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200-BP-1 SITE INVESTIGATION
ANALYTICAL CHEMISTRY SUPPORT PROJECT

TASKS 2 & 4

DATA PACKAGE/REPORT No. 15

Revision 0

September 28, 1992

Prepared by: B.M. Gillespie

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INTRODUCTION

This data package contains the results obtained by Pacific Northwest Laboratory (PNL) staff in the characterization of samples for the 200-BP-1 site investigation analytical chemistry support project. The samples were submitted for analysis by Westinghouse Hanford Company (WHC) under the Technical Project Plan (TPP) 16772 and the Quality Assurance Project Plan (QAPjP) ALO-001. The analytical procedures required for analysis were defined in the Test Instructions (TI) prepared by the PNL 200-BP-1 Project Management Office in accordance with the TPP and the QAPjP ALO-001.

The samples (Table 1) were submitted with the appropriate WHC Chain of Custody (COC) and Sample Analysis Request Forms. The samples were delivered at refrigerated temperature to the 300 Area, 325 Building and 329 Building 200-BP-1 Sample Custodians.

The requested analyses for samples #92-04734, 92-04735, 92-04736, 92-04968, 92-05102 and 92-05150 is the full suite as specified in the WHC SOW. The full suite of analyses parameters of interest are; nitrate, nitrite, phosphate, sulfate, cyanide, free cyanide, complex cyanide, bismuth, the EPA Contract Laboratory Program inorganic target analytes, total alpha, total beta, cesium-137, cobalt-60, ruthenium-106, plutonium-239/240, plutonium-238, strontium-90, technetium-99, total uranium activity, tritium, total organic carbon and the EPA Contract Laboratory Program organic target compound list. Weight percent solid is also determined for soil samples. The other 10 samples were submitted for total and free cyanide analyses. All data are corrected to dry weight except where otherwise stated. The quality control (QC) requirements for the samples are defined in the test instructions for each sample. The QC requirements outlined in the procedures and requested in the WHC SOW were followed. Method blanks, matrix spikes, sample duplicates and/or matrix spike duplicates were analyzed. All QC data required to support results reported are included in this Data Package/Report.

The data in this package are reported in separate tables or CLP Forms (Tables 2 through 16 and CLP Forms) for each analyte or method. Five

appendices are provided; one for Test Instruction, one for Chain of Custody, Sample Analysis Request Forms and Sample Receipt Forms, one that contains the primary inorganic analytical data, one that contains the primary radiochemistry analytical data, and one that contains the primary organic analytical data and full CLP result forms.

CERTIFICATION STATEMENT

I certify that this data package is in compliance with the terms and conditions of the TPP 16772 and QAPjP ALO-001 for completeness. Release of the data contained in this hard copy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Project Manager or the Project Manager's designee, as verified by the following signature.

B. M. Gillespie
B. M. Gillespie
200-BP-1 Project Manager

9/28/92
Date

TABLE 1: 200-BP-1 Sample Numbers

WHC Sample Number	PNL ALO Sample Number	Sample Type	*Analyses Requested
B01S92	92-04661	Soil	CN Suite
B01S94	92-04662	Soil	CN Suite
B01S97	92-04734	Soil	Full Suite
B01S99	92-04735	Soil	Full Suite
B01SB1	92-04736	Soil	Full Suite
B01S96	92-04963	Soil	CN Suite
B01SB3	92-04968	Soil	Full Suite
B01SB7	92-05102	Soil	Full Suite
B01SB6	92-05103	Soil	CN Suite
B01SC0	92-05104	Soil	CN Suite
B01S70	92-05105	Water	CN Suite
B01S72	92-05106	Water	CN Suite
B01SB2	92-05150	Soil	Full Suite
B01SC2	92-05151	Soil	CN Suite
B01SC4	92-05152	Soil	CN Suite
B01SC6	92-05153	Soil	CN Suite

* CN Suite - Total CN, Free CN and Complex CN
Full Suite - Anions, Bismuth, CLP Inorganic Target Analytes, Radiochemistry Suite, TOC and CLP Organic Target Compounds (as defined in Introduction, pg 2.)

TABLE 2:

WEIGHT PERCENT SOLIDS SUMMARY SHEET

SAMPLE ID#	PNL LOG#	SAMPLE WT %	DUPLICATE WT %	AVERAGE SOLIDS WT %
B01S92	92-04661	95.03	94.74	94.9
B01S94	92-04662	95.84	95.91	95.9
B01S97	92-04734	96.56	96.90	96.7
B01S99	92-04735	95.95	95.95	96.0
B01SB1	92-04736	95.53	96.30	95.9
B01S96	92-04963	95.26	96.85	96.1
B01SB3	92-04968	96.98	96.95	97.0
B01SB7	92-05102	96.19	96.22	96.2
B01SB6	92-05103	95.81	96.11	96.0
B01SC0	92-05104	94.47	94.62	94.5
B01SB2	92-05150	94.91	94.66	94.8
B01SC2	92-05151	95.74	95.67	95.7
B01SC4	92-05152	97.35	97.57	97.5
B01SC6	92-05153	97.39	97.50	97.4

Note: Weight Percent Solids were determined following the method outlined in PNL-ALO-504.

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ANION ANALYSIS RESULTS

Ion Chromatography

The samples in this sample delivery group were extracted on 4/2/92 using procedure PNL-ALO-108 and were analyzed on the same day using procedure PNL-ALO-212, in accordance with EPA Method 300.0. Sample preparation and analysis were performed in the 325 building in the 300 area.

Data presentation (see Table 3A-3D, and the notes below)

Each anion has been listed in a separate table with sample, sample duplicate, matrix spike, duplicate matrix spike, and control standard information.

RPD values for samples analyzed in duplicate, spike recoveries for spiked samples and control standard recoveries have also been reported. For soil samples, all analyte values, spike levels, and recoveries were based on dry weights.

The control standard for all anions has been defined as the spiked blank.

Concentration flags (C) and quality flags (Q) have also been appended, where appropriate.

CRDL and IDL values

Analyte	CRDL µg/L	CRDL mg/kg	IDL µg/L	IDL mg/kg
Nitrite-N	15	1	8	0.8
Nitrate-N	15	1	7	0.8
Phosphate-P	60	5	30	1.7
Sulfate	250	20	51	4.0

Values for liquids are in μg/L and for soils in mg/kg. The IDL values for liquid samples have been derived from the standard deviations of analyses of multiple sets of the lowest calibration standard, CAL 1. For solid samples, at an extract buffer weight to sample weight ratio of 10, the IDL values have been estimated to be 0.8xCRDL for NO2-N and NO3-N, 0.33xCRDL for PO4-P, and 0.2xCRDL for SO4.

Hold Times

The hold time of 48 hours after extraction (for soils) was met for the samples analyzed. All dilutions were also completed within this period.

Accuracy and Precision in IC results

The IC anions analysis system has been calibrated with six calibration standards ranging from 0.5 - 30 ppm for the oxy-anions (NO2, NO3, PO4, SO4). The accuracy of the calibration was checked by analyzing three independently derived verification standards at 17%, 50%, and 83% of the calibration range maximum.

The accuracy of reported values between 20-80% of the calibration maximum has been estimated to be ±10%, unless otherwise noted in the Problems section of this report. This level of accuracy may be considered achievable throughout the calibration range unless otherwise specified. The accuracy decreases and errors increase for lower analyte levels and may be 100% at the instrument detection limit.

Quality Control

The criterion for the acceptance of data, that the spiked blank values for the anions of interest are quantitated within ±20%, has been met. Further discussion of this matter is included in the Problems section. The retention time (R.T.) window for the anions of interest, set at ±10%, has been met.

A duplicate set of analyses, performed on both 92-04734/B01S97 and 92-05150/B01SB2, was recovered within the appropriate quantitation limits for all anions.

The samples analyzed in this batch were spiked at a level high enough that a 10-fold dilution of the spiked sample extract would yield usable spike recovery information. The matrix spike and duplicate matrix spike recoveries, for samples 92-03300/B015S1 and 92-04968/B01SB3, were within ±25% for all anions. Further discussion of this matter is included in the Problems section.

Problems

The spike solution used for spiking these samples was prepared in June, 1991 and originally contained 200 ppm halides and 500 ppm oxy-anions. Oxidation of the nitrite has resulted in approximately 75 ppm of the nitrite being converted to nitrate. These values are based on a spike check, carried out the day the samples were analyzed.

A 100x dilution of the spike solution has been analyzed and the results of this analysis are being used to compute the recovery of all the analytes of interest in the spiked blank. This protocol for quantifying the analyte recoveries in the spiked blank and in the spiked samples is justified since the response of independently derived verification standards were within control.

TABLE 3A: ANION IC ANALYSIS DATA
NITRITE (NO2-N)
TASK 2 & 4 SDG 15

CUST ID	ALO #	C1 SAMPLE (mg/Kg)	C	C2 DUP (mg/Kg)	C	RPD	C5 BLANK (mg/Kg)	C	C3 SMPL+ SPIKE (mg/Kg)	C3 SPIKE (mg/Kg)	C6 DUP+ SPIKE (mg/Kg)	C6 SPIKE (mg/Kg)	% RECOVERY C3 SMPL SPIKE	% RECOVERY C6 DUP SPIKE	% RECOVERY C4 CNTRL STD.	Q
B015R5	92-03236+	12.2					0.8	U							93%	
B015S1	92-03300+	0.8	U			0%			119	128	119	128	93%	93%		
B01S75	92-03738+	28.6														
B01S77	92-03901+	7.3														
B01S89	92-03902+	1.6														
B01S97	92-04734	0.9	B	0.9	B											
B01S99	92-04735	39.5														
B01SB1	92-04736	38.1														
B01SB3	92-04968	27.2				2%			147	128	145	128	94%	92%		
B01SB7	92-05102	0.8	U													
B01SB2	92-05150	3.1		2.9		7%										

NOTES:

1. + Not samples in this SDG but reported for QC purposes.
2. 42 ppm X anal. dil. factor / frac. solids spike in sample; see run narrative.
3. RPD values have been calculated using sample duplicates OR the two % spike recovery values.
4. 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml.
5. C5: Method Blank ; C4: Spiked Blank; nominal sample wt=2.00gm.
6. Estimated IDL = 0.8 mg/Kg.
7. CRDL= 1.0 mg/Kg.

Quality Flags [Q]

E: Estimated value, interference present
N: Spike recovery not within control limits
*: Duplicate analysis not within control limits

Concentration Flags [C]

B: IDL <= [Analyte] < CRDL
U: [Analyte] < IDL

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TABLE 3B: ANION IC ANALYSIS DATA
NITRATE (NO3-N)
TASK 2 & 4 SDG 15

CUST ID	ALO #	C1 SAMPLE (mg/Kg)	C	C2 DUP (mg/Kg)	C	RPD	C5 BLANK (mg/Kg)	C	C3 SMPL+ SPIKE (mg/Kg)	C3 SPIKE (mg/Kg)	C6 DUP+ SPIKE (mg/Kg)	C6 SPIKE (mg/Kg)	% RECOVERY C3 SMPL SPIKE	% RECOVERY C6 DUP SPIKE	% RECOVERY C4 CNTRL STD.	Q
B015R5	92-03236+	359					0.8	U							95%	
B015S1	92-03300+	92				2%			222	135	224	135	96%	98%		
B01S75	92-03738+	379														
B01S77	92-03901+	59.4														
B01S89	92-03902+	151														
B01S97	92-04734	92		83		10%										
B01S99	92-04735	681														
B01SB1	92-04736	651														
B01SB3	92-04968	151				5%			298	136	291	136	108%	103%		
B01SB7	92-05102	5.9														
B01SB2	92-05150	292		283		3%										

NOTES:

1. + Not samples in this SDG but reported for QC purposes.
2. 60 ppm X anal. dil. factor / frac. solids spike in sample; see run narrative.
3. RPD values have been calculated using sample duplicates OR the two % spike recovery values.
4. 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml.
5. C5: Method Blank ; C4: Spiked Blank; nominal sample wt=2.00gm.
6. Estimated IDL = 0.8 mg/Kg.
7. CRDL = 1.0 mg/Kg.

Quality Flags [Q]

E: Estimated value, interference present
N: Spike recovery not within control limits
*: Duplicate analysis not within control limits

Concentration Flags [C]

B: IDL <= [Analyte] < CRDL
U: [Analyte] < IDL

TABLE 3C: ANION IC ANALYSIS DATA
PHOSPHATE (PO4-P)
TASK 2 & 4 SDG 15

CUST ID	ALO #	C1 SAMPLE (mg/Kg)	C	C2 DUP (mg/Kg)	C	RPD	C5 BLANK (mg/Kg)	C	C3 SMPL+ SPIKE (mg/Kg)	C3 SPIKE (mg/Kg)	C6 DUP+ SPIKE (mg/Kg)	C6 SPIKE (mg/Kg)	% RECOVERY C3 SMPL SPIKE	% RECOVERY C6 DUP SPIKE	% RECOVERY C4 CNTRL STD.	Q
B015R5	92-03236+	20					1.7	U							94%	
B015S1	92-03300+	1.7	U			1%			153	160	151	160	96%	94%		
B01S75	92-03738+	14.4														
B01S77	92-03901+	22.9														
B01S89	92-03902+	10.4														
B01S97	92-04734	1.7	U	1.7	U											
B01S99	92-04735	14														
B01SB1	92-04736	14.1														
B01SB3	92-04968	32				1%			165	161	163	160	83%	82%		
B01SB7	92-05102	1.7	U													
B01SB2	92-05150	8.9		8.1		9%										

NOTES:

1. + Not samples in this SDG but reported for QC purposes.
2. 49 ppm X anal. dil. factor / frac. solids spike in sample; see run narrative.
3. RPD values have been calculated using sample duplicates OR the two % spike recovery values.
4. 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml.
5. C5: Method Blank ; C4: Spiked Blank; nominal sample wt=2.00gm.
6. Estimated IDL = 1.7 mg/Kg.
7. CRDL= 5 mg/Kg.

Quality Flags [Q]

E: Estimated value, interference present
N: Spike recovery not within control limits
*: Duplicate analysis not within control limits

Concentration Flags [C]

B: IDL <= [Analyte] < CRDL
U: [Analyte] < IDL

TABLE 3D: ANION IC ANALYSIS DATA
SULFATE (SO4)
TASK 2 & 4 SDG 15

CUST ID	ALO #	C1 SAMPLE (mg/Kg)	C	C2 DUP (mg/Kg)	C	RPD	C5 BLANK (mg/Kg)	C	C3 SMPL+ SPIKE (mg/Kg)	C3 SPIKE (mg/Kg)	C6 DUP+ SPIKE (mg/Kg)	C6 SPIKE (mg/Kg)	% RECOVERY C3 SMPL SPIKE	% RECOVERY C6 DUP SPIKE	% RECOVERY C4 CNTRL STD.	Q
B015R5	92-03236+	165					4	U							95%	
B015S1	92-03300+	44.1				0%			523	500	524	500	96%	96%		
B01S75	92-03738+	344														
B01S77	92-03901+	68.6														
B01S89	92-03902+	91.9														
B01S97	92-04734	51.7		48.2		7%										
B01S99	92-04735	291														
B01SB1	92-04736	280														
B01SB3	92-04968	86.6				1%			572	500	567	500	97%	96%		
B01SB7	92-05102	8.7	B													
B01SB2	92-05150	276		266.4		4%										

NOTES:

1. + Not samples in this SDG but reported for QC purposes.
2. 50 ppm X anal. dil. factor / frac. solids spike in sample; see run narrative.
3. RPD values have been calculated using sample duplicates OR the two % spike recovery values.
4. 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml.
5. C5: Method Blank ; C4: Spiked Blank; nominal sample wt=2.00gm.
6. Estimated IDL= 4 mg/Kg.
7. CRDL= 20 mg/Kg.

Quality Flags [Q]

E: Estimated value, interference present
N: Spike recovery not within control limits
*: Duplicate analysis not within control limits

Concentration Flags [C]

B: IDL <= [Analyte] < CRDL
U: [Analyte] < IDL

CYANIDE ANALYSIS RESULTS

Total cyanide analysis was performed in room 313 of building 325 of the Hanford Site 300 area. This data package includes cyanide results for 14 soil-sediment samples and two water samples. Cyanide results are presented by colorimetric analysis run batch. Data Results are summarized in Table 4a (soild/sediments) and Table 4b (water).

Total cyanide results for soil-sediment samples and corresponding duplicates (where applicable) were below the instrument detection limit (IDL) of 0.2 mg/kg for samples 92-04661, 92-04662, 92-05102, 92-05103, 92-05104, 92-05151, 92-05152, and 92-05153. The remaining six soil-sediment samples contained from 0.4 to 1.7 mg/kg CN. Since none of the samples contained more than 2.0 mg/kg CN, no Free CN analyses were performed. The total cyanide results for the two water samples were below the IDL of 4 μg/L which was adjusted for the 250 mL sample volume.

The 12 day hold time specified for cyanide analysis under the CLP protocol was met for all samples in this data package.

Average spiked soil-sediment sample cyanide recovery was 99% with a standard deviation of 3%. Spiked water sample cyanide recovery was 101%.

Accuracy and precision can be inferred from the recovery data for the distilled CN laboratory control standard; i.e., ICV-6 (LCS-0789), prepared by ICF Corporation. The average recovery of cyanide for the laboratory control sample analyzed with the soil-sediment samples was 102% with a standard deviation of 3%. Recovery of cyanide for the laboratory control sample analyzed with the water samples was 99%. Recovery value for ICV-6 is based on the spiking of 2 ml of stock standard ICV-6 to 500 ml of deionized water and recovery back calculated to the original ICV-6 cyanide concentration.

Cyanide found in blanks analyzed for analysis groups within the data package were below the IDL of 2 μg/L.

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The IDL for liquids in the colorimetric cyanide analysis procedure is 2 μg/L, based on the EPA CLP approved procedure for determining IDLs. For solids the comparable colorimetric cyanide IDL is 0.2 mg/kg, assuming a sample weight of 5 g.

TABLE 4a: TOTAL CYANIDE ANALYSIS DATA TASK 2&4
SDG #15

SOILS-SEDIMENTS Sample ID	PNL Log#	Sample G1 (mg/kg)	C	Sample Dup G2 (mg/kg)	C	RPD	Blank G5 (µg/L)	C	Spike added (µg)	Sample + Spike G3 (mg/kg)	ICV G4 (mg/L)	%Recoveries Smpl + Spk G3	%Recoveries ICV G4	Q	Notes
B01S92	92-04661	0.2	U	0.2	U	N/A	2.0	U	48.3	10.3	9.4	100%	100%		1-5
B01S94	92-04662	0.2	U												
B01S96	92-04963	0.5	B	0.4	B	14%	2.0	U	48.3	10.1	9.6	97%	102%		1-5
B01S97	92-04734	0.4	B												2,3,5
B01S99	92-04735	1.6		1.7		4%	2.0	U	48.6	11.4	9.3	100%	99%		1-5
B01SB1	92-04736	1.6													2,3,5
B01SB7	92-05102	0.2	U	0.2	U	N/A	2.0	U	48.6	10.1	10.0	100%	106%		1-5
B01SB3	92-04968	0.5	B												2,3,5
B01SB6	92-05103	0.2	U	0.2	U	N/A	2.0	U	48.6	10.2	9.5	101%	101%		1-5
B01SC0	92-05104	0.2	U												2,3,5
B01SC2	92-05151	0.2	U	0.2	U	N/A	2.0	U	48.8	10.3	10.0	101%	106%		1-5
B01SC4	92-05152	0.2	U												2,3,5
B01SC6	92-05153	0.2	U	0.2	U	N/A	2.0	U	49.1	9.4	9.4	92%	100%		1-5
B01SB2	92-05150	1.6													2,3,5
											Mean	99%	102%		
											Std Dev	3%	3%		

Footnotes
1. Stock ICV-6=9.4 mg/L; 2 mL (18.8 µg CN) added to distillation flask & recovered in 250 mL NaOH.
2. Contract required detection limit for soil-sediment = 1.0 mg/kg.
3. IDL for solids is 0.2 mg/kg based on 5 g sample; Sample IDL adjusted for weight used.
4. RPD must be within one CRDL when either sample or duplicate are below 5X CRDL.
5. C Flags: U= <IDL, B= <CRDL but =>IDL; Q Flags: N= Spike Recovery Failed, *= RPD failed.

TABLE 4b: TOTAL CYANIDE ANALYSIS DATA TASK 2&4
SDG #15

WATERS Sample ID	PNL Log#	Sample G1 (µg/L)	C	Sample Dup G2 (µg/L)	C	RPD	Blank G5 (µg/L)	C	Spike added (µg)	Sample+ Spike G3 (µg/L)	ICV G4 (mg/L)	%Recoveries Smpl+ Spk G3	ICV G4	Q	Footnote#
B01S70	92-05105	4.0	U	4.0	U	N/A	2.0	U	48.8	98.3	9.3	101%	99%		1-5
B01S72	92-05106	4.0	U												2,3,5
											Mean	101%	99%		
											Std Dev	N/A	N/A		

Footnotes
1. Stock ICV-6=9.4 mg/L; 2 mL (18.8 µg CN) added to distillation flask & recovered in 250 mL NaOH.
2. Contract required detection limit for water = 10 µg/L.
3. IDL for liquids is 2 µg/L based on 500 mL sample; Sample IDL adjusted for volume distilled.
4. RPD must be within one CRDL when either sample or duplicate are below 5X CRDL.
5. C Flags: U= <IDL, B= <CRDL but =>IDL; Q Flags: N= Spike Recovery Failed, *= RPD failed.

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FREE CYANIDE ANALYSIS RESULTS

Total cyanide results were all below 2 mg/Kg for soils and below 20 μg/L for water, therefore free cyanide analysis was not performed on the samples in this set.

TABLE 5: FREE CYANIDE ANALYSIS DATA

No data necessary.

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COMPLEX CYANIDE ANALYSIS RESULTS

Total cyanide results were all below 2 mg/Kg and/or 20 μg/L, therefore free cyanide analysis was not performed on the samples in this set. A complex cyanide result is calculated as the difference between the total cyanide results and the free cyanide results.

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TABLE 6: COMPLEX CYANIDE ANALYSIS DATA

No data necessary.

GRAPHITE FURNACE ATOMIC ABSORPTION ANALYSIS RESULTS

Samples for this SDG and their accompanying QC samples were prepared following acid extraction procedure PNL-ALO-101 "Acid Digestion for Metal Analysis". The methodology is consistent with the CLP procedure for acid digestion of waters and sediments. Extracts were analyzed by graphite furnace atomic absorption (GFAA) spectrometry following procedures PNL-ALO-214 (As), PNL-ALO-215 (Se), PNL-ALO-216 (Bi), PNL-ALO-217 (Pb), PNL-ALO-220 (Tl), and PNL-ALO-221 (Ag). The PNL GFAA procedures are comparable to CLP SOW 788 GFAA Methods. Digestion of samples and GFAA analysis were performed in building 325 and analyses were performed on 5/27/92 through 6/10/92. The CLP SOW 788 required hold times of 180 days was met.

All GFAA analyses were conducted on the 5100 Perkin Elmer AA. The quarterly IDL results are listed on Table 7a/7b. However, the detection limits, as determined by the CLP protocol, are lower (with the exception of As and Ag) than is typical for GFAA analysis. The analytical solutions used for the instrument detection limit evaluations were about 5 times the "approximate" detection limits stated in CLP 788. The high precision obtained on these solutions produced calculated detection limits which are 2-3 times lower than normal. It should be noted, however, that the "C" flags are based on these low detection limits.

The accuracy of the analyses for this SDG can be estimated from the average of the ICV and CCV percent recoveries, while the analytical precision can be ascertained from the standard deviation of these recoveries.

		Ag	As	Bi	Pb	Se	Tl
ICV/CCV	%Recovery:	93%	95%	100%	107%	98%	104%
	Std. Dev.:	2%	5%	2%	3%	2%	3%

The RPD was omitted in Table 7a for Ag, Bi, and Se since the measured concentrations were below the instrument detection limits. The RPD for As and Tl was calculated even though the sample results were below 5x CRDL; the 1

CRDL limit was applied. All samples contained significant quantities of Pb; the RPD was 24% requiring a "*" flag for Pb results in this SDG.

Various problems were encountered during the analysis of this SDG. The problems and issues are addressed on either a "per analyte" or "general" basis.

******** Selenium:
The Se post-digestions spike recoveries were unacceptable on the first set of analyses (5/29/92) and a 10x dilution was performed on the sample and reanalysis was performed (6/02/92). The Se results for all samples were below the CRDL and, since the reanalysis spike recoveries remained very low the Se results were flagged (i.e., "W").

