL DATE 9/9/88

EXPECTED NO. OF SAMPLES —

EXPECTED MATRIX Water

CLIENT Engineering Science Inc

PROJ. MGR. Baker

SHIPPER Fed Ex

DUE DATE 9/27/88

DISTRIBUTION
AUTO ✓
ICAP
I-PREP
O-PREP
GC
GCMS
RAD
PROJ. MGR. ✓
OTHER ✓

(REVISED 5/88)

ORIGINAL ✓

REVISION

STORAGE/LOCATION SSB

SAMPLE NO.	AA17662	AA17663								
SAMP ID &	BG-MW	BG-MW								
DESCRIPTION	42-GW1	32-GW1								
SAMPLE DATE	9/8/88	→								
MATRIX	Water	→								
ANAL CODE	SPECIFIC METHOD	CONTAINER/ PRESERVATIVE	LOT #							
H353.2	Nitrate/Nitrite Cadmium Reduction	QT plas/n		X	X					

8923

DISPOSAL

NORMAL

HAZARDOUS

DATE TO DISPOSE

PM SIGNATURE

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature)

SHIP TO:
ENGINEERING-SCIENCE
LABORATORY, INC.
600 Bancroft Way
Berkeley, CA 94710

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED: SW8040, 8020	EPA 608	EPA 625	EPA 418.1	SW 6010, 7000, 7131	SW7421, 7470	SW9310, 9315	SM429 NITRATE	REMARKS
9-8-88	0845	DANGB-BG-MW42-GW-1	1								X	Nitrate analysis is colorimetric.
9-8-88	1100	DANGB-BG-MW32-GW-1	1								X	" "

9-8-88

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	9-8-88 1800	Fed Ex Airbill # 949031427 1			

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks

3249

metaTRACE, Inc.

SAMPLE ARRIVAL NOTIFICATION/LABORATORY CHAIN OF CUSTODY

(REVISED 5/84)

PAGE 1 OF 1
DATE 9-20-88
PROJECT NO. 135-04
SAMPLE ARRIVAL DATE 9-26-88
EXPECTED NO. OF SAMPLES
EXPECTED MATRIX Water

CLIENT Engineering Science Lab
PROJ. MGR. Peter
SHIPPER Fed Ex
DUE DATE 9-22-88

DISTRIBUTION
AUTO ✓
ICAP
I-PREP
O-PREP
GC
GCMS
RAD
PROJ. MGR. ✓
OTHER ✓

ORIGINAL ✓
REVISION
STORAGE/LOCATION

SAMPLE NO.	AA18300	AA18301								
SAMP ID &	DANGB-2-MW2-	DANGB-2-MW1								
DESCRIPTION	GW-1	GW-1								
SAMPLE DATE	9/19/88	—								
MATRIX	WATER	—								

ANAL CODE	SPECIFIC METHOD	CONTAINER/ PRESERVATIVE	LOT #									
H353.2	Nitrate/Nitrite Cadmium Reduction	QT. PLASTIC		✓	✓							

DISPOSAL

NORMAL
HAZARDOUS
DATE TO DISPOSE
PM SIGNATURE

COMMENTS

3250

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION
OR001	Duluth ANGB/Duluth, Mn.

SAMPLER(S): (Signature)

SHIP TO: ~~ENGINEERING-SCIENCE~~ ~~LABORATORY, INC.~~ ~~600 Bancroft Way~~ ~~Berkeley, CA 94710~~ Met-Trace - Earth City, MO

DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED: SW8010, 8020	EPA 608	EPA 625	EPA 418.1	SW 8010, 7060, 7131	SW7421, 7470	SW9310, 9315	SM429	REMARKS
9-19-88	1530	DANGB-2-MW2-GW-1	1									ANALYZE COLORIMETRICALLY FOR NITRATES
9-19-88	1605	DANGB-2-MW1-GW-1	1									" "

32511

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	9-19-88 1800	Fed Ex Airbill # 949031422 3			

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
			9/20/88 08:5?	

