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**200-BP-1 SITE INVESTIGATION  
ANALYTICAL CHEMISTRY SUPPORT PROJECT**

**TASKS 2 & 4**

**DATA PACKAGE/REPORT No. 8**

**Revision 0**

**May 15, 1991**

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**Pacific Northwest Laboratory**

**(PNL Project #16772)**



## 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 # 92-00306 and 92-00358 are the full suite as specified in the WHC SOW. The full suite analysis parameters of interest are; nitrate, nitrite, phosphate, sulfate, cyanide, free cyanide, complex cyanide, bismuth, the 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 Contract Laboratory Program organic target compound list. The other five samples were submitted for total cyanide and free cyanide analyses. Weight percent solid was determined for all soil samples, 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. Sample duplicates, methods blank, matrix spikes and/or matrix spike duplicates were analyzed. All QC data needed to support reported results 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 data tables.

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

5-15-92  
Date

**TABLE 1: 200-BP-1 Sample Numbers**

<u>WHC Sample Number</u>	<u>PNL ALO Sample Number</u>	<u>Sample Type</u>	<u>*Analyses Requested</u>
B015G4	92-00019	Soil	CN Suite
B015G6	92-00116	Soil	CN Suite
B015G8	92-00117	Soil	CN Suite
B015G9	92-00306	Soil	Full Suite
B015H4	92-00356	Soil	CN Suite
B015H6	92-00357	Soil	CN Suite
B015H1	92-00358	Soil	Full Suite

- \* CN Suite - Total CN, Free CN and Complex CN  
Full Suite - Anions Bi, CLP Inorganic Target Analytes, Radiochemistry Suite,  
TOC and CLP Organic Target Compounds (as defined in Introduction, pg2.)

TABLE 2:  
WEIGHT PERCENT SOLIDS SUMMARY SHEET

SAMPLE ID#	PNL LOG#	SAMPLE WT %	DUPLICATE WT %	AVERAGE SOLIDS WT %
B015G4	92-00019	97.56	97.49	97.5
B015G6	92-00116	96.35	96.45	96.4
B015G8	92-00117	98.04	96.79	97.4
B015G9	92-00306	96.74	97.03	96.9
B015H4	92-00356	96.37	96.59	96.5
B015H6	92-00357	95.56	95.63	95.6
B015H1	92-00358	96.68	96.61	96.6

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

**ANION ANALYSIS RESULTS****Ion Chromatography**

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

**Data presentation** (see Table 3, and the notes below)

Each anion has been listed on a separate page 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.

CLP flags ( C ) and Quality control flags ( Q ) have also been appended, where appropriate.

**CRDL and IDL values**

<u>Analyte</u>	<u>CRDL</u>		<u>IDL</u>	
	<u>ug/L</u>	<u>mg/kg</u>	<u>ug/L</u>	<u>mg/kg</u>
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 ug/L and those for solids 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 NO<sub>2</sub>-N and NO<sub>3</sub>-N, 0.33xCRDL for PO<sub>4</sub>-P, and 0.2xCRDL for SO<sub>4</sub>.

#### Hold Times

The hold time of 48 hours after extraction (for soils) was met for the samples analyzed.

#### 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 (NO<sub>2</sub>, NO<sub>3</sub>, PO<sub>4</sub>, SO<sub>4</sub>). The accuracy of the calibration was checked by analyzing three independently derived verification standards at 17%, 50%, and 75% of the calibration range maximum. Unless noted otherwise, spike levels in the samples or extracts were nominally at 5 ppm for all oxyanions at the time of injection.

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. The accuracy decreases and errors increase for lower analyte levels and may be 100% at the instrument detection limit.

#### Quality Control

A method blank and spiked blank were prepared using the extraction buffer. Unlike the samples, these solutions were not filtered through 0.45 um filters following the extraction step, for which 100% extraction efficiency has been assumed.

The criterion for the acceptance of data, that the spiked blank values for the anions of interest are quantitated within  $\pm 20\%$ , has been met. The retention time (R.T.) window for all anions, set at  $\pm 10\%$ , has been met.

A duplicate set of analyses, performed on 92-00358/B015H1 was recovered with %RPD values within the appropriate windows for all anions.

The matrix spike and duplicate matrix spike recoveries, for 92-01246/B01515 (not a sample in this SDG), were within  $\pm 25\%$  for NO<sub>2</sub> and SO<sub>4</sub> and considered acceptable. The erratic spike recovery results for NO<sub>3</sub> (MS at -109%, MSD at 171%) cannot be considered meaningful, NO<sub>3</sub> present in the samples exceeded the amount spiked by approximately 30x.

The low recovery of the PO<sub>4</sub> spike, 20%, may be due to matrix components such as transition metals which can bind this anion. The acceptable recoveries for the spiked blank eliminates deterioration of the spike standard concentrate as an explanation for the low recoveries in the spiked sample.

#### Problems

No other problems have been identified.

TABLE 3: ANION IC ANALYSIS DATA  
NITRITE (NO2-N)

SOIL SAMPLES

SAMPLE ID#	PNL LOG#	C1		C2			C5 BLANK (mg/kg)	C3		C6		% RECOVERIES			Q
		SAMPLE (mg/kg)	C	SAMPLE	DUP	C		RPD	SPIKE+SAMPLE (mg/kg)	SPIKE (mg/kg)	DUP+SPIKE (mg/kg)	SPIKE (mg/kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE	
B015G9	92-00306	0.8	U				0.8	U							
B015H1	92-00358	0.8	U	0.8	U										
B015K3	92-00921+	0.8	U												
B015L5	92-01246+	0.8	U						12.8	16	12.5	15.7	80	80	82
B015M9	92-01827+	0.8	U												

IDL= 0.8 (mg/Kg, solids)  
CRDL= 1.0 (mg/Kg, solids)

NOTES:

- + Not samples in this SDG but reported for QC purposes
- 100% spike level in extract is expected to be 5ppm each for Nitrate, Nitrite, Phosphate, and Sulfate
- 5ppm X dil. factor / frac. solids = spike level (mg/Kg) in solid for Nitrate, Nitrite, Phosphate, and Sulfate
- 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml
- Method blank used for C5; nominal sample wt=2.00 gm

C FLAGS

B: IDL ≤ Analyte level < CRDL  
U: Analyte not detected; <IDL

Q FLAGS

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

TABLE 3: ANION IC ANALYSIS DATA  
NITRATE (NO3-N)

SOIL SAMPLES

SAMPLE IO#	PNL LOG#	C1		C2			C5		C3		C6		% RECOVERIES				
		SAMPLE (mg/kg)	C	SAMPLE (mg/kg)	DUP (mg/kg)	C	RPD	BLANK (mg/kg)	C	SPIKE+SAMPLE (mg/kg)	SPIKE (mg/kg)	DUP+SPIKE (mg/kg)	SPIKE (mg/kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE	C4 CONTROL	Q
B015G9	92-00306	179					0.8	U									
B015H1	92-00358	3.7		4.4		17											
B015K3	92-00921+	27.4															
B015L5	92-01246+	362							349	11.9	382	11.7	-109	171		106	
B015M9	92-01827+	30.9															

IDL= 0.8 (mg/Kg, solids)  
CRDL= 1.0 (mg/Kg, solids)

NOTES:

- + Not samples in this SDG but reported for QC purposes
- 100% spike level in extract is expected to be 5ppm each for Nitrate, Nitrite, Phosphate, and Sulfate
- 5ppm X dil. factor / frac. solids = spike level (mg/Kg) in solid for Nitrate, Nitrite, Phosphate, and Sulfate
- 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml
- Method blank used for C5; nominal sample wt=2.00 gm

C FLAGS

B: IDL ≤ Analyte level < CRDL  
U: Analyte not detected; <IDL

Q FLAGS

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

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TABLE 3: ANION IC ANALYSIS DATA  
PHOSPHATE (PO4-P)

SOIL SAMPLES

SAMPLE ID#	PNL LOG#	C1		C2			C5		C3		C6		% RECOVERIES			Q
		SAMPLE (mg/kg)	C	SAMPLE (mg/kg)	DUP C	RPD	BLANK (mg/kg)	C	SPIKE+SAMPLE (mg/kg)	SPIKE (mg/kg)	DUP+SPIKE (mg/kg)	SPIKE (mg/kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE	C4 CONTROL	
B015G9	92-00306	2.5	B				1.7	U								N
B015H1	92-00358	3.9	B	3.8	B	2.6										N
B015K3	92-00921+	4.2	B													N
B015L5	92-01246+	3.4	B						7.2	17.1	6	16.8	22	16	94	N
B015M9	92-01827+	11.2														N

IDL= 1.7 (mg/Kg, solids)  
CRDL= 5.0 (mg/Kg, solids)

NOTES:

- + Not samples in this SDG but reported for QC purposes
- 100% spike level in extract is expected to be 5ppm each for Nitrate, Nitrite, Phosphate, and Sulfate
- 5ppm X dil. factor / frac. solids = spike level (mg/Kg) in solid for Nitrate, Nitrite, Phosphate, and Sulfate
- 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml
- Method blank used for C5; nominal sample wt=2.00 gm

C FLAGS

B: IDL ≤ Analyte level < CRDL  
U: Analyte not detected; <IDL

Q FLAGS

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

TABLE 3: ANION IC ANALYSIS DATA  
SULFATE (SO4)

SOIL SAMPLES

SAMPLE ID#	PNL LOG#	C1		C2			C5 BLANK (mg/kg)	C3		C6		% RECOVERIES			
		SAMPLE (mg/kg)	C	SAMPLE (mg/kg)	DUP (mg/kg)	C		RPD	SPIKE+SAMPLE (mg/kg)	SPIKE (mg/kg)	DUP+SPIKE (mg/kg)	SPIKE (mg/kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE	C4 CONTROL
B015G9	92-00306	32					4								
B015H1	92-00358	13	B	15	B	14.3									
B015K3	92-00921+	20													
B015L5	92-01246+	30						69.4	52.6	71.1	51.6	75	80	96	
B015M9	92-01827+	101													

IDL= 4 (mg/Kg, solids)  
CRDL= 20 (mg/Kg, solids)

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NOTES:

- + Not samples in this SDG but reported for QC purposes
- 100% spike level in extract is expected to be 5ppm each for Nitrate, Nitrite, Phosphate, and Sulfate
- 5ppm X dil. factor / frac. solids = spike level (mg/Kg) in solid for Nitrate, Nitrite, Phosphate, and Sulfate
- 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml
- Method blank used for C5; nominal sample wt=2.00 gm

C FLAGS

B: IDL ≤ Analyte level < CRDL  
U: Analyte not detected; <IDL

Q FLAGS

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

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CYANIDE ANALYSIS RESULTS

Total cyanide analysis (PNL-ALO-270) was performed in room 313 of building 325 in the Hanford Site 300 area. This data package includes cyanide results for seven soil-sediment samples. Cyanide results are presented by colorimetric analysis run batch. Data results are summarized in Table 4.

Total cyanide results for soil-sediment samples and corresponding duplicates (where applicable) were below the instrument detection limit (IDL) of 0.6 mg/kg, with the exception of samples 92-00019 and 92-00357.

The 12 day hold time specified for cyanide analysis under the CLP protocol was exceeded for the initial four soil/sediment samples. Hold time was exceeded by 1-day for samples 92-00116 and 92-00306, by 3-days for 92-00019 and by 6-days for 92-00117.

Average spiked soil-sediment sample cyanide recovery was 99% with a standard deviation of 2%.

Average recovery of cyanide for initial calibration verification sample (ICV-6) was 109% with a standard deviation of 2% in the case of the soil-sediment samples. Recovery value for ICV-6 (LCS-0789, prepared by ICF Corporation) 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 in the data package were below the stated IDL.

TABLE 4: TOTAL CYANIDE ANALYSIS DATA FOR TASK 2&4  
SDG #8

SOIL-SEDIMENT SAMPLES

Sample ID#	PNL Log#	Sample G1 (mg/kg)	C	Sample dup. G2 (mg/kg)	C	XRPD	Blank G5 (µg/L)	C	Spike added (µg)	Sample+ spike G3 (mg/kg)	sample G4 (ICV) (mg/L)	Sample+ spike G3 recovery(%)	sample G4 (ICV) recovery(%)	Flags Q	Footnote 1,2,3 (ALL)	
B015G4	92-00019	0.8	B	0.8	B	N/A	5.9	U	48.55	10.5	10.1	98	107			
B015G6	92-00116	0.6	U													
B015G8	92-00117	0.6	U	0.6	U	N/A	5.9	U	48.55	10.1	10.3	100	109			
B015G9	92-00306	0.6	U													
B015H1	92-00358	0.6	U	0.6	U	N/A	5.9	U	48.55	9.3	10.5	100	112			
B015H4	92-00356	0.6	U													
B015H6	92-00357	1.5		1.7		7.9	5.9	U	48.55	11.2	9.96	96	106			
												Mean	99	109		
												Std. Dev.	2	2		

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Footnotes

1. Concentration of stock ICV-6=9.4 mg/L (9.4 µg of cyanide is added to each distillation flask and recovered in 250 mL of NaOH).
2. Contract required detection limit for soil-sediment = 1.0 mg/kg.
3. Duplicate precision under the CLP protocol must be within one CRDL when either sample or duplicate are below 5X CRDL.

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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.**

**COMPLEX CYANIDE ANALYSIS RESULTS**

Total cyanide results were all below 2 mg/Kg and/or 20  $\mu$ g/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.

**TABLE 6: COMPLEX CYANIDE ANALYSIS DATA**

**No data necessary.**

GRAPHITE FURNACE ATOMIC ABSORPTION ANALYSIS RESULTS

Samples and their accompanying QC samples were prepared following acid extraction procedure PNL-ALO-101 "Acid Digestion for Metal Analysis". The methodology is consistent with 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 were consistent with CLP SOW 7/88 GFAA Methods. Digestion of samples and GFAAS analyses were performed in building 325. The CLP SOW 7/88 and contract required hold times of 180 days and 120 days, respectively, were met.

All GFAA analyses were conducted on a Perkin-Elmer 5100 A.A instrument, except Ag and Se analyses were performed on the A.A 5000 PE. The quarterly IDLs for these two instruments are shown on Table 7.

The accuracy of these analyses is briefly described in the following table:

	<u>Ag</u>	<u>As</u>	<u>Bi</u>	<u>Pb</u>	<u>Se</u>	<u>Tl</u>
Ave %Spike Recovery:	86%	98%	104%	86%	102%	93%
Standard Deviation:	±7%	±7%	±4%	±3%	±11%	±3%

Precision of sample duplicates (i.e., RPD) was omitted for Ag, Se, Tl and Bi since the measured concentrations were below the instrument detection limits. The RPD for As and Pb was 11.2% and 2.5% respectively.

The low post-digestion spike recovery for the Ag, Pb, and Se in the LCS sample (B4) can not be explained, and the CLP does not require any remedial action in this case.

A low post-digestion spike recovery of 78% for the method blank (B5) for the Arsenic was initially observed, and as a CLP-required corrective action this blank was reanalyzed with a new spike. The observed spike recovery for this reanalysis was 90%.

TABLE 7: GRAPHITE FURNACE AA ANALYSIS DATA  
SDG #8

SOLID SAMPLES

Analyte	Sample ID#	PNL Log#	B1				B2				B5				B3		**B6		
			Sample mg/Kg	Post Spike %Rec	Flags C	Q	Dupl. mg/Kg	Post Spike %rec	C	B1&B2 %RPD	Blank µg/L	Post Spike %rec	C	Sample+ Spike µg/L	Digest Spike %rec	LCS mg/Kg	LCS %rec	Post Spike %rec	
Ag	B0015G9	92-00306	0.04	89	U														
As	B0015G9	92-00306	6.47	101															
Bi	B0015G9	92-00306	0.17	102	U														
Pb	B0015G9	92-00306	3.11	88															
Se	B0015G9	92-00306	0.06	106	U														
Tl	B0015G9	92-00306	0.13	94	U														
Ag	B0015H1	92-00358	0.04	88	U														
As	B0015H1	92-00358	5.44	105															
Bi	B0015H1	92-00358	0.17	102	U														
Pb	B0015H1	92-00358	2.93	85															
Se	B0015H1	92-00358	0.06	109	U														
Tl	B0015H1	92-00358	0.7	92	B														
Ag	B015K3*	92-00921	0.04	85	U														
As	B015K3*	92-00921	8.22	100															
Bi	B015K3*	92-00921	0.17	96	U														
Pb	B015K3*	92-00921	3.21	85															
Se	B015K3*	92-00921	0.06	107	U														
Tl	B015K3*	92-00921	0.13	95	U														

\* Not samples in the SDG but reported for QC purposes

\*\* B6 designation applies only to Bi analysis. The unit for B6 is in ug/L not in mg/Kg as all other elements are.

Ag and Se were analysed by the AA5000 PE; all other elements were analysed by the AA5100 PE.

The IDL (ug/L): for AA5000 PE (10/16/91) Ag=0.2,As=0.4,Bi=1.3,Pb=0.9,Se=0.3,Tl=0.5

The IDL (ug/L): for AA5100 PE (10/16/91) Ag=0.6,As=0.8,Bi=0.9,Pb=1.5,Se=1.0,Tl=0.7

The CRDL (ug/L): Ag=10,As=10,Bi=60,Pb=3,Se=5,Tl=10

The analytical spike levels in ug/L is 20 for Ag,As,Bi,Pb,Tl and 10 for Se

The pre-digestion spike (ug/L): Ag=40,As=40,Bi=50,Pb=20,Se=10,Tl=50

Pre-digestion spike (µg/L): Ag=40,As=40,Bi=20,Pb=20,Se=10,Tl=50

LCS standard: Ag, As, Pb, Se, Tl -- ICF 0287; Bi -- NIST 3109

ICV/CCV used during analyses: Ag,Pb,Tl--ICF0389; As,Se--ICF 0590; Bi--NIST 3106

RPD only calculated if both sample and duplicate are greater than IDL.

Flags

U Analyzed but not detected (less than IDL)

B Less than CRDL but greater than or equal to IDL

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 Method. Digestion of samples and CVAA Hg analysis were performed in the 325 building, laboratory 313. The CLP SOW 7/88 and contract required hold times of 26 days was met on the original analyses which failed qualification; the samples were received on 10/8-11/91; with the initial analysis being performed on 10/16/91 and followup analysis being performed on 11/04/91 and 2/28/92.

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 were implemented in early February 1992 (DR 91-099 was initiated). These modifications, which were primarily changes in the reaction chamber design and path length reductions, improved the detection limit by 10x and significantly improved 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. Another deviation noted is that the calibration standards were not digested as specified in the procedure. The failure to digest the standards could potentially bias the Hg results slightly low.