The soil matrix and the presence of Fe may bias Se and As results when deuterium background correction is used (as is the case with the PE 5100) rather than Zeeman background correction. The reportable detection limit for Se has been increased by ten-fold due to the necessity of diluting the samples to reduce the matrix interferences responsible for poor analytical spike recoveries.

The initial runs for Se produced negative analytical spike recoveries due to the requirement that the sample results which are less than the IDL be set to zero to calculate the spike recovery. However, by using measured sample and spiked sample absorbances (negative or positive) to calculate the recovery of the spike, all analytical spikes recoveries ranged between 83% to 127%. This provides information to support the contention that the negative absorbances are due to signal suppression caused by a matrix constituent and not due to an analysis or system error.

******** Silver:
The analysis of Ag was performed using peak height as a measure of concentration. Since peak area is generally the accepted parameter for monitoring relative concentration, the absorbance

peak areas were used to regenerate a calibration curve and recalculate all analytical results. Based on peak areas, the ICV/CCV, pre-digestion spikes, LCS, and analytical spikes were all excellent.

The use of a 5x dilution for the ICV/CCV measurement was considered marginal since it produced a Ag standard solution at 20.8 μg/L which was slightly above the upper limit of the calibration range (i.e., 20.0 μg/L). The ICV/CCV measured values ranged from 19.7 to 20.4 μg/L and the over range measurement is not considered significant.

******** Lead:
For the initial analyses performed on 6/10/92 the calibration check standard (i.e., 10 μg/L) used as part of the calibration operation analyzed at 13.6 μg/L which is outside the acceptance limit of 10% variance. Based on this, as well as the fact that the analytical spike recoveries were low, the Pb analyses were rerun (also 6/10/92).

The reason for the poor relative percent difference for sample 92-05102 (B01SB7) is unknown; however, inhomogeneity of the sample is the most likely cause.

The analytical spike concentration was 20 μg/L, significantly above the 2X CRDL of 6 μg/L. Although this was a deviation from the routine analysis protocol, it is considered to have no adverse effect on the validity of the results primarily due to the fact that the Pb concentration in all samples was relatively high with two samples requiring pre-analysis dilution. The analytical spike recovery was good for all samples within this SDG.

The LCS appeared to fail on the tabulated results. However, on further evaluation the Pb analysis appears to have a significantly high "blank". This consistent analysis "blank" ranged from 0.8 to 1.1 μg/L and contributed a significant high bias to the reported results (for most

samples this bias is approximately 10%). Based on this observation the LCS was corrected for the consistent analysis "blank" and the results fell within the acceptance limits. The reason for the analysis "blank" is unknown.

******** Arsenic:
The analytical spike for the last sample was inadvertently omitted. However, based on the CCV, which immediately followed, and the good analytical spike recoveries for all other similar samples in this analysis batch, no reanalysis was performed.

******** Bismuth:
Numerous absorbances of samples with analytical spikes are over-range; however, the results are as good as analytical spike measurements which are within the calibration range, indicating that the linear range extends above the highest calibration standard (i.e., 50 μg/L).

******** General:
The pre-digestion spikes for all analytes were added in concentration equivalent to those required by ICP analysis. These spike concentrations are 25 to 200 times higher than those prescribed for GFAA analyses. This condition was reported to the Program Manager, and subsequently WHC, and authorization was received to proceed with the use of the digestates containing the high spikes. Although the pre-digestion spike concentrations were extremely high, the recoveries for these solutions were quite good as expected.

All analyte calibration curves were constructed using the P-E AA non-linear fit. Although linear calibration is a routine requirement, evaluation of the calibration curves indicate a good linear correlation. Therefore, the instrument reported results <u>have not been</u> re-computed to a linear calibration curve.

TABLE 7a: GRAPHITE FURNACE AA ANALYSIS DATA FOR TASKS 2 & 4 -- SDG #15

Analyte	Sample ID#	PNL Log#	B1 Sample mg/Kg	B1 Post Spike Rec	B1 Flags C	B1 Flags Q	B2 Dupl. mg/Kg	B2 Post Spike Rec	B2 C	B2 Q	B1&B2 RPD	B5 Blank mg/Kg	B5 Post Spike Rec	B5 C	B3 Sample+ Spike mg/Kg	B3 Digest Spike Rec	B6 (a) B4 LCS mg/Kg	B4 LCS Rec	B4 Post Spike Rec
Ag	B01SB7	92-05102	0.14	95%	U		0.13	95%	U		N/A	0.14	97%	U			22.48	101%	85%
As	B01SB7	92-05102	2.15	104%			3.05	88%			35%	0.19	105%	U			946.66	103%	95%
Bi	B01SB7	92-05102	0.29	96%	U		0.28	95%	U		N/A	0.29	99%	U			1936.0	97%	(b)
Pb	B01SB7	92-05102	5.51	93%		*	4.35	93%		*	24%	0.11	97%	B			(c)304.66	129%	96%
Se	B01SB7	92-05102	1.29	67%	U	W	1.20	71%	U	W	N/A	0.13	98%	U			33.73	86%	92%
Tl	B01SB7	92-05102	0.11	104%	B		0.11	108%	B		0%	0.07	101%	U			45.98	118%	99%
Ag	B01S97	92-04734	0.13	94%	U										11.74	114%			
As	B01S97	92-04734	1.31	102%	B										441.73	108%			
Bi	B01S97	92-04734	0.27	94%	U										2107.0	103%			
Pb	B01S97	92-04734	2.93	92%		*									101.47	97%			
Se	B01S97	92-04734	1.17	66%	U	W									394.84	97%			
Tl	B01S97	92-04734	0.07	109%	B										417.78	102%			
Ag	B01S99	92-04735	0.14	95%	U														
As	B01S99	92-04735	0.67	113%	B														
Bi	B01S99	92-04735	5.01	92%															
Pb	B01S99	92-04735	5.73	92%		*													
Se	B01S99	92-04735	1.30	57%	U	W													
Tl	B01S99	92-04735	0.07	111%	B														

The CRDL (IDL) in ug/L: for AA5100 PE (05/18/92) Ag=10 (0.69), As=10 (0.93), Bi=60 (0.1.44), Pb=3 (0.45), Se=5 (0.63), Tl=10 (0.33)
The CRDL (IDL) in mg/Kg @200X: Ag=2.0 (0.14), As=2.0 (0.18), Bi=12 (0.30), Pb=0.6 (0.09), Se=1.0 (0.13), Tl=2.0 (0.07)
The analytical spike levels in ug/L is 20 for As, Bi, Pb, Tl and 10 for Ag, Se.
LCS standard: Ag, As, Pb, Se, Tl -- ICF 0287; Bi -- Inorganic Ventures G-BI0119
ICV/CCV used during analyses: Ag, Pb, Tl -- ICF ICV4(1290); As, Se -- ICF ICV2(1290); Bi--IV G-BI0119.

Pre-digestion spike (ug/L): Ag=50, As=2000, Bi=10000, Pb=500, Se=2000, Tl=2000. Note that these spike levels are for those required by ICP (not GFAA); no redigestions for GFAA levels were performed.

(a) The spiked blank (B6) is used for the Bi control standard; spike is at 10,000 ug/L (equivalent to 2000 mg/Kg).
(b) No analytical spike performed on these samples.
(c) Pb bias slightly high by measureable CCB; value corrected for CCB within limits (284.6 mg/Kg).
(d) Analysis dates: Ag (6/4/92), As (5/27/92), Bi (6/3/92), Pb (6/10/92), Se (5/29 & 6/2/92), Tl (6/3/92).

CLP Flags: U = [Analyte] < IDL B = IDL <= [Analyte] < CRDL
N = Pre-digestion Spike Recovery not within control limits.
W = Post-digestion spike recovery not within control limits; sample absorbance < 50% of spike absorbance.
* = RPD not within control limits.

TABLE 7b: GRAPHITE FURNACE AA ANALYSIS DATA FOR TASKS 2 & 4 -- SDG #15

Analyte	Sample ID#	PNL Log#	B1 (a) Sample mg/Kg	B1 Post Spike Rec	Flags C	Flags Q
Ag	B01SB1	92-04736	0.13	96%	U	
As	B01SB1	92-04736	1.36	104%	B	
Bi	B01SB1	92-04736	4.65	86%		
Pb	B01SB1	92-04736	6.82	88%		*
Se	B01SB1	92-04736	1.16	58%	U	W
Tl	B01SB1	92-04736	0.09	112%	B	
Ag	B01SB3	92-04968	0.11	97%	U	
As	B01SB3	92-04968	2.60	108%		
Bi	B01SB3	92-04968	0.28	102%	B	
Pb	B01SB3	92-04968	4.05	94%		*
Se	B01SB3	92-04968	0.91	69%	U	W
Tl	B01SB3	92-04968	0.10	114%	B	
Ag	B01SB2	92-05150	0.13	96%	U	
As	B01SB2	92-05150	2.70	(b)		
Bi	B01SB2	92-05150	4.30	91%		
Pb	B01SB2	92-05150	12.40	95%		*
Se	B01SB2	92-05150	1.30	73%	U	W
Tl	B01SB2	92-05150	0.12	110%	B	

The CRDL (IDL) in ug/L: for AA5100 PE (05/18/92) Ag=10 (0.69), As=10 (0.93), Bi=60 (0.1.44), Pb=3 (0.45), Se=5 (0.63), Tl=10 (0.33)

The CRDL (IDL) in mg/Kg @200X: Ag=2.0 (0.14), As=2.0 (0.18), Bi=12 (0.30), Pb=0.6 (0.09), Se=1.0 (0.13), Tl=2.0 (0.07)
The analytical spike levels in ug/L is 20 for As, Bi, Pb, Tl and 10 for Ag, Se.

(a) Supporting QC (e.g., LCS, duplicates, pre-digestion spikes) shown in Table 7a.
(b) No analytical spike performed on these samples; see narrative.
(c) Analysis dates: Ag (6/4/92), As (5/27/92), Bi (6/3/92), Pb (6/10/92), Se (5/29 & 6/2/92), Tl (6/3/92).

CLP Flags: U = [Analyte] < IDL B = IDL <= [Analyte] < CRDL
W = Post-digestion spike recovery not within control limits; sample absorbance < 50% of spike absorbance.
* = RPD for batch duplicate not within control limits.

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MERCURY COLD VAPOR ATOMIC ABSORPTION ANALYSIS RESULTS

Samples and their accompanying QC samples were analyzed by cold vapor atomic absorption (CVAA) spectrometry following procedure PNL-ALO-213 (Mercury in Water, Solids, and Sludges by Manual Cold Vapor Technique). The PNL manual CVAA procedure is consistent with CLP SOW 788 CVAA Methodology. Digestion of samples and CVAA Hg analysis were performed in the 325 building, laboratory 313. The CLP SOW 788 and contract required hold times of 26 days was not met; the following summarizes the hold time deviations:

Sample ID	Received	Analyzed	Total Hold time
B01S97, B01S99, B01SB1	03/05/92	04/22/92	48 days
B01SB3	03/09/92	04/22/92	44 days
B01SB7	03/11/92	04/22/92	42 days
B01SB2	03/13/92	04/22/92	40 days

Due to difficulties in obtaining consistent acceptance of the ICV/CCV analysis and also in meeting the recovery requirements of the LCS, minor modifications of the procedure have been documented (DR-91-99) and implemented. These modifications, which were primarily changes in the reaction chamber design and path length reductions, improve the detection limit by 10x and significantly improve reproducibility at the concentration levels required by the contract. These modifications have been incorporated into a new revision of the Hg procedure which is currently undergoing technical review.

The CVAA Hg analyses were conducted on a Perkin-Elmer 5000 AA instrument. The results for the samples are reported in Table 8, along with the QC spike and duplicate from B01S97, ICV/CCV and LCS recoveries.

For the 4/22/92 daily Hg analysis batch the average recovery for the two ICV/CCV analyses was 89.5%. The analysis of the LSC (0287) sample was 13.7 mg/kg (within the 8.5-17.0 certified range) and the pre-digestion spike recovery was 100%. Precision, as indicated by the RPD of the sample and duplicate, was 10%.

TABLE 8: Hg COLD VAPOR AA ANALYSIS DATA
SDG #15

SOLID SAMPLES

Sample ID#	PNL Log#	B1 Sample mg/Kg	B1 Flags C	B1 Flags Q	B2 Dupl. mg/Kg	B2 C	B1&B2 %RPD	B5 Blank ug/L	B5 C	B3 (a) Sample +Spike mg/Kg	B3 (a) Digest Spike %rec	B4 (b) LCS mg/Kg	B4 (b) LCS %rec
B01S97	92-04734	0.04		H	0.03		10%	0.004	U	0.24	100%	13.65	108%
B01S99	92-04735	0.39		H									
B01SB1	92-04736	0.31		H									
B01SB3	92-04968	0.10		H									
B01SB7	92-05102	0.01	B	H									
B01SB2	92-05150	0.34		H									

(a) B3 Predigestion Spike Level = 0.05 ug Hg in 25 mL aliquot.
(b) LCS 0287 Hg certified at 12.7 mg/Kg (Range 8.5 to 17.0 mg/Kg)
(c) If analyzed, NIST SRM2704 certified at 1.47 ug/g Hg
(d) RPD only calculated if both sample and duplicate are >IDL
(e) IDL = 0.04 ug/L [or 0.004 mg/kg -- (.04ug/L * 0.1L) / 1g]
(f) CRDL = 0.2 ug/L [or 0.02 mg/kg -- (0.2ug/L * 0.1L) / 1g]
(g) Calibration standards NIST SRM3133, ICV/CCV standard Johnson-Matthey 14395

CLP Flags
U: [Analyte] < IDL
H: Hold time not met
B: IDL ≤ [Analyte] < CRDL

INDUCTIVELY COUPLED PLASMA ATOMIC EMISSION SPECTROPHOTOMETRIC ANALYSIS RESULTS

Samples and their accompanying quality control samples were prepared following acid digestion by procedure PNL-ALO-101, Acid Digestion for Metal Analysis. The methodology is consistent with the CLP procedure for the acid digestion of waters and sediments. Digestates were then analyzed by Inductively Coupled Plasma Atomic Emission Spectrophotometry (ICP-AES) following procedure PNL-ALO-211. This method is comparable to EPA method 200.7 CLP-M. Calibration standard source and preparation information are located in the PNL-ACL instrument archive file: "ICP-325-405". The analysis was performed in ICP lab 405, building 325 in the 300 area.

The data is presented following U.S. EPA - CLP reporting format according to the SOW 788 protocol. Analyte concentrations are reported as dry weight corrected concentrations on "FORM I - IN, INORGANIC ANALYSES DATA SHEET". Spike sample recoveries are reported on "FORM V (Part 1) - IN, SPIKE SAMPLE RECOVERY". Duplicates and RPD's (Relative Percent Differences) are reported on "FORM VI - IN, DUPLICATES". Laboratory quality control sample results are reported on "FORM VII - IN, LABORATORY CONTROL SAMPLE". CRDL (Contract Required Detection Limits) and IDL (Instrument Detection Limits) are reported on "FORM X - IN, INSTRUMENT DETECTION LIMITS (QUARTERLY)".

This report contains the results for all of the samples including two pre-digestion spiked samples and two post-digestion spiked samples for antimony recovery tests. One of the pre-digestion spiked samples failed to meet the recovery limits for antimony, however the other pre-digestion spiked sample was within the recovery limits. This was the first time that antimony has ever passed the pre-digestion spike recovery test. Because antimony has routinely failed the pre-digestion spike recovery test in the past, two "post-digestion" spiked samples were prepared and analyzed. Both post-digestion spiked sample results for antimony were within acceptance limits. This is the fifth group of samples that have had a pre-digestion spike recovery test fail for the analyte antimony.

Precision and accuracy for the quality control samples were within EPA acceptance limits with the following exceptions: low aluminum recovery from the laboratory control sample; low pre-digestion spike recovery for antimony, cadmium and manganese; poor duplicate sample precision (21% to 48% relative percent difference) for aluminum, cadmium, calcium, chromium, copper, iron, magnesium, manganese, vanadium, and zinc; and slightly elevated cadmium and zinc levels in the preparation blanks. A continuing calibration blank analysis was inadvertently omitted near the beginning of a run. Examination of the raw data indicated that the calibration blanks which were analyzed before and after this period of time in the run were all below contract required detection limit (CRDL) or below the instrument detection limit (IDL). Therefore the omission of this single calibration blank should not have any significant affect on the data results.

The poor duplicate sample precision and pre-digestion spiked sample recovery failure for cadmium and manganese is most likely attributable to sample in-homogeneity. Especially since the "soil" samples were gravelly-coarse sand in texture, with rock chips measuring one centimeter or more and containing hydrous oxide coatings. A pre-digestion spiked blank was measured, even though not required, in an attempt to confirm the proper concentration for antimony in the pre-digestion spiking solution. The pre-digestion spiked matrix blank indicated acceptable recovery (100±6%) for <u>all</u> of the spiked analytes, including antimony. Since the pre-digestion spiked matrix blank recovery was acceptable and the pre-digestion spiked sample recovery was acceptable, with the exception of cadmium and manganese, it appears that the cause of the pre-digestion spiked sample recovery failure for cadmium and manganese was a result of sample in-homogeneity. Post-spiking for cadmium and manganese was not performed.

Cadmium in the preparation blank was reported to be about 4.4 mg/Kg. The reported cadmium concentrations in all of the samples were lower than the preparation blank. The cause of the apparent cadmium contamination in the preparation blank is not known; therefore, the reported sample cadmium concentrations may be biased high by up to 4.4 mg/Kg. Zinc in the preparation blank was also reported to be about 4.9 mg/Kg. Zinc in the samples typically

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measured about ten times this amount (approximately 50 mg/Kg) and therefore should not cause a serious problem.

The cause for the low recovery for aluminum in the laboratory control standard LCS(0287) is not known. Calibration verification standards were well within the 90% to 110% control limits. The aluminum concentration in the LCS(0287) is very low (approximately 300 mg/Kg) compared to the concentration of aluminum found in the samples (5000 to 10,000 mg/Kg).

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U.S. EPA - CLP

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

B01SB1

Lab Name: BATTELLE_PNL Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 15____

Matrix (soil/water): SOIL_ Lab Sample ID: 92-4736B1_

Level (low/med): LOW__ Date Received: 03/05/92

% Solids: _95.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10400			P
7440-36-0	Antimony	3.0	U	N	P
7440-39-3	Barium	75.2			P
7440-41-7	Beryllium	0.47	B		P
7440-43-9	Cadmium	1.7			P
7440-70-2	Calcium	9300			P
7440-47-3	Chromium	10.5		*	P
7440-48-4	Cobalt	13.4			P
7440-50-8	Copper	18.9			P
7439-89-6	Iron	37900		*	P
7439-95-4	Magnesium	5220			P
7439-96-5	Manganese	489		*	P
7440-02-0	Nickel	45.0			P
7440-09-7	Potassium	1050			P
7440-23-5	Sodium	7880			P
7440-62-2	Vanadium	101		*	P
7440-66-6	Zinc	61.7			P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

ORIGINAL_--_SOIL_SAMPLE,_ACID_LEACHED

DATE_ANALYZED:_19_MAY_92

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U.S. EPA - CLP

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

B01SB3

Lab Name: BATTELLE_PNL_____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 15____

Matrix (soil/water): SOIL_ Lab Sample ID: 92-4968B1_

Level (low/med): LOW__ Date Received: 03/09/92

% Solids: _97.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	7220			P
7440-36-0	Antimony_	2.8	U	N	P
7440-39-3	Barium___	61.9			P
7440-41-7	Beryllium	0.42	B		P
7440-43-9	Cadmium__	1.5			P
7440-70-2	Calcium__	9460			P
7440-47-3	Chromium_	12.6		*	P
7440-48-4	Cobalt___	5.7	B		P
7440-50-8	Copper___	13.0			P
7439-89-6	Iron____	17200		*	P
7439-95-4	Magnesium	5190			P
7439-96-5	Manganese	282		*	P
7440-02-0	Nickel___	11.3			P
7440-09-7	Potassium	1060			P
7440-23-5	Sodium___	2700			P
7440-62-2	Vanadium_	37.0		*	P
7440-66-6	Zinc_____	37.7			P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:
ORIGINAL_--_SOIL_SAMPLE,_ACID_LEACHED
DATE_ANALYZED:_19_MAY_92

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

B01SB7

Lab Name: BATTELLE_PNL Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 15____

Matrix (soil/water): SOIL_ Lab Sample ID: 92-5102B1_

Level (low/med): LOW__ Date Received: 03/11/92

% Solids: _96.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6240			P
7440-36-0	Antimony	2.8	U	N	P
7440-39-3	Barium	64.9			P
7440-41-7	Beryllium	0.39	B		P
7440-43-9	Cadmium	1.3			P
7440-70-2	Calcium	7730			P
7440-47-3	Chromium	9.6		*	P
7440-48-4	Cobalt	6.6	B		P
7440-50-8	Copper	13.6			P
7439-89-6	Iron	17100		*	P
7439-95-4	Magnesium	4430			P
7439-96-5	Manganese	281		*	P
7440-02-0	Nickel	9.0			P
7440-09-7	Potassium	911	B		P
7440-23-5	Sodium	270	B		P
7440-62-2	Vanadium	39.5		*	P
7440-66-6	Zinc	37.6			P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

ORIGINAL_--_SOIL_SAMPLE,_ACID_LEACHED

DATE_ANALYZED:_19_MAY_92

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U.S. EPA - CLP

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

B01S97

Lab Name: BATTELLE_PNL Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 15____

Matrix (soil/water): SOIL_ Lab Sample ID: 92-4734B1_

Level (low/med): LOW__ Date Received: 03/05/92

% Solids: _96.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6170			P
7440-36-0	Antimony	2.6	U	N	P
7440-39-3	Barium	71.4			P
7440-41-7	Beryllium	0.43	B		P
7440-43-9	Cadmium	2.7			P
7440-70-2	Calcium	7350			P
7440-47-3	Chromium	8.8		*	P
7440-48-4	Cobalt	8.1	B		P
7440-50-8	Copper	16.1			P
7439-89-6	Iron	22000		*	P
7439-95-4	Magnesium	3860			P
7439-96-5	Manganese	289		*	P
7440-02-0	Nickel	6.6	B		P
7440-09-7	Potassium	624	B		P
7440-23-5	Sodium	996			P
7440-62-2	Vanadium	60.5		*	P
7440-66-6	Zinc	42.3			P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

ORIGINAL -- SOIL SAMPLE, ACID LEACHED

DATE ANALYZED: 19 MAY 92

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

B01S99

Lab Name: BATTELLE_PNL Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 15____

Matrix (soil/water): SOIL_ Lab Sample ID: 92-4735B1_

Level (low/med): LOW__ Date Received: 03/05/92

% Solids: _96.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10200			P
7440-36-0	Antimony	2.8	U	N	P
7440-39-3	Barium	73.0			P
7440-41-7	Beryllium	0.44	B		P
7440-43-9	Cadmium	1.7			P
7440-70-2	Calcium	9220			P
7440-47-3	Chromium	8.6		*	P
7440-48-4	Cobalt	13.0			P
7440-50-8	Copper	20.4			P
7439-89-6	Iron	36200		*	P
7439-95-4	Magnesium	5100			P
7439-96-5	Manganese	464		*	P
7440-02-0	Nickel	37.7			P
7440-09-7	Potassium	1020			P
7440-23-5	Sodium	7520			P
7440-62-2	Vanadium	99.8		*	P
7440-66-6	Zinc	59.9			P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:
ORIGINAL -- SOIL SAMPLE, ACID LEACHED
DATE ANALYZED: 19 MAY 92

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

B01SB2

Lab Name: BATTELLE_PNL Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 15--17

Matrix (soil/water): SOIL_ Lab Sample ID: 92-05150-B

Level (low/med): LOW__ Date Received: 03/13/92

% Solids: _94.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	15800		*	P
7440-36-0	Antimony_	3.2	U		P
7440-39-3	Barium___	91.2			P
7440-41-7	Beryllium	0.28	B		P
7440-43-9	Cadmium__	1.1		N*	P
7440-70-2	Calcium__	8450		*	P
7440-47-3	Chromium_	12.1		*	P
7440-48-4	Cobalt___	8.4	B		P
7440-50-8	Copper___	19.7		*	P
7439-89-6	Iron____	22500		*	P
7439-95-4	Magnesium	4340		*	P
7439-96-5	Manganese	294		N*	P
7440-02-0	Nickel___	30.7			P
7440-09-7	Potassium	875	B		P
7440-23-5	Sodium___	8700			P
7440-62-2	Vanadium_	66.7		*	P
7440-66-6	Zinc____	42.3		*	P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

ORIGINAL_--_SOIL_SAMPLE,_ACID_LEACHED

DATE_ANALYZED:_20_MAY_1992

TASK_2_&_4_SDG#_15

FORM I - IN

3/90

96150741782

ICP/MS ANALYSIS RESULTS

Samples in this SDG were not analyzed for Tc-99 and U concentrations as radioactive dose levels of leachate solutions were above instrument allowable radioactivity limits. Leachate solutions were not diluted to allowable limits as the resulting IDL would, most probably, exceed the concentration of analytes of interest in the samples. Samples will be analyzed at a later date by alternate methods and/or instruments.