FEDERAL EXPRESS

AIRBILL

USE THIS AIRBILL FOR DOMESTIC SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

PACKAGE TRACKING NUMBER 9490314223

9490314223

SENDER'S COPY

Sender's Federal Express Account Number: 1196-4207-6 | Date: 11

1 From (Your Name) Please Print: Kim Yo... | Your Phone Number (Very Important): (6...) 4...

Company: Engineering-Science, Inc. | Department/Floor No.: ...

Street Address: 210 S. Illinois Ave

City: Oak Ridge | State: | ZIP Required:

2 To (Recipient's Name) Please Print: ... | Recipient's Phone Number (Very Important): (...) ...

Company: Air Toxic Inc. | Department/Floor No.:

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 1...E Raider Trail North

City: Fairfield Glade | State: TN | ZIP Required: 38...

3 YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE.): 02 001

PAYMENT: [X] Bill Sender [ ] Bill Recipient's FedEx Acct. No. [ ] Bill 3rd Party FedEx Acct. No. [ ] Bill Credit Card [ ] Cash

4 IF HOLD FOR PICK-UP, Print FEDEX Address Here
Street Address:
City | State | ZIP Required

SERVICES

1 [ ] PRIORITY 1 Overnight Delivery
2 [ ] COURIER-PAK OVERNIGHT ENVELOPE*
3 [ ] OVERNIGHT BOX
4 [ ] OVERNIGHT TUBE
5 [ ] STANDARD AIR Delivery not later than second business day
6 [ ] OVERNIGHT LETTER*
7 [ ]
8 [ ]
9 [ ]
10 [ ]
* Declared Value Limit $100.

DELIVERY AND SPECIAL HANDLING

1 [ ] HOLD FOR PICK-UP (If no Box No.)
2 [ ] DELIVER WEEKDAY
3 DELIVER SATURDAY (Extra charges) [ ]
4 [ ] DANGEROUS GOODS (Extra charges)
5 [ ] CONSTANT SURVEILLANCE SERVICE (CSS) (Extra charges, obtain Signature first! Applications)
6 [ ] DRY ICE ____ kgs.
7 [ ] OTHER SPECIAL SERVICE ____
8 [ ]
9 [ ] SATURDAY PICK-UP. (Extra charges)
10 [ ]
11 [ ]
12 [ ] HOLIDAY DELIVERY (If offered) (Extra charges)

PACKAGES	WEIGHT	YOUR DECLARED VALUE (See rates)	OVER SIZE
Total	Total	Total	

Received At
1 [ ] Regular Stop
2 [ ] On-Call Stop
3 [ ] Drop Box 4 [ ] BSC 5 [ ] Station

FEDEX Corp Employee No.:

Date/Time for FEDEX Use:

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY

Use of this airbill constitutes your agreement to the service conditions in our current Service Guide which is available upon request. See back of sender's copy of this airbill for further information.

We will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay or non-delivery unless you specify a higher amount in the space to the left, pay 40¢ per additional $100 specified and document your actual loss in the event of a claim. Maximum amount limitations found in the current Federal Express Service Guide apply. Your rights to recover from Federal Express for loss of the intrinsic value of the package, as well as for loss of sales, income, interest, profit, attorney's fees, costs and any other form of damage whether direct, incidental, consequential or special is limited to the greater of $100 or the declared value specified to the left. In no event shall your recovery exceed your actual loss.

In the event of untimely delivery Federal Express will at your request and with some limitations, refund all transportation charges paid. See Service Guide for further information.

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Federal Express Use	
Base Charges	
Declared Value Charge	
Other 1	
Other 2	
Total Charges	

PART #2041738900
REVISION DATE 7/88
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SENDER'S COPY

9490314223

8252

metaTRACE, Inc. 1371E Rider Trail North • Earth City, MO 63045 • (314) 298-8566

CERTIFICATE OF ANALYSIS

PREPARED FOR: ENGINEERING-SCIENCE LABORATORY, INC. PN 135-04
600 BANCROFT WAY
BERKELEY, CA 94710

metaTRACE SAMPLE NUMBER: ... LISTED BELOW
DATE RECEIVED: LISTED BELOW
DATE ANALYZED: 9/21/88
METHOD: EPA 353.2
SAMPLING LOCATION: DULUTH ANGB