The CVAA Hg analyses were conducted on a Perkin-Elmer 5000 AA instrument. The results for the samples in this SDG (B015G9 and B015H1) are reported in Table 8, along with the QC spike and duplicate from B00X75, (not a sample in this SDG) ICV/CCV and LCS recoveries. Results from both the 2/28/92 analysis and the 10/16/91 (and 11/04/91) analyses are included for comparison. The reliability and validity of the analyses conducted after the procedural modifications is considered to be significantly better than the original analyses.

For the 2/28/92 daily Hg analysis batch, which included 13 samples other than those in this SDG, the average recovery for five ICV/CCV analyses was 98.2% with a  $1\sigma$  of 7.1%. The analysis of the LSC (0287) sample was 10.1 mg/kg (within the 8.5-17.0 certified range) and the recovery for an additional control standard, NIST SRM2704, was 88.3%. Precision, as indicated by the RPD of the sample and duplicate, was 5%. A reanalysis of the spike was required due to a paper jam on the recorder; the spike recovery was 71.3%.

TABLE 8: Hg COLD VAPOR AA ANALYSIS DATA FOR TASKS 2 & 4  
SDG #8

SOLID SAMPLES

Sample ID#	PNL Log#	B1		B2		B5			B3 (a)		B4 (b,c)	
		Sample mg/Kg	Flags C Q	Dupl. mg/Kg	C	B1&B2 %RPD	Blank ug/L	C	Sample +Spike mg/Kg	Digest Spike %rec	LCS mg/Kg	LCS %rec
BOOX75 (h)	91-07815	0.14	N	0.15		5.0%	0.04	U	0.23	71.3%	10.1	79.3%
	10/16/91	(0.10)	N									
NIST SRM2704											1.3	88.3%
B015G9	92-00306	0.25	N									
	10/16/91	(0.10)	B N									
	11/04/91	(0.07)	B N	(0.11)	B							
B015H1	92-00358	0.07	N									
	10/16/91	(0.20)	N	(0.22)								
	11/04/91	(0.22)	N	(0.15)	B							

- (a) B3 Predigestion Spike Level = 0.05 ug Hg
- (b) LCS 0287 Hg certified at 12.7 mg/Kg (Range 8.5 to 17.0 mg/Kg)
- (c) 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 0.005 mg/kg -> 0.2g sample, 25 mL analysis aliquot]
- (f) CRDL = 0.2 ug/L [or 0.1 mg/kg -> 0.2g sample, 100 mL analysis aliquot]
- (g) Calibration standards NIST SRM3133, ICV/CCV standard Johnson-Matthey 14395
- (h) BOOX75 not part of SDG; sample used for QC during batch analysis.
- (i) Values in ( ) were analyzed originally on the date indicated.

INDUCTIVELY COUPLED PLASMA ATOMIC EMISSION SPECTROPHOTOMETRICANALYSIS 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. The analysis was performed in ICP lab 405, building 325 in the 300 area. The CLP hold time of 180 days was met for all analytes.

The data is presented following U.S. EPA - CLP reporting format according to the SOW 7/88 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)". All CLP Forms may be found in Appendix C10.

This discussion is relative to the following samples (ACL Log-In #'s) 92-0306B, 92-0358B, 92-0921B, 92-1246B, 92-1827B (last three samples listed not a part of this SDG).

There are two report packages. The first report contains the results of the original or 1st sample analysis run. The second report contains the "Post-Digestion Spike" recovery. The second analytical analysis was necessary because one analyte, antimony, failed to meet predigestion spike recovery limits. The post digestion spiked sample showed acceptable recovery results for antimony. This is the second group of samples that have failed the spike

recovery test which indicates that the EPA sample solubilization procedure may not be adequate.

Precision and accuracy for all samples and quality control samples, with the exception of cadmium in the preparation blank and antimony in the Pre-Digestion Spike recovery test discussed above, were within EPA acceptance limits. Instrument detection limits for all analytes reported were below EPA contract required detection limits as defined in SOW 7/88. Quarterly linear range verification results were analyzed and reported in the 1st report package (20 Dec. 1991).

Cadmium in the preparation blank was reported to be about 4.7 mg/Kg. The upper limit for this analyte is 2 mg/Kg. The reported cadmium concentrations in all of the samples are very low and are also about the same concentration as the preparation blank. The cause of the apparent cadmium contamination in the preparation blank is not known therefore the reported sample cadmium concentrations are suspect.

Note that the maximum concentration standard (LRA2) for nickel was low (ca. 94%) instead of 95% to 105%. The standard (LRA2) was re-analyzed later (01/06/92) and found acceptable. The significance of nickel being 1% below the lower limit should be of little concern since the largest concentration involving this analyte was less than 5% of this calibration standard. It should be noted that nickel was within the acceptance limit in all quality control standards measured (eg. ICV1, CRI, ICSAB, etc.). Further, the same LRA2 standard was re-analyzed during the Post-Digestion Spike recovery test (01/06/92). All of the analytes measured, including nickel, were within the acceptance limits.



9613497.1948

U.S. EPA - CLP

1  
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

B015H1

Lab Name: BATTELLE\_PNL Contract: \_\_\_\_\_

Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: 8,9,10

Matrix (soil/water): SOIL Lab Sample ID: 92-0358B1

Level (low/med): LOW Date Received: 12/03/91

% Solids: 96.1

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6010	-	-	P
7440-36-0	Antimony	2.8	U	N	P
7440-39-3	Barium	68.6	-	-	P
7440-41-7	Beryllium	0.26	B	-	P
7440-43-9	Cadmium	2.0	-	-	P
7440-70-2	Calcium	5670	-	-	P
7440-47-3	Chromium	10.3	-	-	P
7440-48-4	Cobalt	6.2	B	-	P
7440-50-8	Copper	18.6	-	-	P
7439-89-6	Iron	18600	-	-	P
7439-95-4	Magnesium	4240	-	-	P
7439-96-5	Manganese	269	-	-	P
7440-02-0	Nickel	12.9	-	-	P
7440-09-7	Potassium	838	B	-	P
7440-23-5	Sodium	1070	-	-	P
7440-62-2	Vanadium	33.8	-	-	P
7440-66-6	Zinc	34.2	-	-	P

Color Before: \_\_\_\_\_ Clarity Before: \_\_\_\_\_ Texture: NON-HO  
Color After: \_\_\_\_\_ Clarity After: \_\_\_\_\_ Artifacts: \_\_\_\_\_

Comments:  
ORIGINAL SOIL SAMPLE LEACHATE  
\_\_\_\_\_  
\_\_\_\_\_

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 diluted an additional 10X for samples 92-00306-B1,2,3 and 921 (total dilution ~2000X) and 5X for samples 92-00306-B5,6 and 358, 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  $^{99}\text{Tc}$ ), while uranium was determined using procedure PNL-ALO-282 (Determination of Uranium Concentration / Isotopic Composition Using ICP/MS). Samples were prepared in the 325 building and the  $^{99}\text{Tc}$  and U determinations were performed in building 3708 in the 300 area.

A total of two analytical runs were necessary; the first was used as a screen to determine approximate elemental concentrations so that standards could be prepared with appropriate concentrations for the second analysis. The additional dilution should have necessarily resulted in raising the detection limit of the digestate sample(s) as received (i.e., undiluted), however the detection limit of Tc and U in the solutions analyzed was significantly lower than the LLD listed in the analytical procedures (LLD for the run was 1 ppt instead of 10 ppt). The result of this is that the detection limit of U and Tc for the digestate sample(s) as received is 5-10 ppt--approximately the same as if the samples had not been further diluted for analysis. Uranium concentrations were below the level (200 ppb) at which reliable uranium isotopic data could be obtained by this technique. The concentrations for total uranium based on  $^{235}\text{U}$  agreed well with that based on  $^{238}\text{U}$ , therefore natural isotopic abundance was assumed, and the uranium activity was calculated from the relative activity of the  $^{238}\text{U}$  isotope (48.1% for natural uranium). (See ICN #1 for PNL-ALO-282.) For technetium, the only samples that had spectra with observable peaks at mass 99 were the spiked samples. The other samples having values that are reported above the detection limit are deceptively high due to an increased background (a matrix effect) observed for the soil digestate samples, which affected the spike

recovery and concentration results. Although these values are above the reported detection limit (~1 ppt for blanks), they are still quite low.

For the blank spike, the additional 5X dilution that was necessary to mitigate observed matrix effects resulted in lowering the spike concentration to 8 ppt; in that the uranium concentration in blanks is often measurable and can be quite variable at these levels, misleading recovery is therefore not surprising. For the sample spike, the spike level was insignificant in comparison to what was observed in the sample; because the added uranium was negligible, the sample spike was essentially another sample replicate. This has been a problem on previous analyses as well; to correct for this, it is suggested that spike concentrations be increased; from 40 ppt to 80 ppt for Tc-99, and from 40 ppt to 800 ppt for uranium.

Another general concern is in regards to Tc-99 analysis in soils. Given a detection limit of 10 ppt for water, this amounts 170 pCi/L. The same concentration for a soil digestion and a 200X dilution factor (digestion as received) gives 34 pCi/gram; if additional dilution is necessary, this could be much higher. While this technique is believed to be effective in analyzing untreated water samples, the high dilution factors resulting from digestions makes ICP/MS not nearly as efficient for soils. Significant improvements could be made if the samples were first preconcentrated.

Quality control measures included the analysis of blind standards, duplicate analyses, and analysis of spiked samples. Results for check standards are in good agreement with standard values. Precision estimates based on duplicate analyses are difficult to estimate due to the detection limit values obtained in most cases for these samples.

TABLE 9: ICP-MS ANALYSIS DATA FOR TASKS 2 & 4  
SDG #8

Spike recovery values corrected for contributions from blank or sample

PNL sample I.D. Number (a)	DRY WEIGHT	DILUTION FACTOR (b)	ICP/MS Analysis No.	Tc-99, ng/ml solution analyzed	Tc-99, ng/g soil (c,d)	Tc-99, ng/g spiked (d)	Tc-99, spike recovery, % (e,f)	Tc-99, pCi/g, dry soil (f)	U, ng/ml solution analyzed	U, ng/g soil (c,d)	U, ng/g spiked (d)	U, spike recovery, % (e,g)	U, pCi/g (total), dry soil (h)
92-00306-B1	1.0165	2007.6	6	0.001	2.0			34	1.1860	2380			1.7
92-00306-B2	1.0223	1996.3	8	0.005±.001	10.0			170±35	1.0640	2120			1.5
92-00306-B3	1.0205	1999.8	10	0.0114	22.8	7.8	165	386	0.9810	1960	7.79	87	1.4
92-00306-B5	N/A	1000.0	4	0.0012	1.2			20	0.0040	4.0			0.0
92-00306-B6	N/A	1000.0	3	0.0084	8.4	8.0	91	142	0.0078	7.8	7.95	65	N/A
92-00358-B1	1.1623	894.8	12	0.010±.004	9.2			160±70	1.973	1770			1.2
92-00921-B1*	1.1159	1899.0	14	0.0041	7.8			132	16.984	32300			22.6

(a) Sample types:

B1 = sample

B2 = sample, duplicate

B3 = sample + Tc/U spike

B5 = procedural blank

B6 = procedural blank + Tc/U spike

\* Not samples in the SDG but reported for QC purposes

(b) units of mL/g dry soil except for -B5 and -B6 samples (blank/blank spike) units of mL; includes 5X or 10X addition dil.

(c) leachate concentration corrected for preparation dilution factor and additional dilution for analysis (5X or 10X).

(d) -B3 reported in units of ng/g; -B6 reported in ng

(e) Recovery = [Spiked Sample]/([Sample]+[Spike])

(f) Despite positive values obtained for Tc, only spike samples had an observable Tc peak. Values >LLD are due to an increased background observed for soil digestate samples.

(g) For blank spike, [U] in diluted sample approached LLD.

(h) total uranium activity calculated using natural isotopic abundance for soil leachate [U] < 200 ppb: pCi = [U]\*0.000336/0.481

DL= Detection Limit is dependent on sample weight and dilution volume (see footnote C).

GAMMA ENERGY ANALYSIS RESULTS

Five soil samples were received between October 4 and November 14, 1991 as part of Sample Delivery Groups No. 8 (92-00306 and 92-00358), No. 9 (92-00921), and No. 10 (92-01246, and 92-01827) and were analyzed by Gamma Energy Analysis (GEA) as one batch. A duplicate sample and a matrix blank were analyzed per the Test Instructions received. A total of 7 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. Because of the activity associated with these samples, they were not prepared in the large tuna can geometry which holds approximately 220 g of soil. Instead, the samples were initially prepared in a glass scintillation vial which contained about 15 g of soil and was counted on shelf 2 of the sample holder for diode L (Sample 92-00358). Sample 92-00306 had too much activity to be counted in this position and the holder was raised to shelf 5 (to obtain a reasonable dead time for the analyzer).

The aliquots were taken and reported per "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 for the two samples are as follows: (see Table 2)

<u>ALO No.</u>	<u>WHC No.</u>	<u>% Solids</u>
92-00306	B015G9	96.89
92-00358	B015H1	96.65

Therefore, one can convert the reported values to a dry weight basis if desired.

The calibration standard used for calibrating the glass scintillation vial on shelf 2 was also used to calibrate the vial on shelf 5.

The samples were then analyzed by gamma-ray spectroscopy to determine the quantities of  $^{60}\text{Co}$ ,  $^{106}\text{Ru}$ , and  $^{137}\text{Cs}$  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  $^{60}\text{Co}$ ,  $^{106}\text{Ru}$ , and  $^{137}\text{Cs}$  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. In most cases, two counts were taken of the sample. A short count of 10 minutes was taken to obtain a peak for  $^{137}\text{Cs}$  that did not overflow the analyzer and a longer count to obtain better numbers for  $^{106}\text{Ru}$  and  $^{60}\text{Co}$  where the peak for  $^{137}\text{Cs}$  may have overflowed the analyzer. Therefore, both counts were used to obtain the recommended values for each isotope in each sample.

Two aliquots of sample 92-00358 were measured. For  $^{137}\text{Cs}$ , the counting errors are 1.1% and 0.9% and the mean and standard deviation for the two analyses are  $2045 \pm 219$  (11%). This is below the required precision for soils of  $\pm 35\%$ .

The detection limits were determined from sample 92-00358-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 9 samples prepared in the glass scintillation vials was determined to be 14.212 g. This weight was assumed to allow the calculation of detection limits in pCi/g for  $^{60}\text{Co}$ ,  $^{106}\text{Ru}$ , and  $^{137}\text{Cs}$ . The detection limits at one sigma are  $<0.06$ ,  $<0.6$ , and  $<0.04$  pCi/g, respectively.

**Table 10: Gamma Energy Analysis of Soils**

Recommended Values

Batch 5

Diode L

(Radionuclide activity in pCi/g<sup>a</sup>)

Customer ID	Sample ID	Collection Date	Weight (g)	<sup>60</sup> Co	<sup>106</sup> Ru	<sup>137</sup> Cs
B015G9	92-00306-L-1	10/4/91 14:20	14.200	<8	<500	$(5.72 \pm 0.06) \times 10^5$
B015H1	92-00358-L-1	10/9/91 10:45	14.205	<0.4	<18	$1890 \pm 20$
B015H1	92-00358-L-2	10/9/91 10:45	14.201	<0.3	<15	$2200 \pm 20$
B015H1	92-00358-L-5	11/8/91 11:06	14.212	<0.15	<1.6	<0.11
B015K3	92-00921-L-1*	10/22/91 11:31	13.975	$28.6 \pm 1.6$	<280	$(5.62 \pm 0.06) \times 10^5$
B015L5	92-01246-L-1*	11/6/91 11:44	1.6300	<30	<2300	$(2.00 \pm 0.02) \times 10^6$
B015M9	92-01827-L-1*	11/14/91 14:06	1.5020	<20	<1200	$(1.23 \pm 0.01) \times 10^6$

<sup>a</sup> The one sigma uncertainties are based on counting statistics. All "<" values are detection limits associated with each "not detected" analysis.

The detection limits are determined from Sample 92-00358-L-5. The detection limits in pCi/g for <sup>60</sup>Co, <sup>106</sup>Ru, and <sup>137</sup>Cs at one sigma are < 0.06, <0.6, and <0.04. Note that the detection limits quoted above were calculated as if the isotope were present at a level that is 2.5 times the square root of twice the average background.

\* Samples not in SDG but reported as a part of analytical batch.

TOTAL ALPHA ANALYSIS RESULTS

Two soil samples (92-00306 and 92-00358) were analyzed along with the appropriate QA samples for total alpha activity. Procedures PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis, PNL-ALO-460, Source Preparation for Gross Alpha Analysis, and PNL-ALO-461, Alpha Counting Procedure were followed. All analytical work and calculations were performed in Building 329 and 329T5 of the 300 area.

Nominally 5 grams of soil were sub-sampled for each analysis. The blank spike consisted of 10mL 8M HNO<sub>3</sub> with a known Pu-239 spike; the matrix spikes consisted of the sample spiked with a known amount of Pu-239. The blank consisted of 10mL 8M HNO<sub>3</sub>.

Sample 92-00306 contains  $107.5 \pm 6.9$  pCi/g and 92-00358 contains  $2.7 \pm 0.7$  pCi/g total alpha activity. Results are reported as "per received" sample weight.

The blank spike recovery is 114%. The matrix spike was run in duplicate with the Pu-239 spike. The average recovery of the matrix spike and matrix spike duplicate is 87.7%. The precision, reflected in the relative percent difference (RPD) of sample number 92-00358, is 15%. The recoveries of the two matrix spikes and blank spike average  $96.5\% \pm 27.8$  and indicates an average bias of -3.5%. The QAPP requires an accuracy of  $\pm 50\%$  and precision of  $\pm 35\%$ .

No hold times are defined for total alpha analysis.

TABLE 11: TOTAL ALPHA ANALYSIS DATA  
TASK 2 & 4 SDG #8

WHC Sample #	Sample #	Sample Type	Total Alpha (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Spike % Rec.
B015G9	92-00306-A-1a	Soil	107.5	6.9				
B015H1	92-00358-A-1a	Soil	2.9	0.7				
	92-00358-A-2a	Soil duplicate	2.5	0.6	15			
	92-00358-A-3a	Matrix Spike	12.79	1.3		9.08	0.09	111
	92-00358-A-3a	Matrix Spike	9.25	1.1		10.13	0.11	64.5
	BL-00306-A-5a	Blank	<0.56					
	BS-00358-A-4a	Blank Spike	10.9	1.1		9.57	0.1	114

Detection limit for 5g soil samples: 0.6 pCi/g

Error is based on the propagated error of volume and counting uncertainties.