9613474.1783

TABLE 9: ICP-MS Analysis Data

No data available at this time.

9613474.1784

FROM THE DESK OF:

PAT REICH
SAMPLE MANAGEMENT
(509) 372-2785/H4-14

TO: ~~B01SH7-PNL-068~~ 5/24/96 M.H.
B01S92-PNL-063

DATE: March 29, 1995

SUBJECT: **TC-99 AND URANIUM DATA FOR** ~~B01SH7-PNL-068~~ 5/24/96 M.H.
B01S92-PNL-063

Due to Lab sample batching the Tc-99 and Uranium analysis with the complete raw data requested for this data package is filed in ~~B015P1-PNL-069.~~
B015PD-PNL-055

Attached is a copy of the PNL Summary and Cover letter with the sample results included.

Thank You,

Pat Reich
Sample Management

Tc-99 + U are filed in B015PD-PNL-055 for packages B015ND-PNL-061, B015Q4-PNL-056, B015PD-PNL-055, B01S92-PNL-063, B01SC7-PNL-064, B01SH7-PNL-068, B067Y5-PNL-066, B06813-PNL-067.

J.M. Duncan
5/23/96

D. E. Ayres
5/23/96

9613474.1785

COPY

Battelle
Pacific Northwest Laboratories
P.O. Box 999
Richland, Washington U.S.A. 99352
Telephone (509) 376-5802
Telex 15-2874

October 14, 1992

OCT 1992
RECEIVED
OSM DMO

Ms. J. M. Duncan, T6-08
Westinghouse Hanford Company
P.O. Box 1970
Richland, Washington 99352

Dear Ms. Duncan:

TRANSMITTAL OF 200-BP-1 SITE INVESTIGATION ANALYTICAL CHEMISTRY SUPPORT PROJECT, TASKS 2 AND 4, ICP-MS Tc-99 AND URANIUM DATA PACKAGE/REPORT FOR NOS. 12-19, REVISION 0, OCTOBER 14, 1992

(Ref: Letter to J. A. Lerch, "Transmittal of Interim Change Notice for Pacific Northwest Laboratory (PNL) Analytical Procedure for the 200-BP-1 Site Investigation Analytical Chemistry Support Project." dated April 1, 1992.)

Enclosed are two copies of the report and one copy of the appendices of the subject 200-BP-1 Tasks 2 and 4, ICP-MS Tc-99 and Uranium Data Package/Report for SDG Nos. 12-19, Revision 0, October 14, 1992 and a PNL Analytical Chemistry Laboratory Data Report/Package Acknowledgement Form for the data report/package. Please sign the form and return to me as agreed upon in the reference above.

Also, a reminder, PNL is to be notified of validation of all data report/packages as defined in the "Memorandum of Understanding Between the Pacific Northwest Laboratory (PNL) and Westinghouse Hanford Company (WHC) on 325 Laboratory Operations in Support of Hanford Site Tank Waste Characterization Activities, March 10, 1992."

If you have any questions about the above or after reviewing the data, please give me a call on 376-5802.

Sincerely,

B. M. Gillespie

B. M. Gillespie
200-BP-1 PNL Project Manager
Analytical Laboratory Operations

Enclosures

9613474.1786

COPY

200-BP-1 SITE INVESTIGATION
ANALYTICAL CHEMISTRY SUPPORT PROJECT

TASKS 2 & 4

ICP-MS Tc-99 and Uranium

DATA PACKAGE/REPORT for SDG NOs. 12-19

Revision 0

RECORD COPY

October 14, 1992

OCT 1992
RECEIVED
OSM DMO

Prepared by: B.M. Gillespie

Pacific Northwest Laboratory

(PNL Project #16772)

9615974.1787

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9613974.1788

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Appendix A: Test Instructions

Appendix B: Chain of Custody

B1 - Westinghouse Chain of Custody and Sample Analysis Request Forms

B2 - PNL Chain of Custody Forms

Appendix C: Radiochemistry Analysis Primary Data

C1 - Introduction

C2 - Laboratory Analyst Signature List

C3 - ICP-MS, Tc-99 and Uranium Activity Analysis

9613141.1799

TABLES

Table 1: 200-BP-1 Sample Numbers 4

Table 2: ICP-MS, Tc-99 and Uranium Activity Analysis 10

9613471.1790

CONTRIBUTORS LIST

PROJECT MANAGEMENT OFFICE

BM Gillespie, Project Manager
TL Ehlert, Quality Engineer
RM Nipper, Project Assistant
JL Reilly, Senior Clerk
SL Humphreys, Senior Clerk

QUALITY CONTROL OFFICERS

KJ Kuhl-Klinger

RADIOCHEMISTRY ANALYSIS

DW Koppenaal, Sub Task Leader
JP Bramson
MW Goheen
EJ Wyse

HOT CELL ANALYSIS

RT Steele
FV Hoopes
JK Rau

INTRODUCTION

This data package contains the results obtained by Pacific Northwest Laboratory (PNL) staff in the characterization of samples for the 200-BP-1 Site Investigation Analytical Chemistry Support Project. The samples were submitted for analysis by Westinghouse Hanford Company (WHC) under the Technical Project Plan (TPP) 16772 and the Quality Assurance Project Plan (QAPjP) ALO-001. The analytical procedures required for analysis were defined in the Test Instructions (TI) prepared by the PNL 200-BP-1 Project Management Office in accordance with the TPP and the QAPjP ALO-001.

The samples (Table 1) were submitted with the appropriate WHC Chain of Custody (COC) and Sample Analysis Request Forms. The samples were delivered to the 300 Area, 325 building 200-BP-1 Sample Custodian.

The analyses requested for the samples in this report are technicium-99 and uranium. The quality control (QC) requirements for the samples are defined in the test instructions for each sample. The QC requirements outlined in the procedures and requested in the WHC SOW were followed. Method blanks, matrix spikes, sample duplicates and/or matrix spike duplicates were analyzed. All QC data that exist are included in this Data Package/Report.

Three appendices are provided; one for Test Instruction, one for Chain of Custody, Sample Analysis Request Forms and Sample Receipt Forms and one that contains the primary ICP-MS analytical data.

CERTIFICATION STATEMENT

I certify that this data package is in compliance with the terms and conditions of the TPP 16772 and QAPjP ALO-001 for completeness. Release of the data contained in this hard copy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Project Manager or the Project Manager's designee, as verified by the following signature.

B. M. Gillespie
B. M. Gillespie
200-BP-1 Project Manager

10/14/92
Date

9615979.1793

200-BP-1 TASKS 2 AND 4 ICP-MS HOT SAMPLE ANALYSES

DATA PACKAGE TASK 2&4, #12

B015P1	92-02332
B015P5	92-02628
B015P9	92-02629
B015Q1	92-02630

DATA PACKAGE TASK 2&4, #13

B015R5	92-03236
B015S1	92-03300

DATA PACKAGE TASK 2&4, #14

B01S75	92-03738
B01S77	92-03901
B01S89	92-03902

DATA PACKAGE TASK 2&4, #15

B01S97	92-04734
B01S99	92-04735
B01SB1	92-04736
B01SB3	92-04968
B01SB7	92-05102
B01SB2	92-05150

DATA PACKAGE TASK 2&4, #16

B01SC7	92-05270
B01SC9	92-05271
B01SD9	92-05352
B01SD7	92-05353
B01SF7	92-05490
B01SF9	92-05491
B01SG3	92-05492
B01SG7	92-05633
B01SG9	92-05634
B01SH3	92-05690

DATA PACKAGE TASK 2&4, #17

B01SH7	92-05877
B01SB4	92-05953
B01SC8	92-05954

9613479.1794

200-BP-1 TASKS 2 AND 4 ICP-MS HOT SAMPLE ANALYSES
(continued)

DATA PACKAGE TASK 2&4, #18

B067Y5	92-06428
B067Y7	92-06713
B067Z3	92-06726
B067Z5	92-06727
B06809	92-06904

DATA PACKAGE TASK 2&4, #19

B06813	92-06963
B06815	92-06964
B06823	92-07040
B06825	92-07141
B06827	92-07142

9613474.1795

RADIOCHEMICAL DATA TABLES

ICP/MS ANALYSIS RESULTS

The project samples and accompanying QC were prepared for ICP/MS analysis using procedure PNL-ALO-101, Acid Digestion for Metal Analysis. This methodology is consistent with CLP Inorganics acid digestion for metals. The resulting digestates were further diluted and analyzed by inductively coupled plasma mass spectrometry (ICP/MS) according to procedure PNL-ALO-280, Inductively Coupled Plasma Mass Spectrometric (ICP/MS) Analysis. Technetium was determined using procedure PNL-ALO-281 (ICP/MS Determination of ^{99}Tc), and uranium was determined using procedure PNL-ALO-282 (Determination of Uranium Concentration / Isotopic Composition Using ICP/MS). The calibration standard concentrations for these analyses are documented in the raw data. Samples were prepared in the 325 building and the ^{99}Tc and U determinations were performed on the shielded ICP/MS unit in room 115 of building 3708 in the 300 area. A total of five analytical runs were necessary to include all regular and QC samples. The fifth analysis was performed for samples requiring a reanalysis. Criteria for a reanalysis included memory effects, concentrations outside calibration range, or general inconsistencies.

Previous ICP/MS analyses for 200-BP-1 samples involved the use of an ultrasonic nebulizer (USN) to maximize instrument sensitivity. Unfortunately, a USN for radioactive use has not yet been acquired, so the samples were aspirated using a conventional pneumatic nebulizer. While the extra sensitivity may have been beneficial for determining the technetium concentration, it would have had a negative impact on the uranium analysis. In fact, it is almost certain that the use of a USN would have resulted in additional dilutions to obtain the uranium concentration in many of the samples. As it was, all samples were analyzed for Tc at an additional dilution of only 2X to mitigate matrix effects.

Results were calculated using PQ software as outlined in PNL-ALO-280 and the operations manuals. Additional calculations can be necessary, however, to correct for interferences with elements of interest. At mass 99, technetium is interfered by an isotope of ruthenium; a correction is therefore necessary to subtract out the isobaric ruthenium contribution. To be accurate, this

correction factor assumes natural ruthenium isotopic abundance. There are indications that the apparent Ru in these samples is not of natural isotopic abundance; this is not surprising considering the likely source of this ruthenium. It appears that this ruthenium does not contain a measurable isotope at mass 99. For this reason, correction factors for ruthenium were obtained but were not applied in calculating the technetium concentrations. (These factors are reported in the data table however for information and for the sake of completeness.) Judging from the spiked sample recovery values, the decision not to factor in the possible Ru contribution appears to be legitimate. Some samples were calculated as containing small but measurable quantities of technetium, however the corresponding spectrum did not indicate a positive identifiable peak; these results are reported but parenthesized to indicate qualitative uncertainty.

As specified in ALO-280, appropriate internal standards were used to correct for instrument drift and general signal suppression. The elements chosen were indium (for technetium), thorium and thallium (for uranium). Indium is commonly used as an internal standard due to its absence in all but very few samples. There is more difficulty in choosing an appropriate internal standard for the high masses; there aren't that many of them above mass 200, and those that exist may be present in soils. For this reason, two elements were chosen to represent the high mass response. Unfortunately, the results indicate that many of the samples contain at least one of these elements in measurable concentrations. This was not a problem in 4 of the 5 runs, because indium served as a legitimate substitute; for one run (2922a) however, only uranium was being analyzed and indium was not scanned. To obtain legitimate results for this run, the uranium concentration for all runs was calculated against each internal standard, and the results calculated against Th and Tl were compared with those calculated against In. A thorough analysis of the data indicates that the results calculated against Tl most closely resembled the In results. It appeared that there was a small but measurable quantity of Th in many of the samples (indicated by 10-20% lower uranium concentrations relative to those obtained against In and Tl), and the few samples that contained Tl contained it in significant quantities (indicated by dramatically lower uranium concentrations relative to those

obtained against In and Th). Simply put, the presence of thallium was obvious when reviewing the raw data but the presence of Th was not. Therefore the results obtained on 2922a were calculated using Tl as the internal standard unless Tl was present in the sample. The three samples that contained Tl were calculated using Th as the internal standard.

Quality control measures included the analysis of check standards, sample duplicates, and spiked samples. Technetium matrix spike recoveries show good agreement with true values, but the uranium concentration in the samples is again far greater than the amount spiked, thereby invalidating the spiked sample recovery. Additionally, the blank spike uranium recovery for sample 2628-B6 was negatively affected by a relatively high blank concentration; this is not believed to be significant, however, considering the significantly higher uranium concentration observed in the samples. The uranium recovery for 5633-B6 is acceptable if the uncertainty of the value is considered. Recovery for Tc and U was calculated using the following formula:

Matrix Spike recovery (%) = 100 * ([Spiked Sample] - [Sample]) / [Spike]

Blank Spike recovery (%) = 100 * ([Spiked Blank] - [Blank]) / [Spike]

Unless otherwise specified, the uncertainty of the values reported is estimated at <±10%, and is based on known versus found check standard results, results between duplicate samples, and deviations between analytical runs. Data in parentheses should be considered suspect.

200-BP-1 HOT SOIL ANALYSIS

Tc-99 and Uranium determinations

Sep. 30, 1992

PNL Sample I.D. # (a)	Digest. Dil. Factor (b)	ICP/MS Analysis No.	Analysis Dilution Factor (c)	[Tc-99] ng/ml leachate (d)	[Tc-99] ng/g soil (e,i)	Ru Correctn Factor (g)	[Tc-99] ng/g spiked (f)	[Tc-99] spike yield, % (h)	[Tc-99] pCi/g, dry soil
2332 - B1	180.5	2925a32	2x	<0.02	<4				<70
2628 - B1	175.5	2925a38	2x	0.03	5				(90)
2628 - B2	179.6	2925a37	2x	0.04	8				(100)
2628 - B3	172.7	2925a36	2x	0.12	21	0.160	17	90%	350
2628 - B5	200.0	2925a35	2x	<0.02	<4				<70
2628 - B6	200.0	2925a33	2x	0.12	24	0.884	20	120%	410
2629 - B1	193.5	2928a17	2x	0.02	5				(80)
2630 - B1	183.6	2925a24	2x	<0.02	<4				<70
3236 - B1	197.8	2925a28	2x	0.03	5				(90)
3237 - B1	182.0	2921a31	2x	0.04	6				(100)
3300 - B1	178.0	2928a19	2x	0.02	4	0.734			60
3738 - B1	184.5	2921a19	2x	0.03	6				(100)
3901 - B1	191.7	2921a17	2x	<0.02	<4				<70
3901 - B2	198.7	2925a20	2x	<0.02	<4				<70
3901 - B3	158.4	2925a21	2x	0.11	17	0.197	16	108%	290
3901 - B4	198.0	2925a4	2x	0.03±0.01	6±2				(100±30)
3901 - B5	200.0	2925a8	2x	<0.02	<4				<70
3901 - B6	200.0	2925a5	2x	0.12	24	0.955	20	120%	410
3902 - B1	183.2	2921a18	2x	0.03	5				(80)
4734 - Spike		2925a7	2x	0.12		0.949			
4734 - B1	186.7	2925a8	2x	<0.02	<4				<70
4735 - B1	207.0	2925a16	2x	0.03	7				(100)
4736 - B1	183.9	2925a12	2x	0.08	10				(200)
4968 - B1	144.8	2925a14	2x	<0.02	<3				<50
5102 - B1	204.5	2925a22	2x	<0.02	<4				<70
5102 Dup	200.0	2925a27	2x	<0.02	<4				<70
5150 - B1	189.0	2925a13	2x	0.02	5				(80)
5270 - B1	174.5	2923a16	2x	0.07	13				(200)
5271 - B1	192.7	2923a9	2x	<0.02	<4				<70
5352 - B1	168.0	2923a23	2x	<0.02	<3				<60
5353 - B1	141.0	2923a4	2x	<0.02	<3				<50
5490 - B1	185.3	2923a20	2x	<0.02	<4				<70
5491 - B1	173.7	2923a19	2x	<0.02	<3				<60
5492 - B1	192.1	2928a16	2x	<0.02	<4				<70
5633 - B1	205.5	2928a7	2x	0.03±0.02	6±4	0.509			100±70
5633 - B2	170.1	2923a21	2x	<0.02	<3				<70
5633 - B3	194.3	2923a7	2x	0.13	25	0.891	19	100%	426
5633 - B4	195.9	2923a13	2x	0.1±0.2	20±40				(340±680)
5633 - B5	200.0	2928a9	2x	<0.02	<4				<70
5633 - B6	200.0	2928a10	2x	0.11	22	0.945	20	110%	370
5634 - B1	170.0	2923a5	2x	0.04	7				(100)
5690 - B1	199.4	2923a25	2x	<0.02	<4				<70
5877 - B1	185.7	2923a26	2x	0.03±0.04	5±7				(90±100)
5953 - B1	152.2	2923a22	2x	0.08±0.01	12±2				(200±30)

PNL Sample I.D. # (a)	ICP/MS Analysis No.	Analysis Dilution Factor (c)	[U] ng/ml leachate (d)	[U] µg/g soil (e,i)	[U] µg/g spiked (f)	[U] spike yield, % (h, i)	[U] pCi/g, dry soil (j)
2332 - B1	2925a32	2x	146	26.7			18.7
2628 - B1	2925a38	2x	288	50.5			35.3
2628 - B2	2925a37	2x	284	51.0			35.6
2628 - B3	2925a36	2x	329	56.8	0.173	3639%	39.7
2628 - B5	2925a35	2x	2±8	0.4±2			0.3±2
2628 - B6	2925a33	2x	1±4	0.2±0.8	0.200	-88%	0.1±0.5
2629 - B1	2928a17	2x	226	44.1			30.8
2630 - B1	2925a24	2x	34.4	8.32			4.41
3236 - B1	2925a28	2x	43.0	8.50			5.94
3237 - B1	2922a30	2x	80.0	13.0			9.05
3300 - B1	2928a19	2x	2.51	0.44			0.31
3738 - B1	2922a29	2x	221	40.8			28.5
3901 - B1	2922a27	5x	407	78.0			54.5
3901 - B2	2922a22	5x	402	79.1			55.2
3901 - B3	2922a23	5x	401	62.7	0.156	-9816%	43.8
3901 - B4	2922a3	2x	75.5	14.8			10.3
3901 - B5	2922a4	2x	0.22	0.04			0.03
3901 - B6	2922a5	2x	1.10	0.22	0.200	88%	0.15
3902 - B1	2922a28	5x	1060	173			121
4734 - Spike	2925a7	2x	9.13				
4734 - B1	2925a8	2x	2.8±0.7	0.52±0.13			0.36±0.09
4735 - B1	2925a16	2x	103	21.3			14.9
4736 - B1	2925a12	2x	164	30.2			21.1
4968 - B1	2925a14	2x	352	51.0			35.6
5102 - B1	2928a4	2x	3.80	0.78			0.54
5102 Dup	2928a22	2x	5.14	1.03			0.72
5150 - B1	2925a13	2x	314	59.4			41.5
5270 - B1	2928a13	50x	1830	319			223
5271 - B1	2923a9	2x	273	52.6			36.7
5352 - B1	2923a23	2x	348	58.1			40.6
5353 - B1	2923a4	2x	290	40.9			28.6
5490 - B1	2923a20	2x	451	83.8			58.4
5491 - B1	2923a19	2x	91.0	15.8			11.0
5492 - B1	2928a16	2x	3.05	0.59			0.41
5633 - B1	2928a7	2x	39.0	8.01			5.60
5633 - B2	2923a21	2x	45.0	7.65			5.35
5633 - B3	2923a7	2x	38.0	7.36	4.194	-325%	5.16
5633 - B4	2923a13	2x	72.0	14.1			9.85
5633 - B5	2928a9	2x	0.1±0.1	0.02			0.01±0.01
5633 - B6	2928a10	2x	0.8±0.2	0.16±0.04	0.200	70%	0.11±0.03
5634 - B1	2923a5	2x	577	98.1			68.5
5690 - B1	2928a20	2x	2.88	0.57			0.40
5877 - B1	2928a12	50x	1310	217			152
5953 - B1	2923a22	2x	898	138			95.3

200-BP-1 HOT SOIL ANALYSIS

Tc-99 and Uranium determinations

Sep. 30, 1992

PNL Sample I.D. # (a)	Digest. Dil. Factor (b)	ICP/MS Analysis No.	Analysis Dilution Factor	[Tc-99] ng/ml leachate (d)	[Tc-99] ng/g soil	Ru Correctn Factor	[Tc-99] ng/g spiked	[Tc-99] spike yield, %	[Tc-99] pCi/g, dry soil
5954 - B1	134.3	2923a27	2x	0.08	10				(200)
6428 - B1	146.9	2921a28	2x	0.02	3				(50)
6713 - B1	169.4	2928a6	2x	<0.02	<4				<70
6726 - B1	187.0	2921a22	2x	0.03	5	0.367			80
6727 - B1	194.2	2921a24	2x	0.03	5				(80)
6904 - B1	184.3	2921a29	2x	<0.02	<4				<70
6963 - B1	175.9	2921a6	2x	<0.02	<4				<60
6964 - B1	191.6	2921a32	2x	<0.02	<4				<70
7040 - B1	193.1	2921a23	2x	<0.02	<4				<70
7141 - B1	176.6	2921a21	2x	<0.02	<4				<70
7142 - B1	145.7	2921a7	2x	<0.02	<3				<50
1%HNO3		2923a30	1.053X	<0.01					
1%HNO3		2921a1	1.053X	<0.01					
1%HNO3		2921a5	1.053X	<0.01					
1%HNO3		2921a25	1.053X	<0.01					
1%HNO3		2921a34	1.053X	<0.01					
HNO3/ H20 Blank		2921a8	2x	<0.01					
50 ppt Tc-99		2925a9	1.053X	0.05					
50 ppt Tc-99		2928a14	1.053X	0.05					
100ppt Tc-99		2921a18	1.053X	0.10					
100ppt Tc-99		2921a20	1.053X	0.09					
500ppt Tc-99		2921a11	1.053X	0.46					
500ppt Tc-99		2921a26	1.053X	0.49					
7.6 pCi/L U									
7.6 pCi/L U									
7.6 pCi/L U									
41.0 pCi/L U									
41.0 pCi/L U									
41.0 pCi/L U									
LCS (287)		2925a10	2x	0.02					
Process Blank		2925a11	2x	<0.02					
"Spike"		2925a17	2x	0.12					

ICP/MS Analysis No.	Analysis Dilution Factor	[U] ng/ml leachate (d)	[U] µg/g soil	[U] µg/g spiked	[U] spike yield, %	[U] pCi/g, dry soil
2923a27	2x	652	87.8			61.2
2922a16	20x	3280	488			341
2922a7	5x	409	77.5			54.1
2922a6	2x	146	27.3			19.1
2922a24	2x	136	26.8			18.7
2922a12	2x	38.6	6.75			4.71
2922a20	5x	449	79.0			55.2
2922a13	2x	211	40.4			28.2
2922a14	2x	2.88	0.56			0.39
2922a19	20x	1730	306			213
2922a6	5x	375	54.6			38.2
2925a1	1.053X	<0.05				
2925a23	1.053X	<0.05				
2925a29	1.053X	<0.05				
2923a1	1.053X	<0.05				
2923a14	1.053X	0.30				
2922a10	2x	0.06				
2922a15	1.053X	7.81				
2923a15	1.053X	7.56				
2928a15	1.053X	6.00				
2922a31	1.053X	41.9				
2923a29	1.053X	40.0				
2925a34	1.053X	42.2				
2925a10	2x	69.3				
2925a11	2x	<0.05				
2925a17	2x	<0.05				

200-BP-1 HOT SOIL ANALYSIS

Tc-99 and Uranium determinations

Sep. 30, 1992

PNL Sample I.D. # (a)	Digest. Dil. Factor (b)	ICP/MS Analysis No.	Analysis Dilution Factor	[Tc-99] ng/ml leachate (d)	[Tc-99] ng/g soil	Ru Correctn Factor	[Tc-99] ng/g spiked	[Tc-99] spike yield, %	[Tc-99] pCi/g, dry soil	ICP/MS Analysis No.	Analysis Dilution Factor	[U] ng/ml leachate (d)	[U] µg/g soil	[U] µg/g spiked	[U] spike yield, %	[U] pCi/g, dry soil

(a) Sample types:
B1 = sample
B2 = sample, duplicate
B3 = sample + Tc/U spike
B4 = laboratory control sample
B5 = procedural blank
B6 = procedural blank + Tc/U spike

(b) units of mL/g dry soil except for -B5 and -B6 samples (blank/blank spike) units of mL.
(c) additional dilution for analysis
(d) = analyzed concentration X analysis dilution factor
(e) = leachate concentration X digestion dilution factor
(f) -B3 reported in units of ng/g for Tc and µg/g for U; -B6 reported in ng for Tc and µg for U.
(g) estimated fraction of mass 99 actually due to technetium based on natural Ru isotopic abundance.
Because Ru isotopic abundance is suspected to be unnatural, this factor was not used in calculating the final [Tc] result.
(h) = ([Spiked Sample] - [Sample]) / [Spike]
(i) not valid for spiked samples; [U] in soil/leachate >> [U] of added spike
(j) all uranium found to be natural isotopic abundance. Total uranium activity calculated using following formula: pCi/g = [U-236]*0.336/0.481

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GAMMA ENERGY ANALYSIS

Nineteen soil samples were received between March 5, 1992 and April 6, 1992 as part of Sample Delivery Groups No. 15, 16, and 17 and were analyzed by Gamma Energy Analysis (GEA) as one batch. Four duplicate samples and a matrix blank were analyzed per the Test Instructions received. A total of 24 samples were analyzed by GEA. The sample preparation and counting were performed in the 329 building in the 300 Area.