LAB NUMBER	SAMPLE IDENTITY	DATE RECEIVED	MATRIX	NITRATES	UNITS
AA18335	DANGB-2-MW37-GW-1	09/21/88	WATER	< 0.02	MG/L
AA18336	DANGB-2-MW41-GW-1	09/21/88	WATER	0.05	MG/L
AA18337	DANGB-2-GW2E-GW-1	09/21/88	WATER	< 0.02	MG/L
AA18338	DANGB-BR9	09/21/88	WATER	< 0.02	MG/L
AA18339	DANGB-2-MW40-GW-1	09/21/88	WATER	0.08	MG/L
AA18340	DANGB-2-MW55-GW-1	09/21/88	WATER	0.09	MG/L
METHOD BLANK	NA		WATER	< 0.02	MG/L
LAB CONTROL SAMPLE	NA		WATER	102	%

metalRACE, Inc.

(REVISED 5/88)

PAGE 1 OF 1
DATE 9-21-88
PROJECT NO. 135-04
SAMPLE ARRIVAL DATE 9-21-88
EXPECTED NO. OF SAMPLES —
EXPECTED MATRIX Water

CLIENT Engineering Science Lab
PROJ. MGR. Acker
SHIPPER Fed Ex
DUE DATE 10-5-88

DISTRIBUTION
AUTO ✓
ICAP
I-PREP
O-PREP
GC
GCMS
RAD
PROJ. MGR. ✓
OTHER ✓

ORIGINAL ✓
REVISION
STORAGE/LOCATION
RZB

SAMPLE NO.	AA 18335	AA 18336	AA 18337	AA 18338	AA 18339	AA 18340			
SAMP ID &	DANGB-2 MW-37	DANGB-2 MW-41	DANGB-2 GW25-	DANGB BR9	DANGB-2 MW40	DANGB-2			
DESCRIPTION	GW1	GW1	GW1	—	GW1	MW-55 GW1			
SAMPLE DATE	9-20-88	→	→	→	→	→			
MATRIX	WATER	→	→	→	→	→			
ANAL CODE	SPECIFIC METHOD	CONTAINER/ PRESERVATIVE	LOT #						
H353.2	Nitrate/Nitrite Cadmium Reduction	QTpl4m		OX	OX	OX	OX	OX	OX

DISPOSAL
NORMAL ✓ ✓ ✓ ✓ ✓ ✓
HAZARDOUS
DATE TO DISPOSE
PM SIGNATURE

COMMENTS

CC1

metaTRACE, Inc.

Chain-of-Custody

Page _____ of _____

Client: Engineering Science

Project No: 135-04

Due Date: 10-5-88 Report To: Asher

Date Received: 9-21-88

Received By: _____

Sample Location: _____

Items	Date	Signature Received	Analysis	Relinquished By	Returned By	Date	Received By
18335-40	9-22-88	Bill Tarbs	Nitrate	Mary Phan	Bill Tarbs	9-24-88	Mary Phan

5523

CERTIFICATE OF ANALYSIS

PREPARED FOR: ENGINEERING-SCIENCE LABORATORY, INC. PN 135-04
600 BANCROFT WAY
BERKELEY, CA 94710

metaTRACE SAMPLE NUMBER: LISTED BELOW
DATE RECEIVED: LISTED BELOW
DATE ANALYZED: 9/23/88
METHOD: EPA 353.2
SAMPLING LOCATION: DULUTH ANGB

LAB NUMBER	SAMPLE IDENTITY	DATE RECEIVED	MATRIX	NITRATES	UNITS
AA18469	DANGB-BR10	09/22/88	WATER	< 0.02	MG/L
AA18470	DANGB-2-GW2A-GW1	09/22/88	WATER	< 0.02	MG/L
AA18471	DANGB-2-MW56-GW1	09/22/88	WATER	< 0.02	MG/L
AA18472	DANGB-2-GW2C-GW1	09/22/88	WATER	0.86	MG/L
AA18473	DANGB-2-MW4-GW1	09/22/88	WATER	0.53	MG/L
AA18474	DANGB-2-GW2D-GW-1	09/22/88	WATER	< 0.02	MG/L
AA18475	DANGB-2-MW39-GW-1	09/22/88	WATER	0.52	MG/L
METHOD BLANK	NA		WATER	< 0.02	MG/L
LAB CONTROL SAMPLE	NA		WATER	101	%

metaTRACE, Inc.