TOTAL BETA ANALYSIS RESULTS

Two soil samples (92-00306 and 92-00358) were analyzed for total beta content according to procedures PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis, PNL-ALO-462, Source Preparation for Gross Beta Analysis, and PNL-ALO-463, Beta Counting Procedure. Along with the samples, a sample duplicate, a blank, a blank spike, and a matrix spike were run. The sample results are reported per received sample weight. Total beta activity was calculated using the counting efficiency for Sr/Y-90. All chemistry and calculations were performed in building 329 and 329T5 in the 300 area.

Soil sample 92-00306 contains 622,000 pCi/g  $\pm 2\%$  and soil sample 92-00358 contains 2670  $\pm 11\%$  total beta activity. Results are reported as "per received" sample weight.

Nominally 3 to 5 g of soil were analyzed for total beta content. The detection limit for this sample size on the low background counters (used for low level samples) is approximately 1 pCi/g. The detection limit on the regular beta counters is approximately 8 pCi/g. The blank was below the detection limit of 8 pCi/g. The relative percent difference (RPD) for the duplicate samples is 6%. The matrix spike activity recovery could not be calculated for the spike addition was too low and was lost in the counting uncertainty of the samples. This sample is then considered to be essentially a triplicate analysis. Folding this analysis into the determination of the average for sample 92-00358 results in an average value of 2670  $\pm 11\%$  pCi/g. This precision value, 11%, is used in place of the 6.1% RPD due to the fact it is more conservative. This is within the Technical Project Plan specification (TPPS) of  $\pm 35\%$ .

The blank spike recovery initially was high at 213%. The blank spike was replated and found to have a total average recovery of 109%; it was replated again with the matrix spike and blank and found to have a 156% recovery. Because of the variation in the blank spike results, it was plated again, this time in triplicate, and the spike recoveries were calculated at 112%, 124%,

and 111%. It is concluded that some sort of cross contamination is occurring when the blank spike is plated in close proximity to the high activity samples. Because the soil samples already contain significant beta activity (>3000 counts), small levels of cross contamination (e.g. 200 counts) are not distinguishable; the counts are lost in the counting uncertainty. However, a small contamination on the blank spike (660 counts) results in a significant change in the spike recovery factor. It is not understood at this time why the blank did not exhibit the same degree of contamination as that of the blank spike. For this batch of samples, the average blank spike recovery of the four samples plated separately from the soil samples is used to determine the spike recovery. The average recovery, therefore, is 114%.

Overall, the accuracy of the method is concluded to be within the required  $\pm 20\%$  with a bias of approximately +14 percent. The precision of the method, measured by the standard deviation of the 3 replicate determinations is 11 percent.

TABLE 12: TOTAL BETA ANALYSIS DATA  
TASK 2 & 4 SDG #8

WHC Sample #	Sample #	Sample Type	Total Beta (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Spike % Rec.
B015G9	92-00306-A-1a	Soil	622300	13300				
B015H1	92-00358-A-1a	Soil	2590	63				
	92-00358-A-2a	Soil duplicate	2440	62	6.1			
	92-00358-A-3a	Matrix Spike	2990	69		18.4	0.9	na
	BL-00306-A-5a	Blank	<7.7					
	BS-00306-A-4a	Blank Spike	22.1 *	2.4		19.39	1.0	114

\*Average of 21.4 +/- 3.8 , 24.0 +/- 3.7, 21.8 +/- 4.0 and 21.1 +/- 7.1 pCi/g

Minimum detectable activity for a 5g soil sample is approximately 7.7 pCi/g.

Contract detection limits can be achieved by use of the low background beta counters;  
the results from this batch were counted on the regular background beta counters  
due to high sample activity.

Error is based on the propagated error of volume and counting uncertainties.

PLUTONIUM ANALYSIS RESULTS

Soil samples, 92-00306 and 92-00358 were prepared and analyzed with their corresponding QC samples. Analyses were performed according to Procedures PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis, PNL-ALO-466, Plutonium Separation, PNL-ALO-468, Electroplating, and PNL-ALO-469, Alpha Energy Analysis. The digestion, separation, source preparation, and counting were performed in building 329 in the 300 area.

An appropriate aliquot (ranging from a nominal 0.5g to 10 g) was subsampled from each received sample. All samples were spiked with Pu-242 tracer which was used to correct each individual sample result for Pu yield. The Pu-239 recovery for the blank spike was excellent at 95% and indicates that a bias of 5% was obtained for this batch. This is well within the target accuracy of  $\pm 25\%$ . The duplicate samples have a relative percent difference (RPD) of 11% for Pu-239+240 and 32% for Pu-238 which are both within the project target of  $\pm 35\%$  precision. Also, the precision is expected to be less for the Pu-238 since the activity is two orders of magnitude less than the Pu-239+240 activity and is of the same order of magnitude as the minimum detectable activity reported for the blank and blank spike. The results for the blank were good for both Pu-239+240 and Pu-238; in each case a minimum detectable activity was reported. The results are reported per received sample weight (not corrected for weight percent solids).

No hold times are defined for plutonium analyses.

TABLE 13: Pu 238 and Pu 239/240 DATA ANALYSIS  
SDG #8

WHC Sample #	Program Sample ID	Sample Type	Pu-239+240 pCi/g	+/- 1 sigma	Pu-239+240 RPD	Pu-238 pCi/g	+/- 1 sigma	Pu-238 RPD	Pu-239 Spike pCi/g	+/- 1 sigma	% Recovery
B015G9	92-00306-A-1c	Soil	1.21E+02	4.95E+00		1.87E+00	1.30E-01				
B015H1	92-00358-A-1c	Soil	2.39E-01	1.01E-02	11	2.92E-03	8.37E-04	32			
	92-00358-A-2c	Duplicate	2.68E-01	1.04E-02		4.03E-03	8.48E-04				
	92-00306-A-4c	Blank Spike	2.23E+00	7.61E-02		< 1E-03			2.35E+00	1.46E-02	95
	92-00306-A-5c	Blank	< 5E-04			< 1E-03					

Pu-239+240 detection limit is approximately 5 E-04 pCi/g.

Pu-238 detection limit is approximately 1 E-03 pCi/g.

59 Errors quoted are the propagated error of individual measurements.

920306-A-1c

STRONTIUM ANALYSIS RESULTS

An aliquot of sample leachate was taken from samples 92-00306, 92-00358, 92-00358 duplicate, and BL-00306 leached on 10/22/91. The leach procedure used was PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis. This was followed by Procedure PNL-ALO-465, Strontium-90 Analysis (Oxalate-Nitric Acid Method), and PNL-ALO-463, Beta Counting Procedure. All work was performed in building 329 and 329T5 of the 300 area.

Soil sample 92-00306 contains  $67700 \pm 4900$  pCi/g and soil sample 92-00358 contains  $457 \pm 33$  pCi/g. Results are reported as "per received" sample weight.

The analysis for Sr-90 proceeded smoothly; all QC criteria as defined in the QAPJP-ALO-001 were met. The blank spike was used to determine the batch yield. Because it was essentially 100%, virtually no correction for radioisotope recovery needed to be made. The matrix spike shows 93.5% recovery indicating a method bias of -6.5%. The precision, estimated by the relative percent difference of the duplicates, is 1.8%. The blanks were running just above the detection limit but, due to the magnitude of Sr in the samples, this had minimal impact on the sample results.

The Sr-90 analysis does not correct for the presence of Sr-89; all activity is assumed to be from Sr-90.

No hold times are defined for strontium analysis.

TABLE 14: STRONTIUM-90 ANALYSIS DATA FOR TASK 2 & 4  
SDG #8

Parameters of Interest

WHC Sample #	Sample #	Sample Type	Strontium (pCi/g)	+/- 1 sigma*	RPD	Spike Conc. (pCi/g)	+/- 1 sigma*	Spike % Rec.	Normalized % Yield**	
B015G9	92-00306-A-1b	Soil	67700	4900						
B015H1	92-00358-A-1b	Soil	452	33						
	92-00358-A-2b	Soil Duplicate	461	34	1.8					
	92-00306-A-3b	Matrix Spike	46.3	3.6		49.5	2.5	93.5		
	BL-00306-A-5b	Blank	0.1	0.02						
	BL-00306-A-5b	Blank duplicate	0.3	0.04						
	BS-00306-A-4b	Blank Spike	Used to determine batch yield <sup>a</sup>							103.5

Minimum detectable activity for a sample is approximately 0.06 pCi/g.

\* 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 blank spike recovery which has been normalized to 100% chemical recovery.

## TRITIUM ANALYSIS RESULTS

The 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 leach, distillation and counting were performed in building 329 in the 300 Area.

A nominal 5 g was initially subsampled. After leaching and distillation, the aliquot counted is equivalent to approximately 0.3 g of soil. The blank (or method) spike was used to determine batch yield which, in turn, was used as a correction factor for the other analyses in that batch. (This factor is  $F_s$ , the recovery correction factor, as defined in PNL-ALO-441). The batch yield was determined to be 75%. The duplicate samples had a relative percent difference of 41%. This is somewhat outside the project target of  $\pm 35\%$  precision. The mean gross counting rates of the sample and duplicate were 21 and 17 cpm, respectively. This may be compared with about 13 cpm (gross) for the blank and 12 cpm for the distilled deep well water blanks. At such low counting rates RPD values are not very meaningful.

These results have been delayed due to malfunction of both the Beckman LSC system in 329 building and the backup Packard LSC system in 325 building.

Note that sample results are reported per received sample weight (not corrected for weight percent solids). No hold times are defined for tritium analysis.

TABLE 15: TRITIUM ANALYSIS FOR TASK 2 & 4  
SDG #8

WHC Sample #	Project Sample ID	Sample Type	Tritium (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Recov. Corr. Factor, % Fs
B015G9	92-00306-K-1	Soil	16	3				
B015H1	92-00358-K-1	Soil	23	3				
B015K3	92-00921-K-1*	Soil	56	4				
	92-00921-K-2*	Duplicate	37	3	41			
	92-00921-K-5*	Blank	<4 *					
	92-00921-K-4*	Method Spike Used to Determine Batch Yield						75

Approximate Detection Limit = 10 pCi/g (variations occur due to actual sample size)

\* Not samples in the SDG but reported for QC purposes

\* Based on 0.3 g sample size

TOTAL ORGANIC CARBON ANALYSIS RESULTS

Samples 92-0306 (B015G9) and 92-0358 (B015H1) were prepared by procedure PNL-7-40.37, rev. 0, "Determination of Carbon in Solids Using the Coulometrics Carbon Dioxide Coulometer". The methodology is consistent with SW 846 method 9060. Procedure PNL-7-40.37 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.

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<sub>2</sub> adsorbed on the sample boat and ladle. The blank is obtained by removing the quartz ladle and platinum boat from the furnace tube and exposing them to air. These parts are then placed in 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 ug of total organic carbon. 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.

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 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 the results are above this method quantification limit (instrument background carbon levels).

An average "method detection limit" for this analytical method may be estimated from the standard deviation around the blank values determined during the analyses. This "method detection limit" is defined as three times the standard deviation of the blank values. The method detection limit expressed in concentration terms would be dependent on the sample size analyzed. This value is useful in evaluating future applicability of this analytical method. At 10 minutes (normal run time) this value was less than 1 ug C. The nature of the sample required that the run time be extended to 30 minutes to oxidize all organic carbon present. While consecutive blank determinations met the 0.5 ug carbon blank criterion at 10 minutes, previous blank determinations under similar circumstances did not meet this criterion when extended to 30 minutes. Therefore, the blank value used was determined by extending out the second of consecutive blank determinations to 30 minutes, after the blank criterion was met for consecutive runs at 10 minutes. Later blank determinations that met the 0.5 ug carbon criterion at 10 minutes did not meet this criterion at 30 minutes, and were found to have method detection limits of ~1-3 ug C at 30 minutes. Organic carbon contained in these samples proved to be well above these higher detection limits, and the affect of these higher detection limits is considered negligible on the reported results.

The samples were analyzed in duplicate as specified in TI-200BP-1-96 and TI-200BP-1-99. The relative percent differences, estimates of relative standard deviation, were 5% and 10%. This variability is mostly attributed to the inherent heterogeneity of the soil sample received. It should be noted, however, that the remote possibility of analytical error cannot be completely eliminated based on existing data.

At least one standard is analyzed each day as a 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. Upon review of the standard result (of the same Kodak Glucose standard) for this set of data, the recoveries were 96.2% and 97.4%. The average recovery was 96.8% with a relative percent difference of less than 1%. The conclusion

is that precision from this set of data is  $\pm 1\%$  relative and a bias (accuracy) of  $-3\%$  on the average. The reported values are corrected for instrument bias.

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 time was met for both samples.

TABLE 16: TOTAL ORGANIC CARBON ANALYSIS DATA FOR TASKS 2 & 4  
SDG #8

Soil Samples

68

WHC Sample #	PNL ALO #	Sample Type	Sample wt. g	ug C Results	ug C in Sample	mg/Kg Sample	RSD (%) Dups	% rec. spike	Date Received	Date Analyzed
B015G9	92-0306-1	Sample	0.471	65.5	50.2	1100	5		10-08-91	10-15-91
B015G9	92-0306-2	Duplicate	0.05347	76.4	61.1	1180			10-08-91	10-15-91
B015G9	92-0306-3	Standard						96.8		10-15-91
B015G9	92-0306-4	Blank		15.3						10-15-91
B015H1	92-0358-1	Sample	0.04076	36.9	21.6	547	10		10-11-91	10-15-91
B015H1	92-0358-2	Duplicate	0.0653	54.9	39.6	626			10-11-91	10-15-91
B015H1	92-0358-3	Standard						96.8		10-15-91
B015H1	92-0358-4	Blank		15.3						10-15-91

Total Organic Carbon by PNL Procedure 7-40.37, on Instrument WA92040,

325 Bldg., rm 701. Data reported from LRB 52996, pp 142-44 & 150.

920306-1-99

VOLATILE ORGANIC COMPOUND ANALYSIS REPORT

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

SAMPLE DESCRIPTION

<u>Sample ID</u>	<u>ACL Lab Number</u>
B015H1	92-00358
B015H1MS	92-00358MS
B015H1MSD	92-00358MSD
B015G9	92-00306

The samples, B015H1, and B015G9, were received in the 325 Building on 10/11/91, and 10/08/91, respectively.

SAMPLE PREPARATION

One gram aliquots of the samples were transferred to 20 mL pre-cleaned VOA vials, and accurately weighed. The samples were serially dissolved in 5mL of lab water, then added to a purge 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. Samples were analyzed within the 10 day hold time.

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. While these forms are all included in this report, the quality assurance performance requirements are summarized below:

<u>Form</u>	<u>Information</u>	<u>Comments</u>
2A	Surrogate Recovery	Meets all requirements.
3A	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:

<u>File Name</u>	<u>Sample Number</u>	<u>Sample Analyzed</u>
>VB401		Mass Calibration/Tune Check
>VB402		Daily Calibration
>VB403		Method Blank
>VB404	92-00358	B015H1
>VB405	92-00358 DUP	B015H1 DUP
>VB406	92-00358 MS	B015H1 MS
>VB407	92-00358 MSD	B015H1 MSD
>VB408	92-00306	B015G9
>VB409	92-00306 DUP	B015G9 DUP

Lab data are also maintained as follows:

<u>Activity</u>	<u>LRB Number</u>	<u>Page Number</u>
GC/MS injection log	BNW-52907	86-87

**RESULTS**

**CLP Target Compounds:** The attached 1A Forms show that volatile target compounds, Acetone and 2-Butanone, were observed in sample 92-00306 above the Contract Required Quantitation Limits, (CRQL's). Acetone and 2-Butanone were also observed in the blank, and 92-00358, but they were below the CRQL. Hence, these compounds are "B-flagged". 1,1,1-Trichloroethane was observed at the CRQL in sample 92-0358DUP, and below the CRQL in samples 92-00358, 92-00358 MS, 92-00358 MSD, and 92-00306.

In summary, no target compounds were in the samples above the quantitation limits.

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

<u>"Q" Flag</u>	<u>Definition</u>
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 the samples.

9613497.1973

1A  
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015G9

Lab Name: BATTELLE-PNL

Contract: -----

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

Matrix: (soil/water) SOIL

Lab Sample ID: 92-00306

Sample wt/vol: 1.121 (g/mL) G

Lab File ID: &gt;VB408

Level: (low/med) LOW

Date Received: 10/08/91

‡ Moisture: not dec. 3.0

Date Analyzed: 10/14/91

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	46.	U
74-83-9-----	Bromomethane	46.	U
75-01-4-----	Vinyl Chloride	46.	U
75-00-3-----	Chloroethane	46.	U
75-09-2-----	Methylene Chloride	23.	U
67-64-1-----	Acetone	83.	B
75-15-0-----	Carbon Disulfide	23.	U
75-35-4-----	1,1-Dichloroethane	23.	U
75-34-3-----	1,1-Dichloroethane	23.	U
540-59-0-----	1,2-Dichloroethene (total)	23.	U
67-66-3-----	Chloroform	23.	U
107-02-2-----	1,2-Dichloroethane	23.	U
78-93-3-----	2-Butanone	53.	B
71-55-6-----	1,1,1-Trichloroethane	7.	J
56-23-5-----	Carbon Tetrachloride	23.	U
108-05-4-----	Vinyl Acetate	46.	U
75-27-4-----	Bromodichloromethane	23.	U
78-87-5-----	1,2-Dichloropropane	23.	U
10061-01-5-----	cis-1,3-Dichloropropene	23.	U
79-01-6-----	Trichloroethene	23.	U
124-48-1-----	Dibromochloromethane	23.	U
79-00-5-----	1,1,2-Trichloroethane	23.	U
71-43-2-----	Benzene	23.	U
10061-02-6-----	trans-1,3-Dichloropropene	23.	U
75-25-2-----	Bromoform	23.	U
108-10-1-----	4-Methyl-2-pentanone	46.	U
591-78-6-----	2-Hexanone	46.	U
127-18-4-----	Tetrachloroethene	23.	U
79-34-5-----	1,1,2,2-Tetrachloroethane	23.	U
108-88-3-----	Toluene	23.	U
108-90-7-----	Chlorobenzene	23.	U
100-41-4-----	Ethylbenzene	23.	U
100-42-5-----	Styrene	23.	U
133-02-7-----	Xylene (total)	23.	U

FORM I VOA

1/89 Rev.