The samples were prepared for counting following PNL-ALO-105. This procedure covers the preparation of solid samples for GEA. The samples were either prepared in a glass scintillation vial (which contained 13 to 16 g of soil and were counted on shelf 2 or shelf 5 of the sample holder for diode L) or in a 2/5 dram polyvial (which contained about 1.0 g of soil and counted on shelf 4 of the sample holder for diode L).

The aliquot weights are "as received" soil; ie., the soil was not dried. A percent solids determination has been performed as part of Task 2 and 4 and the results can be found in Table 2 of this report. Therefore, one can convert the reported values to a dry weight basis if desired.

The counting geometries used to count the samples have been calibrated during the performance of past work for this program. The samples were counted in three different calibrated geometries on Diode L - 1) a glass scintillation vial on shelf 2 of sample holder, 2) a glass scintillation vial on shelf 5 of sample holder, and 3) a 2/5 dram polyvial counted on shelf 4 of the sample holder.

The samples were then analyzed by gamma-ray spectroscopy to determine the quantities of Co-60, Ru-106, and Cs-137 present. This portion of the work was performed following PNL-ALO-464 and PNL-ALO-470. The samples were counted on diode L which is a lithium-drifted germanium [Ge(Li)] detector. Table 10 presents the measured quantities for Co-60, Ru-106, and Cs-137 in the soils. The detection limits quoted are calculated as if the isotope was present at a level that is 2.5 times the square root of twice the average background. For

the "hotter" samples, at least two counts were taken of each sample. A short count of 100 to 1000 seconds was taken to obtain a peak for Cs-137 that did not overflow the analyzer and a longer count was taken to obtain better sensitivity for Ru-106 and Co-60 but the peak for Cs-137 may have overflowed the analyzer. Therefore, both counts were used to obtain the recommended values for each isotope in each sample.

Two aliquots of the following samples were measured: 92-04736, 92-05352, 92-05490, and 92-05954. For Cs-137, the counting error is around 1.0% for each sample. The mean and standard deviation for each pair of samples was calculated. The average of the standard deviations for each pair was then determined to be 8.5%. This is well below the required precision for soils of ± 35%.

The detection limits were determined from sample 92-05954-L-5 which is an empty glass scintillation vial counted on shelf 2 of the sample holder for diode L. The average weight of the preceding 18 samples prepared in the glass scintillation vials was determined to be 14.7 g. This weight was assumed to allow the calculation of detection limits in pCi/g for Co-60, Ru-106, and Cs-137. The detection limits at one sigma are 0.08, 0.8 and 0.06 pCi/g, respectively.

Table 10: Gamma Energy Analysis of Soils

Diode L

(Radionuclide activity in pCi/g[a])

WHC Sample ID	Sample ID	Collection Date	Weight (g)	Co-60	Ru-106	Cs-137
B01S97	92-04734-L-1	3/2/92 10:12	16.433	1.11 ± 0.09	<34	(8.52 ± 0.09) X 10^4
B01S99	92-04735-L-1	3/3/92 10:15	1.0717	<70	<4000	(3.34 ± 0.06) X 10^6
B01SB1	92-04736-L-1	3/3/92 10:15	12.074	<350	<3000	(2.88 ± 0.03) X 10^6
B01SB1	92-04736-L-2	3/3/92 10:15	1.0962	<40	<3300	(2.75 ± 0.01) X 10^6
B01SB3	92-04968-L-1	3/5/92 10:40	15.846	<3	<210	(1.66 ± 0.02) X 10^5
B01SB7	92-05102-L-1	3/10/92 08:33	15.275	<0.14	<0.47	<0.20
B01SB2	92-05150-L-1	3/11/92 08:50	1.2004	<480	<2500	(4.50 ± 0.05) X 10^6
B01SC7	92-05270-L-1*	3/13/92 08:55	1.0658	<830	<15000	(1.29 ± 0.01) X 10^7
B01SC7	92-05271-L-1*	3/16/92 14:00	14.838	<3	<190	(4.12 ± 0.04) X 10^5
B01SD9	92-05352-L-1*	3/19/92 14:32	15.179	0.70 ± 0.20	<16	(9.12 ± 0.28 X 10^2
B01SD9	92-05352-L-2*	3/19/92 14:32	16.621	0.596 ± 0.006	<2	(9.47 ± 0.09) X 10^2
B01SD7	92-05353-L-1*	3/19/92 10:20	14.404	<2	<140	(5.44 ± 0.03) X 10^4
B01SF7	92-05490-L-1*	3/23/92 14:16	14.144	<210	<14000	(2.35 ± 0.02) X 10^6
B01SF7	92-05490-L-2*	3/23/92/14:16	0.9269	<90	<5300	(1.84 ± 0.02) X 10^6
B01SF9	92-05491-L-1*	3/25/92 09:04	14.794	<0.2	<9	(3.02 ± 0.03) X 10^3
B01SG3	92-05492-L-1*	3/25/92 13:26	14.464	<0.3	<3	2.50 ± 0.36
B01SG9	92-05634-L-1*	3/30/92 10:02	13.680	3.1 ± 0.1	<30	(5.64 ± 0.06) X 10^3
B01SH3	92-05690-L-1*	3/31/92 09:03	13.214	<0.3	<3.5	4.39 ± 0.40
B01SG7	92-05633-L-1*	3/26/92 10:45	16.738	1.81 ± 0.17	<44	(1.25 ± 0.01) X 10^4
B01SH7	92-05877-L-1*	4/1/92 10:21	1.0683	62 ± 10	<2700	(4.41 ± 0.04) X 10^6
B01SB4	92-05953-L-1*	4/8/92 08:34	1.2256	<90	<5600	(2.88 ± 0.03) X 10^6

Table 10: Gamma Energy Analysis of Soils Continued

B01SC8	92-05954-L-1*	4/8/92 10:21	15.268	50 ± 2	<690	(1.37 ± 0.01) X 10^6
B01SC8	92-05954-L-2*	4/8/92 10:21	0.8959	64 ± 7	<2200	(1.60 ± 0.03) X 10^6
B01SC8	92-05954-L-5*	4/8/92 10:21	14.7	<0.19	<1.9	<0.14

Footnotes

[a] The one sigma uncertainties are based on counting statistics. All "<" values are detection limits associated with each "not detected" analysis. The detection limits are calculated as if the isotope was present at a level that is 2.5 times the square root of twice the average background.

* Sample not in this SDG but reported for QC and analytical batch purposes.

TOTAL ALPHA ANALYSIS RESULTS

Total alpha analysis for SDG 15 was performed in April, 1992 in two batches. The samples were grouped in batches based on activity levels. Five high activity samples were analyzed along with the QC samples in the first batch. One low activity level sample was analyzed with 3 low level samples from SDG 16 along with the QC samples in the second batch. From the first batch, a nominal 1 gram sample size was taken for analysis; from the second batch, a nominal 4 gram sample size was taken for analysis. The samples were leached per procedure PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis. Aliquots of the leachate solutions and blank were taken to perform the alpha analysis. Total alpha analysis proceeded per Procedure PNL-ALO-460, Source Preparation for Gross Alpha Analysis, and PNL-ALO-461, Alpha Counting Procedure. All work was performed in building 329 and 329T5 of the 300 area.

Two samples contain significant rock fractions: B01S97, and B01S99. Because many rocks were present in B01S97, a sample was taken after sifting through a kitchen sieve. In the second sample, B01S99, an aliquot was taken after rolling the rocks away.

Due to the high activity of the samples in the first batch, the matrix spike could not be added to a soil aliquot directly. This would have required a very small soil sample be taken and a large alpha spike added. A small sub-sample size would not necessarily be representative of the whole sample due to sample inhomogeneity. Therefore, a matrix spike recovery calculation would have a high degree of uncertainty. To circumvent this problem, an alpha spike was added to an aliquot of a sample leachate (B01SB1); error due to sampling problems is no longer a factor. This spiking protocol tests all analytical parameters except the leaching process. The second batch utilizes the usual procedure of spiking the soil prior to leaching. The activity of these soils is low and spiking provides meaningful spike recovery results.

The analysis for total alpha activity proceeded smoothly; all QC criteria were met. In the first batch, the matrix spike resulted in 100%

recovery and the blank spike resulted in 106% recovery. In the second batch, the matrix spike resulted in 83% recovery and the blank spike resulted in 111% recovery. These values indicate an average batch bias of 0%. The precision, estimated by the relative percent difference of the duplicates, averages 16%. The largest contribution to the imprecision is estimated to come from the sample heterogeneity at the 1 g sample size. Alpha activity in the blank was not detectable at <0.7 pCi/g.

A column in the table indicates the normalized blank value. This is a normalization relative to the actual sample size taken for analysis. Due to extremely high activity (in some cases) a very small aliquot of the soil leachate is analyzed. This would result in a relative blank value quite different from the blank based on a 1 gram equivalent sample size. In the case of a slightly positive blank value, it will help put the sample results in proper perspective, and so it is provided as a courtesy.

Results are reported on the basis of the as-received weight, i.e. not corrected for percent solids.

No hold times are defined for total alpha analysis.

TABLE 11: TOTAL ALPHA ANALYSIS DATA
TASKS 2 & 4 SDG #15

WHC Sample ID	Parameters of Interest Sample #	Sample Type	Alpha (pCi/g)	+/- 1 sigma*	Normalized Blank**	RPD	Spike Conc. (pCi/g)	+/- 1 sigma*	Spike % Rec.
First Batch									
B01S97	92-04734-A-1a	Soil	69.4	8.7	<20				
B01S99	92-04735-A-1a	Soil	1870	250	<600				
B01SB1	92-04736-A-1a	Soil	2200	280	<600				
B01SB1	92-04736-A-2a	Duplicate	2390	300	<700	8			
B01SB3	92-04968-A-1a	Soil	187	16	<20				
B01SB2	92-05150-A-1a	Soil	2380	230	<400				
	92-04736-A-3a	Matrix Spike	11680	860	<600		9430	200	100
	92-04736-A-4a	Blank Spike	25.1	1.6	<0.7		23.84	0.13	106
	92-04736-A-5a	Method Blank	<0.7						
Second Batch									
B01SB7	92-05102-A-1a	Soil	1.94	0.40	<0.1				
B01SF9	92-05491-A-1a +	Soil	8.30	0.93	<0.2				
B01SF9	92-05491-A-2a +	Duplicate	6.59	0.89	<0.1	23			
	92-05491-A-3a +	Matrix Spike	89.7	7.1	<0.5		99.64	0.56	83
	92-05491-A-4a +	Blank Spike	133	11	<0.6		119.77	0.64	111
	92-05491-A-5a +	Method Blank	<0.6						

*One sigma uncertainties are based on propagation of mass, volume, and counting uncertainties.

**Blank value normalized to sample size analyzed. See narrative for details.

+ Sample not a part of this SDG.

TOTAL BETA ANALYSIS RESULTS

Total beta analysis for SDG 15 was performed in April, 1992 in two batches. The samples were grouped in batches based on activity levels. Five high activity samples were analyzed along with the QC samples in the first batch. One low activity level sample was analyzed with 3 low level samples from SDG 16 along with the QC samples in the second batch. From the first batch, a nominal 1 gram sample size was taken for analysis; from the second batch, a nominal 4 gram sample size was taken for analysis. The samples were leached per procedure PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis. Aliquots of the leachate solutions and blank were taken to perform the alpha analysis. Total beta analysis proceeded per Procedure PNL-ALO-462, Source Preparation for Gross Beta Analysis, and PNL-ALO-463, Beta Counting Procedure. Detectors are calibrated relative to Sr/Y-90. All work was performed in building 329 and 329T5 of the 300 area.

Two samples contain significant rock fractions: B01S97, and B01S99. Because many rocks were present in B01S97, a sample was taken after sifting through a kitchen sieve (nominal pore size of 1.7 mm). In the second sample, B01S99, an aliquot was taken after rolling the rocks away.

Due to the high activity of the samples in the first batch, the matrix spike could not be added to a soil aliquot directly. This would have required a very small soil sample be taken and a large beta spike added. A small sub-sample size would not necessarily be representative of the whole sample due to sample inhomogeneity. Therefore, a matrix spike recovery could not be accurately calculated. To circumvent this problem, a beta spike was added to an aliquot of a sample leachate (B01SB1); error due to sampling problems is no longer a factor. This spiking protocol tests all analytical parameters except the leaching process. The second batch utilizes the usual procedure of spiking the soil prior to leaching.

An aliquot (10 ml) of the matrix spike resulted in 61% recovery. Because this recovery was so low, another aliquot (10 ml) of the matrix spike solution was plated and counted which resulted in 104% recovery. It is unknown why the

first plating was so low in recovery. It appears to be due to some problem relating to the transfer of a 10 ml solution aliquot onto a beta dish. Because the duplicate values agree well with each other and the blank spike resulted in 104% recovery, the initial transfer of the matrix spike solution was determined to be an isolated incident and the recovery data is not included with average spike recovery determination.

The analysis for total beta activity proceeded smoothly; most QC criteria were met. In the first batch, the matrix spike resulted in 100% recovery and the blank spike resulted in 97% recovery. In the second batch, too much sample (3 grams as opposed to 0.75 grams) was taken for analysis. The added spike activity was not high enough to determine the spike recovery without introducing large errors in the calculation. For example, spike recovery determined by the method described in the QAPjP, ALO-001, is 188 ± 155%. Therefore, to accommodate this sample, an alternative equation is used to determine the matrix spike recovery: the observed value is divided by the sum of the average sample value plus the known added spike value. For the example given, the matrix spike recovery becomes 104 ± 6%. The overall batch bias, based on the average spike recovery, is +1.3%. The precision, estimated by the relative percent difference of the duplicates, averages 5%.

Beta activity in the blank was detected in the first batch (13.7 pCi/g). This blank value is generally the result of contamination from the samples themselves and is insignificant relative to the sample values (see the normalized blank). The normalized blank value is a normalization relative to the actual sample size taken for analysis. Due to extremely high sample activity, a very small aliquot of the soil leachate is analyzed. This results in a relative blank value quite different from the blank based on a 1 gram equivalent sample size. In this case of a positive blank value, it shows the worst case estimated relative contamination. Beta activity from the second batch run was not detectable at 1.7pCi/g. When normalized to the sample size taken (average of 4 grams), this results in a detection limit of about 0.4pCi/g.

The results are reported per received sample weight, i.e. (not corrected for weight percent solids). No hold times are defined for total beta analysis.

TABLE 12: TOTAL BETA ANALYSIS DATA
TASKS 2 & 4 SDG #15

WHC Sample ID	Parameters of Interest Sample #	Sample Type	Beta (pCi/g)	+/- 1 sigma*	Normalized Blank**	RPD	Spike Conc. (pCi/g)	+/- 1 sigma*	Spike % Rec.
First Batch									
B01S97	92-04734-A-1a	Soil	2.25E+05	5.8E+03	4.3E+03				
B01S99	92-04735-A-1a	Soil	8.67E+06	3.2E+05	5.4E+05				
B01SB1	92-04736-A-1a	Soil	8.56E+06	3.2E+05	5.4E+05				
B01SB1	92-04736-A-2a	Duplicate	8.88E+06	3.3E+05	5.6E+05	4			
B01SB3	92-04968-A-1a	Soil	3.40E+05	1.3E+04	2.4E+04				
B01SB2	92-05150-A-1a	Soil	1.11E+07	4.4E+05	9.0E+05				
	92-04736-A-3a	Matrix Spike	1.80E+07	6.1E+05	5.4E+05		9.48E+06	5.4E+05	100
	92-04736-A-4a	Blank Spike	46.3	1.9	13.7		47.9	2.4	97
	92-04736-A-5a	Method Blank	13.7	1.7					
Second Batch									
B01SB7	92-05102-A-1a	Soil	2.79	0.42	<0.43				
B01SF9	92-05491-A-1a+	Soil	1680	92	<0.43				
B01SF9	92-05491-A-2a+	Duplicate	1580	88	<0.43	6			
	92-05491-A-3a+	Matrix Spike	1044	56	<0.57		75.7	3.8	(a)
		MS Replate	1772	98	<0.57		75.7	3.8	(a)
	92-05491-A-4a+	Blank Spike	249	14	<1.7		240	12	104
	92-05491-A-5a+	Method Blank	<1.7						

*One sigma uncertainties are based on propagation of mass, volume, and counting uncertainties.

**Blank value normalized to sample size analyzed. See narrative for details.

a) See narrative for discussion of matrix spike.

+ Samples not a part of this SDG.

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PLUTONIUM ANALYSIS RESULTS

Plutonium analyses were performed in April and May, 1992, on samples from sample delivery group (SDG) #15 and #16 along with their corresponding QC samples. Sample analyses were split into two analytical batches. The first batch contained higher radioactivity level samples; the second batch was a combination of SDG 15 and SDG 16 low and non-radioactive samples. For the first batch, a nominal 1 gram sample size was taken for acid leaching. From the leachate, an appropriate sized aliquot was taken for radiochemical separation and analysis. This was necessary due to the relatively high level of activity in the samples. For the second batch, a nominal 2 grams were leached and the entire leachate underwent radiochemical separation and analysis. The leach procedure used was PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis. Analysis was completed according to Procedures PNL-ALO-466, Plutonium Separation, PNL-ALO-468, Electroplating, and PNL-ALO-469, Alpha Energy Analysis. All work was performed in buildings 329 and 329T5 in the 300 area.

Two samples contain significant rock fractions: B01S97, and B01S99. Because many rocks were present in B01S97, a sample was taken after sifting through a kitchen sieve, the nominal pore size of which is 1.7mm. In the second sample, B01S99, an aliquot was taken after rolling the rocks away.

All samples from the first batch were spiked with Pu-242 tracer after leaching to correct for radiochemical yield of each individual sample. Tracer was added directly to the soil samples from the second batch. The Pu-239 recoveries for the blank spikes in the two batches are 84% and 91% indicating an overall average bias of -13%. The precision, estimated by the relative percent difference of the duplicates, is ± 15% (first batch) and ± 11% (second batch) for Pu-239, averaging ± 13%. The precision of Pu-238 is estimated from the first batch to be ± 19%. Precision can not be estimated from the second batch duplicate values because the results are too low in Pu-238 concentration. These parameters are within the project target precision (± 35%) and accuracy (± 25%).

No detectable amount of Pu-238 was found in either of the two blanks. Plutonium-239+240 was detected only in the blank of the second batch, but at an extremely low level, 0.002 pCi/g (well below the required detection limit of 0.5 pCi/g). This correlates to only about 3% of the activity found in the duplicate samples. Also, Pu-239+240 was not detected in sample B01SB7. Therefore, the slightly positive blank value is determined to be inconsequential to this analysis set.

The results for the blanks and blank spikes are reported relative to a 1 gram sample size. Two columns in the data table indicate the normalized blank values. This is a normalization relative to the actual sample size taken for analysis. Due to extremely high activity (in some cases) a very small aliquot of the soil leachate is analyzed. This results in a relative blank value quite different from the blank based on a 1 gram equivalent sample size. In the case of a slightly positive blank value, it helps put the sample results in proper perspective, and so the normalized blank value is provided as a courtesy.

The results are reported per received sample weight (not corrected for weight percent solids). No hold times are defined for plutonium analyses.

TABLE 13: PLUTONIUM ANALYSIS DATA FOR TASKS 2 & 4
SDG #15

Client Sample ID	Program Sample ID	Sample Type	Pu-239+240 pCi/g	+/- 1 sigma*	Pu-239+240 RPD	Pu-239+240 Normalized Blank**	Pu-238 pCi/g	+/- 1 sigma*	Pu-238 RPD	Pu-238 Normalized Blank**	Pu-239 Spike pCi/sample	+/- 1 sigma	% Recovery
Batch One													
B01S97	92-04734-A-1c	Soil	3.41E+01	1.25E+00		< 7 E-02	5.19E-01	5.28E-02		< 5 E-02			
B01S99	92-04735-A-1c	Soil	1.12E+03	4.08E+01		< 2 E+00	5.03E+01	3.12E+00		< 2 E+00			
B01SB1	92-04736-A-1c	Soil	1.32E+03	5.00E+01		< 4 E+00	5.29E+01	4.23E+00		< 3 E+00			
B01SB1	92-04736-A-2c	Duplicate	1.53E+03	5.79E+01	15	< 4 E+00	6.43E+01	4.98E+00	19	< 3 E+00			
B01SB3	92-04968-A-1c	Soil	9.42E+01	3.33E+00		< 7 E-02	4.63E+00	2.16E-01		< 6 E-02			
B01SB2	92-05150-A-1c	Soil	9.95E+03	3.82E+02		< 7 E+00	4.09E+02	3.50E+01		< 6 E+00			
	92-04736-A-5c	Blank	< 2 E-02				< 2 E-02						
	92-04736-A-4c	Blank Spike	1.02E+01	3.30E-01			< 1 E-02				1.22E+01	2.20E-01	84
Batch Two													
B01SB7	92-05102-A-1c	Soil	< 2 E-03			1 E-03	< 3 E-03			< 7 E-04			
B01SF9	92-05491-A-1c	Soil +	7.32E-02	1.03E-02		1 E-03	< 8 E-03			< 7 E-04			
B01SF9	92-05491-A-2c	Duplicate +	6.59E-02	5.41E-03	11	1 E-03	4.05E-03	1.60E-03	na	< 7 E-04			
	92-05491-A-5c	Blank +	2.06E-03	9.24E-04			< 2 E-03						
	92-05491-A-4c	Blank Spike +	1.08E+01	2.99E-01			< 3 E-03				1.19E+01	1.10E-01	91

* Propogated error based on combination of counting, pipetting, and volume uncertianties.
** Blank value when normalized to actual sample size analyzed, in pCi/g.
\+ Samples included for QC purposes--these were the batch duplicates.

All sample analyses are based on received sample weight, i.e. no correction for weight percent solids.

STRONTIUM ANALYSIS RESULTS

Strontium analysis of SDG #15 samples was performed in April, 1992 in two batches. The first batch consisted of high level activity samples where a nominal 1 gram sample size was taken for analysis. The second batch consisted of low level samples from SDG #15 and #16 where a nominal 2 grams sample size was taken for analysis. The QC sample in the second batch (B01SF9) came from SDG #16. The samples were leached per procedure PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis. Samples from the first batch were diluted serially and aliquots of appropriate activity were taken for Sr-90 analysis. The strontium analysis continued per Procedure PNL-ALO-465, Strontium-90 Analysis (Oxalate-Nitric Acid Method), and PNL-ALO-463, Beta Counting Procedure. All analytical work and calculations were performed in building 329 and 329T5 of the 300 area.

Two samples contain significant rock fractions: B01S97, and B01S99. Because many rocks were present in B01S97, a sample was taken after sifting through a kitchen sieve. In the second sample, B01S99, an aliquot was taken after rolling the rocks away.

The analysis for strontium-90 proceeded smoothly. The matrix or yield spike of a known blank soil was used to determine the batch yield. The yields of the two batches agreed well: 95% and 96%. All samples of each batch are calculated on the basis of their ratio to the corresponding matrix spike recovery which has been normalized to 100% chemical recovery.

The blank spike consisted of 8M HNO_3 and resulted in 111% (first batch) and 97% (second batch) recoveries. A matrix spike was run with the first batch which consisted of a known blank soil spiked with Sr-90 and it resulted in 104% recovery. The second batch matrix spike sample consisted of B01SF9 and resulted in 93% recovery of Sr-90. Based on the blank and matrix spike recoveries, the overall bias is calculated to be +1.3%. The precision, estimated by the relative percent difference of the duplicates, is ± 13%.