SAMPLE ARRIVAL NOTIFICATION/LABORATORY CHAIN OF CUSTODY

(REVISED 5/88)

PAGE 1 OF 1

DATE 9-22-88

PROJECT NO. 135-04

SAMPLE ARRIVAL DATE 9-22-88

EXPECTED NO. OF SAMPLES

EXPECTED MATRIX Water

CLIENT Engineering Science Lab

PROJ. MGR. Baker

SHIPPER Fed Ex

DUE DATE 10-6-88

DISTRIBUTION
AUTO ✓
ICAP
I-PREP
C-PREP
GC
GCMS
RAD
PROJ. MGR. ✓
OTHER ✓

ORIGINAL ✓

REVISION

STORAGE/LOCATION 514D

SAMPLE NO.	AA18469	AA18470	AA18471	AA18472	AA18473	AA18474	AA18475		
SAMP ID &	DANGB-	DANGB-2 GW2A-	DANGB-2 MW5B-	DANGB-2 GW2C	DANGB-2 MW4-	DANGB-2 GW2D	DANGB-2-		
DESCRIPTION	BRID	GW1	GW1	GW1	GW1	GW1	MW39-GW1		
SAMPLE DATE	9-21-88	→	→	→	→	→	→		
MATRIX	WATER	→	→	→	→	→	→		

ANAL CODE	SPECIFIC METHOD	CONTAINER/ PRESERVATIVE	LOT #								
H353.2	Nitrate/Nitrite Cadmium Reduction	QTpoly		X	X	X	X	X	X	X	

4538

DISPOSAL

NORMAL

HAZARDOUS

DATE TO DISPOSE

PM SIGNATURE

CC1

Page _____ of _____

metaTRACE, Inc.

Chain-of-Custody

Client: Engineering Science

Project No: 135-04

Due Date: 10-6-88 Report To: Asher

Date Received: 9-22-88

Received By: _____

Sample Location: _____

Items	Date	Signature Received	Analysis	Relinquished By	Returned By	Date	Received By
18469-475	9-23-88	Bill Tarr	NO_3	Mary Fisher	Bill Tarr	9-24-88	Mary Fisher

3258

CERTIFICATE OF ANALYSIS

PREPARED FOR: ENGINEERING-SCIENCE LABORATORY, INC. PN 135-04
600 BANCROFT WAY
BERKELEY, CA 94710

metaTRACE SAMPLE NUMBER: LISTED BELOW
DATE RECEIVED: LISTED BELOW
DATE ANALYZED: 9/23/88
METHOD: EPA 353.2
SAMPLING LOCATION: DULUTH ANGB

LAB NUMBER	SAMPLE IDENTITY	DATE RECEIVED	MATRIX	NITRATES	UNITS
AA18641	DANGB-2-MW7-GW1	09/23/88	WATER	< 0.02	MG/L
AA18642	DANGB-2-MW6-GW1	09/23/88	WATER	0.14	MG/L
AA18643	DANGB-2-MW5-GW1	09/23/88	WATER	< 0.02	MG/L
AA18644	DANGB-2-MW38-GW1	09/23/88	WATER	< 0.02	MG/L
AA18645	DANGB-2-GW2B-GW1	09/23/88	WATER	< 0.02	MG/L
METHOD BLANK	NA		WATER	< 0.02	MG/L
LAB CONTROL SAMPLE	NA		WATER	102	%

metaTRACE, Inc.

SAMPLE ARRIVAL NOTIFICATION/LABORATORY CHAIN OF CUSTODY

(REVISED 5/88)

PAGE 1 OF 1

DATE 9-23-88

PROJECT NO. 135-04

SAMPLE ARRIVAL DATE 9-23-88

EXPECTED NO. OF SAMPLES

EXPECTED MATRIX Water

CLIENT Engineering Science Lab

PROJ. MGR. Peter

SHIPPER Fed Ex

DUE DATE 10-3-88

DISTRIBUTION
AUTO ✓
ICAP
I-PREP
O-PREP
GC
GCMS
RAD
PROJ. MGR. ✓
OTHER ✓

ORIGINAL ✓

REVISION

STORAGE/LOCATION

SISE

SAMPLE NO.	AA18641	AA18642	AA18643	AA18644	AA18645
SAMP ID &	DANGB-2 MW7-	DANGB-2 MW-6	DANGB-2 MW5	DANGB-2 MW38	DANGB-2 OW28-
DESCRIPTION	GW1	GW1	GW1	GW1	GW1
SAMPLE DATE	9-22-88	→	→	→	→
MATRIX	WATER	→	→	→	→