9613497.1974

1E  
VOLATILE ORGANICS ANALYSIS DATA SHEET  
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

B015G9

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

Matrix: (soil/water) SOIL

Lab Sample ID: 92-00306

Sample wt/vol: 1.1211 (g/mL) g

Lab File ID: >VB408

Level: (low/med) LOW

Date Received: 10/08/91

‡ Moisture: not dec. -3.0

Date Analyzed: 10/14/91

Column: CAP

Dilution Factor: 1.00

CONCENTRATION UNITS:

Number TICs found: 0

(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				

9613497.1975

1A  
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015H1

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

Matrix: (soil/water) SOIL

Lab Sample ID: 92-00358

Sample wt/vol: 0.9431 (g/mL) G

Lab File ID: &gt;VB404

Level: (low/med) LOW

Date Received: 10/11/91

‡ Moisture: not dec. 3.3

Date Analyzed: 10/14/91

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	55.	U
74-83-9	-----Bromomethane	55.	U
75-01-4	-----Vinyl Chloride	55.	U
75-00-3	-----Chloroethane	55.	U
75-09-2	-----Methylene Chloride	28.	U
67-64-1	-----Acetone	28.	JB
75-15-0	-----Carbon Disulfide	27.	U
75-35-4	-----1,1-Dichloroethene	27.	U
75-34-3	-----1,1-Dichloroethane	27.	U
540-59-0	-----1,2-Dichloroethene (total)	27.	U
67-66-3	-----Chloroform	27.	U
107-02-2	-----1,2-Dichloroethane	27.	U
78-93-3	-----2-Butanone	35.	JB
71-55-6	-----1,1,1-Trichloroethane	8.	J
56-23-5	-----Carbon Tetrachloride	27.	U
108-05-4	-----Vinyl Acetate	55.	U
75-27-4	-----Bromodichloromethane	27.	U
78-87-5	-----1,2-Dichloropropane	27.	U
10061-01-5	-----cis-1,3-Dichloropropene	27.	U
79-01-6	-----Trichloroethene	27.	U
124-48-1	-----Dibromochloromethane	27.	U
79-00-5	-----1,1,2-Trichloroethane	27.	U
71-43-2	-----Benzene	27.	U
10061-02-6	-----trans-1,3-Dichloropropene	27.	U
75-25-2	-----Bromoform	27.	U
108-10-1	-----4-Methyl-2-pentanone	55.	U
591-78-6	-----2-Hexanone	55.	U
127-18-4	-----Tetrachloroethene	27.	U
79-34-5	-----1,1,2,2-Tetrachloroethane	27.	U
108-88-3	-----Toluene	27.	U
108-90-7	-----Chlorobenzene	27.	U
100-41-4	-----Ethylbenzene	27.	U
100-42-5	-----Styrene	27.	U
133-02-7	-----Xylene (total)	27.	U

FORM I VOA

1/89 Rev.

961349'.1976

1E  
VOLATILE ORGANICS ANALYSIS DATA SHEET  
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

B015H1

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

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

Matrix: (soil/water) SOIL Lab Sample ID: 92-00358<sup>8</sup> R 11/7/91

Sample wt/vol: 0.9431 (g/mL) g Lab File ID: >VB404

Level: (low/med) LOW Date Received: 10/11/91

% Moisture: not dec. -3.3 Date Analyzed: 10/14/91

Column: CAP Dilution Factor: 1.00

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

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
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26.				
27.				
28.				
29.				
30.				

SEMI-VOLATILE ORGANIC ANALYSIS

Analysis of two 200-BP-1 samples for semivolatile organic compounds by gas chromatography/mass spectrometry (GC/MS) is the subject of this report.

SAMPLE DESCRIPTION AND PREPARATION

<u>Sample ID</u>	<u>ACL Lab Number</u>
METHOD BLANK	92-00358-E-4
B015H1	92-00358-E-1
B015H1 DUP	92-00358-E-1 D
B015H1 MS	92-00358-E-2
B015H1 MSD	92-00358-E-3
B015G9	92-00306-E-1
B015G9 DUP	92-00306-E-1 D

B015G9 was received 10/08/91, and B015H1 on 10/11/91, both in good condition. Extractions and sample preparations were accomplished on the method blank, samples and spiked samples under the following conditions:

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

ANALYSIS METHOD

- GC/MS procedure: PNL-ALO-345.
- GC/MS instrumentation: HP-5890/5970 GC/MS (WB46867)
- GC/MS location: Lab 325, 325 building.

Screening analyses were performed on these samples using the GC/MS on x100 diluted samples. These results indicated that concentration of the samples could be conducted according to procedure, and that a dilution would not be necessary. However, sample B015G9 could not be evaporated to the prescribed volume, so it was diluted by a factor of two.

QUALITY CONTROL

The QC features in the analytical procedure were followed as described below. Holding time requirements for both the extractions and analyses were met. The following lists the attached CLP forms that relate to QC and summarizes the QC results.

<u>Form</u>	<u>Information</u>	<u>Comments</u>
2D	Surrogate Recovery	Met requirements. One surrogate, 2-Fluorophenol, was not integrated as discussed below in this section.
3D	MS/MSD Recovery	Met requirements.
4B	Method Blank Summary	Met method blank requirements.
5B	Tune/Mass Calibration	Met requirements.
6B,C	Initial Calibration	Met requirements.
7B,C	Daily Calibration	Met requirements.
8B,C	Internal Standards	Met requirements.

The 2-Fluorophenol was not integrated because its retention time decreased sufficiently so that all of the peak was not scanned by the mass spectrometer (MS). Analysis of the sample was repeated the following day with MS scanning started earlier. The 2-Fluorophenol was present at 82% recovery. That analysis is not used in this report since it fell 6-minutes outside the 12-hour analysis time limit.

DATA

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

<u>File Name</u>	<u>Sample Number</u>	<u>Sample Analyzed</u>
>XC401		DFTPP mass calibration
>XC402		Daily calibration
>XC403	92-358/306-E-4	Method blank
>XC405	92-00358-E-1	B015H1

>XC406	92-00358-E-1D	B015H1 DUP
>XC407	92-00358-E-2	B015H1 MS
>XC408	92-00358-E-3	B015H1 MSD
>XC409	92-00306-E-1	B015G9
>XC410	92-00306-3-1D	B015G9 DUP

Laboratory data is maintained as follows:

<u>Activity</u>	<u>LRB Number</u>	<u>Page Number</u>
• GC/MS injection log	BNW-53728	16
• Extraction bench sheet: filed with data in the ACL/ALO records center		
• GC/MS hard copy data, sample report: filed with data in the ACL/ALO records center		

## RESULTS

CLP Target Compounds: As seen in the attached 1B,C Forms for sample B015G9, only one target compound was found, Di-n-butylphthalate (410 and 460 ug/Kg), and that compound was in the blank at an acceptable concentration of 300 ug/Kg. Di-n-butylphthalate was also found in B015G9 at 740 and 350 ug/Kg. Di-n-octylphthalate was also in B0015G9 at 47 and 46 ug/Kg, considerably lower than the quantitation limit. These two phthalate compounds are common contaminants from plastics.

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

<u>"Q" Flag</u>	<u>Definition</u>
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.

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.

There were four TIC's found in the blank. These were also found in sample B015H1. In the duplicate for B015H1, there was an additional TIC, an ester of hexanedioic acid. This ester and the triphenylphosphine oxide are probably contaminants from the laboratory renovation in progress. In sample B015G9, the four contaminants were present in addition to six other TIC's. The alkane TIC's appeared to be both straight and branched chain.

The TIC content in both samples is less than 1% of the organic carbon as determined in the TOC (total organic carbon) analyses (~1200000 ug/Kg for B015G9 and ~600 ug/Kg for B015H1), which is too low to account for the inability to concentrate sample B015G9 down to the prescribed volume. In addition, performance of any sort of an organic constituent characterization by gas chromatographic methodologies is very unlikely because of the suspected non-volatility of the organics. Such a characterization will require liquid chromatographic methodologies.

9613497.1981

1B  
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015H1

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

B 12-29/104

Matrix: (soil/water) SOIL

Lab Sample ID: 92-358-E-1

Sample wt/vol: 29.7 (g/mL) G

Lab File ID: >XC405

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec.3.4 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 8.5

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

FORM I SV-1

1/87 Rev.

9613497.1982

1C  
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015H1

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

E 12-2-91 PNL

Matrix: (soil/water) SOIL

Lab Sample ID: 92-358-E-1

Sample wt/vol: 29.7 (g/mL) G

Lab File ID: &gt;XC405

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec.3.4 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 8.5

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	410.	B
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	350.	U
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

FORM I SV-2

1/87 Rev.

9613497.1983

1F  
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET  
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

B015H1

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.:

B 12-2-91 EW

Matrix: (soil/water) SOIL

Lab Sample ID: 92-358-E-1

Sample wt/vol: 29.7 (g/mL) G

Lab File ID: >XC405

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec.3.4 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 8.5

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.	Unknown	4.39	1300.	JB
2.	Unknown	5.36	390.	JB
3. 791286	Phosphine oxide, triphenyl-	34.65	340.	JB
4.	Unknown	5.11	710.	JB
5.				
6.				
7.				
8.				
9.				
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27.				
28.				
29.				
30.				

FORM I SV-TIC

1/87 Rev.

9613497.1984

1B  
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015G9

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: 8 12-2-91 784

Matrix: (soil/water) SOIL

Lab Sample ID: 92-306-E-1

Sample wt/vol: 30.6 (g/mL) G

Lab File ID: &gt;XC409

Level: (low/med) LOW

Date Received: 10/08/91

% Moisture: not dec.3 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 6.5

Dilution Factor: 2.00000

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

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
108-95-2-----	Phenol	670.	U D
111-44-4-----	bis(2-Chloroethyl) Ether	670.	U D
95-57-8-----	2-Chlorophenol	670.	U D
541-73-1-----	1,3-Dichlorobenzene	670.	U D
106-46-7-----	1,4-Dichlorobenzene	670.	U D
100-51-6-----	Benzyl alcohol	670.	U D
95-50-1-----	1,2-Dichlorobenzene	670.	U D
95-48-7-----	2-Methylphenol	670.	U D
39638-32-9-----	bis(2-chloroisopropyl) ether	670.	U D
106-44-5-----	4-Methylphenol	670.	U D
621-64-7-----	N-Nitroso-Di-n-propylamine	670.	U D
67-72-1-----	Hexachloroethane	670.	U D
98-95-3-----	Nitrobenzene	670.	U D
78-59-1-----	Isophorone	670.	U D
88-75-5-----	2-Nitrophenol	670.	U D
105-67-9-----	2,4-Dimethylphenol	670.	U D
65-85-0-----	Benzoic acid	3400.	U D
111-91-1-----	bis(2-Chloroethoxy) methane	670.	U D
120-83-2-----	2,4-Dichlorophenol	670.	U D
120-82-1-----	1,2,4-Trichlorobenzene	670.	U D
91-20-3-----	Naphthalene	670.	U D
106-47-8-----	4-Chloroaniline	670.	U D
87-68-3-----	Hexachlorobutadiene	670.	U D
59-50-7-----	4-Chloro-3-methylphenol	670.	U D
91-57-6-----	2-Methylnaphthalene	670.	U D
77-47-4-----	Hexachlorocyclopentadiene	670.	U D
88-06-2-----	2,4,6-Trichlorophenol	670.	U D
95-95-4-----	2,4,5-Trichlorophenol	3400.	U D
91-58-7-----	2-Chloronaphthalene	670.	U D
88-74-4-----	2-Nitroaniline	3400.	U D
131-11-3-----	Dimethylphthalate	670.	U D
208-96-8-----	Acenaphthylene	670.	U D
606-20-2-----	2,6-Dinitrotoluene	670.	U D

FORM I SV-1

1/87 Rev.

9615497-1985

1C  
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015G9

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: E-12-2-91 (24)

Matrix: (soil/water) SOIL

Lab Sample ID: 92-306-E-1

Sample wt/vol: 30.6 (g/mL) G

Lab File ID: >XC409

Level: (low/med) LOW

Date Received: 10/08/91

% Moisture: not dec.3 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 6.5

Dilution Factor: 2.00000

CONCENTRATION UNITS:

CAS NO. COMPOUND (ug/L or ug/Kg) ug/Kg Q

99-09-2-----	3-Nitroaniline	3400.	U D
83-32-9-----	Acenaphthene	670.	U D
51-28-5-----	2,4-Dinitrophenol	3400.	U D
100-02-7-----	4-Nitrophenol	3400.	U D
132-64-9-----	Dibenzofuran	670.	U D
121-14-2-----	2,4-Dinitrotoluene	670.	U D
84-66-2-----	Diethylphthalate	670.	U D
7005-72-3-----	4-Chlorophenyl-phenylether	670.	U D
86-73-7-----	Fluorene	670.	U D
100-01-6-----	4-Nitroaniline	3400.	U D
534-52-1-----	4,6-Dinitro-2-methylphenol	3400.	U D
86-30-6-----	N-Nitrosodiphenylamine (1)	670.	U D
101-55-3-----	4-Bromophenyl-phenylether	670.	U D
118-74-1-----	Hexachlorobenzene	670.	U D
87-86-5-----	Pentachlorophenol	3400.	U D
85-01-8-----	Phenanthrene	670.	U D
120-12-7-----	Anthracene	670.	U D
84-74-2-----	Di-n-butylphthalate	740.	BD
206-44-0-----	Fluoranthene	670.	U D
129-00-0-----	Pyrene	670.	U D
85-68-7-----	Butylbenzylphthalate	670.	U D
91-94-1-----	3,3'-Dichlorobenzidine	1300.	U D
56-55-3-----	Benzo(a)anthracene	670.	U D
218-01-9-----	Chrysene	670.	U D
117-81-7-----	bis(2-Ethylhexyl)phthalate	670.	U D
117-84-0-----	Di-n-octylphthalate	47.	J D
205-99-2-----	Benzo(b)fluoranthene	670.	U D
207-08-9-----	Benzo(k)fluoranthene	670.	U D
50-32-8-----	Benzo(a)pyrene	670.	U D
193-39-5-----	Indeno(1,2,3-cd)pyrene	670.	U D
53-70-3-----	Dibenz(a,h)anthracene	670.	U D
191-24-2-----	Benzo(g,h,i)perylene	670.	U D

(1) - Cannot be separated from Diphenylamine

FORM I SV-2

1/87 Rev.

9613497.1986

1F  
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET  
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

B015G9

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: 2-12-91 PNL

Matrix: (soil/water) SOIL

Lab Sample ID: 92-306-E-1

Sample wt/vol: 30.6 (g/mL) G

Lab File ID: >XC409

Level: (low/med) LOW

Date Received: 10/08/91

% Moisture: not dec.3 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 6.5

Dilution Factor: 2.00000

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

Number TICs found: 10

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	Unknown	4.37	1600.	JB
2.	Unknown	5.34	400.	JB
3.	Unknown	5.62	310.	J
4.	Unknown Alkane	12.58	330.	J
5.	Unknown Alkane	13.17	410.	J
6.	Unknown Alkane	14.76	460.	J
7.	Unknown Alkane	15.73	420.	J
8.	Unknown	19.56	1600.	J
9.	791286 Phosphine oxide, triphenyl-	34.64	430.	JB
10.	Unknown	5.10	860.	JB
11.				
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FORM I SV-TIC

1/87 Rev.

PCB/PESTICIDE ANALYSIS RESULTSSAMPLE ANALYSIS REPORTED

Analysis of two, 200-BP-1 samples consisting of sample delivery group eight (SDG No. 8) for pesticides and PCBs (Aroclors) by gas chromatography/electron capture detection (GC/ECD) is the subject of this report.

SAMPLE DESCRIPTION AND PREPARATION

<u>Sample ID</u>	<u>ACL Lab Number</u>
B015G9	92-00306-P-1
B015G9 Duplicate	92-00306-P-1D
B015H1	92-00358-P-1
B015H1 Duplicate	92-00358-P-1D
B015H1 MS	92-00358-P-2
B015H1 MSD	92-00358-P-3
Method Blank	92-00358-P-4

The samples were received in good condition on 10/08/91 and 10/11/91 respectively. Extractions of both samples and spiked samples were performed on 10/17/91.

- 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.

<u>Form</u>	<u>Information</u>	<u>Comments</u>
2F	Surrogate Recovery	Meets all requirements.
3F	MS/MSD Recovery	Meets all requirements.
4C	Method Blank Summary	Did not meet 20% criteria.
8D	Evaluation Standards	Meets all requirements
8E	Retention Time Summary	Meets all requirements.
9	Standards Summary	%D exceeded limits for one compound Methoxychlor.
10	Identification Summary	Meets all requirements.

Note: (1) All holding times were met.

(2) Due to current automation constraints, forms 8 and 9 are provided for the primary column only. The user of this data is instructed to refer to spreadsheets entitled "Retention Time Determination Form" in place of the forms 8 and 9 for the confirmatory analysis. The spreadsheet is included in this package to assist in the confirmation of the reported results.

DATA

Laboratory data is maintained in as follows:

<u>Activity</u>	<u>LRB Number</u>	<u>Page Number</u>
• GC/ECD injection log	BNW-53202	65-66
• 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. False "hits" are manually lined out, that page is then initialed and dated.

## RESULTS

As indicated on the attached 1D Forms, in sample B015G9 target compounds found were Endosulfan II (17.1 ug/Kg), and Aroclor 1254 (313.2 ug/Kg). Each of the analytes found were above the contract required quantitation limit (CRQL). The following defines the Q-flags in the Form 1's.

<u>"Q" Flag</u>	<u>Definition</u>
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.
E	Indicates that quantitation was outside of the calibration range.
C	Indicated results were confirmed by GC/MS analysis.

9613497.1990

1D  
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015G9

Lab Name: Battelle PNL

Contract:

Lab Code: PNL

Case No.:

SAS No.:

SDG No.: 8

Matrix: (soil/water) Soil

Lab Sample ID: 92-00306-P-1

Sample wt/vol: 30.6 (g/mL) g

Lab File ID: -----

Level: (low/med) LOW

Date Received: 10/08/91

% Moisture: not dec. 3.01 dec. ----

Date Extracted: 10/17/91

Extraction: (SepF/Cont/Sonc) Sonc

Date Analyzed: 11/28/91

GPC Cleanup: (Y/N) N pH: 6.5

Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS:	
		(ug/L or ug/Kg)	ug/Kg Q
319-84-6-----	alpha-BHC	8.0	U
319-85-7-----	beta-BHC	8.0	U
319-86-8-----	delta-BHC	8.0	U
58-89-9-----	gamma-BHC (Lindane)	8.0	U
76-44-8-----	Heptachlor	8.0	U
309-00-2-----	Aldrin	8.0	U
1024-57-3-----	Heptachlor epoxide	8.0	U
959-98-8-----	Endosulfan I	8.0	U
60-57-1-----	Dieldrin	16.0	U
72-55-9-----	4,4'-DDE	16.0	U
72-20-8-----	Endrin	16.0	U
33213-65-9-----	Endosulfan II	17.1	
72-54-8-----	4,4'-DDD	16.0	U
1013-07-8-----	Endosulfan sulfate	16.0	U
50-29-3-----	4,4'-DDT	16.0	U
72-43-5-----	Methoxychlor	80.0	U
53494-70-5-----	Endrin ketone	16.0	U
5103-71-9-----	alpha-Chlordane	80.0	U
5103-74-2-----	gamma-Chlordane	80.0	U
8001-35-2-----	Toxaphene	160.0	U
12674-11-2-----	Arochlor-1016	80.0	U
11104-28-2-----	Arochlor-1221	80.0	U
11141-16-5-----	Arochlor-1232	80.0	U
53469-21-9-----	Arochlor-1242	80.0	U
12672-29-6-----	Arochlor-1248	80.0	U
11097-69-1-----	Arochlor-1254	313.2	
11096-82-5-----	Arochlor-1260	160.0	U

FORM I PEST

1/89 Rev.