The blank resulted in detectable activity in the first batch, 1.4 pCi/g, and no detectable activity in the second batch, <0.6 pCi/g. These blank values are normalized against the samples (based on the sample mass analyzed) to provide a more meaningful blank value relative to the sample value. This normalization process would represent the worst case scenario of sample contamination. For the first batch, the normalized blank represents less than 5% of the Sr-90 activity.

The Sr-90 analysis does not correct for the presence of Sr-89; all activity is assumed to be from Sr-90. The results are reported per received sample weight (not corrected for weight percent solids). No hold times are defined for Sr-90 analysis.

TABLE 14: STRONTIUM-90 ANALYSIS DATA
TASKS 2 & 4 SDG #15

WHC Sample ID	Parameters of Interest Sample #	Sample Type	Strontium (pCi/g)	+/- 1 sigma*	Normalized Blank***	RPD	Spike Conc. (pCi/g)	+/- 1 sigma*	Spike % Rec.	Normalized % Yield**
First Batch										
B01S97	92-04734-A-1b	Soil	5.89E+04	4.67E+03	8.9E+02					
B01S99	92-04735-A-1b	Soil	2.98E+06	2.71E+05	1.4E+05					
B01SB1	92-04736-A-1b	Soil	2.90E+06	2.58E+05	1.4E+05					
B01SB1	92-04736-A-2b	Duplicate	3.32E+06	2.92E+05	1.5E+05	13.5				
B01SB3	92-04968-A-1b	Soil	9.89E+04	8.29E+03	2.5E+03					
B01SB2	92-05150-A-1b	Soil	3.53E+06	2.97E+05	9.3E+04					
	92-04736-A-3b	Matrix Spike	431	32.9	1.4		414	21	104	
	92-04736-A-3b	Yield Spike	Used to determine Batch yield							95
	92-04736-A-4b	Blank Spike	53.5	4.7	1.4		48.3	2.4	111	
	92-04736-A-5b	Method Blank	1.41	0.44						
Second Batch										
B01SB7	92-05102-A-1b	Soil	0.65	0.20	<0.3					
B01SF9	92-05491-A-1b +	Soil	40.8	3.2	<0.2					
B01SF9	92-05491-A-2b +	Duplicate	36.0	2.9	<0.2	12.7				
	92-05491-A-3b +	Matrix Spike	294	22	<0.4		274	14	93	
	92-05491-A-3b +	Yield Spike	Used to determine Batch yield							96
	92-05491-A-4b +	Blank Spike	46.0	4.1	<0.6		47.4	2.4	97	
	92-05491-A-5b +	Method Blank	<0.61							

* One sigma uncertainties are based on propagation of mass, volume, and counting uncertainties.

** All Sr-90 analyses are calculated on the basis of their ratio to the matrix spike recovery which has been normalized to 100% chemical recovery.

*** Blank value when normalized to actual sample mass analyzed.

\+ Sample not a part of this SDG.

TRITIUM ANALYSIS RESULTS

Six soil samples and their corresponding QC samples were prepared and analyzed according to procedures PNL-ALO-441, Radionuclide Separation and Analysis Procedure for Tritium, and PNL-ALO-443, Liquid Scintillation Counting Procedure for Tritium. The leaching, distillation and counting were performed in building 329 in the 300 area.

Two samples contain significant rock fractions: B01S97, and B01S99. Because many rocks were present in B01S97, a sample was taken after sifting through a kitchen sieve. In the second sample, B01S99, an aliquot was taken after rolling the rocks away.

A nominal 6 grams were initially sub-sampled for leaching. After leaching and a double distillation, the aliquots counted are equivalent to approximately 0.8 g. A pre-leached sample (B01SB3) was used to determine the batch yield or recovery correction factor (F_s). The recovery correction factor is applied to each analytical result in the batch. The yield is 85.1%. This is consistent with past experience.

The duplicate values agree well with each other (9% RPD). The blank spike consists of a pre-leached sample (B01SB3, duplicate) with a known amount of tritium spike added. It is essentially a duplicate of the batch yield sample described above. The blank spike recovery of 85.4% is obtained. The matrix spike sample consists of an as received sample (B01SB3) to which a known tritium spike is added. Recovery of the matrix spike shows good recovery of 80.7%. Averaging both spike recoveries results in 83% average recovery, indicating an average -17% bias.

The blank result indicates a non-detectable amount of tritium (<21 pCi/g). The tritium blank value is based on a 1 gram sample size. To determine the normalized blank value relative to the samples, the blank value is divided by the corresponding sample size (grams). Therefore, the value for B01S97, 20.7 ± 1.6 pCi/g, is a real value, distinguishable from the blank (normalized to <3 pCi/g).

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One deficiency report is associated with this analysis (91-105). It allows us to operate more effectively for the soil analysis and allows for better equation application to the procedure.

The sample results are reported per received sample weight (not corrected for percent solids).

No hold times are defined for tritium analysis.

TABLE 15: TRITIUM ANALYSIS DATA
TASKS 2 & 4 SDG #15

WHC Sample ID	Parameters of Interest Sample #	Sample Type	Tritium (pCi/g)	+/- 1 sigma*	Normalized Blank**	RPD	Conc. (pCi/g)	+/- 1 sigma*	Spike % Rec.	RCF Fs***
B01S97	92-04734-K-1	Soil	20.7	1.6	<3					
B01S99	92-04735-K-1	Soil	85.7	3.5	<4					
B01SB1	92-04736-K-1	Soil	41.3	2.5	<4					
B01SB3	92-04968-K-1	Soil	42.3	2.1	<4					
B01SB3	92-04968-K-2	Duplicate	38.6	2.0	<4	9				
B01SB7	92-05102-K-1	Soil	<4.7		na					
B01SB2	92-05150-K-1	Soil	37.5	2.3	<4					
	92-03901-K-4	Matrix Spike	663	21	<4		772	13	80.7	
	92-03300-K-4	Blank Spike	3608	116	<21		4225	49	85.4	
	92-03901-K-5	Method Blank	<21							
	92-03901-K-4	Yield spike to determine Fs								85.1

* One sigma uncertainties are based on propagation of mass, volume, and counting uncertainties.
** Blank value normalized to sample size analyzed (pCi/g). Refer to narrative for details.
*** Recovery Correction Factor, Fs.
nd: not detected
na: not applicable

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TOTAL ORGANIC CARBON ANALYSIS RESULTS

The following samples (SDG #15) were prepared by procedure PNL-ALO-380, Rev. 0, "Determination of Carbon in Solids Using the Coulometrics Carbon Dioxide Coulometer":

ACL Number	WHC Number
92-04734	B01S97
92-04735	B01S99
92-04736	B01SB1
92-04968	B01SB3
92-05102	B01SB7
92-05150	B01SB2

The procedure methodology is consistent with SW 846 method 9060. PNL-ALO-380 defines the operation of the instrument used as well as the analysis of the sample. SW 846 method 9060 leaves the option for the analyst to follow the manufacturer's instrument instructions for calibration, analysis procedure, and calculations.

Blank Determination

With the Coulometrics TOC analyzer, an average (daily) blank must be determined prior to calibration check of the instrument and analysis of samples. The major carbon source in the blank is CO_2 adsorbed on the sample boat and ladle. The blank is obtained by removing the quartz ladle and sample boat (platinum or porcelain) from the furnace tube and exposing them to air. These parts are then placed back into the furnace and carbon analysis is performed on this blank. This procedure is repeated until consecutive blank values differ by no more than 0.5 μg of total organic carbon for every 10 minutes of analysis time. As there is no sample preparation prior to analysis, this instrument blank is also considered to be the methods blank when determining TOC by this method.

Detection Limits

The blank thus obtained has a direct effect on the quantification limit for each sample as this value must be subtracted from each sample value determined. However, this blank value is not an indicator of instrument sensitivity, and should not be considered as an indication of the true instrument detection limit. If the instrument were operated in a carbon-free atmosphere, a lower blank value could be observed. It is not possible to determine an absolute instrument detection limit (i.e., a measurement of instrument sensitivity) under current laboratory operating conditions. For purposes of this report, the daily blank value is used as the lower quantification limit for the analyses. Reported results indicate that sample organic carbon levels are above this method quantification limit (instrument background carbon levels).

A "method detection limit" for this analytical method may be estimated from the absolute difference between final consecutive blank values. The "method detection limit", defined as three times this difference, expressed in μg of total organic carbon is ~1.7 μg. The method detection limit expressed in concentration terms would be dependent on the sample size analyzed.

Standard Analysis

A Kodak glucose standard was analyzed in duplicate as an initial one point calibration of the instrument. The manufacturer's manual states to use a single point calibration of the instrument as the instrument exhibits a linear response. Each standard determination consisted of a 30 minute analysis and reported results are corrected with the average 30 minute blank value. Initial recoveries of the same glucose standard on 3/18/92 were 103% & 99.5%, with an average of 101%, and a relative percent difference (RPD) of 3.4%. Standard recoveries on 3/19/92 were 99.4% and 98.1%, with an average of 98.8%, and a RPD of 1.3%. Standard recoveries were slightly higher than normal, but still within accepted control limits. Based on duplicate analysis results, estimated precision from this set of data is $\pm$ 3.4% relative, with a bias (accuracy) of +1% on the average for 3/18/92 analyses, and $\pm$ 1.3% with a

bias of -1.2% on the average for 3/19/92 analyses. Reported sample values are corrected for the corresponding average standard recoveries.

Sample Analysis

All samples were first screened and then analyzed in duplicate (as specified in TI-200BP-1-157, 161, 164, and 168) for 30 minutes at ~510 °C. The RPD between duplicate analyses ranged from 2.9% to 12.9%. Analysis deviation is mostly attributed to the inherent heterogeneity of the soil samples received, and the small sample sizes analyzed. Due to the small sample size required (2 - 100+ mg), a selective sub-sample of smaller soil particles is necessary. The very nature of this sample selection process may bias reported carbon results and increase deviation between replicate analyses.

Reported sample organic carbon levels are not adjusted for moisture content of the soil matrix.

Hold Times

The Environmental Protection Agency (EPA) hold time for Total Organic Carbon Analysis in soils is defined at 14 days from the date of sampling. The hold times were met for these samples.

TABLE 16: TOTAL ORGANIC CARBON DATA FOR TASKS 2 & 4
SDG #15

Soil Samples

WHC Sample	PNL ALO #	Sample Type	Sample wt. g	ug C Results	ug C in Sample	mgC/Kg Sample	RPD Dups	% rec.* standard	Date Received	Date Analyzed
B01S97	92-04734-1	Sample	0.10484	67.41	50.81	480	3.1		3-05-92	3-18-92
B01S97	92-04734-2	Duplicate	0.14796	90.54	73.94	495			3-05-92	3-18-92
B01S99	92-04735-1	Sample	0.10344	63.21	46.61	446	12.9		3-05-92	3-18-92
B01S99	92-04735-2	Duplicate	0.12258	65.13	48.53	392			3-05-92	3-18-92
B01SB1	92-04736-1	Sample	0.09134	50.51	33.91	368	8.9		3-05-92	3-18-92
B01SB1	92-04736-2	Duplicate	0.10530	59.33	42.73	402			3-05-92	3-18-92
B01SB1	92-04736-3	Standard	0.00489	2037	2021		3.4	103		3-18-92
B01SB1	92-04736-3	Std Dup	0.00468	1878	1862			99.5		3-18-92
B01SB1	92-04736-4	Blank		16.60						3-18-92
B01SB3	92-04968-1	Sample	0.13416	54.39	34.59	261	3.8		3-09-92	3-19-92
B01SB3	92-04968-2	Duplicate	0.13012	54.62	34.82	271			3-09-92	3-19-92
B01SB7	92-05102-1	Sample	0.13091	92.39	72.59	561	10.0		3-11-92	3-19-92
B01SB7	92-05102-2	Duplicate	0.09216	76.23	56.43	620			3-11-92	3-19-92
B01SB2	92-05150-1	Sample	0.12800	50.66	30.86	244	2.9		3-13-92	3-19-92
B01SB2	92-05150-2	Duplicate	0.13810	52.15	32.35	237			3-13-92	3-19-92
B01SB2	92-05150-3	Standard	0.00503	2019	1999		1.3	99.4		3-19-92
B01SB2	92-05150-3	Std Dup	0.00349	1389	1369			98.1		3-19-92
B01SB2	92-05150-4	Blank		19.80						3-19-92

* Based on standard carbon content of 40.0% by weight.

Total Organic Carbon by Procedure PNL-ALO-380, on Instrument WA92040,
325 Bldg., rm 701. Data reported from LRB 52821, pp 80-89.

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VOLATILE ORGANIC COMPOUND ANALYSIS REPORT

SAMPLE ANALYSIS REPORTED

Analysis of four soil samples for volatile organic compounds by gas chromatography/mass spectrometry (GC/MS) is the subject of this report.

SAMPLE DESCRIPTION

Sample ID	ACL Lab Number
B01S97	92-04734
B01S99	92-04735
B01SB1	92-04736
B01SB3	92-04968

The samples, B01S97, B01S99, and B01SB1 were received in the 325 building on 03/05/92. Sample B01SB3 was received in the 325 building on 03/09/92. These samples are referred to as part of SDG #15.

SAMPLE PREPARATION

A five gram aliquot of the sample was weighed in a tared purge vessel. 5mL of lab water was then added to the vessel, and the vessel attached to a Tekmar Liquid Sample Concentrator equipped with a heated purge.

The analysis followed EPA-CLP SOW 2/88 procedures for the analysis of volatile compounds in soils.

ANALYSIS METHOD

- GC/MS procedure: PNL-ALO-335.
- GC/MS instrumentation: HP-5890/5970 GC/MS (WB46864).
- GC/MS location: Lab 327-A, 325 building.

QUALITY CONTROL

Quality control procedures specified for this method were followed. These forms are all included in this report, and the quality assurance performance requirements are summarized as follows:

Form	Information	Comments
2B	Surrogate Recovery	Meets all requirements.
3B	MS/MSD Recovery	Meets all requirements.
4A	Method Blank Summary	Meets all requirements.
5A	Tune/Mass Calibration	Meets all requirements.
6A	Initial Calibration	5 point calibration. Meets all requirements.
7A	Daily Calibration	Meets all requirements.
8A	Internal Standards	Meets all requirements.

DATA

A hard copy is kept on file in the ACL data management office.

The data and calibration are archived on magnetic tape in the 325 building, 327-A laboratory. The following is the list of pertinent files:

File Name	Sample Number	Sample Analyzed
>OB001		Mass Calibration/Tune Check
>OB002		Daily Calibration
>OB003		Method Blank
>OB004	92-04734	B01S97
>OB005	92-04734 DUPE	B01S97 DUPE
>OB006	92-04735	B01S99
>OB007	92-04735 DUPE	B01S99 DUPE
>OB008	92-04735 MS	B01S99 MS
>OB009	92-04735 MSD	B01S99 MSD
>OB010	92-04736	B01SB1
>OB011	92-04736 DUPE	B01SB1 DUPE
>OB012	92-04968	B01SB3
>OB013	92-04968 DUPE	B01SB3 DUPE

Lab data are also maintained as follows:

Activity	LRB Number	Page Number
GC/MS injection log	BNW-52907	100-101

RESULTS

CLP Target Compounds: The attached 1A Forms show that volatile target compounds, **Acetone, 2-Butanone, 4-Methyl-2-pentanone, and 2-Hexanone**, were observed in the BLANK. Hence, these compounds are "B-flagged". **Acetone** and **2-Butanone** were in the Blank above the Contract Required Quantitation Limit (CRQL), while 4-Methyl-2-pentanone and 2-Hexanone were observed below the CRQL in the Blank. Acetone and 2-Butanone were observed in 92-04734 and 92-04736, but were below the CRQL. Chloromethane and 2-Butanone were observed in 92-04734 DUPE, but were below the CRQL. Acetone was observed in 92-04735 and 92-04736 DUPE, below the CRQL. No target compounds were observed in 92-04735 DUPE and 92-04968 DUPE. 2-Butanone was observed in 92-04968, below the CRQL.

In summary, no CLP Target Compounds were observed in the samples 92-04734, 92-04735, 92-04736, and 92-04968 above the quantitation limits.

The following defines the qualifiers, Q-flags, in the Form 1's:

"Q" Flag	Definition
U	Indicates the compound was analyzed for but not detected, the U-flagged concentration number is the CRQL.
J	Indicates an estimated value for the target or tentatively identified compounds, spectra meet criteria but response is below the CRQL for the target compounds.
B	Compound was found in the blank.
X	Indicates compound was manually deleted because all requirements were not met.

D	Analysis was performed on a diluted sample.
E	Indicates that Quantitation was outside the calibration range.

Tentatively Identified Compounds: As shown in the attached 1E Forms, no non-EPA target compounds were observed in the BLANK. However, in the samples 92-04734, and 92-04734 DUPE 2-Ethyl-1-hexanol was observed. In sample 92-04735, 2-Ethyl-1-hexanol, Dodecane, and an Unknown Alkane were observed. In sample 92-04735 DUPE, 2-Ethyl-1-hexanol, Dodecane, and two Unknown Alkanes were observed. In sample 92-04736, 2-Ethyl-1-hexanol, two Unknown Alkanes, and Tridecane were observed. In sample 92-04736 DUPE, 2-Ethyl-1-hexanol, Dodecane, two Unknown Alkanes, and Tridecane were observed. In sample 92-04968 and 92-04968 DUPE, an Unknown was observed.

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

92-04734

Lab Name: BATTELLE-PNL Contract: ------

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: B01S97

Sample wt/vol: 5.090 (g/mL) G Lab File ID: >OB004

Level: (low/med) LOW Date Received: 03/05/92

% Moisture: not dec. 3.3 Date Analyzed: 3/10/92

Column: (pack/cap) CAP Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	10.	U
74-83-9	Bromomethane	10.	U
75-01-4	Vinyl Chloride	10.	U
75-00-3	Chloroethane	10.	U
75-09-2	Methylene Chloride	5.	U
67-64-1	Acetone	5.	JB
75-15-0	Carbon Disulfide	5.	U
75-35-4	1,1-Dichloroethene	5.	U
75-34-3	1,1-Dichloroethane	5.	U
540-59-0	1,2-Dichloroethene (total)	5.	U
67-66-3	Chloroform	5.	U
107-02-2	1,2-Dichloroethane	5.	U
78-93-3	2-Butanone	4.	JB
71-55-6	1,1,1-Trichloroethane	5.	U
56-23-5	Carbon Tetrachloride	5.	U
108-05-4	Vinyl Acetate	10.	U
75-27-4	Bromodichloromethane	5.	U
78-87-5	1,2-Dichloropropane	5.	U
10061-01-5	cis-1,3-Dichloropropene	5.	U
79-01-6	Trichloroethene	5.	U
124-48-1	Dibromochloromethane	5.	U
79-00-5	1,1,2-Trichloroethane	5.	U
71-43-2	Benzene	5.	U
10061-02-6	trans-1,3-Dichloropropene	5.	U
75-25-2	Bromoform	5.	U
108-10-1	4-Methyl-2-pentanone	10.	U
591-78-6	2-Hexanone	10.	U
127-18-4	Tetrachloroethene	5.	U
79-34-5	1,1,2,2-Tetrachloroethane	5.	U
108-88-3	Toluene	5.	U
108-90-7	Chlorobenzene	5.	U
100-41-4	Ethylbenzene	5.	U
100-42-5	Styrene	5.	U
133-02-7	Xylene (total)	5.	U

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

92-04734

Lab Name: BATTELLE-PNL Contract: ------

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: B01S97

Sample wt/vol: 5.090 (g/mL) G Lab File ID: >OB004

Level: (low/med) LOW Date Received: 03/05/92

% Moisture: not dec. 3.3 Date Analyzed: 3/10/92

Column: CAP Dilution Factor: 1.00000

Number TICs found: 1

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	104767	1-Hexanol, 2-ethyl-	30.05	26.	J
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
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23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

92-04735

Lab Name: BATTELLE-PNL Contract: ------

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: B01S99

Sample wt/vol: 5.456 (g/mL) G Lab File ID: >OB006

Level: (low/med) LOW Date Received: 03/05/92

% Moisture: not dec. 4.0 Date Analyzed: 3/10/92

Column: (pack/cap) CAP Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	10.	U
74-83-9	Bromomethane	10.	U
75-01-4	Vinyl Chloride	10.	U
75-00-3	Chloroethane	10.	U
75-09-2	Methylene Chloride	5.	U
67-64-1	Acetone	8.	JB
75-15-0	Carbon Disulfide	5.	U
75-35-4	1,1-Dichloroethene	5.	U
75-34-3	1,1-Dichloroethane	5.	U
540-59-0	1,2-Dichloroethene (total)	5.	U
67-66-3	Chloroform	5.	U
107-02-2	1,2-Dichloroethane	5.	U
78-93-3	2-Butanone	10.	U
71-55-6	1,1,1-Trichloroethane	5.	U
56-23-5	Carbon Tetrachloride	5.	U
108-05-4	Vinyl Acetate	10.	U
75-27-4	Bromodichloromethane	5.	U
78-87-5	1,2-Dichloropropane	5.	U
10061-01-5	cis-1,3-Dichloropropene	5.	U
79-01-6	Trichloroethene	5.	U
124-48-1	Dibromochloromethane	5.	U
79-00-5	1,1,2-Trichloroethane	5.	U
71-43-2	Benzene	5.	U
10061-02-6	trans-1,3-Dichloropropene	5.	U
75-25-2	Bromoform	5.	U
108-10-1	4-Methyl-2-pentanone	10.	U
591-78-6	2-Hexanone	10.	U
127-18-4	Tetrachloroethene	5.	U
79-34-5	1,1,2,2-Tetrachloroethane	5.	U
108-88-3	Toluene	5.	U
108-90-7	Chlorobenzene	5.	U
100-41-4	Ethylbenzene	5.	U
100-42-5	Styrene	5.	U
133-02-7	Xylene (total)	5.	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
92-04735

Lab Name: BATTELLE-PNL Contract: ------

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: B01S99

Sample wt/vol: 5.456 (g/mL) G Lab File ID: >OB006

Level: (low/med) LOW Date Received: 03/05/92

% Moisture: not dec. 4.0 Date Analyzed: 3/10/92

Column: CAP Dilution Factor: 1.00000

Number TICs found: 3

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	104767	1-Hexanol, 2-ethyl-	30.04	10.	J
2.	112403	Dodecane	31.16	6.	J
3.		UNKNOWN ALKANE	31.73	7.	J
4.					
5.					
6.					
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9.					
10.					
11.					
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13.					
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29.					
30.					