ANAL CODE	SPECIFIC METHOD	CONTAINER/ PRESERVATIVE	LOT #					
H353.2	Nitrate/Nitrite Cadmium Reduction	16a plastic		OX	OX	OX	OX	OX

DISPOSAL

NORMAL	✓	✓	✓	✓	✓	
HAZARDOUS						
DATE TO DISPOSE						
PM SIGNATURE						

COMMENTS

3200

CERTIFICATE OF ANALYSIS

PREPARED FOR: ENGINEERING-SCIENCE LABORATORY, INC. PN 135-04
600 BANCROFT WAY
BERKELEY, CA 94710

metaTRACE SAMPLE NUMBER: LISTED BELOW
DATE RECEIVED: LISTED BELOW
DATE ANALYZED: 10/04/88
METHOD: EPA 353.2
SAMPLING LOCATION: DULUTH ANGB

LAB NUMBER	SAMPLE IDENTITY	DATE RECEIVED	MATRIX	NITRATES	UNITS
AA18865	DANGB-BG-SL5-SW1	09/24/88	WATER	0.69	MG/L
AA18866	DANGB-BG-SL4-SW1	09/24/88	WATER	0.10	MG/L
AA18867	DANGB-BG-SL25-SW1	09/24/88	WATER	0.07	MG/L
AA18868	DANGB-BG-SL1-SW1	09/27/88	WATER	0.09	MG/L
AA18869	DANGB-BG-SL2-SW1	09/27/88	WATER	0.04	MG/L
AA18870	DANGB-BG-SL3-SW1	09/27/88	WATER	0.74	MG/L
AA18871	DANGB-2-SL7-SW1	09/27/88	WATER	0.04	MG/L
AA18872	DANGB-2-SL6-SW1	09/27/88	WATER	0.04	MG/L
AA18873	DANGB-2-SL29-SW1	09/27/88	WATER	< 0.02	MG/L
METHOD BLANK	NA		WATER	< 0.02	MG/L
LAB CONTROL SAMPLE	NA		WATER	92	%

metaTRACE, Inc.

SAMPLE ARRIVAL NOTIFICATION/LABORATORY CHAIN OF CUSTODY

PAGE 1 OF 1
DATE 9/27/88
PROJECT NO. 135-04
SAMPLE ARRIVAL DATE 9/24/88
EXPECTED NO. OF SAMPLES
EXPECTED MATRIX Water

CLIENT Engineering Science Lab
PROJ. MGR. Peter
SHIPPER Fed Ex
DUE DATE 10-15-88

DISTRIBUTION
AUTO ✓
ICAP
I-PREP
O-PREP
GC
GCMS
RAD
PROJ. MGR. ✓
OTHER ✓

(REVISED 5/88)
ORIGINAL ✓
REVISION
STORAGE/LOCATION
(W) RED R6I

SAMPLE NO.	AA18865	AA18866	AA18867
SAMP ID & DESCRIPTION	DANGB-BG-SLS-SW1	SLA-SW1	SL25-SW1
SAMPLE DATE	9/23/88	—	—
MATRIX	WATER	—	—

ANAL CODE	SPECIFIC METHOD	CONTAINER/ PRESERVATIVE	LOT #			
H353.2	Nitrate/Nitrite Cadmium Reduction	602. PLASTIC	COLD	✓	✓	✓

6323

DISPOSAL

NORMAL
HAZARDOUS
DATE TO DISPOSE
PM SIGNATURE

COMMENTS

CC1

metaTRACE, Inc.