9613497.1991

1D  
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015H1

Lab Name: Battelle PNL

Contract:

Lab Code: PNL

Case No.:

SAS No.:

SDG No.: 8

Matrix: (soil/water) Soil

Lab Sample ID: 92-00358-P-1

Sample wt/vol: 29.7 (g/mL) g

Lab File ID: -----

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec. 3.4 dec. ----

Date Extracted: 10/17/91

Extraction: (SepF/Cont/Sonc) Sonc

Date Analyzed: 11/28/91

GPC Cleanup: (Y/N) N pH: 8.5

Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS:	
		(ug/L or ug/Kg)	ug/Kg
319-84-6	alpha-BHC	8.0	U
319-85-7	beta-BHC	8.0	U
319-86-8	delta-BHC	8.0	U
58-89-9	gamma-BHC (Lindane)	8.0	U
76-44-8	Heptachlor	8.0	U
309-00-2	Aldrin	8.0	U
1024-57-3	Heptachlor epoxide	8.0	U
959-98-8	Endosulfan I	8.0	U
60-57-1	Dieldrin	16.0	U
72-55-9	4,4'-DDE	16.0	U
72-20-8	Endrin	16.0	U
33213-65-9	Endosulfan II	16.0	U
72-54-8	4,4'-DDD	16.0	U
1013-07-8	Endosulfan sulfate	16.0	U
50-29-3	4,4'-DDT	16.0	U
72-43-5	Methoxychlor	80.0	U
53494-70-5	Endrin ketone	16.0	U
5103-71-9	alpha-Chlordane	80.0	U
5103-74-2	gamma-Chlordane	80.0	U
8001-35-2	Toxaphene	160.0	U
12674-11-2	Arochlor-1016	80.0	U
11104-28-2	Arochlor-1221	80.0	U
11141-16-5	Arochlor-1232	80.0	U
53469-21-9	Arochlor-1242	80.0	U
12672-29-6	Arochlor-1248	80.0	U
11097-69-1	Arochlor-1254	160.0	U
11096-82-5	Arochlor-1260	160.0	U

FORM I PEST

1/89 Rev.

9613497.1992

Westinghouse Hanford Company	CHAIN OF CUSTODY	
Custody Form Initiator <u>M. C. Douglas</u>	Project #: 91-019	
Company Contact <u>W. S. Thompson</u>	Telephone <u>(509) 376-2153</u>	
Project Designation/Sampling Locations <u>200-BP-1 Operable Unit</u>	Collection Date <u>9/30/91</u>	
<u>Boring: 216-B-49A</u>	Time <u>0932</u>	
Ice Chest No. <u>Coleman 8</u>	Field Logbook No. <u>WHC-N-287-3</u>	
Bill of Lading/Airbill No. <u>N/A</u>	Offsite Property No. <u>N/A</u>	
Method of Shipment <u>Hand Carry</u>	<u>200-BP-1 QA PLAN: ALO-001</u>	
Shipped to <u>325 PNL Laboratory</u>	<u>PROGRAM: 16772</u>	
Possible Sample Hazards/Remarks <u>None indicated by hand-held instruments</u>	<u>FILE CAT: _____</u>	
Sample Identification		
<u>① B01564</u>		
<u>1; 120 ml; glass; soil; CLP - Total Cn, Free Cn, Ferro Cn</u>		
<div style="display: flex; justify-content: space-around;"> <div style="width: 45%; border-right: 1px solid black; height: 100px; position: relative;"> <div style="position: absolute; top: 0; left: 0; right: 0; bottom: 0; border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black;"></div> </div> <div style="width: 45%; border-right: 1px solid black; height: 100px; position: relative;"> <div style="position: absolute; top: 0; left: 0; right: 0; bottom: 0; border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black;"></div> </div> </div>		
<input checked="" type="checkbox"/> Field Transfer of Custody <span style="margin-left: 100px;">CHAIN OF POSSESSION</span> <span style="float: right;">(Sign and Print Names)</span>		
Relinquished by: <u>M. C. Douglas</u> <u>Matthew C. Douglas</u>	Received by: <u>W. S. Thompson</u> <u>Rendy's Thompson</u>	Date/Time: <u>10/1/91 10:58</u>
Relinquished by: <u>W. S. Thompson</u> <u>Rendy's Thompson</u>	Received by: <u>J. ROBBINS</u> <u>J. Robbins</u>	Date/Time: <u>10/1/91 1200</u>
Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:
Final Sample Disposition		
Disposal Method:	Disposed by:	Date/Time:
Comments:		

A 6000-407 (12/90)

B01-002



SAMPLE RECEIPT FORM

Delivered by: WENDY THOMPSON Date/Time: 10/1/91

Received by: J. ROBBINS

Customer Sample Number(s): ~~B015G4~~ B015G4 <sup>10/1/91</sup>

ALO Sample Number(s): ~~91-10~~ 92-00019 <sup>10/1/91</sup>

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 (Verify that ice still exists such that samples are at refrigerated temperature).

OK (~~WATER~~ WATER IN CONTACT WITH ICE VERIFIED TO BE AT 0°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

9613497.1995

Westinghouse Hanford Company	CHAIN OF CUSTODY	
Custody Form Initiator <u>M. C. Douglas / W.S. THOMPSON</u>	Project #: 91-019	
Company Contact <u>W.S. Thompson</u>	Telephone <u>(509) 376-2153</u>	
Project Designation/Sampling Locations <u>200-BP-1 Operable Unit</u>	Collection Date <u>10/1/91</u>	
<u>Boring: 216-B-49A SOB</u>	Time <u>0931, 1048</u>	
Ice Chest No. <u>Coleman 8</u>	Field Logbook No. <u>WHC-N-287-3</u>	
Bill of Lading/Airbill No. <u>N/A</u>	Offsite Property No. <u>N/A</u>	
Method of Shipment <u>Hand Carry</u>	200-BP-1 QA PLAN: <u>ALO-001</u>	
Shipped to <u>325 PNL Laboratory</u>	PROGRAM: <u>16772</u>	
Possible Sample Hazards/Remarks <u>No chemical or radiological hazards detected using field instrumentation.</u>		
Sample Identification		
① <u>B015G6</u>		
<u>1; 120 ml; glass; soil; CLP - Total Cn, Free Cn, Ferro Cn</u>		
② <u>B015G8</u>		
<u>1; 120 ml; glass; soil; CLP - Total Cn, Free Cn, Ferro Cn</u>		
<input checked="" type="checkbox"/> Field Transfer of Custody      CHAIN OF POSSESSION      (Sign and Print Names)		
Relinquished by: <u>M. C. Douglas</u> <u>Matthew C. Douglas</u>	Received by: <u>W.S. Thompson</u> <u>Heudys Thompson</u>	Date/Time: <u>10/3/91 1030</u>
Relinquished by: <u>W.S. Thompson</u> <u>Heudys Thompson</u>	Received by: <u>J. ROBBINS</u> <u>J. Robbins</u>	Date/Time: <u>10-3-91 12:30</u>
Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:
Final Sample Disposition		
Disposal Method:	Disposed by:	Date/Time:
Comments:		

A-6000-407 (12/90)

B01-005



SAMPLE RECEIPT FORMDelivered by: WENDY THOMPSON Date/Time: 10-3-91 1230Received by: JAMES ROBBINSCustomer Sample Number(s): BØ15 G6 BØ15 G8ALO Sample Number(s): 92-00116 92-00117

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 (Verify that ice still exists such that samples are at refrigerated temperature).  
OK (WATER IN CONTACT WITH ICE IS VERIFIED)  
(TO BE AT 0°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

9613497.1998

Westinghouse Hanford Company	CHAIN OF CUSTODY	
Custody Form Initiator <u>Wendy S. Thompson</u>	Project #: 91-019	
Company Contact <u>W S Thompson</u>	Telephone <u>(509) 376-2153</u>	
Project Designation/Sampling Locations <u>200-BP-1 Operable Unit</u>	Collection Date <u>10/4/91</u>	
<u>Boring: <del>216-B-49A</del> 216-B-50B</u>	Time <u>1420</u>	
Ice Chest No. <u>803EM</u>	Field Logbook No <u>WHC-N-287-3</u>	
Bill of Lading/Airbill No. <u>N/A</u>	Offsite Property No. <u>N/A</u>	
Method of Shipment <u>Hand Carry</u>		
Shipped to <u>325 PNL Laboratory</u>		
Possible Sample Hazards/Remarks <u>Radioactive Soil Sample 3.6mK/box jar 0.000718 Ci/Total (Cs-137) just 10/8/91</u>		
All analysis CLP. See lab statement of work for 200-BP-1 RI/FS (TASK 2)		
Sample Identification		
① <u>B01569</u>		
<u>1, 120 ml; glass; soil; CLP-NO3; SO4; PO4; ICP/AA metals; ICP/ms for total Uranium</u>		
<u>Bi; Total CN; Free CN; Ferrous CN.</u>		
<input type="checkbox"/> Field Transfer of Custody <span style="margin-left: 100px;">CHAIN OF POSSESSION</span> <span style="float: right;">(Sign and Print Names)</span>		
Relinquished by: <u>Wendy S Thompson</u>	Received by: <u>J. ROBBINS</u> <u>James Robbins</u>	Date/Time: <u>16:33</u> <u>10-8-91</u>
Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:
Final Sample Disposition		
Disposal Method:	Disposed by:	Date/Time:
Comments:		



<b>Westinghouse Hanford Company</b>	<b>CHAIN OF CUSTODY</b>											
Custody Form Initiator <u>Wendy S. Thompson</u>	Project #: <u>91-019</u>											
Company Contact <u>W.S. Thompson</u>	Telephone <u>(509) 376-2153</u>											
Project Designation/Sampling Locations <u>200-BP-1 Operable Unit</u>	Collection Date <u>10/4/91</u>											
<u>Boring: 216-B-49A 216-B-50B</u>	Time <u>1420</u>											
Ice Chest No. <u>80 TEM</u>	Field Logbook No. <u>WIC-N-287-3</u>											
Bill of Lading/Airbill No. <u>N/A</u>	Offsite Property No. <u>N/A</u>											
Method of Shipment <u>Hand Carry</u>												
Shipped to <u>325 PNL Laboratory</u>												
Possible Sample Hazards/Remarks <u>RADIOACTIVE SOIL SAMPLE 0.00078 Ci / pack <sup>total</sup> <del>est 37</del> <sup>10/8/91</sup></u>												
<u>All Analysis CLP. See Lab. STATEMENT OF WORK FOR 200-BP-1 RI/FS (TASK 2).</u>												
Sample Identification												
<u>(1) B01569</u>												
<u>1, 125 ml.; amber glass; soil; CLP - VOA (11 mK/hr on jar)</u>												
<u>1, 950 ml.; amber glass; soil; CLP - Semi-VOA; Pest/PCB; TOC (15 mK/hr on jar)</u>												
<u>1, 120 ml. glass; soil; CLP - NO<sub>3</sub>; SO<sub>4</sub>; PO<sub>4</sub>; ICP/AA METALS; ICP/MS for <sup>IC 99</sup> <del>Formal Uranium</del></u>												
<u>10/4/91 wst</u>	<u>Big Tom, free CN, ferro CN.</u>											
<input type="checkbox"/> Field Transfer of Custody <table style="width:100%; border: none;"> <tr> <td style="width:33%; text-align: center;"><b>CHAIN OF POSSESSION</b></td> <td style="width:66%; text-align: right;"><b>(Sign and Print Names)</b></td> </tr> <tr> <td>Relinquished by: <u>W.S. Thompson</u> <u>Wendy S. Thompson</u></td> <td>Received by: <u>Liana L. Bellafante</u> Date/Time: <u>10/8/91 4.33 pm</u></td> </tr> <tr> <td>Relinquished by:</td> <td>Received by: Date/Time:</td> </tr> <tr> <td>Relinquished by:</td> <td>Received by: Date/Time:</td> </tr> <tr> <td>Relinquished by:</td> <td>Received by: Date/Time:</td> </tr> </table>			<b>CHAIN OF POSSESSION</b>	<b>(Sign and Print Names)</b>	Relinquished by: <u>W.S. Thompson</u> <u>Wendy S. Thompson</u>	Received by: <u>Liana L. Bellafante</u> Date/Time: <u>10/8/91 4.33 pm</u>	Relinquished by:	Received by: Date/Time:	Relinquished by:	Received by: Date/Time:	Relinquished by:	Received by: Date/Time:
<b>CHAIN OF POSSESSION</b>	<b>(Sign and Print Names)</b>											
Relinquished by: <u>W.S. Thompson</u> <u>Wendy S. Thompson</u>	Received by: <u>Liana L. Bellafante</u> Date/Time: <u>10/8/91 4.33 pm</u>											
Relinquished by:	Received by: Date/Time:											
Relinquished by:	Received by: Date/Time:											
Relinquished by:	Received by: Date/Time:											
Final Sample Disposition												
Disposal Method:	Disposed by:	Date/Time:										
Comments:												



Westinghouse  
Hanford Company

SAMPLE ANALYSIS REQUEST

PART I: FIELD SECTION

Collector WENDY S THOMPSON; T.G. HOGAN Date Sampled 10/4/91 Time 1420 hours  
 Company Contact WENDY S THOMPSON Telephone (509) 376-2153

Sample Number	Number and Type of Sample Containers	Type of Sample*	Analysis Requested
① B0156-9	1, 125 ml. amber glass	Soil; CLP - YOA	
	1, 450 ml. amber glass	Soil; CLP - SEMI-VOA	PEST/PCB; TOC
	1, 120 ml. glass	Soil; CLP - ALL; S <sub>1</sub> ; S <sub>2</sub> ; S <sub>3</sub> ; S <sub>4</sub> ; S <sub>5</sub> ; S <sub>6</sub> ; S <sub>7</sub> ; S <sub>8</sub> ; S <sub>9</sub> ; S <sub>10</sub> ; S <sub>11</sub> ; S <sub>12</sub> ; S <sub>13</sub> ; S <sub>14</sub> ; S <sub>15</sub> ; S <sub>16</sub> ; S <sub>17</sub> ; S <sub>18</sub> ; S <sub>19</sub> ; S <sub>20</sub> ; S <sub>21</sub> ; S <sub>22</sub> ; S <sub>23</sub> ; S <sub>24</sub> ; S <sub>25</sub> ; S <sub>26</sub> ; S <sub>27</sub> ; S <sub>28</sub> ; S <sub>29</sub> ; S <sub>30</sub> ; S <sub>31</sub> ; S <sub>32</sub> ; S <sub>33</sub> ; S <sub>34</sub> ; S <sub>35</sub> ; S <sub>36</sub> ; S <sub>37</sub> ; S <sub>38</sub> ; S <sub>39</sub> ; S <sub>40</sub> ; S <sub>41</sub> ; S <sub>42</sub> ; S <sub>43</sub> ; S <sub>44</sub> ; S <sub>45</sub> ; S <sub>46</sub> ; S <sub>47</sub> ; S <sub>48</sub> ; S <sub>49</sub> ; S <sub>50</sub> ; S <sub>51</sub> ; S <sub>52</sub> ; S <sub>53</sub> ; S <sub>54</sub> ; S <sub>55</sub> ; S <sub>56</sub> ; S <sub>57</sub> ; S <sub>58</sub> ; S <sub>59</sub> ; S <sub>60</sub> ; S <sub>61</sub> ; S <sub>62</sub> ; S <sub>63</sub> ; S <sub>64</sub> ; S <sub>65</sub> ; S <sub>66</sub> ; S <sub>67</sub> ; S <sub>68</sub> ; S <sub>69</sub> ; S <sub>70</sub> ; S <sub>71</sub> ; S <sub>72</sub> ; S <sub>73</sub> ; S <sub>74</sub> ; S <sub>75</sub> ; S <sub>76</sub> ; S <sub>77</sub> ; S <sub>78</sub> ; S <sub>79</sub> ; S <sub>80</sub> ; S <sub>81</sub> ; S <sub>82</sub> ; S <sub>83</sub> ; S <sub>84</sub> ; S <sub>85</sub> ; S <sub>86</sub> ; S <sub>87</sub> ; S <sub>88</sub> ; S <sub>89</sub> ; S <sub>90</sub> ; S <sub>91</sub> ; S <sub>92</sub> ; S <sub>93</sub> ; S <sub>94</sub> ; S <sub>95</sub> ; S <sub>96</sub> ; S <sub>97</sub> ; S <sub>98</sub> ; S <sub>99</sub> ; S <sub>100</sub>	ICP/MS FOR TOTAL CHLORINE & F
		DATE 10/4/91	FOUR

Field Information\*\* ALL ANALYSIS IS CLP; SEE STATEMENT OF WORK; SAMPLES SUPPORT 200-PP-1 RT/ES (TASK 2); 216-B-50B HOING.

Special Handling and/or Storage KEEP SAMPLES CHILLED.

Possible Sample Hazards RADIOACTIVE SOIL SAMPLE 8.000718 Ci/package  
125 ml jar - 11 mR/hr; 450 ml jar - 15 mR/hr (5.137)  
total

PART II: LABORATORY SECTION

Received by \_\_\_\_\_ Title \_\_\_\_\_ Date \_\_\_\_\_  
 Analysis Required \_\_\_\_\_

\*Indicate whether sample is soil, sludge, water, etc.  
 \*\*Use back of page for additional information relative to sample location. A-6000-406 (05/90)

SAMPLE RECEIPT FORMDelivered by: WENDY THOMPSON Date/Time: 10-8-91Received by: J. ROBBINS, DIANA BellofattoCustomer Sample Number(s): BØ15G9ALO Sample Number(s): 92-00306

1. Customer Chain-of-Custody Form: Present  Absent
2. Additional Shipping Forms (list):  
SAR, RSR
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 (Verify that ice still exists such that samples are at refrigerated temperature).  
OK
6. Condition of Sample Vials.  
OK
7. Verification of Agreement or Monagreement of Information on Receiving Documents.  
OK
8. Resolution of Problems or Discrepancies.  
OK

RETURN COMPLETED FORM TO PROJECT MANAGER

B01-012

9613497.2003.