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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

92-04736

Lab Name: BATTELLE-PNL Contract: ------

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: B01SB1

Sample wt/vol: 5.365 (g/mL) G Lab File ID: >OB010

Level: (low/med) LOW Date Received: 03/05/92

% Moisture: not dec. 4.1 Date Analyzed: 3/10/92

Column: (pack/cap) CAP Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	10.	U
74-83-9	Bromomethane	10.	U
75-01-4	Vinyl Chloride	10.	U
75-00-3	Chloroethane	10.	U
75-09-2	Methylene Chloride	5.	U
67-64-1	Acetone	5.	JB
75-15-0	Carbon Disulfide	5.	U
75-35-4	1,1-Dichloroethene	5.	U
75-34-3	1,1-Dichloroethane	5.	U
540-59-0	1,2-Dichloroethene (total)	5.	U
67-66-3	Chloroform	5.	U
107-02-2	1,2-Dichloroethane	5.	U
78-93-3	2-Butanone	6.	JB
71-55-6	1,1,1-Trichloroethane	5.	U
56-23-5	Carbon Tetrachloride	5.	U
108-05-4	Vinyl Acetate	10.	U
75-27-4	Bromodichloromethane	5.	U
78-87-5	1,2-Dichloropropane	5.	U
10061-01-5	cis-1,3-Dichloropropene	5.	U
79-01-6	Trichloroethene	5.	U
124-48-1	Dibromochloromethane	5.	U
79-00-5	1,1,2-Trichloroethane	5.	U
71-43-2	Benzene	5.	U
10061-02-6	trans-1,3-Dichloropropene	5.	U
75-25-2	Bromoform	5.	U
108-10-1	4-Methyl-2-pentanone	10.	U
591-78-6	2-Hexanone	10.	U
127-18-4	Tetrachloroethene	5.	U
79-34-5	1,1,2,2-Tetrachloroethane	5.	U
108-88-3	Toluene	5.	U
108-90-7	Chlorobenzene	5.	U
100-41-4	Ethylbenzene	5.	U
100-42-5	Styrene	5.	U
133-02-7	Xylene (total)	5.	U

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

92-04736

Lab Name: BATTELLE-PNL Contract: ------

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: B01SB1

Sample wt/vol: 5.365 (g/mL) G Lab File ID: >OB010

Level: (low/med) LOW Date Received: 03/05/92

% Moisture: not dec. 4.1 Date Analyzed: 3/10/92

Column: CAP Dilution Factor: 1.00000

Number TICs found: 4

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	104767	1-Hexanol, 2-ethyl-	30.04	11.	J
2.		UNKNOWN ALKANE	31.27	5.	J
3.		UNKNOWN ALKANE	31.74	8.	J
4.	629505	Tridecane	31.94	13.	J
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

92-04968

Lab Name: BATTELLE-PNL Contract: ------

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: B01SB3

Sample wt/vol: 5.045 (g/mL) G Lab File ID: >OB012

Level: (low/med) LOW Date Received: 03/09/92

% Moisture: not dec. 3.0 Date Analyzed: 3/10/92

Column: (pack/cap) CAP Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	10.	U
74-83-9	Bromomethane	10.	U
75-01-4	Vinyl Chloride	10.	U
75-00-3	Chloroethane	10.	U
75-09-2	Methylene Chloride	5.	U
67-64-1	Acetone	10.	U
75-15-0	Carbon Disulfide	5.	U
75-35-4	1,1-Dichloroethene	5.	U
75-34-3	1,1-Dichloroethane	5.	U
540-59-0	1,2-Dichloroethene (total)	5.	U
67-66-3	Chloroform	5.	U
107-02-2	1,2-Dichloroethane	5.	U
78-93-3	2-Butanone	6.	JB
71-55-6	1,1,1-Trichloroethane	5.	U
56-23-5	Carbon Tetrachloride	5.	U
108-05-4	Vinyl Acetate	10.	U
75-27-4	Bromodichloromethane	5.	U
78-87-5	1,2-Dichloropropane	5.	U
10061-01-5	cis-1,3-Dichloropropene	5.	U
79-01-6	Trichloroethene	5.	U
124-48-1	Dibromochloromethane	5.	U
79-00-5	1,1,2-Trichloroethane	5.	U
71-43-2	Benzene	5.	U
10061-02-6	trans-1,3-Dichloropropene	5.	U
75-25-2	Bromoform	5.	U
108-10-1	4-Methyl-2-pentanone	10.	U
591-78-6	2-Hexanone	10.	U
127-18-4	Tetrachloroethene	5.	U
79-34-5	1,1,2,2-Tetrachloroethane	5.	U
108-88-3	Toluene	5.	U
108-90-7	Chlorobenzene	5.	U
100-41-4	Ethylbenzene	5.	U
100-42-5	Styrene	5.	U
133-02-7	Xylene (total)	5.	U

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

92-04968

Lab Name: BATTELLE-PNL Contract: ------

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: B01SB3

Sample wt/vol: 5.045 (g/mL) G Lab File ID: >OB012

Level: (low/med) LOW Date Received: 03/09/92

% Moisture: not dec. 3.0 Date Analyzed: 3/10/92

Column: CAP Dilution Factor: 1.00000

Number TICs found: 1

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	Unknown	31.35	11.	J
2.				
3.				
4.				
5.				
6.				
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VOLATILE ORGANIC COMPOUND ANALYSIS REPORT

SAMPLE ANALYSIS REPORTED

Analysis of two soil samples for volatile organic compounds by gas chromatography/mass spectrometry (GC/MS) is the subject of this report.

SAMPLE DESCRIPTION

Sample ID	ACL Lab Number
B01SB7	92-05102
B01SB2	92-05150

The samples, B01SB7, B01SB2, were received in the 325 Building on 03/11/92 and 03/13/92, respectively. These samples are referred to as part of SDG #15.

SAMPLE PREPARATION

A five gram aliquot of the sample was weighed in a tared purge vessel. 5mL of lab water was then added to the vessel, and the vessel attached to a Tekmar Liquid Sample Concentrator equipped with a heated purge.

The analysis followed EPA-CLP SOW 2/88 procedures for the analysis of volatile compounds in soils.

ANALYSIS METHOD

- GC/MS procedure: PNL-ALO-335.
- GC/MS instrumentation: HP-5890/5970 GC/MS (WB46864).
- GC/MS location: Lab 327-A, 325 building

QUALITY CONTROL

Quality control procedures specified for this method were followed. These forms are all included in this report, and the quality assurance performance requirements are summarized as follows:

Form	Information	Comments
2B	Surrogate Recovery	Meets all requirements.
3B	MS/MSD Recovery	Meets all requirements.
4A	Method Blank Summary	Meets all requirements.
5A	Tune/Mass Calibration	Meets all requirements.
6A	Initial Calibration	5 point calibration. Meets all requirements.
7A	Daily Calibration	Meets all requirements.
8A	Internal Standards	Meets all requirements.

DATA

A hard copy is kept on file in the ACL data management office.

The data and calibration are archived on magnetic tape in the 325 building, 327-A laboratory. The following is the list of pertinent files:

File Name	Sample Number	Sample Analyzed
>0B9B1		Mass Calibration/Tune Check
>0B902		Daily Calibration
>0B903		Method Blank
>0B904	92-05102	B01SB7
>0B905	92-05102 DUPE	B01SB7 DUPE
>0B906	92-05102 MS	B01SB7 MS
>0B907	92-05102 MSD	B01SB7 MSD
>0B908	92-05150	B01SB2
>0B909	92-05150 DUPE	B01SB2 DUPE

Lab data are also maintained as follows:

Activity	LRB Number	Page Number
GC/MS injection log	BNW-52907	102-103

RESULTS

CLP Target Compounds: The attached 1A Forms show that volatile target compounds, **Acetone, and 2-Butanone**, were observed in the BLANK, but they were below the Contract Required Quantitation Limits, (CRQLs). Hence, these

compounds are "B-flagged". The observed CLP Target compounds are summarized in the following table:

	Acetone	Butanone	Toluene
Blank	JB	JB	U
92-05102	JB	JB	J
92-05102Dup	JB	JB	J
92-05150	JB	JB	J
92-05150Dup	U	U	J

In summary, no CLP Target Compounds were observed in the samples 92-05102 and 92-05150 above the quantitation limits.

The following defines the qualifiers, Q-flags, in the Form 1's:

"Q" Flag	Definition
U	Indicates the compound was analyzed for, but not detected, the U-flagged concentration number is the CRQL.
J	Indicates an estimated value for the target or tentatively identified compounds, spectra meet criteria but response is below the CRQL for the target compounds.
B	Compound was found in the blank.
X	Indicates compound was manually deleted because all requirements were not met.
D	Analysis was performed on a diluted sample.
E	Indicates that Quantitation was outside the calibration range.

Tentatively Identified Compounds: As shown in the attached 1E Forms, no non-EPA target compounds were observed in the BLANK or in sample 92-05102. However, a highly branched aliphatic ester was observed in the sample 92-05150.

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

92-05102

Lab Name: BATTELLE-PNL Contract: ------

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: B01SB7

Sample wt/vol: 5.072 (g/mL) G Lab File ID: >OB904

Level: (low/med) LOW Date Received: 03/11/92

% Moisture: not dec. 3.8 Date Analyzed: 3/19/92

Column: (pack/cap) CAP Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	10.	U
74-83-9	Bromomethane	10.	U
75-01-4	Vinyl Chloride	10.	U
75-00-3	Chloroethane	10.	U
75-09-2	Methylene Chloride	5.	U
67-64-1	Acetone	5.	JB
75-15-0	Carbon Disulfide	5.	U
75-35-4	1,1-Dichloroethene	5.	U
75-34-3	1,1-Dichloroethane	5.	U
540-59-0	1,2-Dichloroethene (total)	5.	U
67-66-3	Chloroform	5.	U
107-02-2	1,2-Dichloroethane	5.	U
78-93-3	2-Butanone	4.	JB
71-55-6	1,1,1-Trichloroethane	5.	U
56-23-5	Carbon Tetrachloride	5.	U
108-05-4	Vinyl Acetate	10.	U
75-27-4	Bromodichloromethane	5.	U
78-87-5	1,2-Dichloropropane	5.	U
10061-01-5	cis-1,3-Dichloropropene	5.	U
79-01-6	Trichloroethene	5.	U
124-48-1	Dibromochloromethane	5.	U
79-00-5	1,1,2-Trichloroethane	5.	U
71-43-2	Benzene	5.	U
10061-02-6	trans-1,3-Dichloropropene	5.	U
75-25-2	Bromoform	5.	U
108-10-1	4-Methyl-2-pentanone	10.	U
591-78-6	2-Hexanone	10.	U
127-18-4	Tetrachloroethene	5.	U
79-34-5	1,1,2,2-Tetrachloroethane	5.	U
108-88-3	Toluene	3.	J
108-90-7	Chlorobenzene	5.	U
100-41-4	Ethylbenzene	5.	U
100-42-5	Styrene	5.	U
133-02-7	Xylene (total)	5.	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

92-05102

Lab Name: BATTELLE-PNL Contract: ------

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: B01SB7

Sample wt/vol: 5.072 (g/mL) G Lab File ID: >OB904

Level: (low/med) LOW Date Received: 03/11/92

% Moisture: not dec. 3.8 Date Analyzed: 3/19/92

Column: CAP Dilution Factor: 1.00000

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
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FORM I VOA-TIC 1/87 Rev.

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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

92-05150

Lab Name: BATTELLE-PNL Contract: ------

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: B01SB2

Sample wt/vol: 5.234 (g/mL) G Lab File ID: >OB908

Level: (low/med) LOW Date Received: 03/13/92

% Moisture: not dec. 5.2 Date Analyzed: 3/19/92

Column: (pack/cap) CAP Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	10.	U
74-83-9	Bromomethane	10.	U
75-01-4	Vinyl Chloride	10.	U
75-00-3	Chloroethane	10.	U
75-09-2	Methylene Chloride	5.	U
67-64-1	Acetone	7.	JB
75-15-0	Carbon Disulfide	5.	U
75-35-4	1,1-Dichloroethene	5.	U
75-34-3	1,1-Dichloroethane	5.	U
540-59-0	1,2-Dichloroethene (total)	5.	U
67-66-3	Chloroform	5.	U
107-02-2	1,2-Dichloroethane	5.	U
78-93-3	2-Butanone	6.	JB
71-55-6	1,1,1-Trichloroethane	5.	U
56-23-5	Carbon Tetrachloride	5.	U
108-05-4	Vinyl Acetate	10.	U
75-27-4	Bromodichloromethane	5.	U
78-87-5	1,2-Dichloropropane	5.	U
10061-01-5	cis-1,3-Dichloropropene	5.	U
79-01-6	Trichloroethene	5.	U
124-48-1	Dibromochloromethane	5.	U
79-00-5	1,1,2-Trichloroethane	5.	U
71-43-2	Benzene	5.	U
10061-02-6	trans-1,3-Dichloropropene	5.	U
75-25-2	Bromoform	5.	U
108-10-1	4-Methyl-2-pentanone	10.	U
591-78-6	2-Hexanone	10.	U
127-18-4	Tetrachloroethene	5.	U
79-34-5	1,1,2,2-Tetrachloroethane	5.	U
108-88-3	Toluene	2.	J
108-90-7	Chlorobenzene	5.	U
100-41-4	Ethylbenzene	5.	U
100-42-5	Styrene	5.	U
133-02-7	Xylene (total)	5.	U

FORM I VOA 1/89 Rev.

9613474.1843

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

92-05150

Lab Name: BATTELLE-PNL Contract: ------

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: B01SB2

Sample wt/vol: 5.234 (g/mL) G Lab File ID: >OB908

Level: (low/med) LOW Date Received: 03/13/92

% Moisture: not dec. 5.2 Date Analyzed: 3/19/92

Column: CAP Dilution Factor: 1.00000

Number TICs found: 1

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	74381401	Propanoic acid, 2-methyl-,	31.33	10.	J
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
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SEMI-VOLATILE ORGANIC ANALYSIS

SAMPLE ANALYSIS REPORTED

Analysis of sample B01S97, B01S99, B01SB1, B01SB3, B01SB7, and B01SB2 from SDG 15 for semivolatile organic compounds by gas chromatography/mass spectrometry (GC/MS) is the subject of this report.

SAMPLE DESCRIPTION AND PREPARATION

Sample ID	ACL Lab Number
B01S97	92-04734
B01S99	92-04735
B01SB1	92-04736
B01SB3	92-04968
B01SB7	92-05102
B01SB2	92-05150

The samples 4734, 4735, and 4736 were received on 03/05/92; sample 4968 on 03/09/92; sample 5102 on 03/11/92; and 5150 on 03/13/92. Extractions of both samples and spiked sample 5102 were performed.

- Extraction procedure — PNL-ALO-344.
- Extraction location — Lab 302, 325 building
- Extraction type — Sonication, low level, soil
- Sample/Extract storage temperature — 4°C(+/-2°)

ANALYSIS METHOD

- GC/MS procedure: — PNL-ALO-345.
- GC/MS instrumentation: — HP-5890/5970 GC/MS System BNA1 (WD03976)
- GC/MS location: — Lab 325, 325 building.

QUALITY CONTROL

The QC features in the analytical procedure were followed as described below. The following lists the attached CLP forms that relate to QC and summarizes the QC results.

9613474.1845

Form	Information	Comments
2D	Surrogate Recovery	All requirements were met.
3D	MS/MSD Recovery	All requirements were met.
4B	Method Blank Summary	All requirements were met.
5B	Tune/Mass Calibration	All requirements were met.
6B,C	Initial Calibration	All requirements were met.
7B,C	Daily Calibration	All requirements were met.
8B,C	Internal Standards	All requirements were met.

The following comments provide additional information on QC and related features for analysis of these samples.

- Holding time. Extraction and analysis holding time requirements were met.
- Surrogate recoveries. The recovery for 2,4,6-Tribromophenol in B01S97 and B01SB2 was low but met requirements. However the retention time in both sample analyses shifted outside the normal identification range thus indicating some sort of a matrix effect, most likely the co-elution of a large amount of tributylphosphate.

DATA

The data and calibration are archived on magnetic tape in the 325 building, 325 laboratory. The following is the list of the pertinent files.

File Name	Sample Number	Sample Analyzed
>DA101		Mass calibration and tune check
>DA102		Continuing calibration
>DA103	92-05102-E4	SBLK75, method blank
>DA104	92-04734-E1	B01S97
>DA105	92-04735-E1	B01S99
>DA106	92-04736-E1	B01SB1
>DA107	92-04968-E1	B01SB3
>DA108	92-05102-E1	B01SB7

>DA109	92-05150-E1	B01SB2
>DA110	92-05102-E2	B01SB7 MS
>DA111	92-05102-E3	B01SB7 MSD

Laboratory data is maintained as follows:

Activity	Location
• GC/MS injection log	BNW-52908 pg. 124-5, Lab 325
• Extraction bench sheet:	filed with data in the ACL/ALO records center, Room 25
• GC/MS data, sample report:	filed with data in the ACL/ALO records center, Room 25

RESULTS

CLP Target Compounds: As seen in the attached 1B,C Forms, target compounds found are:

	Concentration, ug/Kg					
	B01S97	B01S99	B01SB1	B01SB3	B01SB7	B01SB2
Butylbenzylphthalate	30	19	19	--	--	--
bis(2-Ethylhexyl)phthalate	38	33	39	17	21	24
Di-n-octylphthalate	37	45	50	15	--	--

The phthalates are common contaminants, especially in the presence of plastics. However, there were no phthalates in the method blank, so these phthalates may be native to the samples. No other target compounds were observed.

Tentatively Identified Compounds (TIC): The attached 1F Forms show results for the TIC's. Concentration estimates for the TIC's are made assuming that the response factor for each TIC is one. The peak area for each TIC is then compared to the area of the nearest internal standard (for which concentrations are known) to estimate the TIC concentrations. Identification of the TIC is made by a computer search of the NIST mass spectral library to attempt a match with the spectrum of each of the TIC's. The TIC's reported as

"Unknown" did not have satisfactory matches with library spectra. The TIC concentration estimate and identification are reported only if the TIC peak area is 10% or greater than the nearest internal standard peak area.

There were three TIC's present in the blank, two aldol condensation products formed in soil sample preparations and an unknown alkane. All the samples except B01SB7 contained Tributylphosphate. All samples except B01S97 contained some long chain (perhaps branched) hydrocarbons, >C20. Samples B01S99, B01SB1, B01SB7, and B01SB2 contained normal paraffin hydrocarbon constituents plus hexadecane. All samples except B01SB3 contained some relatively volatile oxygen containing compounds.

The following defines the Q-flags in the Form 1's

"Q" Flag	Definition
U	Indicates the compound was analyzed for, but not detected, the U-flagged concentration is the Contract Required Quantitation Limit.
J	Indicates an estimated value for target and tentatively identified compounds, spectra meet criteria but response is below Contract Required Quantitation Limit for the target compounds.
B	Indicates compound was found in the blank.
X	Indicates compound was manually deleted because all requirements were not met.
D	Indicates analysis was performed on a diluted sample.
E	Indicates that quantitation was outside of the calibration range.
A	Aldol condensation product.

9613474.1848

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01S97

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 4734-E1

Sample wt/vol: 30.25 (g/mL) G Lab File ID: >DA104

Level: (low/med) LOW Date Received: 03/05/92

% Moisture: not dec. ~~4.44~~ 3.27 dec. -- Date Extracted: 13/15/92

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH: 9.17 Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
108-95-2	Phenol	350.	U
111-44-4	bis(2-Chloroethyl)Ether	350.	U
95-57-8	2-Chlorophenol	350.	U
541-73-1	1,3-Dichlorobenzene	350.	U
106-46-7	1,4-Dichlorobenzene	350.	U
100-51-6	Benzyl alcohol	350.	U
95-50-1	1,2-Dichlorobenzene	350.	U
95-48-7	2-Methylphenol	350.	U
39638-32-9	bis(2-chloroisopropyl)ether	350.	U
106-44-5	4-Methylphenol	350.	U
621-64-7	N-Nitroso-Di-n-propylamine	350.	U
67-72-1	Hexachloroethane	350.	U
98-95-3	Nitrobenzene	350.	U
78-59-1	Isophorone	350.	U
88-75-5	2-Nitrophenol	350.	U
105-67-9	2,4-Dimethylphenol	350.	U
65-85-0	Benzoic acid	1700.	U
111-91-1	bis(2-Chloroethoxy)methane	350.	U
120-83-2	2,4-Dichlorophenol	350.	U
120-82-1	1,2,4-Trichlorobenzene	350.	U
91-20-3	Naphthalene	350.	U
106-47-8	4-Chloroaniline	350.	U
87-68-3	Hexachlorobutadiene	350.	U
59-50-7	4-Chloro-3-methylphenol	350.	U
91-57-6	2-Methylnaphthalene	350.	U
77-47-4	Hexachlorocyclopentadiene	350.	U
88-06-2	2,4,6-Trichlorophenol	350.	U
95-95-4	2,4,5-Trichlorophenol	1700.	U
91-58-7	2-Chloronaphthalene	350.	U
88-74-4	2-Nitroaniline	1700.	U
131-11-3	Dimethylphthalate	350.	U
208-96-8	Acenaphthylene	350.	U
606-20-2	2,6-Dinitrotoluene	350.	U

9613474.1849

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01S97

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 4734-E1

Sample wt/vol: 30.25 (g/mL) G Lab File ID: >DA104

Level: (low/med) LOW Date Received: 03/05/92

% Moisture: not dec. ~~4.44~~ 3.27 dec. -- Date Extracted: 13/15/92

6/30/92 MC

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH: 9.17 Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
99-09-2	3-Nitroaniline	1700.	U
83-32-9	Acenaphthene	350.	U
51-28-5	2,4-Dinitrophenol	1700.	U
100-02-7	4-Nitrophenol	1700.	U
132-64-9	Dibenzofuran	350.	U
121-14-2	2,4-Dinitrotoluene	350.	U
84-66-2	Diethylphthalate	350.	U
7005-72-3	4-Chlorophenyl-phenylether	350.	U
86-73-7	Fluorene	350.	U
100-01-6	4-Nitroaniline	1700.	U
534-52-1	4,6-Dinitro-2-methylphenol	1700.	U
86-30-6	N-Nitrosodiphenylamine (1)	350.	U
101-55-3	4-Bromophenyl-phenylether	350.	U
118-74-1	Hexachlorobenzene	350.	U
87-86-5	Pentachlorophenol	1700.	U
85-01-8	Phenanthrene	350.	U
120-12-7	Anthracene	350.	U
84-74-2	Di-n-butylphthalate	350.	U
206-44-0	Fluoranthene	350.	U
129-00-0	Pyrene	350.	U
85-68-7	Butylbenzylphthalate	30.	J
91-94-1	3,3'-Dichlorobenzidine	690.	U
56-55-3	Benzo(a)anthracene	350.	U
218-01-9	Chrysene	350.	U
117-81-7	bis(2-Ethylhexyl)phthalate	38.	J
117-84-0	Di-n-octylphthalate	37.	J
205-99-2	Benzo(b)fluoranthene	350.	U
207-08-9	Benzo(k)fluoranthene	350.	U
50-32-8	Benzo(a)pyrene	350.	U
193-39-5	Indeno(1,2,3-cd)pyrene	350.	U
53-70-3	Dibenz(a,h)anthracene	350.	U
191-24-2	Benzo(g,h,i)perylene	350.	U

(1) - Cannot be separated from Diphenylamine

9613474.1850

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

B01S97

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 4734-E1

Sample wt/vol: 30.25 (g/mL) G Lab File ID: >DA104

Level: (low/med) LOW Date Received: 03/05/92

% Moisture: not dec. ~~4.44~~ 3.27 MC 6/30/92 dec. -- Date Extracted: 13/15/92

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH: 9.17 Dilution Factor: 1.00000

Number TICs found: 10

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	4.51	1300.	JAB
2.		Unknown	4.82	1700.	JAB
3.		Unknown	5.25	190.	J
4.		Unknown	5.30	440.	J
5.	104767	1-Hexanol, 2-ethyl-	5.77	210.	J
6.		Unknown	6.05	240.	JA
7.		Unknown	7.51	150.	J
8.		Unknown alkane	14.95	140.	J
9.	126738	Phosphoric acid tributyl est	19.86	20000.	J
10.		Unknown alkane	34.33	210.	JB
11.					
12.					
13.					
14.					
15.					
16.					
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9613474.1851

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01S99

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 4735-E1

Sample wt/vol: 30.96 (g/mL) G Lab File ID: >DA105

Level: (low/med) LOW Date Received: 03/05/92

% Moisture: not dec.4.05 dec. -- Date Extracted: 13/15/92

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH: 10.15 Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
108-95-2	Phenol	340.	U
111-44-4	bis(2-Chloroethyl)Ether	340.	U
95-57-8	2-Chlorophenol	340.	U
541-73-1	1,3-Dichlorobenzene	340.	U
106-46-7	1,4-Dichlorobenzene	340.	U
100-51-6	Benzyl alcohol	340.	U
95-50-1	1,2-Dichlorobenzene	340.	U
95-48-7	2-Methylphenol	340.	U
39638-32-9	bis(2-chloroisopropyl)ether	340.	U
106-44-5	4-Methylphenol	340.	U
621-64-7	N-Nitroso-Di-n-propylamine	340.	U
67-72-1	Hexachloroethane	340.	U
98-95-3	Nitrobenzene	340.	U
78-59-1	Isophorone	340.	U
88-75-5	2-Nitrophenol	340.	U
105-67-9	2,4-Dimethylphenol	340.	U
65-85-0	Benzoic acid	1700.	U
111-91-1	bis(2-Chloroethoxy)methane	340.	U
120-83-2	2,4-Dichlorophenol	340.	U
120-82-1	1,2,4-Trichlorobenzene	340.	U
91-20-3	Naphthalene	340.	U
106-47-8	4-Chloroaniline	340.	U
87-68-3	Hexachlorobutadiene	340.	U
59-50-7	4-Chloro-3-methylphenol	340.	U
91-57-6	2-Methylnaphthalene	340.	U
77-47-4	Hexachlorocyclopentadiene	340.	U
88-06-2	2,4,6-Trichlorophenol	340.	U
95-95-4	2,4,5-Trichlorophenol	1700.	U
91-58-7	2-Chloronaphthalene	340.	U
88-74-4	2-Nitroaniline	1700.	U
131-11-3	Dimethylphthalate	340.	U
208-96-8	Acenaphthylene	340.	U
606-20-2	2,6-Dinitrotoluene	340.	U