Chain-of-Custody

Page _____ of _____

Client: ENGINEERING SCIENCE

Project No: 135-04

Due Date: 10-15-88 Report To: ASHLEY

Date Received: 9/24/88

Received By: [signature] RBL

Sample Location: _____

Items	Date	Signature Received	Analysis	Relinquished By	Returned By	Date	Received By
12865-867	10/4/88	[signature]	NITRATE	W. Stebbins	J. Chrzastek	10-4-88	Mary Ellen

3283

metaTRACE, Inc.

SAMPLE ARRIVAL NOTIFICATION/LABORATORY CHAIN OF CUSTODY

(REVISED 5/88)

PAGE 1 OF 1

DATE 9/27/88

PROJECT NO. 135-04

SAMPLE ARRIVAL DATE 9/27/88

EXPECTED NO. OF SAMPLES

EXPECTED MATRIX Water

CLIENT Engineering Science Lab

PROJ. MGR. Decker

SHIPPER Fed Ex

DUE DATE 10-17-88

DISTRIBUTION
AUTO ✓
ICAP
I-PREP
O-PREP
GC
GCMS
RAD
PROJ. MGR. ✓
OTHER ✓

ORIGINAL ✓

REVISION

STORAGE/LOCATION R2D

SAMPLE NO.	AA18868	AA18869	AA18870								
SAMP ID & DESCRIPTION	DANGB-BG-	—	—								
	SL1-SW1	SL2-SW1	SL3-SW1								
SAMPLE DATE	9/24/88	—	—								
MATRIX	WATER	—	—								

ANAL CODE	SPECIFIC METHOD	CONTAINER/ PRESERVATIVE	LOT #									
H353.2	Nitrate/Nitrite Cadmium Reduction	16oz. PLASTIC	COLD	O ✓	O ✓	O ✓						

DISPOSAL

NORMAL	✓	✓	✓								
HAZARDOUS											
DATE TO DISPOSE											
PM SIGNATURE											

COMMENTS

327.4

CC1

metaTRACE, Inc.

Chain-of-Custody

Page _____ of _____

Client: ENGINEERING SCIENCE

Project No: 135-04

Due Date: 10-17-88 Report To: ASHLEY

Date Received: 9/27/88

Received By: [signature]

Sample Location: RZD

Items	Date	Signature Received	Analysis	Relinquished By	Returned By	Date	Received By
18868→870	10/4/88	[signature]	NITRATE	[signature]	[signature]	10-4-88	[signature]

3265

metaTRACE, Inc. SAMPLE ARRIVAL NOTIFICATION/LABORATORY CHAIN OF CUSTODY

(REVISED 5/88)

PAGE 1 OF 1
DATE 9/27/88
PROJECT NO. 135-04
SAMPLE ARRIVAL DATE 9/27/88
EXPECTED NO. OF SAMPLES
EXPECTED MATRIX Water

CLIENT Engineering Science Lab
PROJ. MGR. DeAlen
SHIPPER Fed Ex
DUE DATE 10-17-88

DISTRIBUTION
AUTO ✓
ICAP
I-PREP
O-PREP
GC
GCMS
RAD
PROJ. MGR. ✓
OTHER ✓

ORIGINAL ✓
REVISION
STORAGE/LOCATION R2D

SAMPLE NO.				AA18871	AA18872	AA18873				
SAMP ID & DESCRIPTION				DANGB-2 SL7-SW1	— SL6-SW1	— SL29-SW1				
SAMPLE DATE				9/26/88	—	—				
MATRIX				WATER	—	—				
ANAL CODE	SPECIFIC METHOD	CONTAINER/ PRESERVATIVE	LOT #							
H353.2	Nitrate/Nitrite Cadmium Reduction	16oz. PLASTIC	COLD	OL ✓	OL ✓	OL ✓				

3266

DISPOSAL
NORMAL ✓ ✓ ✓
HAZARDOUS
DATE TO DISPOSE
PM SIGNATURE

COMMENTS

metaTRACE, Inc.

CC1

Page _____ of _____

Chain-of-Custody

Client: ENGINEERING SCIENCE

Project No: 135-04

Due Date: 10-17-88 Report To: ASHER

Date Received: 9/27/88

Received By: [signature]

Sample Location: RZD

Items	Date	Signature Received	Analysis	Relinquished By	Returned By	Date	Received By
18871→73	10/4/88	[signature]	NITRATE	[signature]	[signature]	10-4-88	[signature]

3267

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