Westinghouse Hanford Company	CHAIN OF CUSTODY	
Custody Form Initiator <u>W.S. Thompson</u>	Project #: <u>91-019</u>	
Company Contact <u>W.S. Thompson</u>	Telephone <u>(509) 376-2153</u>	
Project Designation/Sampling Locations <u>200-BP-1 Operable Unit</u>	Collection Date <u>10/4/91</u>	
Boring: <u>216-B-49A 216-B-50B w/t 10/4/91</u>	Time <u>1420</u>	
Ice Chest No. <u>80JEM</u>	Field Logbook No. <u>WHC-N-287-3</u>	
Bill of Lading/Airbill No. <u>N/A</u>	Offsite Property No. <u>N/A</u>	
Method of Shipment <u>Hand Carry</u>		
Shipped to <u>329 PNL Laboratory</u>		
Possible Sample Hazards/Remarks <u>MARKED on jar Cs137</u> <u>RADIOACTIVE SOIL SAMPLE - 0.000858 Ci/package</u>		
<u>ALL ANALYSIS CLP - SEE LAB STATEMENT OF WORK FOR 200-BP-1 RI/ES (TASK2)</u>		
Sample Identification		
<u>① B015G9</u>	<u>(1/2 full) glass bottle</u>	
<u>1,1000 ml; SOIL; CLP - TOTAL α; TOTAL β; GEA; Sr90; Pu(AcH) Co; Cs137; Ru106</u>		<u>Fe99</u>
		<u>w/t 10/4/91</u>
<input type="checkbox"/> Field Transfer of Custody		
CHAIN OF POSSESSION (Sign and Print Names)		
Relinquished by: <u>W.S. Thompson</u> <u>W.S. Thompson</u>	Received by: <u>MSW</u>	Date/Time: <u>10-8-91 1610</u>
Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:
Final Sample Disposition		
Disposal Method:	Disposed by:	Date/Time:
Comments:		

B01-013



SAMPLE RECEIPT FORMDelivered by: WS Thompson Date/Time: 10-8-91 1610Received by: N L WynhoffCustomer Sample Number(s): R01569ALO Sample Number(s): ~~91~~<sup>no</sup> 92-00306  
10-8-91

1. Customer Chain-of-Custody Form: Present  Absent
2. Additional Shipping Forms (list):  
Sample Analysis Request, offsite RSR
3. Custody Seals on Shipping and/or Sample Containers and their Conditions.  
Present  Absent   
If Present, Condition: sealed, OK
4. Sample Tag(s) ID Numbers if not Recorded on the Chain-of-Custody Record or on Sample Vial.  
Notes: on COL
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, T=30C
6. Condition of Sample Vials. OK
7. Verification of Agreement or Nonagreement of Information on Receiving Documents. OK
8. Resolution of Problems or Discrepancies.  
None

RETURN COMPLETED FORM TO PROJECT MANAGER

B01-015

Westinghouse Hanford Company	CHAIN OF CUSTODY	
Custody Form Initiator <u>Wendy S. Thompson</u>	Project #: <u>91-019</u> <u>376-2153 wat</u>	
Company Contact <u>W.S. Thompson</u>	Telephone <u>(509) 547-6621</u> <sup>10/19/91</sup>	
Project Designation/Sampling Locations <u>200-BP-1 Operable Unit</u> <u>#1, #2 216-B-SDB</u> <u>Boring: 216-B-49A #3</u>	Collection Date <u>10/19/91</u>	Time <u>① 1045, ② 1045, ③ 1350</u>
Ice Chest No. <u>SML109</u>	Field Logbook No. <u>WHC-N-287-3</u>	
Bill of Lading/Airbill No. <u>N/A</u>	Offsite Property No. <u>N/A</u>	
Method of Shipment <u>Hand Carry</u>		
Shipped to <u>325 PNL Laboratory</u>		
Possible Sample Hazards/Remarks <u>#1, #2 are Radioactive soil samples, #3 is</u> <u>&lt; 200 pCi/gm. All analysis is CLP. See lab statement of work.</u>		
Sample Identification		
① <u>BO15H1</u>	<u>1, 120 ml, <del>amber</del> glass; soil, CLP-NO<sub>3</sub>, <sup>wat 10/19/91</sup> <del>N</del> SO<sub>4</sub>, PO<sub>4</sub>, ICP/AA metals; ICP/MS for</u>	<u>Te99 and total Uranium; Bi;</u>
		<u>Total CN, free CN; ferrocN</u>
② <u>BO15H4</u>	<u>1, 120 ml., glass; soil; CLP- Total CN, free <del>CN</del> CN; ferrocN</u>	
③ <u>BO15H6</u>	<u>1, 120 ml., glass; soil; CLP- TOTAL CN, free CN; ferrocN</u>	
<input type="checkbox"/> Field Transfer of Custody		
CHAIN OF POSSESSION (Sign and Print Names)		
Relinquished by: <u>W.S. Thompson</u> <u>Wendy S. Thompson</u>	Received by: <u>J. ROBBINS</u> <u>James Robbins</u>	Date/Time: <u>10-11-91 1310</u>
Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:
Final Sample Disposition		
Disposal Method:	Disposed by:	Date/Time:
Comments:		



Westinghouse Hanford Company

SAMPLE ANALYSIS REQUEST

PART I: FIELD SECTION

Collector Wendy S. Thompson; J.G. Hogan Date Sampled 10/9/91 Time 1045 hours  
Company Contact Wendy S. Thompson Telephone (509) 376-2153 1045  
1350

Sample Number	Number and Type of Sample Containers	Type of Sample*	Analysis Requested
① B015H1	1, 120 ml. glass; soil	CLP-TOTAL CN; free CN; ferro CN; NO <sub>3</sub> ; PO <sub>4</sub> SO <sub>4</sub>	ICP/MS for total uranium and E99, ICP/AA metals, Bi
② B015H4	1, 120 ml. glass; soil	CLP-TOTAL CN; ferro CN; free CN	
③ B015H6	1, 120 ml. glass; soil	CLP-TOTAL CN; ferro CN; free CN	

Field Information\*\* Samples support 200-BD-1 RI/FS (TASK 2/4).  
All analysis is CLP. See lab statement of work.

Special Handling and/or Storage keep samples chilled

Possible Sample Hazards Sample #1 & #2 is Radioactive. Sample #3 is < 200dpm total activity.

PART II: LABORATORY SECTION

Received by \_\_\_\_\_ Title \_\_\_\_\_ Date \_\_\_\_\_  
Analysis Required \_\_\_\_\_

\*Indicate whether sample is soil, sludge, water, etc.  
\*\*Use back of page for additional information relative to sample location. A-6000-406 (05/90)

9613497.2008

Westinghouse Hanford Company	CHAIN OF CUSTODY	
Custody Form Initiator <u>Wendy S. Thompson</u>	Project #: 91-019	
Company Contact <u>W.S. Thompson</u>	Telephone <u>376-2153</u>	
Project Designation/Sampling Locations <u>200-BP-1 Operable Unit</u>	Collection Date <u>10/19/91</u>	
<u>Boring: 216-B-49A 216-B-50B</u>	Time <u>1045</u>	
Ice Chest No. <u>SML 105</u>	Field Logbook No. <u>WHC-N-287-3</u>	
Bill of Lading/Airbill No. <u>N/A</u>	Offsite Property No. <u>N/A</u>	
Method of Shipment <u>Hand Carry</u>		
Shipped to <u>325 PNL Laboratory</u>		
Possible Sample Hazards/Remarks <u>Radioactive Soil Sample; keep chilled; all analysis w/ CLP. See lab statement of work. No chemical hazards detected with field instruments.</u>		
Sample Identification		
<u>wst 10/19/91</u>		
<u>① B01SH1</u>		
<u>1, 125ml., amber glass; soil; CLP-VOA</u>		
<u>1, 950ml., amber glass; soil; CLP- Semi-VOA; Pest / PCB; TOC</u>		
CHAIN OF POSSESSION (Sign and Print Names)		
<input type="checkbox"/> Field Transfer of Custody		
Relinquished by: <u>W.S. Thompson</u> <u>Wendy S. Thompson</u>	Received by: <u>Diana L. Bellafante</u>	Date/Time: <u>10/11/91 1:05 pm</u>
Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:
Final Sample Disposition		
Disposal Method:	Disposed by:	Date/Time:
Comments:		

A-6000-407 (12/90)

B01-018



SAMPLE RECEIPT FORMDelivered by: Wendy Thompson Date/Time: 10/11/91 12:50 pmReceived by: Diana Bellafatto, J.M. RobbinsCustomer Sample Number(s): B015H1, B015H4, B015H6ALO Sample Number(s): <sup>92-00357</sup>  
~~92-00355~~, 92-00356, 92-00357  
<sub>6m  
11-8-91</sub>

1. Customer Chain-of-Custody Form: Present  Absent \_\_\_\_\_
2. Additional Shipping Forms (list): Standard RSR, SHK
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 (Verify that ice still exists such that samples are at refrigerated temperature).  
OK
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

B01-020





SAMPLE RECEIPT FORMDelivered by: Wendy Thompson Date/Time: 10-11-91 12:12Received by: D. L. McMullinCustomer Sample Number(s): B015H1ALO Sample Number(s): ~~92-00355~~ <sup>92-00358</sup> <sub>11-12-91</sub>

1. Customer Chain-of-Custody Form: Present  Absent \_\_\_\_\_
2. Additional Shipping Forms (list):  
Sample Analysis Request
3. Custody Seals on Shipping and/or Sample Containers and their Conditions.  
Present  Absent \_\_\_\_\_  
If Present, Condition: Good - She broke the seals to get our sample out
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.) Good
6. Condition of Sample Vials. OK
7. Verification of Agreement or Nonagreement of Information on Receiving Documents. OK
8. Resolution of Problems or Discrepancies. N/A

RETURN COMPLETED FORM TO PROJECT MANAGER

B01-023

ALO CHAIN OF CUSTODY

200-BP-1 QA PLAN: ALO-001

PROGRAM: 16772

FILE CAT.: 112

<u>92-00355</u> 00358 11/06/91	Tc-99/U	SOIL
ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
SENDER <u>Jim Brown</u>		11/06/91 14:15
		DATE
RECEIVER <u>[Signature]</u>		11/6/91 14:45
		DATE

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
SENDER		DATE
RECEIVER		DATE

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
SENDER		DATE
RECEIVER		DATE

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
SENDER		DATE
RECEIVER		DATE

Original - Project Management Office  
 Copy - Sender  
 Copy - Receiver

Applicable Test Instruction  
TI-200BP-1-97

9613497.2015

ALO CHAIN OF CUSTODY

Chain of Custody Number: 200BP-1-95-001  
PROGRAM: 16772  
FILE CAT.: 14.2

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
92-00306	Tc-99/U	SOIL
SENDER <u><i>Steve Barman</i></u>		DATE <u>11/06/91 14:15</u>
RECEIVER <u><i>E. J. Wipe</i></u>		DATE <u>11/6/91 14:45</u>

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
SENDER _____		DATE _____
RECEIVER _____		DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
SENDER _____		DATE _____
RECEIVER _____		DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
SENDER _____		DATE _____
RECEIVER _____		DATE _____

Original - Project Management Office  
Copy - Sender  
Copy - Receiver

Applicable Test Instruction  
TI-200BP-1-95

B02-002

**Report To**

**Westinghouse Hanford Company  
Richland, Washington**

**Data Validation Report  
200-BP-1 RI/FS**

**Laboratory: Pacific Northwest Laboratory**

**Data Packages: B00X68-PNL-050, B00X64-PNL-051, B015G4-PNL-052, B015H8-PNL-053**

**Sample Matrix: Soil and Water**

**Analysis Type: Organics/Inorganics/Wet Chemistry/Radiochemistry**

**Prepared By**

**Golder Associates Inc.  
Redmond, Washington**

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## 1. INTRODUCTION

This report presents the results of data validation conducted on organic, inorganic, wet chemistry and radiochemistry analyses performed on soil and water samples collected in support of the 200-BP-1 Operable Unit remedial investigation/feasibility study (RI/FS) at the Hanford Site. The samples were analyzed for several parameters by the Pacific Northwest Laboratory (PNL) in Richland, Washington. The following analyses were validated:

- Volatile Organics
- Semivolatile Organics
- Pesticides/PCBs
- Metals/Cyanide
- Wet Chemistry
- Gross Alpha/Beta
- Strontium-90
- Alpha spectroscopy (Isotopic Plutonium)
- Tritium
- Gamma Spectroscopy
- ICP/MS (Technetium-99 and Total Uranium)

Data verification was conducted by comparison of the reported results against the raw data and laboratory worksheets provided in the data packages, discrepancies noted were corrected on the laboratory report forms provided in Attachment 3. The radiochemistry sample results and minimum detectable activity values were verified using computer spreadsheet models. Printouts of the spreadsheet data are provided in Appendix B.

Sample identifications, locations and sample dates are provided in Table 1. Data validation was conducted in accordance with the Westinghouse Hanford Company statement of work (WHC 1991) and validation procedures (WHC 1992a and 1992b).

Data qualifiers applied as a result of the validation performed are summarized below:

- B Indicates the compound or analyte was analyzed for and detected. The value reported is less than the CRQL but greater than the IDL.
- U Indicates the compound or analyte was analyzed for and not detected. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory. The data are usable for decision making purposes.
- UJ Indicates the compound or analyte was analyzed for and not detected. Due to an identified quality control deficiency identified during data validation the value reported may not accurately reflect the sample quantitation limit. The data are usable for decision making purposes.
- J Indicates the compound or analyte was analyzed for and detected. The associated value is estimated but the data are usable for decision making processes.

- R Indicates the compound or analyte was analyzed for and due to an identified quality control deficiency the data are unusable.
- NJ Indicates presumptive evidence of a compound at an estimated value.
- N Indicates presumptive evidence of a compound.

## 2. DATA QUALITY OBJECTIVES

### 2.1 Completeness

Data quality objectives for the project specified the use of CLP methods for the TCL volatiles, semivolatiles, pesticides/PCBs and TAL metals/cyanide analytes and the use of standard methods for the wet chemistry parameters. The data packages were complete for all requested analyses and met the data quality objectives of the work plan with the exception of the items listed below.

- The volatile initial calibration form associated with SDG B00X64 was submitted with the data package, however, the supporting raw data was not included. No qualification was necessary since the ICV calculations were confirmed in the other three data packages completing this data set.
- The mercury analysis for SDG B015G4 was provided for two of three analysis dates in which all holding times were exceeded. The sample run performed on October 16, 1991 is the only set that does not exceed the holding time for mercury analysis, however, the data was not provided for this run.
- The graphite furnace (GFAA) raw data was not provided in the data package for SDG B015H8. The data was provided in another data package (SDG B015G4), therefore the data could be validated.
- The strontium-90 blank and blank spike results in SDG B00X68 have been rejected (R) since the reported blank spike is not associated with the reported blank sample.
- The technetium-99 results in SDG B00X68 have been rejected (R) since the associated raw data was not submitted with the data package, hence, the results could not be verified.
- The strontium-90 counter control and background data associated with detectors 1, 2, and 3 which are associated with the laboratory blank and laboratory blank duplicate samples in SDGs B015H8 and B015G4 were not included in the data package. The continuing calibration information data for strontium in other SDGs of this data set do not include the associated date of analysis. Therefore, the strontium-90 results for BL-00306 and BL-00306 Dup have been qualified as rejected (R).

- The initial calibration raw data associated with the parameters gross alpha, gross beta, strontium-90, and tritium was not provided. However, since general calibration information was submitted, but was not detector specific, the associated sample results have been qualified as estimated (J for detects, UJ for non-detects).
- The gamma spectroscopy raw data sheet for sample B00X77 (SDG B00X64) listing the MDA values of ruthenium-106 and cobalt-60 was missing from the data package. No qualification was required since the positive results could be verified.

A total of 28 samples were validated as part of this data set with a total of 858 determinations (analyses) reported. Out of the 858 determinations reported, 678 were deemed valid which results in a completeness of 79 percent  $([2501/2671] \times 100)$ . This completeness percentage does not meet the work plan objective of 80% or the QAPJP objective of 90%.

## 2.2 Detection Limit and Sample Result Verification

The following detection limits, minimum detectable activity (MDA), and sample results could not be verified based on the raw data provided.

### Volatiles

- The sample results associated with SDG B015G4 reported methylene chloride, toluene, carbon tetrachloride, and 1,1,1-trichloroethane as undetected. However, the sample results for these compounds were recalculated and detected during the validation process. Therefore, the results have been corrected on the associated laboratory report forms.

### Semivolatiles

- Compounds identified during the validation process but were not reported by the laboratory for SDG B00X68, sample B00X75 were bis-(2-ethylhexyl)phthalate and di-n-octylphthalate which were also detected in the blank and subsequently qualified as undetected (U).
- Compound di-n-butylphthalate was reported at 44 ug/kg and has been corrected to 22 ug/kg due to a laboratory error.

### Pesticides

- Aldrin for SDG B00X68, sample B00X75, was not reported by the laboratory and has been corrected on the report form.
- Heptachlor was not reported in the blank associated with SDG B00X68. This compound was corrected on the laboratory report form and corresponding

results for sample B00X75 have been qualified as undetected (U) due to blank contamination.

### Metals

- All cyanide results were corrected to the CRQL of 10 mg/kg from the reported 0.6 mg/kg value, which could not be verified.
- The reporting limits for the analytes performed by the GFAA were adjusted to the CRDL value for non-detects instead of the reported "<IDL" values for all associated samples.

### Wet Chemistry

- The detected result for nitrate was calculated incorrectly for sample B00X75 in SDG B00X68. The associated result has been recalculated and corrected on the laboratory report form.
- The detected results for nitrite, nitrate, and phosphate were calculated incorrectly for samples B015G9 and B015H1. The associated results have been recalculated and corrected on the laboratory report forms.

### Radiochemistry

- The detected result for plutonium-239 was calculated incorrectly for the laboratory blank in SDG B00X68. The associated result has been recalculated and corrected on the laboratory report form.
- The detected results for plutonium-238 were calculated incorrectly for samples B015H1 and B015K3. The associated results have been recalculated and corrected on the laboratory report forms.
- Reported MDA values for plutonium-238 in the laboratory blank for SDG B00X68 could not be verified therefore, the associated result has been qualified as estimated (UJ).
- The total uranium results for samples B015G9, B015G9 duplicate, and B015G9 matrix spike could not be verified. Therefore, the associated results have been rejected (R).

### **2.3 Sample Quantitation Limits**

Sample quantitation limits were met with the exception of differences due to moisture content sample size and dilution factors.

### 3. QUALIFIED DATA

This section presents a summary of the qualifications required based on validation of the subject data package.

#### 3.1 Major Deficiencies

The following presents a summary of the rejected data.

##### Volatiles

- The holding times for B00X75 and B00X77 (both the samples and laboratory duplicates) were exceeded by a factor greater than two (28 days). Therefore, the associated sample results have been qualified as rejected (R).