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01S99

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 4735-E1

Sample wt/vol: 30.96 (g/mL) G Lab File ID: >DA105

Level: (low/med) LOW Date Received: 03/05/92

% Moisture: not dec.4.05 dec. -- Date Extracted: 13/15/92

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH: 10.15 Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
99-09-2	3-Nitroaniline	1700.	U
83-32-9	Acenaphthene	340.	U
51-28-5	2,4-Dinitrophenol	1700.	U
100-02-7	4-Nitrophenol	1700.	U
132-64-9	Dibenzofuran	340.	U
121-14-2	2,4-Dinitrotoluene	340.	U
84-66-2	Diethylphthalate	340.	U
7005-72-3	4-Chlorophenyl-phenylether	340.	U
86-73-7	Fluorene	340.	U
100-01-6	4-Nitroaniline	1700.	U
534-52-1	4,6-Dinitro-2-methylphenol	1700.	U
86-30-6	N-Nitrosodiphenylamine (1)	340.	U
101-55-3	4-Bromophenyl-phenylether	340.	U
118-74-1	Hexachlorobenzene	340.	U
87-86-5	Pentachlorophenol	1700.	U
85-01-8	Phenanthrene	340.	U
120-12-7	Anthracene	340.	U
84-74-2	Di-n-butylphthalate	340.	U
206-44-0	Fluoranthene	340.	U
129-00-0	Pyrene	340.	U
85-68-7	Butylbenzylphthalate	19.	J
91-94-1	3,3'-Dichlorobenzidine	670.	U
56-55-3	Benzo(a)anthracene	340.	U
218-01-9	Chrysene	340.	U
117-81-7	bis(2-Ethylhexyl)phthalate	33.	J
117-84-0	Di-n-octylphthalate	45.	J
205-99-2	Benzo(b)fluoranthene	340.	U
207-08-9	Benzo(k)fluoranthene	340.	U
50-32-8	Benzo(a)pyrene	340.	U
193-39-5	Indeno(1,2,3-cd)pyrene	340.	U
53-70-3	Dibenz(a,h)anthracene	340.	U
191-24-2	Benzo(g,h,i)perylene	340.	U

(1) - Cannot be separated from Diphenylamine

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
B01S99

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 4735-E1

Sample wt/vol: 30.96 (g/mL) G Lab File ID: >DA105

Level: (low/med) LOW Date Received: 03/05/92

% Moisture: not dec. 4.05 dec. -- Date Extracted: 13/15/92

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH: 10.15 Dilution Factor: 1.00000

Number TICs found: 30

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	Unknown	4.52	1100.	JAB
2.	Unknown	4.80	640.	JAB
3.	Unknown	5.26	150.	J
4.	Unknown	5.29	280.	J
5. 104767	1-Hexanol, 2-ethyl-	5.77	200.	J
6. 112403	Dodecane	8.67	200.	J
7. 17301234	Undecane, 2,6-dimethyl-	8.97	200.	J
8.	Unknown alkane	10.27	520.	J
9. 629505	Tridecane	10.91	630.	J
10.	Unknown alkane	12.45	140.	J
11.	Unknown alkane	12.79	870.	J
12. 629594	Tetradecane	13.37	1000.	J
13.	Unknown alkane	14.61	140.	J
14.	Unknown alkane	14.97	810.	J
15. 629629	Pentadecane	15.94	730.	J
16. 544763	Hexadecane	18.49	240.	J
17. 126738	Phosphoric acid tributyl est	19.78	3400.	J
18. 57103	Hexadecanoic acid	26.98	180.	J
19.	Unknown alkane	27.71	190.	J
20.	Unknown	28.32	430.	J
21.	Unknown alkane	29.37	460.	J
22.	Unknown alkane	30.81	800.	J
23.	Unknown alkane	32.12	770.	J
24.	Unknown alkane	33.32	400.	J
25.	Unknown alkane	34.43	230.	J
26.	Unknown alkane	35.48	160.	J
27.	Unknown alkane	36.47	190.	J
28.	Unknown	37.28	340.	J
29.	Unknown alkane	38.33	190.	J
30.	Unknown	40.38	140.	J

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01SB1

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 4736-E1

Sample wt/vol: 30.78 (g/mL) G Lab File ID: >DA106

Level: (low/med) LOW Date Received: 03/05/92

% Moisture: not dec. 4.08 dec. -- Date Extracted: 13/15/92

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH: 10.12 Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
108-95-2	Phenol	340.	U
111-44-4	bis(2-Chloroethyl)Ether	340.	U
95-57-8	2-Chlorophenol	340.	U
541-73-1	1,3-Dichlorobenzene	340.	U
106-46-7	1,4-Dichlorobenzene	340.	U
100-51-6	Benzyl alcohol	340.	U
95-50-1	1,2-Dichlorobenzene	340.	U
95-48-7	2-Methylphenol	340.	U
39638-32-9	bis(2-chloroisopropyl)ether	340.	U
106-44-5	4-Methylphenol	340.	U
621-64-7	N-Nitroso-Di-n-propylamine	340.	U
67-72-1	Hexachloroethane	340.	U
98-95-3	Nitrobenzene	340.	U
78-59-1	Isophorone	340.	U
88-75-5	2-Nitrophenol	340.	U
105-67-9	2,4-Dimethylphenol	340.	U
65-85-0	Benzoic acid	1700.	U
111-91-1	bis(2-Chloroethoxy)methane	340.	U
120-83-2	2,4-Dichlorophenol	340.	U
120-82-1	1,2,4-Trichlorobenzene	340.	U
91-20-3	Naphthalene	340.	U
106-47-8	4-Chloroaniline	340.	U
87-68-3	Hexachlorobutadiene	340.	U
59-50-7	4-Chloro-3-methylphenol	340.	U
91-57-6	2-Methylnaphthalene	340.	U
77-47-4	Hexachlorocyclopentadiene	340.	U
88-06-2	2,4,6-Trichlorophenol	340.	U
95-95-4	2,4,5-Trichlorophenol	1700.	U
91-58-7	2-Chloronaphthalene	340.	U
88-74-4	2-Nitroaniline	1700.	U
131-11-3	Dimethylphthalate	340.	U
208-96-8	Acenaphthylene	340.	U
606-20-2	2,6-Dinitrotoluene	340.	U

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01SB1

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 4736-E1

Sample wt/vol: 30.78 (g/mL) G Lab File ID: >DA106

Level: (low/med) LOW Date Received: 03/05/92

% Moisture: not dec. 4.08 dec. -- Date Extracted: 13/15/92

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH: 10.12 Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
99-09-2	3-Nitroaniline	1700.	U
83-32-9	Acenaphthene	340.	U
51-28-5	2,4-Dinitrophenol	1700.	U
100-02-7	4-Nitrophenol	1700.	U
132-64-9	Dibenzofuran	340.	U
121-14-2	2,4-Dinitrotoluene	340.	U
84-66-2	Diethylphthalate	340.	U
7005-72-3	4-Chlorophenyl-phenylether	340.	U
86-73-7	Fluorene	340.	U
100-01-6	4-Nitroaniline	1700.	U
534-52-1	4,6-Dinitro-2-methylphenol	1700.	U
86-30-6	N-Nitrosodiphenylamine (1)	340.	U
101-55-3	4-Bromophenyl-phenylether	340.	U
118-74-1	Hexachlorobenzene	340.	U
87-86-5	Pentachlorophenol	1700.	U
85-01-8	Phenanthrene	340.	U
120-12-7	Anthracene	340.	U
84-74-2	Di-n-butylphthalate	340.	U
206-44-0	Fluoranthene	340.	U
129-00-0	Pyrene	340.	U
85-68-7	Butylbenzylphthalate	19.	J
91-94-1	3,3'-Dichlorobenzidine	680.	U
56-55-3	Benzo(a)anthracene	340.	U
218-01-9	Chrysene	340.	U
117-81-7	bis(2-Ethylhexyl)phthalate	39.	J
117-84-0	Di-n-octylphthalate	50.	J
205-99-2	Benzo(b)fluoranthene	340.	U
207-08-9	Benzo(k)fluoranthene	340.	U
50-32-8	Benzo(a)pyrene	340.	U
193-39-5	Indeno(1,2,3-cd)pyrene	340.	U
53-70-3	Dibenz(a,h)anthracene	340.	U
191-24-2	Benzo(g,h,i)perylene	340.	U

(1) - Cannot be separated from Diphenylamine

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
B01SB1

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 4736-E1

Sample wt/vol: 30.78 (g/mL) G Lab File ID: >DA106

Level: (low/med) LOW Date Received: 03/05/92

% Moisture: not dec.4.08 dec. -- Date Extracted: 13/15/92

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH: 10.12 Dilution Factor: 1.00000

Number TICs found: 22

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	4.52	1100.	JAB
2.		Unknown	4.81	600.	JAB
3.		Unknown	5.26	170	J
4.		Unknown	5.30	210.	J
5.		Unknown	5.78	160.	J
6.	112403	Dodecane	8.68	230.	J
7.	6044719	Dodecane, 6-methyl-	8.97	200.	J
8.		Unknown alkane	10.28	560.	J
9.	629505	Tridecane	10.92	700.	J
10.		Unknown alkane	12.80	900.	J
11.	629594	Tetradecane	13.38	1100.	J
12.		Unknown alkane	14.63	140.	J
13.		Unknown alkane	14.98	850.	J
14.	629629	Pentadecane	15.94	800.	J
15.	544763	Hexadecane	18.50	250.	J
16.	126738	Phosphoric acid tributyl est	19.79	3500.	J
17.	57103	Hexadecanoic acid	26.99	190.	J
18.		Unknown	28.32	360.	J
19.		Unknown	34.24	370.	J
20.		Unknown	37.29	390.	J
21.		Unknown alkane	38.33	160.	J
22.		Unknown	40.39	160.	J
23.					
24.					
25.					
26.					
27.					
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1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01SB3

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 4968-E1

Sample wt/vol: 29.45 (g/mL) G Lab File ID: >DA107

Level: (low/med) LOW Date Received: 03/09/92

% Moisture: not dec.3.03 dec. -- Date Extracted: 13/15/92

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH: 10.33 Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
108-95-2	Phenol	350.	U
111-44-4	bis(2-Chloroethyl)Ether	350.	U
95-57-8	2-Chlorophenol	350.	U
541-73-1	1,3-Dichlorobenzene	350.	U
106-46-7	1,4-Dichlorobenzene	350.	U
100-51-6	Benzyl alcohol	350.	U
95-50-1	1,2-Dichlorobenzene	350.	U
95-48-7	2-Methylphenol	350.	U
39638-32-9	bis(2-chloroisopropyl)ether	350.	U
106-44-5	4-Methylphenol	350.	U
621-64-7	N-Nitroso-Di-n-propylamine	350.	U
67-72-1	Hexachloroethane	350.	U
98-95-3	Nitrobenzene	350.	U
78-59-1	Isophorone	350.	U
88-75-5	2-Nitrophenol	350.	U
105-67-9	2,4-Dimethylphenol	350.	U
65-85-0	Benzoic acid	1800.	U
111-91-1	bis(2-Chloroethoxy)methane	350.	U
120-83-2	2,4-Dichlorophenol	350.	U
120-82-1	1,2,4-Trichlorobenzene	350.	U
91-20-3	Naphthalene	350.	U
106-47-8	4-Chloroaniline	350.	U
87-68-3	Hexachlorobutadiene	350.	U
59-50-7	4-Chloro-3-methylphenol	350.	U
91-57-6	2-Methylnaphthalene	350.	U
77-47-4	Hexachlorocyclopentadiene	350.	U
88-06-2	2,4,6-Trichlorophenol	350.	U
95-95-4	2,4,5-Trichlorophenol	1800.	U
91-58-7	2-Chloronaphthalene	350.	U
88-74-4	2-Nitroaniline	1800.	U
131-11-3	Dimethylphthalate	350.	U
208-96-8	Acenaphthylene	350.	U
606-20-2	2,6-Dinitrotoluene	350.	U

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01SB3

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 4968-E1

Sample wt/vol: 29.45 (g/mL) G Lab File ID: >DA107

Level: (low/med) LOW Date Received: 03/09/92

% Moisture: not dec.3.03 dec. -- Date Extracted: 13/15/92

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH: 10.33 Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
99-09-2	3-Nitroaniline	1800.	U
83-32-9	Acenaphthene	350.	U
51-28-5	2,4-Dinitrophenol	1800.	U
100-02-7	4-Nitrophenol	1800.	U
132-64-9	Dibenzofuran	350.	U
121-14-2	2,4-Dinitrotoluene	350.	U
84-66-2	Diethylphthalate	350.	U
7005-72-3	4-Chlorophenyl-phenylether	350.	U
86-73-7	Fluorene	350.	U
100-01-6	4-Nitroaniline	1800.	U
534-52-1	4,6-Dinitro-2-methylphenol	1800.	U
86-30-6	N-Nitrosodiphenylamine (1)	350.	U
101-55-3	4-Bromophenyl-phenylether	350.	U
118-74-1	Hexachlorobenzene	350.	U
87-86-5	Pentachlorophenol	1800.	U
85-01-8	Phenanthrene	350.	U
120-12-7	Anthracene	350.	U
84-74-2	Di-n-butylphthalate	350.	U
206-44-0	Fluoranthene	350.	U
129-00-0	Pyrene	350.	U
85-68-7	Butylbenzylphthalate	350.	U
91-94-1	3,3'-Dichlorobenzidine	700.	U
56-55-3	Benzo(a)anthracene	350.	U
218-01-9	Chrysene	350.	U
117-81-7	bis(2-Ethylhexyl)phthalate	17.	J
117-84-0	Di-n-octylphthalate	15.	J
205-99-2	Benzo(b)fluoranthene	350.	U
207-08-9	Benzo(k)fluoranthene	350.	U
50-32-8	Benzo(a)pyrene	350.	U
193-39-5	Indeno(1,2,3-cd)pyrene	350.	U
53-70-3	Dibenz(a,h)anthracene	350.	U
191-24-2	Benzo(g,h,i)perylene	350.	U

(1) - Cannot be separated from Diphenylamine

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
B01SB3

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 4968-E1

Sample wt/vol: 29.45 (g/mL) G Lab File ID: >DA107

Level: (low/med) LOW Date Received: 03/09/92

% Moisture: not dec.3.03 dec. -- Date Extracted: 13/15/92

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH: 10.33 Dilution Factor: 1.00000

Number TICs found: 7

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	4.53	1300.	JAB
2.		Unknown	4.80	220.	JAB
3.	126738	Phosphoric acid tributyl est	19.73	170.	J
4.		Unknown alkane	27.72	220.	J
5.		Unknown alkane	29.38	360.	J
6.		Unknown alkane	30.82	180.	J
7.		Unknown alkane	34.34	340.	JB
8.					
9.					
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1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01SB7

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 5102-E1

Sample wt/vol: 30.21 (g/mL) G Lab File ID: >DA108

Level: (low/med) LOW Date Received: 03/11/92

% Moisture: not dec.3.79 dec. -- Date Extracted: 13/15/92

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH:9.75 Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
108-95-2	Phenol	340.	U
111-44-4	bis(2-Chloroethyl)Ether	340.	U
95-57-8	2-Chlorophenol	340.	U
541-73-1	1,3-Dichlorobenzene	340.	U
106-46-7	1,4-Dichlorobenzene	340.	U
100-51-6	Benzyl alcohol	340.	U
95-50-1	1,2-Dichlorobenzene	340.	U
95-48-7	2-Methylphenol	340.	U
39638-32-9	bis(2-chloroisopropyl)ether	340.	U
106-44-5	4-Methylphenol	340.	U
621-64-7	N-Nitroso-Di-n-propylamine	340.	U
67-72-1	Hexachloroethane	340.	U
98-95-3	Nitrobenzene	340.	U
78-59-1	Isophorone	340.	U
88-75-5	2-Nitrophenol	340.	U
105-67-9	2,4-Dimethylphenol	340.	U
65-85-0	Benzoic acid	1700.	U
111-91-1	bis(2-Chloroethoxy)methane	340.	U
120-83-2	2,4-Dichlorophenol	340.	U
120-82-1	1,2,4-Trichlorobenzene	340.	U
91-20-3	Naphthalene	340.	U
106-47-8	4-Chloroaniline	340.	U
87-68-3	Hexachlorobutadiene	340.	U
59-50-7	4-Chloro-3-methylphenol	340.	U
91-57-6	2-Methylnaphthalene	340.	U
77-47-4	Hexachlorocyclopentadiene	340.	U
88-06-2	2,4,6-Trichlorophenol	340.	U
95-95-4	2,4,5-Trichlorophenol	1700.	U
91-58-7	2-Chloronaphthalene	340.	U
88-74-4	2-Nitroaniline	1700.	U
131-11-3	Dimethylphthalate	340.	U
208-96-8	Acenaphthylene	340.	U
606-20-2	2,6-Dinitrotoluene	340.	U

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1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01SB7

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 5102-E1

Sample wt/vol: 30.21 (g/mL) G Lab File ID: >DA108

Level: (low/med) LOW Date Received: 03/11/92

% Moisture: not dec. 3.79 dec. -- Date Extracted: 13/15/92

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH: 9.75 Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
99-09-2	3-Nitroaniline	1700.	U
83-32-9	Acenaphthene	340.	U
51-28-5	2,4-Dinitrophenol	1700.	U
100-02-7	4-Nitrophenol	1700.	U
132-64-9	Dibenzofuran	340.	U
121-14-2	2,4-Dinitrotoluene	340.	U
84-66-2	Diethylphthalate	14.	J
7005-72-3	4-Chlorophenyl-phenylether	340.	U
86-73-7	Fluorene	340.	U
100-01-6	4-Nitroaniline	1700.	U
534-52-1	4,6-Dinitro-2-methylphenol	1700.	U
86-30-6	N-Nitrosodiphenylamine (1)	340.	U
101-55-3	4-Bromophenyl-phenylether	340.	U
118-74-1	Hexachlorobenzene	340.	U
87-86-5	Pentachlorophenol	1700.	U
85-01-8	Phenanthrene	340.	U
120-12-7	Anthracene	340.	U
84-74-2	Di-n-butylphthalate	340.	U
206-44-0	Fluoranthene	340.	U
129-00-0	Pyrene	340.	U
85-68-7	Butylbenzylphthalate	340.	U
91-94-1	3,3'-Dichlorobenzidine	690.	U
56-55-3	Benzo(a)anthracene	340.	U
218-01-9	Chrysene	340.	U
117-81-7	bis(2-Ethylhexyl)phthalate	21.	J
117-84-0	Di-n-octylphthalate	340.	U
205-99-2	Benzo(b)fluoranthene	340.	U
207-08-9	Benzo(k)fluoranthene	340.	U
50-32-8	Benzo(a)pyrene	340.	U
193-39-5	Indeno(1,2,3-cd)pyrene	340.	U
53-70-3	Dibenz(a,h)anthracene	340.	U
191-24-2	Benzo(g,h,i)perylene	340.	U

(1) - Cannot be separated from Diphenylamine

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
B01SB7

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 5102-E1

Sample wt/vol: 30.21 (g/mL) G Lab File ID: >DA108

Level: (low/med) LOW Date Received: 03/11/92

% Moisture: not dec.3.79 dec. -- Date Extracted: 13/15/92

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH: 9.75 Dilution Factor: 1.00000

Number TICs found: 11

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	4.53	1200.	JAB
2.		Unknown	4.82	1000.	JAB
3.		Unknown	5.27	180.	J
4.		Unknown	5.30	210.	J
5.		Unknown	7.53	220.	J
6.	57103	Hexadecanoic acid	27.00	190.	J
7.		Unknown alkane	27.73	230.	J
8.		Unknown alkane	29.38	300.	J
9.		Unknown alkane	34.35	420.	JB
10.		Unknown alkane	38.35	190.	J
11.		Unknown	40.41	210.	J
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1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01SB2

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 5150-E1

Sample wt/vol: 30.44 (g/mL) G Lab File ID: >DA109

Level: (low/med) LOW Date Received: 03/13/92

% Moisture: not dec.5.21 dec. -- Date Extracted: 13/15/92

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH:8.90 Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
108-95-2	Phenol	350.	U
111-44-4	bis(2-Chloroethyl)Ether	350.	U
95-57-8	2-Chlorophenol	350.	U
541-73-1	1,3-Dichlorobenzene	350.	U
106-46-7	1,4-Dichlorobenzene	350.	U
100-51-6	Benzyl_alcohol	350.	U
95-50-1	1,2-Dichlorobenzene	350.	U
95-48-7	2-Methylphenol	350.	U
39638-32-9	bis(2-chloroisopropyl)ether	350.	U
106-44-5	4-Methylphenol	350.	U
621-64-7	N-Nitroso-Di-n-propylamine	350.	U
67-72-1	Hexachloroethane	350.	U
98-95-3	Nitrobenzene	350.	U
78-59-1	Isophorone	350.	U
88-75-5	2-Nitrophenol	350.	U
105-67-9	2,4-Dimethylphenol	350.	U
65-85-0	Benzoic_acid	1700.	U
111-91-1	bis(2-Chloroethoxy)methane	350.	U
120-83-2	2,4-Dichlorophenol	350.	U
120-82-1	1,2,4-Trichlorobenzene	350.	U
91-20-3	Naphthalene	350.	U
106-47-8	4-Chloroaniline	350.	U
87-68-3	Hexachlorobutadiene	350.	U
59-50-7	4-Chloro-3-methylphenol	350.	U
91-57-6	2-Methylnaphthalene	350.	U
77-47-4	Hexachlorocyclopentadiene	350.	U
88-06-2	2,4,6-Trichlorophenol	350.	U
95-95-4	2,4,5-Trichlorophenol	1700.	U
91-58-7	2-Chloronaphthalene	350.	U
88-74-4	2-Nitroaniline	1700.	U
131-11-3	Dimethylphthalate	350.	U
208-96-8	Acenaphthylene	350.	U
606-20-2	2,6-Dinitrotoluene	350.	U

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1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01SB2

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 5150-E1

Sample wt/vol: 30.44 (g/mL) G Lab File ID: >DA109

Level: (low/med) LOW Date Received: 03/13/92

% Moisture: not dec. 5.21 dec. -- Date Extracted: 13/15/92

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH: 8.90 Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
99-09-2	3-Nitroaniline	1700.	U
83-32-9	Acenaphthene	350.	U
51-28-5	2,4-Dinitrophenol	1700.	U
100-02-7	4-Nitrophenol	1700.	U
132-64-9	Dibenzofuran	350.	U
121-14-2	2,4-Dinitrotoluene	350.	U
84-66-2	Diethylphthalate	33.	J
7005-72-3	4-Chlorophenyl-phenylether	350.	U
86-73-7	Fluorene	350.	U
100-01-6	4-Nitroaniline	1700.	U
534-52-1	4,6-Dinitro-2-methylphenol	1700.	U
86-30-6	N-Nitrosodiphenylamine (1)	350.	U
101-55-3	4-Bromophenyl-phenylether	350.	U
118-74-1	Hexachlorobenzene	350.	U
87-86-5	Pentachlorophenol	1700.	U
85-01-8	Phenanthrene	350.	U
120-12-7	Anthracene	350.	U
84-74-2	Di-n-butylphthalate	350.	U
206-44-0	Fluoranthene	350.	U
129-00-0	Pyrene	350.	U
85-68-7	Butylbenzylphthalate	350.	U
91-94-1	3,3'-Dichlorobenzidine	690.	U
56-55-3	Benzo(a)anthracene	350.	U
218-01-9	Chrysene	350.	U
117-81-7	bis(2-Ethylhexyl)phthalate	24.	J
117-84-0	Di-n-octylphthalate	350.	U
205-99-2	Benzo(b)fluoranthene	350.	U
207-08-9	Benzo(k)fluoranthene	350.	U
50-32-8	Benzo(a)pyrene	350.	U
193-39-5	Indeno(1,2,3-cd)pyrene	350.	U
53-70-3	Dibenz(a,h)anthracene	350.	U
191-24-2	Benzo(g,h,i)perylene	350.	U

(1) - Cannot be separated from Diphenylamine

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1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

B01SB2

Lab Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 15

Matrix: (soil/water) SOIL Lab Sample ID: 5150-E1

Sample wt/vol: 30.44 (g/mL) G Lab File ID: >DA109

Level: (low/med) LOW Date Received: 03/13/92

% Moisture: not dec.5.21 dec. -- Date Extracted: 13/15/92

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 4/01/92

GPC Cleanup: (Y/N) N pH:8.90 Dilution Factor: 1.00000

Number TICs found: 24

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	4.52	1200.	JAB
2.		Unknown	4.83	1500.	JAB
3.		Unknown	5.27	210.	J
4.		Unknown	5.30	340.	J
5.		Unknown	7.97	150.	J
6.	112403	Dodecane	8.69	250.	J
7.	6044719	Dodecane, 6-methyl-	8.99	170.	J
8.		Unknown alkane	10.29	430.	J
9.	629505	Tridecane	10.91	590.	J
10.		Unknown	11.57	150.	J
11.		Unknown alkane	12.81	750.	J
12.	629594	Tetradecane	13.39	1000.	J
13.		Unknown alkane	14.63	140.	J
14.		Unknown alkane	14.99	860.	J
15.	629629	Pentadecane	15.96	950.	J
16.	544763	Hexadecane	18.51	370.	J
17.	126738	Phosphoric acid tributyl est	19.97	32000.	J
18.		Unknown alkane	25.78	160.	J
19.	57103	Hexadecanoic acid	27.00	200.	J
20.		Unknown alkane	27.73	250.	J
21.		Unknown alkane	29.38	180.	J
22.		Unknown alkane	34.36	380.	JB
23.		Unknown alkane	38.35	150.	J
24.		Unknown alkane	40.41	140.	J
25.					
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PCB/PESTICIDE ANALYSIS RESULTS

SAMPLE ANALYSIS REPORTED

Analysis of six, 200-BP-1 samples consisting of sample delivery group fifteen (SDG No. 15) for pesticides and PCBs (Aroclors) by gas chromatography/electron capture detection (GC/ECD) is the subject of this report.