##### Semivolatiles

- Samples B00X75 and B00X77 contain the tentatively identified compounds (TIC) identified as aldol condensation products which are known to be laboratory contaminants. Therefore, the associated results been qualified as rejected (R).
- The surrogate recovery for 2-fluorophenol was zero percent for sample B015G9 in SDG B015G4. The sample was then re-analyzed, however, the data for the re-analysis was not submitted with the data package. Therefore, the compounds associated with the surrogate 2-fluorophenol in sample B015G9 and B015G9 (laboratory duplicate) have been qualified as rejected (R).

##### Pesticides/PCBs

- Sample B00X77 in SDG B00X64 required re-extraction which was performed out of the holding time by a factor greater than two (14 days). Unfortunately, the data from the first analysis was not provided in the data package. Therefore, the sample results associated with the re-extraction have been qualified as rejected (R).

##### Metals

- The sample results for mercury in B00X75 and B015K3 were rejected (R) since the holding times were exceeded by a factor greater than two (46 days).
- The cyanide result for sample B00X77 was rejected (R) since the holding time was exceeded by a factor greater than two (28 days).
- The matrix spike percent recovery for sample B00X77 was less than 30%, and the sample result was less than the instrument detection limit (IDL). Therefore, the associated sample result has been qualified as rejected (R).

- The laboratory control sample (LCS) for potassium in SDGs B015G4 and B015H8 was less than 50% recovery, therefore, the associated sample results have been rejected (R).

### Radiochemistry

- The plutonium-238 and 239 sample runs associated with SDGs B00X68, B015H8, and B015G4 are not bracketed by acceptable counter control checks. Therefore, the associated results have been qualified as rejected (R).
- Tritium calibration check results for the samples associated with SDGs B015H8 and B015G4 were outside the laboratory control limits causing rejection (R) of the sample results.
- The gross beta result for sample B015H1 duplicate in SDG B015G4 has been rejected (R) since the calibration check was outside of the control limits.

### 3.2 Minor Deficiencies

The following qualifications were required as a result of the validation. Appendices B through E provide supporting documentation and a summary of the samples affected.

#### 3.2.1 Volatile Organics

##### Blanks

The following compounds were detected in the laboratory blanks.

- SDG B015G4: Acetone and 2-butanone
- SDG B015H8: Acetone and 2-butanone

The associated positive sample results with concentrations less than ten times the blank concentrations have been qualified as undetected (U).

#### 3.2.2 Semivolatile Organics

##### Holding Times

The following samples exceeded holding times:

- SDG B00X68: Samples B00X75 and B00X75 duplicate
- SDG B015H8: Samples B015K3, B015K3 (duplicate), B015K3MS, and B015K3MSD were extracted out of holding time

Quantitation limits and results for the above samples have been qualified as estimated (J for detects, UJ for non-detects)

#### Initial Calibration

The following compounds and their associated SDGs exceeded the initial calibration relative standard deviation (RSD) limit of 30%:

- SDG B00X68: Bis-2-chloroethylether, 4-chloroaniline and 3-nitroaniline

The associated sample results have been qualified as estimated (J for detects, UJ for non-detects).

#### Continuing Calibration

The following compounds and their associated SDGs exceeded the continuing calibration percent difference (%D) limit of 25%:

- SDG B00X68: bis-2-chloroethylether, 4-chloroaniline, and 3-nitroaniline
- SDG B00X64: 4-chloroaniline, 3-nitroaniline, 2,4-dinitrophenol, 4-nitrophenol, and 4-nitroaniline
- SDG B015G4: 4-chloroaniline, hexachlorocyclopentadiene, and 3-nitroaniline
- SDG B015H8: Bis(2-chloroisopropyl)ether, 4-chloroaniline, hexachlorocyclopentadiene, and 3-nitroaniline

The associated sample results have been qualified as estimated (J for detects, UJ for non-detects).

#### Blanks

The following compounds were detected in the laboratory blanks:

- SDG B00X68: Di-n-butylphthalate, di-n-octylphthalate, and the TIC identified as unknowns at the retention times of 4.76, 5.80, and 33.84 minutes.
- SDG B00X64: Di-n-octylphthalate and the TIC identified as an unknown at a retention time of 5.04 minutes.
- SDG B015G4: Di-n-butylphthalate, the TIC identified as triphenyl phosphic oxide, and the TICs identified as unknowns at retention times of 4.44, 5.18, and 5.42 minutes.
- SDG B015H8: Di-n-butylphthalate and the TICs identified as unknowns at the retention times of 4.37, 5.09, and 5.32 minutes.

All associated positive samples results less than five or ten times the blank concentration for the above compounds in the respective SDG have been qualified as undetected (U).

### 3.2.3 Pesticides/PCBs

#### Holding Times

The following samples exceeded holding times:

- SDG B00X68: Sample B00X75 and the laboratory blank
- SDG B015H8: Sample B015K3
- SDG B015G4: Samples B015G9 and B015H1

The associated results for the above samples have been qualified as estimated (J for detects, UJ for non-detects).

#### Continuing Calibration

- The continuing calibration percent difference limit of 15% was exceeded for several compounds associated with sample B00X75 in SDG B00X68. However, the associated sample results have already been qualified due to exceeded holding times therefore, no further qualification is required.

#### Blanks

The following compounds were detected in the laboratory blanks:

- SDG B00X68: Heptachlor

All associated positive sample results less than five times the blank concentration for the above compounds in the respective SDG have been qualified as undetected (U).

#### Matrix Spikes

- The matrix spike percent recoveries associated with SDG B00X68 were out of the control limits. The associated sample results have already been qualified due to exceeded holding times therefore, no further qualification was necessary.

### 3.2.4 Metals

#### Holding Times

The following samples exceeded holding times:

- For cyanide, samples B00X72, B015G4, B015G6, B015G8, B015G9, B00X88, and B015H0
- For mercury, sample B00X77

The associated sample results have been qualified as estimated (J for detects, UJ for non-detects).

#### Calibration

- An initial calibration verification (ICV) sample was performed for cyanide analysis in place of a mid-range standard. Therefore, no qualification of the data was required.
- The cyanide ICV percent recovery exceeded control limits for the associated samples in SDGs B015G4 and B015H8. The associated sample results (B015H1, B015H4, and B015K8) have been qualified as estimated (J for detects, UJ for non-detects).

#### Blanks

The following compounds were detected in the laboratory blanks:

- SDG B00X68: Copper
- SDG B00X64: Antimony, copper, cobalt, and potassium
- SDG B015G4: Cadmium and potassium
- SDG B015H8: Cadmium and potassium

All associated positive sample results less than five times the blank concentration for the above compounds in the respective SDG have been qualified as undetected (U).

#### Matrix Spike

The following spike results exceeded the QC limits of 75% to 125%:

- SDG B00X68: Antimony and manganese
- SDG B00X64: Antimony
- SDG B015G4: Antimony
- SDG B015H8: Antimony

The associated sample results have been qualified as estimated (J for detects, UJ for non-detects).

#### Laboratory Control Sample

The following laboratory control sample percent recoveries were out of the specified control limits:

- SDG B00X68: Arsenic
- SDG B00X64: Thallium
- SDG B015G4: Aluminum and sodium
- SDG B015H8: Aluminum and sodium

The associated sample results in the respective SDG have been qualified as estimated (J for detects, UJ for non-detects).

#### Duplicates

- A laboratory duplicate for cyanide was performed on the water sample, B00X82 in SDG B00X64, the RPD value was 61.83%. Therefore, the associated cyanide result has been qualified as estimated (J).

#### Serial Dilutions

The following serial dilution results exceeded the QC limits of 10% for analyte concentrations greater than 50 times the IDL:

- SDG B00X64: Zinc, iron, and manganese

The associated sample results have been qualified as estimated (J for detects, UJ for non-detects).

### **3.2.5 Wet Chemistry**

#### Holding Times

The following samples exceeded holding times for the anion parameters, phosphate, nitrate, nitrite, and sulfate:

- SDG B00X68: Sample B00X75 (nitrite, nitrate, and phosphate only)
- SDG B00X64: Sample B00X77
- SDG B015G4: Samples B015G9 and B015H1

- SDG B015H8: Sample B015K3

The associated sample results have been qualified as estimated (J for detects, UJ for non-detects).

#### Calibration

- The phosphate ICV was outside the control limits for B00X75, therefore, the result has been qualified as estimated (UJ).

#### Duplicates

- The RPD values for nitrate were out of specification for the duplicate analysis for SDG B015G4. Since associated samples had been previously qualified as estimated (J) no further qualification was required.
- The laboratory duplicate for nitrate associated with the samples in SDG B015G4 was out of the control limits, however, the associated samples had been previously qualified due to holding time exceedance.

### 3.2.6 Radiochemistry

#### Holding Times

- All radiochemistry parameters were analyzed within holding time, therefore, no qualification was required.

#### Method Blanks

Positive results are reported in the method blanks for the following parameters:

- SDG B00X64: Gross beta, strontium, and uranium
- SDG B00X68: Gross beta, plutonium-239 and strontium
- SDG B015H8: Gross beta and strontium-90
- SDG B015G4: Strontium-90

The associated positive sample results have been qualified as estimated (J).

#### Matrix Spike Recovery

Sample spike recoveries were between 105% and 115% in the following samples:

- SDG B015H8: Gross beta

The associated sample results have been qualified as estimated (J for detects, UJ for non-detects).

#### Blank Spike Recovery

Blank spike recoveries were between 105% and 115% in the following SDGs causing associated sample results to be qualified as estimated (J for detects, UJ for non-detects):

- SDG B00X68: Gross alpha
- SDG B00X64: Gross alpha
- SDG B015G4: Gross alpha and gross beta

#### Laboratory Control Samples

- No laboratory control samples were analyzed as part of this data set therefore, unless otherwise specified all detected results have been qualified as estimated (J).

#### Duplicate

The duplicate RPD for the following parameters in the associated SDGs were out of the control limits of 35%:

- SDG B00X64 Plutonium and strontium-90
- SDG B015H8 Tritium
- SDG B015G4 Tritium

The associated sample results have been qualified as estimated (J for detects, UJ for non-detects).

### 3.2.7 ICP/MS (Technetium-99 and Total Uranium)

#### Holding Times

- All technetium-99 and total uranium analyses were performed within holding time, therefore, no qualification is required.

#### Method Blanks

- Technetium-99 was present in the method blank associated with SDG B015G4. Therefore, the TC-99 result for B015G9 has been qualified as undetected (U).

### Matrix Spike

The following spike results exceeded the QC limits of 75% to 125%:

- SDG B015G4: Technetium-99 and total uranium
- SDG B015H8: Technetium-99 and total uranium

The associated sample results have been qualified as estimated (J for detects, UJ for non-detects).

### Duplicates

- The duplicate RPD for technetium-99 was out of the control limits for SDG B015G4 and B015H8.

### Laboratory Control Samples

- Laboratory control samples (LCS) were analyzed for technetium-99 and total uranium, however, the LCS concentrations are unknown. Therefore, all detected results have been qualified as estimated (J).

## 4. CONCLUSION

Sections 1 through 3 present a summary of the data quality for the subject data package. The results contained in this report are acceptable for use with the exception of those major deficiencies described in Section 3.1. The original, as received data package will be transmitted at a later date under separate cover for inclusion in the project QA record.

The appendices provide supporting documentation and a tabular summary of the qualified data.

## 5. REFERENCES

WHC, 1991, Westinghouse Hanford Company, Validation of 200-BP-1 Data, Statement of Work, Revision A, November 1991. Westinghouse Hanford Company, Richland, Washington.

WHC, 1992a, Westinghouse Hanford Company, Data Validation Procedures for Chemical Analyses, WHC-SD-EN-002, Rev. 1, 1992. Westinghouse Hanford Company, Richland, Washington.

WHC, 1992b, Westinghouse Hanford Company, Data validation Procedures for Chemical Analyses, WHC-SD-EN-SPP-001, Rev. 0, 1992. Westinghouse Hanford Company, Richland, Washington.

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**TABLES**

TABLE 1

LIST OF SAMPLES VALIDATED, SDG B00X68-PNL-050,  
B00X64-PNL-051, B015G4-PNL-052 AND B015H8-PNL-053

DATA PACKAGE ID	HEIS NO.	PNL ID	SAMPLE DATE	LOCATION	COMMENTS
B00X68-PNL-050	B00X68	91-7426	07/25/91	216-B-49A 3.0-5.5	
B00X68-PNL-050	B00X70	91-7427	07/25/91	216-B-49A 8.5-11.0	
B00X68-PNL-050	B00X72	91-7504	07/29/91	216-B-57A 82.0-84.5	
B00X68-PNL-050	B00X74	91-7623	08/01/91	216-B-57A 109.5-112.0	
B00X68-PNL-050	B00X90	91-7807	08/06/91	216-B-57A 139.0-141.5	
B00X68-PNL-050	B00X75	91-7815	08/06/91	216-B-49A 17.0-20.0	
B00X68-PNL-050	B00X92	91-7875	08/08/91	216-B-57A 166.5-169.0	
B00X68-PNL-050	B00XC0	91-7505	07/30/91	216-B-57A	TRIP BLANK
B00X68-PNL-050	B00X84	91-7624	08/01/91	216-B-57A	EQUIPMENT BLANK
B00X64-PNL-051	B00X64	91-6420	07/09/91	216-B-57A 30.0-33.0	
B00X64-PNL-051	B00X77	91-6421	07/09/91	216-B-57A 30.0-33.0	
B00X64-PNL-051	B00X82	91-6693	07/16/91	216-B-57A	EQUIPMENT BLANK
B00X64-PNL-051	B00X66	91-6906	07/17/91	216-B-57A 55.5-58.0	
B00X64-PNL-051	B00X78	91-6907	07/17/91	216-B-57A 55.5-58.0	
B015G4-PNL-052	B015G4	92-00019	09/30/91	216-B-49A 104.5-107.0	
B015G4-PNL-052	B015G6	92-00116	10/02/91	216-B-50B 3.5-6.0	

TABLE 1 (Cont.)

LIST OF SAMPLES VALIDATED, SDG B00X68-PNL-050,  
B00X64-PNL-051, B015G4-PNL-052 AND B00XH8-PNL-053

DATA PACKAGE ID	HEIS NO.	PNL ID	SAMPLE DATE	LOCATION	COMMENTS
B015G4-PNL-052	B015G8	92-00117	10/02/91	216-B-50B 12.0-16.0	
B015G4-PNL-052	B015G9	92-00306	10/04/91	216-B-50B 15.5-17.5	
B015G4-PNL-052	B015H4	92-00356	10/09/91	216-B-50B 28.0-30.5	
B015G4-PNL-052	B015H6	92-00357	10/09/91	216-B-49A 135.0-137.5	
B015G4-PNL-052	B015H1	92-00358	10/09/91	216-B-50B 28.0-30.5	
B015H8-PNL-053	B015H8	92-00570	10/17/91	216-B-50C 3.5-6.0	
B015H8-PNL-053	B015J8	92-00571	10/17/91	216-B-50C 3.5-6.0	
B015H8-PNL-053	B015K0	92-00572	10/17/91	216-B-50C 11.0-15.0	
B015H8-PNL-053	B015K3	92-00921	10/22/91	216-B-50C 19.0-20.5	
B015H8-PNL-053	B015K2	92-00922	10/22/91	216-B-49A 162.0-164.5	
B015H8-PNL-053	B015K6	92-00931	10/23/91	216-B-50C 28.0-30.5	
B015H8-PNL-053	B00X88	92-00975	10/24/91	216-B-50C	EQUIPMENT BLANK
B015H8-PNL-053	B015H0	92-00976	10/24/91	216-B-49A	FIELD BLANK
B015H8-PNL-053	B015K8	92-00977	10/24/91	216-B-49A 190.5-193.0	

9613497.2034

**APPENDIX A**

**AS QUALIFIED DATA SUMMARY AND  
LABORATORY RESULTS**

BATTELLE - PACIFIC NORTHWEST LABORATORY											
DATA PACKAGE		B00X68		B00X64		B015G4		B015G4		B015H8	
SAMPLE NUMBER		B00X75		B00X77		B015G9		B015H1		B015K3	
VOLATILE ORGANIC COMPOUND	CRQL	Result	Q								
CHLOROMETHANE	10	47	R	48	R	46	U	55	U	34	U
BROMOMETHANE	10	47	R	48	R	46	U	55	U	34	U
VINYL CHLORIDE	10	47	R	48	R	46	U	55	U	34	U
CHLOROETHANE	10	47	R	48	R	46	U	55	U	34	U
METHYLENE CHLORIDE	5	24	R	24	R	23	U	3	J	17	U
ACETONE	10	47	R	50	R	83	B	28	U	34	U
CARBON DISULFIDE	5	24	R	24	R	23	U	27	U	17	U
1,1-DICHLOROETHENE	5	24	R	24	R	23	U	27	U	17	U
1,1-DICHLOROETHANE	5	24	R	24	R	23	U	27	U	17	U
1,2-DICHLOROETHENE (TOTAL)	5	24	R	24	R	23	U	27	U	17	U
CHLOROFORM	5	24	R	24	R	23	U	27	U	17	U
1,2-DICHLOROETHANE	5	24	R	24	R	23	U	27	U	17	U
2-BUTANONE	10	47	R	51	R	53	U	35	U	17	U
1,1,1-TRICHLOROETHANE	5	24	R	24	R	7	J	8	J	17	U
CARBON TETRACHLORIDE	5	24	R	24	R	23	U	27	U	17	U
VINYL ACETATE	10	47	R	48	R	46	U	55	U	34	U
BROMODICHLOROMETHANE	5	24	R	24	R	23	U	27	U	17	U
1,2-DICHLOROPROPANE	5	24	R	24	R	23	U	27	U	17	U
CIS-1,3-DICHLOROPROPENE	5	24	R	24	R	23	U	27	U	17	U
TRICHLOROETHENE	5	24	R	24	R	23	U	27	U	17	U
DIBROMOCHLOROMETHANE	5	24	R	24	R	23	U	27	U	17	U
1,1,2-TRICHLOROETHANE	5	24	R	24	R	23	U	27	U	17	U
BENZENE	5	24	R	24	R	23	U	27	U	17	U
TRANS-1,3-DICHLOROPROPENE	5	24	R	24	R	23	U	27	U	17	U
BROMOFORM	5	24	R	24	R	23	U	27	U	17	U
4-METHYL-2-PENTANONE	10	47	R	48	R	46	U	55	U	34	U
2-HEXANONE	10	47	R	48	R	46	U	55	U	34	U
TETRACHLOROETHENE	5	24	R	24	R	23	U	27	U	17	U
1,1,2,2-TETRACHLOROETHANE	5	24	R	24	R	23	U	27	U	17	U
TOLUENE	5	24	R	9	R	2	J	2	J	17	U
CHLOROBENZENE	5	24	R	24	R	23	U	27	U	17	U
ETHYLBENZENE	5	24	R	24	R	23	U	27	U	17	U
STYRENE	5	24	R	24	R	23	U	27	U	17	U
XYLENES (TOTAL)	5	24	R	24	R	23	U	27	U	17	U