SAMPLE DESCRIPTION AND PREPARATION

Sample ID	ACL Lab Number
B01S97	92-04734-P-1
B01S99	92-04735-P-1
B01SB1	92-04736-P-1
B01SB3	92-04968-P-1
B01SB7	92-05102-P-1
B01SB2	92-05150-P-1
B01SB7 MS	92-05102-P-2
B01SB7 MSD	92-05102-P-3
Method Blank	92-05102-P-4

The samples were received in good condition on 03/05/92 (B01S97, B01S99,and B01SB1), 03/09/92 (B01SB3), and 03/11/92 (B01SB7 and B01SB2). Samples were extracted on 03/15/92.

- Extraction procedure — PNL-ALO-347.
- Extraction location — Lab 302, 325 building
- Extraction type — Sonication, low level, soil
- Sample/Extract storage temperature — 4°C(+/-2°)

ANALYSIS METHOD

- GC/ECD procedure: — PNL-ALO-346.
- GC/ECD instrumentation: — HP-5890 (WB60701)
- GC/ECD location: — Lab 325, 325 building.

Screening analysis was not performed on these samples because a screening instrument was not available, and the screen was not anticipated to be necessary.

The GC/ECD used for analysis employed 0.53 megabore capillary columns for both primary and confirmation analysis.

QUALITY CONTROL

In addition to the result forms (1D) the QC features in the analytical procedure were followed as described. The following lists the attached CLP forms that relate to QC and summarizes the QC results.

Form	Information	Comments
2F	Surrogate Recovery	Meets all requirements.
3F	MS/MSD Recovery	1 of 12 recoveries were outside control limits. RPD met all requirements.
4C	Method Blank Summary	Meets all method blank requirements.
8D	Evaluation Standards	Meets all requirements.
8E	Retention Time Summary	Meets all requirements.
9	Standards Summary	%D exceeded limits for the compound Methoxychlor on the confirmation column.
1D	Extraction Holding Time	Requirements were met.
1D	Analysis Holding Time	Requirements were met.

DATA

Laboratory data is maintained in as follows:

Activity	LRB Number	Page Number
• GC/ECD injection log	BNW-53202	77-78

- Extraction bench sheet: filed with data in the ACL/ALO records center
- GC/ECD hard copy data, sample report: filed with data in the ACL/ALO records center

Within the raw data, true "hits" are labeled manually or circled on the area summary report associated with each sample chromatogram. Unless noted as such, all data system generated hits shall be considered false. The only information printed on the quantitation reports that should be used in evaluating the data are:

- time and date of sample injection
- data file identification
- peak indentification, retention time and response (area)
- instrument identification

RESULTS

As indicated on the attached 1D Forms the blank and the samples were not found to contain target compounds at levels above the contract required quantitation limit (CRQL) and are "Q" flagged accordingly.

The following defines the Q-flags in the Form 1's

"Q" Flag	Definition
U	Indicates the compound was analyzed for, but not detected, the U-flagged concentration is the Contract Required Quantitation Limit.
B	Indicates compound was found in the blank.
D	Indicates analysis was performed on a diluted sample.
M	Indicates a matrix spike compound.

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1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01S97

Lab Name: Battelle PNL Contract:

Lab Code: PNL Case No.: SAS No.: SDG No.: 15

Matrix: (soil/water) soil Lab Sample ID: 92-04734-P-1

Sample wt/vol: 30.25 (g/mL)g Lab File ID: >01214

Level: (low/med) low Date Received: 03/05/92

% Moisture: not dec. 3.27 dec. Date Extracted: 03/15/92

Extraction: (SepF/Cont/Sonc) sonc Date Analyzed: 03/20/92

GPC Cleanup: (Y/N) N pH: 9.17 Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
319-84-6	Alpha-BHC	8.20	U
319-85-7	Beta-BHC	8.20	U
319-86-8	Delta-BHC	8.20	U
58-89-9	Gamma-BHC (Lindane)	8.20	U
76-44-8	Heptachlor	8.20	U
309-00-2	Aldrin	8.20	U
1024-57-3	Heptachlor Epoxide	8.20	U
959-98-8	Endosulfan I	8.20	U
60-57-1	Dieldrin	16.00	U
72-55-9	4,4'-DDE	16.00	U
72-20-8	Endrin	16.00	U
33213-65-9	Endosulfan II	16.00	U
72-54-8	4,4'-DDD	16.00	U
1013-07-8	Endosulfan Sulfate	16.00	U
50-29-3	4,4'-DDT	16.00	U
72-43-5	Methoxychlor	82.00	U
53494-70-5	Endrin Ketone	16.00	U
5103-71-9	alpha-Chlordane	82.00	U
5103-74-2	gamma-Chlordane	82.00	U
8001-35-2	Toxaphene	160.00	U
12674-11-2	Aroclor-1016	82.00	U
11104-28-2	Aroclor-1221	82.00	U
11141-16-5	Aroclor-1232	82.00	U
53469-21-9	Aroclor-1242	82.00	U
12672-29-6	Aroclor-1248	82.00	U
11097-69-1	Aroclor-1254	160.00	U
11096-82-5	Aroclor-1260	160.00	U

FORM I PEST 1/89 Rev

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01S99

Lab Name: Battelle PNL Contract:

Lab Code: PNL Case No.: SAS No.: SDG No.: 15

Matrix: (soil/water) soil Lab Sample ID: 92-04735-P-1

Sample wt/vol: 30.96 (g/mL)g Lab File ID: >01215

Level: (low/med) low Date Received: 03/05/92

% Moisture: not dec. 4.05 dec. Date Extracted: 03/15/92

Extraction: (SepF/Cont/Sonc) sonc Date Analyzed: 03/20/92

GPC Cleanup: (Y/N) N pH: 10.1 Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
319-84-6	Alpha-BHC	8.10	U
319-85-7	Beta-BHC	8.10	U
319-86-8	Delta-BHC	8.10	U
58-89-9	Gamma-BHC (Lindane)	8.10	U
76-44-8	Heptachlor	8.10	U
309-00-2	Aldrin	8.10	U
1024-57-3	Heptachlor Epoxide	8.10	U
959-98-8	Endosulfan I	8.10	U
60-57-1	Dieldrin	16.00	U
72-55-9	4,4'-DDE	16.00	U
72-20-8	Endrin	16.00	U
33213-65-9	Endosulfan II	16.00	U
72-54-8	4,4'-DDD	16.00	U
1013-07-8	Endosulfan Sulfate	16.00	U
50-29-3	4,4'-DDT	16.00	U
72-43-5	Methoxychlor	81.00	U
53494-70-5	Endrin Ketone	16.00	U
5103-71-9	alpha-Chlordane	81.00	U
5103-74-2	gamma-Chlordane	81.00	U
8001-35-2	Toxaphene	160.00	U
12674-11-2	Aroclor-1016	81.00	U
11104-28-2	Aroclor-1221	81.00	U
11141-16-5	Aroclor-1232	81.00	U
53469-21-9	Aroclor-1242	81.00	U
12672-29-6	Aroclor-1248	81.00	U
11097-69-1	Aroclor-1254	160.00	U
11096-82-5	Aroclor-1260	160.00	U

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01SB1

Lab Name: Battelle PNL Contract:

Lab Code: PNL Case No.: SAS No.: SDG No.: 15

Matrix: (soil/water) soil Lab Sample ID: 92-04736-P-1

Sample wt/vol: 30.78 (g/mL)g Lab File ID: >01216

Level: (low/med) low Date Received: 03/05/92

% Moisture: not dec. 4.08 dec. Date Extracted: 03/15/92

Extraction: (SepF/Cont/Sonc) sonc Date Analyzed: 03/20/92

GPC Cleanup: (Y/N) N pH: 10.1 Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
319-84-6	Alpha-BHC	8.10	U
319-85-7	Beta-BHC	8.10	U
319-86-8	Delta-BHC	8.10	U
58-89-9	Gamma-BHC (Lindane)	8.10	U
76-44-8	Heptachlor	8.10	U
309-00-2	Aldrin	8.10	U
1024-57-3	Heptachlor Epoxide	8.10	U
959-98-8	Endosulfan I	8.10	U
60-57-1	Dieldrin	16.00	U
72-55-9	4,4'-DDE	16.00	U
72-20-8	Endrin	16.00	U
33213-65-9	Endosulfan II	16.00	U
72-54-8	4,4'-DDD	16.00	U
1013-07-8	Endosulfan Sulfate	16.00	U
50-29-3	4,4'-DDT	16.00	U
72-43-5	Methoxychlor	81.00	U
53494-70-5	Endrin Ketone	16.00	U
5103-71-9	alpha-Chlordane	81.00	U
5103-74-2	gamma-Chlordane	81.00	U
8001-35-2	Toxaphene	160.00	U
12674-11-2	Aroclor-1016	81.00	U
11104-28-2	Aroclor-1221	81.00	U
11141-16-5	Aroclor-1232	81.00	U
53469-21-9	Aroclor-1242	81.00	U
12672-29-6	Aroclor-1248	81.00	U
11097-69-1	Aroclor-1254	160.00	U
11096-82-5	Aroclor-1260	160.00	U

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1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01SB3

Lab Name: Battelle PNL Contract:

Lab Code: PNL Case No.: SAS No.: SDG No.: 15

Matrix: (soil/water) soil Lab Sample ID: 92-04968-P-1

Sample wt/vol: 29.45 (g/mL)g Lab File ID: >01217

Level: (low/med) low Date Received: 03/09/92

% Moisture: not dec. 3.03 dec. Date Extracted: 03/15/92

Extraction: (SepF/Cont/Sonc) sonc Date Analyzed: 03/20/92

GPC Cleanup: (Y/N) N pH: 10.3 Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
319-84-6	Alpha-BHC	8.40	U
319-85-7	Beta-BHC	8.40	U
319-86-8	Delta-BHC	8.40	U
58-89-9	Gamma-BHC (Lindane)	8.40	U
76-44-8	Heptachlor	8.40	U
309-00-2	Aldrin	8.40	U
1024-57-3	Heptachlor Epoxide	8.40	U
959-98-8	Endosulfan I	8.40	U
60-57-1	Dieldrin	17.00	U
72-55-9	4,4'-DDE	17.00	U
72-20-8	Endrin	17.00	U
33213-65-9	Endosulfan II	17.00	U
72-54-8	4,4'-DDD	17.00	U
1013-07-8	Endosulfan Sulfate	17.00	U
50-29-3	4,4'-DDT	17.00	U
72-43-5	Methoxychlor	84.00	U
53494-70-5	Endrin Ketone	17.00	U
5103-71-9	alpha-Chlordane	84.00	U
5103-74-2	gamma-Chlordane	84.00	U
8001-35-2	Toxaphene	170.00	U
12674-11-2	Aroclor-1016	84.00	U
11104-28-2	Aroclor-1221	84.00	U
11141-16-5	Aroclor-1232	84.00	U
53469-21-9	Aroclor-1242	84.00	U
12672-29-6	Aroclor-1248	84.00	U
11097-69-1	Aroclor-1254	170.00	U
11096-82-5	Aroclor-1260	170.00	U

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PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01SB7

Lab Name: Battelle PNL Contract:

Lab Code: PNL Case No.: SAS No.: SDG No.: 15

Matrix: (soil/water) soil Lab Sample ID: 92-05102-P-1

Sample wt/vol: 30.21 (g/mL)g Lab File ID: >01218

Level: (low/med) low Date Received: 03/11/92

% Moisture: not dec. 3.79 dec. Date Extracted: 03/15/92

Extraction: (SepF/Cont/Sonc) sonc Date Analyzed: 03/20/92

GPC Cleanup: (Y/N) N pH: 9.75 Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
319-84-6	Alpha-BHC	8.30	U
319-85-7	Beta-BHC	8.30	U
319-86-8	Delta-BHC	8.30	U
58-89-9	Gamma-BHC (Lindane)	8.30	U
76-44-8	Heptachlor	8.30	U
309-00-2	Aldrin	8.30	U
1024-57-3	Heptachlor Epoxide	8.30	U
959-98-8	Endosulfan I	8.30	U
60-57-1	Dieldrin	17.00	U
72-55-9	4,4'-DDE	17.00	U
72-20-8	Endrin	17.00	U
33213-65-9	Endosulfan II	17.00	U
72-54-8	4,4'-DDD	17.00	U
1013-07-8	Endosulfan Sulfate	17.00	U
50-29-3	4,4'-DDT	17.00	U
72-43-5	Methoxychlor	83.00	U
53494-70-5	Endrin Ketone	17.00	U
5103-71-9	alpha-Chlordane	83.00	U
5103-74-2	gamma-Chlordane	83.00	U
8001-35-2	Toxaphene	170.00	U
12674-11-2	Aroclor-1016	83.00	U
11104-28-2	Aroclor-1221	83.00	U
11141-16-5	Aroclor-1232	83.00	U
53469-21-9	Aroclor-1242	83.00	U
12672-29-6	Aroclor-1248	83.00	U
11097-69-1	Aroclor-1254	170.00	U
11096-82-5	Aroclor-1260	170.00	U

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1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01SB2

Lab Name: Battelle PNL Contract:

Lab Code: PNL Case No.: SAS No.: SDG No.: 15

Matrix: (soil/water) soil Lab Sample ID: 92-05150-P-1

Sample wt/vol: 30.44 (g/mL)g Lab File ID: >01221

Level: (low/med) low Date Received: 03/11/92

% Moisture: not dec. 5.21 dec. Date Extracted: 03/15/92

Extraction: (SepF/Cont/Sonc) sonc Date Analyzed: 03/20/92

GPC Cleanup: (Y/N) N pH: 8.9 Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
319-84-6	Alpha-BHC	8.30	U
319-85-7	Beta-BHC	8.30	U
319-86-8	Delta-BHC	8.30	U
58-89-9	Gamma-BHC (Lindane)	8.30	U
76-44-8	Heptachlor	8.30	U
309-00-2	Aldrin	8.30	U
1024-57-3	Heptachlor Epoxide	8.30	U
959-98-8	Endosulfan I	8.30	U
60-57-1	Dieldrin	17.00	U
72-55-9	4,4'-DDE	17.00	U
72-20-8	Endrin	17.00	U
33213-65-9	Endosulfan II	17.00	U
72-54-8	4,4'-DDD	17.00	U
1013-07-8	Endosulfan Sulfate	17.00	U
50-29-3	4,4'-DDT	17.00	U
72-43-5	Methoxychlor	83.00	U
53494-70-5	Endrin Ketone	17.00	U
5103-71-9	alpha-Chlordane	83.00	U
5103-74-2	gamma-Chlordane	83.00	U
8001-35-2	Toxaphene	170.00	U
12674-11-2	Aroclor-1016	83.00	U
11104-28-2	Aroclor-1221	83.00	U
11141-16-5	Aroclor-1232	83.00	U
53469-21-9	Aroclor-1242	83.00	U
12672-29-6	Aroclor-1248	83.00	U
11097-69-1	Aroclor-1254	170.00	U
11096-82-5	Aroclor-1260	170.00	U

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01SB7

Lab Name: Battelle PNL Contract:

Lab Code: PNL Case No.: SAS No.: SDG No.: 15

Matrix: (soil/water) soil Lab Sample ID: 92-05102-P-2

Sample wt/vol: 30.08 (g/mL)g Lab File ID: >01222

Level: (low/med) low Date Received: 03/11/92

% Moisture: not dec. 3.79 dec. Date Extracted: 03/15/92

Extraction: (SepF/Cont/Sonc) sonc Date Analyzed: 03/20/92

GPC Cleanup: (Y/N) N pH: 8.9 Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
319-84-6	Alpha-BHC	8.40	U
319-85-7	Beta-BHC	8.40	U
319-86-8	Delta-BHC	8.40	U
58-89-9	Gamma-BHC (Lindane)	29.00	M
76-44-8	Heptachlor	35.00	M
309-00-2	Aldrin	30.00	M
1024-57-3	Heptachlor Epoxide	8.40	U
959-98-8	Endosulfan I	8.40	U
60-57-1	Dieldrin	75.00	M
72-55-9	4,4'-DDE	17.00	U
72-20-8	Endrin	82.00	M
33213-65-9	Endosulfan II	17.00	U
72-54-8	4,4'-DDD	17.00	U
1013-07-8	Endosulfan Sulfate	17.00	U
50-29-3	4,4'-DDT	91.00	M
72-43-5	Methoxychlor	84.00	U
53494-70-5	Endrin Ketone	17.00	U
5103-71-9	alpha-Chlordane	84.00	U
5103-74-2	gamma-Chlordane	84.00	U
8001-35-2	Toxaphene	170.00	U
12674-11-2	Aroclor-1016	84.00	U
11104-28-2	Aroclor-1221	84.00	U
11141-16-5	Aroclor-1232	84.00	U
53469-21-9	Aroclor-1242	84.00	U
12672-29-6	Aroclor-1248	84.00	U
11097-69-1	Aroclor-1254	170.00	U
11096-82-5	Aroclor-1260	170.00	U

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B01SB7

Lab Name: Battelle PNL Contract:

Lab Code: PNL Case No.: SAS No.: SDG No.: 15

Matrix: (soil/water) soil Lab Sample ID: 92-05102-P-3

Sample wt/vol: 30.78 (g/mL)g Lab File ID: >01223

Level: (low/med) low Date Received: 03/11/92

% Moisture: not dec. 3.79 dec. Date Extracted: 03/15/92

Extraction: (SepF/Cont/Sonc) sonc Date Analyzed: 03/20/92

GPC Cleanup: (Y/N) N pH: 8.9 Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
319-84-6	Alpha-BHC	8.20	U
319-85-7	Beta-BHC	8.20	U
319-86-8	Delta-BHC	8.20	U
58-89-9	Gamma-BHC (Lindane)	30.00	M
76-44-8	Heptachlor	38.00	M
309-00-2	Aldrin	32.00	M
1024-57-3	Heptachlor Epoxide	8.20	U
959-98-8	Endosulfan I	8.20	U
60-57-1	Dieldrin	78.00	M
72-55-9	4,4'-DDE	16.00	U
72-20-8	Endrin	85.00	M
33213-65-9	Endosulfan II	16.00	U
72-54-8	4,4'-DDD	16.00	U
1013-07-8	Endosulfan Sulfate	16.00	U
50-29-3	4,4'-DDT	93.00	M
72-43-5	Methoxychlor	82.00	U
53494-70-5	Endrin Ketone	16.00	U
5103-71-9	alpha-Chlordane	82.00	U
5103-74-2	gamma-Chlordane	82.00	U
8001-35-2	Toxaphene	160.00	U
12674-11-2	Aroclor-1016	82.00	U
11104-28-2	Aroclor-1221	82.00	U
11141-16-5	Aroclor-1232	82.00	U
53469-21-9	Aroclor-1242	82.00	U
12672-29-6	Aroclor-1248	82.00	U
11097-69-1	Aroclor-1254	160.00	U
11096-82-5	Aroclor-1260	160.00	U

9613474.1877

Westinghouse Hanford Company	CHAIN OF CUSTODY

Custody Form Initiator PH BUTCHER

Company Contact PH BUTCHER

Telephone (509)376-5045

Project Designation/Sampling Locations 200-BP-1

Collection Date 4/10/92

Ice Chest No. SML-93

Field Logbook No. WHC-N-4461; p 109 & 110

Bill of Lading/Airbill No. N/A

Offsite Property No. N/A

Method of Shipment HAND DELIVER

Shipped to PNL/325

Possible Sample Hazards/Remarks N/A

Sample Identification

B01R10

1, 1L, P, WATER, FREE CYANIDE
1, 1L, P, WATER, TOTAL CYANIDE

[] Field Transfer of Custody	Chain of Possession	(Sign and Print Names)
Relinquished by: Kirby D. Lee K.D.Lee	Received by: REFRIGERATOR	Date/Time: 4/10/92 1400
Relinquished by:	Received by: PHButcher PHButcher	Date/Time: 4/16/92 0730
Relinquished by: PHButcher PHButcher	Received by: J. R. [illegible]	Date/Time: 4-16-92 0910
Relinquished by:	Received by:	Date/Time:

Final Sample Disposition

Disposal Method:	Disposed by:	Date/Time:

Comments:

B01-002

A-6000-407 (12/90) (EF) WEF061
Chain of Custody

9613474.1878

Westinghouse Hanford Company	CHAIN OF CUSTODY

Custody Form Initiator PH BUTCHER

Company Contact PH BUTCHER

Telephone (509)376-5045

Project Designation/Sampling Locations 200-BP-1

Collection Date 4-14-92

Ice Chest No. SAL-93

Field Logbook No. WHC-N-4461

Bill of Lading/Airbill No. N/A

Offsite Property No. N/A

Method of Shipment HAND DELIVER

Shipped to PNL/325

Possible Sample Hazards/Remarks N/A

Sample Identification

B01QZ8

1, 1L, P, WATER, FREE CYANIDE
1, 1L, P, WATER, TOTAL CYANIDE

[] Field Transfer of Custody	Chain of Possession	(Sign and Print Names)
Relinquished by: L.D. Walker LD Walker	Received by: Relinquished to refrigerator	Date/Time: 4/14/92 1400
Relinquished by:	Received by: PHButcher PHButcher	Date/Time: 4/16/92 0730
Relinquished by: PHButcher PHButcher	Received by: J. ROBBINS. James Robbins	Date/Time: 4/16/92 0910
Relinquished by:	Received by:	Date/Time:

Final Sample Disposition

Disposal Method:	Disposed by:	Date/Time:

Comments:

B01-003

A-6000-407 (12/90) (EF) WEF061
Chain of Custody

9613474.1879

SAMPLE RECEIPT FORM

Delivered by: DUSTY BUTCHER Date/Time: 4/16/92 9:03

Received by: JIM ROBBINS

Customer Name or Project: 200BP-1 TASK 7

Customer Sample Number(s): BØ1R10, BØ1QZ8

ALO Sample Number(s): 92-~~06290~~ 06291, 92-06292

1. Customer Chain-of-Custody Form: Present ✓ Absent_____

2. Additional Shipping Forms (list):

   SAR

3. Custody Seals on Shipping and/or Sample Containers and their Conditions.

   Present ✓ Absent_____

   If Present, Condition: INTACT

4. Sample Tag(s) ID Numbers if not Recorded on the Chain-of-Custody Record or on Sample Vial.

   Notes: N/A

5. Condition of Shipping Container (i,e., broken container, dented, breached plastic bag, temperature of sample container as defined in Section 3.0 in PNL-ALO-051, etc.)

   OK 1°C

6. Condition of Sample Vials.

   OK

7. Verification of Agreement or Nonagreement of Information on Receiving Documents.

   OK

8. Resolution of Problems or Discrepancies.

   OK

RETURN COMPLETED FORM TO PROJECT MANAGER

B01-004

9613474.1880

Westinghouse Hanford Company

SAMPLE ANALYSIS REQUEST

PART I: FIELD SECTION

Collector LD Lee / LD Walker Date Sampled *** Time _____ hours

Company Contact PH BUTCHER Telephone (509) 376-5045

Sample Number	Number and Type of Sample Containers	Type of Sample*	Analysis Requested ***
B01R10	2, 1L, P,	W	FREE CYANIDE 4/10/92
		W	TOTAL CYANIDE "
B01QZ8	2, 1L, P	W	Free Cyanide 4/14/92
		W	Total Cyanide "

Field Information** _____

Special Handling and/or Storage _____

Possible Sample Hazards _____

PART II: LABORATORY SECTION

Received by J. Robbins Title Sr. RES SCIENTIST Date 4-16-92

Analysis Required TOTAL CN. B01-005

*Indicate whether sample is soil, sludge, water, etc.

**Use back of page for additional information relative to sample location

A-6000-406 (05/90)

9613474.1881

Samples were delivered directly to the Analysts. Therefore, no other PNL Chain of Custody forms were needed.