B00X64-V.WK1

7010171-1000

## BATTELLE - PACIFIC NORTHWEST LABORATORY

DATA PACKAGE	B00X68		B00X64		B015G4		B015G4		B015H8		
SAMPLE NUMBER	B00X75		B00X77		B015G9		B015H1		B015K3		
SEMIVOLATILE COMPOUND	CRQL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
PHENOL	330	330	UJ	330	U	670	R	350	U	350	UJ
BIS(2-CHLOROETHYL)ETHER	330	330	UJ	330	U	670	R	350	U	350	UJ
2-CHLOROPHENOL	330	330	UJ	330	U	670	R	350	U	350	UJ
1,3-DICHLOROBENZENE	330	330	UJ	330	U	670	R	350	U	350	UJ
1,4-DICHLOROBENZENE	330	330	UJ	330	U	670	R	350	U	350	UJ
BENZYL ALCOHOL	330	330	UJ	330	U	670	R	350	U	350	UJ
1,2-DICHLOROBENZENE	330	330	UJ	330	U	670	R	350	U	350	UJ
2-METHYLPHENOL	330	330	UJ	330	U	670	R	350	U	350	UJ
BIS(2-CHLOROISOPROPYL)ETHER	330	330	UJ	330	U	670	R	350	U	350	UJ
4-METHYLPHENOL	330	330	UJ	330	U	670	R	350	U	350	UJ
N-NITROSO-DI-N-PROPYLAMINE	330	330	UJ	330	U	670	R	350	U	350	UJ
HEXACHLOROETHANE	330	330	UJ	330	U	670	R	350	U	350	UJ
NITROBENZENE	330	330	UJ	330	U	670	R	350	U	350	UJ
ISOPHORONE	330	330	UJ	330	U	670	R	350	U	350	UJ
2-NITROPHENOL	330	330	UJ	330	U	670	R	350	U	350	UJ
2,4-DIMETHYLPHENOL	330	330	UJ	330	U	670	R	350	U	350	UJ
BENZOIC ACID	1600	1700	UJ	1700	U	3400	R	1700	U	1700	UJ
BIS(2-CHLOROETHOXY)METHANE	330	330	UJ	330	U	670	R	350	U	350	UJ
2,4-DICHLOROPHENOL	330	330	UJ	330	U	670	R	350	U	350	UJ
1,2,4-TRICHLOROBENZENE	330	330	UJ	330	U	670	R	350	U	350	UJ
NAPHTHALENE	330	330	UJ	330	U	670	R	350	U	350	UJ
4-CHLOROANILINE	330	330	UJ	330	UJ	670	R	350	UJ	350	UJ
HEXACHLOROBUTADIENE	330	330	UJ	330	U	670	R	350	U	350	UJ
4-CHLORO-3-METHYLPHENOL	330	330	UJ	330	U	670	R	350	U	350	UJ
2-METHYLNAPHTHALENE	330	330	UJ	330	U	670	R	350	U	350	UJ
HEXACHLOROCYCLOPENTADIENE	330	330	UJ	330	U	670	R	350	UJ	350	UJ
2,4,6-TRICHLOROPHENOL	330	330	UJ	330	U	670	R	350	U	350	UJ
2,4,5-TRICHLOROPHENOL	1600	1700	UJ	1700	U	3400	R	1700	U	1700	UJ
2-CHLORONAPHTHALENE	330	330	UJ	330	U	670	R	350	U	350	UJ
2-NITROANILINE	1600	1700	UJ	1700	U	3400	R	1700	U	1700	UJ
DIMETHYLPHTHALATE	330	330	UJ	330	U	670	R	350	U	350	UJ
ACENAPHTHYLENE	330	330	UJ	330	U	670	R	350	U	350	UJ
2,6-DINITROTOLUENE	330	330	UJ	330	U	670	R	350	U	350	UJ
3-NITROANILINE	1600	1700	UJ	1700	UJ	3400	R	1700	UJ	1700	UJ
ACENAPHTHENE	330	330	UJ	330	U	670	R	350	U	350	UJ
2,4-DINITROPHENOL	1600	1700	UJ	1700	UJ	3400	R	1700	U	1700	UJ

BATTELLE - PACIFIC NORTHWEST LABORATORY											
DATA PACKAGE		B00X68		B00X64		B015G4		B015G4		B015H8	
SAMPLE NUMBER		B00X75		B00X77		B015G9		B015H1		B015K3	
SEMIVOLATILE COMPOUND	CRQL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
4-NITROPHENOL	1600	1700	UJ	1700	UJ	3400	R	1700	U	1700	UJ
DIBENZOFURAN	330	330	UJ	330	U	670	R	350	U	350	UJ
2,4-DINITROTOLUENE	330	330	UJ	330	U	670	R	350	U	350	UJ
DIETHYLPHTHALATE	330	620	J	330	U	670	R	350	U	350	UJ
4-CHLOROPHENYL-PHENYLETHER	330	330	UJ	330	U	670	R	350	U	350	UJ
FLUORENE	330	330	UJ	330	U	670	R	350	U	350	UJ
4-NITROANILINE	1600	1700	UJ	1700	UJ	3400	R	1700	U	1700	UJ
4,6-DINITRO-2-METHYLPHENOL	1600	1700	UJ	1700	U	3400	R	1700	U	1700	UJ
N-NITROSODIPHENYLAMINE	330	330	UJ	330	U	670	R	350	U	350	UJ
4-BROMOPHENYL-PHENYLETHER	330	330	UJ	330	U	670	R	350	U	350	UJ
HEXACHLOROBENZENE	330	330	UJ	330	U	670	R	350	U	350	UJ
PHENANTHRENE	330	330	UJ	330	U	670	R	350	U	350	UJ
ANTHRACENE	330	330	UJ	330	U	670	R	350	U	350	UJ
DI-N-BUTYLPHTHALATE	330	350	UJ	22	J	740	R	410	U	580	UJ
FLUORANTHENE	330	330	UJ	330	U	670	R	350	U	350	UJ
PYRENE	330	330	UJ	330	U	670	R	350	U	350	UJ
BUTYLBENZYLPHTHALATE	330	330	UJ	330	U	670	R	350	U	350	UJ
3,3'-DICHLOROBENZIDINE	660	670	UJ	670	U	1300	R	700	U	700	UJ
BENZO(A)ANTHRACENE	330	330	UJ	333	U	670	R	350	U	350	UJ
CHRYSENE	330	330	UJ	333	U	670	R	350	U	350	UJ
BIS(2-ETHYLHEXYL)PHTHALATE	330	23	J	333	U	670	R	350	U	350	UJ
PENTACHLOROPHENOL	1600	1700	UJ	1700	U	3400	R	1700	U	1700	UJ
DI-N-OCTYLPHTHALATE	330	330	UJ	330	U	47	R	350	U	350	UJ
BENZO(B)FLUORANTHENE	330	330	UJ	330	U	670	R	350	U	350	UJ
BENZO(K)FLUORANTHENE	330	330	UJ	330	U	670	R	350	U	350	UJ
BENZO(A)PYRENE	330	330	UJ	330	U	670	R	350	U	350	UJ
INDENO(1,2,3-CD)PYRENE	330	330	UJ	330	U	670	R	350	U	350	UJ
DIBENZ(A,H)ANTHRACENE	330	330	UJ	330	U	670	R	350	U	350	UJ
BENZO(G,H,I)PERYLENE	330	330	UJ	330	U	670	R	350	U	350	UJ

BATTELLE - PACIFIC NORTHWEST LABORATORY											
DATA PACKAGE	B00X68			B00X64		B015G4		B015G4		B015H8	
SAMPLE NUMBER	B00X75			B00X77		B015G9		B015H1		B015K3	
PESTICIDE/PCB COMPOUND	CRQL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
ALPHA-BHC	8	8	UJ	8	R	8	UJ	8	UJ	8	UJ
BETA-BHC	8	8	UJ	8	R	8	UJ	8	UJ	8	UJ
DELTA-BHC	8	8	UJ	8	R	8	UJ	8	UJ	8	UJ
GAMMA-BHC (LINDANE)	8	8	UJ	8	R	8	UJ	8	UJ	8	UJ
HEPTACHLOR	8	9.8	UJ	8	R	8	UJ	8	UJ	8	UJ
ALDRIN	8	6.6	J	8	R	8	UJ	8	UJ	8	UJ
HEPTACHLOR EPOXIDE	8	8	UJ	8	R	8	UJ	8	UJ	8	UJ
ENDOSULFAN I	8	8	UJ	8	R	8	UJ	8	UJ	8	UJ
DIELDRIN	16	16	UJ	16	R	16	UJ	16	UJ	16	UJ
4,4'-DDE	16	16	UJ	16	R	16	UJ	16	UJ	16	UJ
ENDRIN	16	16	UJ	16	R	16	UJ	16	UJ	16	UJ
ENDOSULFAN II	16	16	UJ	16	R	17.1	J	16	UJ	16	UJ
4,4'-DDD	16	16	UJ	16	R	16	UJ	16	UJ	16	UJ
ENDOSULFAN SULFATE	16	16	UJ	16	R	16	UJ	16	UJ	16	UJ
4,4'-DDT	16	16	UJ	16	R	16	UJ	16	UJ	16	UJ
METHOXYCHLOR	80	80	UJ	80	R	80	UJ	80	UJ	80	UJ
ENDRIN KETONE	16	16	UJ	16	R	16	UJ	16	UJ	16	UJ
ALPHA-CHLORDANE	80	80	UJ	80	R	80	UJ	80	UJ	80	UJ
GAMMA-CHLORDANE	80	80	UJ	80	R	80	UJ	80	UJ	80	UJ
TOXAPHENE	160	160	UJ	160	R	160	UJ	160	UJ	160	UJ
AROCLOR-1016	80	80	UJ	80	R	80	UJ	80	UJ	80	UJ
AROCLOR-1221	80	80	UJ	80	R	80	UJ	80	UJ	80	UJ
AROCLOR-1232	80	90	J	80	R	80	UJ	80	UJ	80	UJ
AROCLOR-1242	80	80	UJ	80	R	80	UJ	80	UJ	80	UJ
AROCLOR-1248	80	80	UJ	80	R	80	UJ	80	UJ	80	UJ
AROCLOR-1254	160	160	UJ	160	R	313	J	160	UJ	160	UJ
AROCLOR-1260	160	160	UJ	160	R	160	UJ	160	UJ	160	UJ

BATTELLE - PACIFIC NORTHWEST LABORATORY											
DATA PACKAGE		B00X68		B00X64		B015G4		B015G4		B015H8	
SAMPLE NUMBER		B00X75		B00X77		B015G9		B015H1		B015K3	
INORGANIC ANALYTES	CRDL	Result	Q								
ALUMINUM	40	7420		7610		8030	J	6010	J	8700	J
ANTIMONY	12	4.6	UJ	4.3	UJ	2.6	UJ	2.8	UJ	2.9	UJ
ARSENIC	2	2.3	J	2.4	B	6.47	B	5.44	B	8.22	B
BARIUM	40	59.1		63.7		78.6		68.6		69.9	
BERYLLIUM	1	0.45	B	0.3	B	0.26	B	0.26	B	0.29	B
CADMIUM	1	0.58	U	0.54	U	2	U	2	U	1.6	U
CALCIUM	1000	7290		6500		7350		5670		6390	
CHROMIUM	2	8.8		7.6		10.2		10.3		12.5	
COBALT	10	8.3	B	7.1	U	7.3	B	6.2	B	6.9	B
COPPER	5	18.3	U	11.9	U	21.5		18.6		17.1	
IRON	20	14500		14700	J	22200		18600		18000	
LEAD	1	5.9		5.5		3.11		2.93	B	3.21	
MAGNESIUM	1000	4730		4710		4160		4240		4560	
MANGANESE	3	288	J	289	J	269		269		279	
MERCURY	0.04	0.14	R	0.1	R	0.25	J	0.07	J	0.09	R
NICKEL	8	14.2		11		11.6		12.9		11.6	
POTASSIUM	1000	1270		1080	U	793	R	838	R	1170	R
SELENIUM	1	0.14	U	0.14	U	5	U	5	U	5	U
SILVER	2	0.09	U	10	U	10	U	10	U	10	U
SODIUM	1000	780	B	113	B	596	J	1070	J	815	J
THALLIUM	2	0.22	U	1	UJ	10	U	0.7	B	10	U
VANADIUM	10	24.8		23.6		52.1		33.8		35.9	
ZINC	4	36.6		36.8	J	44.1		34.2		37.7	
BISMUTH	12	0.27	U	60	U	0.17	U	0.17	U	0.17	U
NITRATE-N	500	887		23.6	J	686	J	16.2	J	121	J
NITRITE-N	NA	1	U	1	UJ	1	UJ	1	UJ	1	UJ
PHOSPHATE-P	1	5	UJ	5	UJ	7.9	J	12.2	J	12.7	J
SULFATE	100	162		23.6	J	32	J	13	J	20	J
TOTAL ORGANIC CARBON	NA	529		194		1100		547		579	

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BATTELLE - PACIFIC NORTHWEST LABORATORY

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SAMPLE NO.	PARAMETER	RESULT	Q	UNITS
B00X64	CN (TOTAL)	1	U	MG/KG
B00X66	CN (TOTAL)	1	U	MG/KG
B00X68	CN (TOTAL)	0.6	U	MG/KG
B00X70	CN (TOTAL)	0.6	U	MG/KG
B00X72	CN (TOTAL)	0.6	UJ	MG/KG
B00X74	CN (TOTAL)	0.6	U	MG/KG
B00X75	CN (TOTAL)	1.6		MG/KG
B00X77	CN (TOTAL)	1	R	MG/KG
B00X78	CN (TOTAL)	1	U	MG/KG
B00X82	CN (TOTAL)	19.4	J	UG/L
B00X84	CN (TOTAL)	5.9	U	UG/L
B00X88	CN (TOTAL)	5.9	UJ	UG/L
B00X90	CN (TOTAL)	0.6	U	MG/KG
B00X92	CN (TOTAL)	0.6	U	MG/KG
B00XC0	CN (TOTAL)	5.9	U	UG/L
B015G4	CN (TOTAL)	0.8	J	MG/KG
B015G6	CN (TOTAL)	0.6	UJ	MG/KG
B015G8	CN (TOTAL)	0.6	UJ	MG/KG
B015G9	CN (TOTAL)	0.6	UJ	MG/KG
B015H0	CN (TOTAL)	5.9	UJ	UG/L
B015H1	CN (TOTAL)	0.6	UJ	MG/KG
B015H4	CN (TOTAL)	0.6	UJ	MG/KG
B015H6	CN (TOTAL)	1.5		MG/KG
B015H8	CN (TOTAL)	1	U	MG/KG
B015J8	CN (TOTAL)	1	U	MG/KG
B015K0	CN (TOTAL)	1	U	MG/KG
B015K2	CN (TOTAL)	0.8	B	MG/KG
B015K3	CN (TOTAL)	1	U	MG/KG
B015K6	CN (TOTAL)	1	U	MG/KG
B015K8	CN (TOTAL)	1.2	J	MG/KG

BATTELLE - PACIFIC NORTHWEST LABORATORY											
DATA PACKAGE		B00X68		B00X64		B015G4		B015G4		B015H8	
SAMPLE NUMBER		B00X75		B00X77		B015G9		B015H1		B015K3	
RADIOCHEMICAL ANALYTE	CRQL	RESULT	Q	RESULT	Q	RESULT	Q	RESULT	Q	RESULT	Q
GROSS ALPHA	6	48.9	J	6.3	J	107.5	J	2.9	J	25.7	J
GROSS BETA	3	159330	J	47771	J	622300	J	2590	J	64500	J
CESIUM-137	0.6	21270	J	67000	J	572000	J	1890	J	562000	J
COBALT-60	0.02	1.23	J	0.46	U	8	U	0.4	U	28.6	J
PLUTONIUM-238	0.0001	0.428	R	0.00623	J	1.87	R	0.00283	R	0.0446	R
PLUTONIUM-239+240	0.0001	32.3	R	0.00325	J	121	R	0.239	R	2.96	R
RUTHENIUM-106	0.2	32	U	33	U	500	U	18	U	280	U
STRONTIUM-90	0.15	62600	J	1.2	J	67700	J	452	J	7750	J
TECHNETIUM-99	0.5	48	R	60	J	34	UJ	160	J	132	J
TRITIUM	1	39	J	16	J	16	R	23	R	56	R
TOTAL URANIUM	0.3	41	J	0.4	J	1.7	R	1.2	J	22.6	J

1A  
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B00X75  
716-6-49A 17-20

Lab Name: BATTELLE-PNL Contract: -----  
 Lab Code: ----- Case No.: ----- SAS No.: ----- SDG No.: -----  
 Matrix: (soil/water) SOIL Lab Sample ID: 91-7815  
 Sample wt/vol: 1.1047 (g/mL) G Lab File ID: >WA505  
 Level: (low/med) LOW Date Received: 08/08/91  
 % Moisture: not dec. 4.0 Date Analyzed: 11/05/91  
 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	47.	R
74-83-9	-----Bromomethane	47.	
75-01-4	-----Vinyl Chloride	47.	
75-00-3	-----Chloroethane	47.	
75-09-2	-----Methylene Chloride	24.	
67-64-1	-----Acetone	47.	
75-15-0	-----Carbon Disulfide	24.	
75-35-4	-----1,1-Dichloroethene	24.	
75-34-3	-----1,1-Dichloroethane	24.	
540-59-0	-----1,2-Dichloroethene (total)	24.	
67-66-3	-----Chloroform	24.	
107-02-2	-----1,2-Dichloroethane	24.	
78-93-3	-----2-Butanone	47.	
71-55-6	-----1,1,1-Trichloroethane	24.	
56-23-5	-----Carbon Tetrachloride	24.	
108-05-4	-----Vinyl Acetate	47.	
75-27-4	-----Bromodichloromethane	24.	
78-87-5	-----1,2-Dichloropropane	24.	
10061-01-5	-----cis-1,3-Dichloropropene	24.	
79-01-6	-----Trichloroethene	24.	
124-48-1	-----Dibromochloromethane	24.	
79-00-5	-----1,1,2-Trichloroethane	24.	
71-43-2	-----Benzene	24.	
10061-02-6	-----trans-1,3-Dichloropropene	24.	
75-25-2	-----Bromoform	24.	
108-10-1	-----4-Methyl-2-pentanone	47.	
591-78-6	-----2-Hexanone	47.	
127-18-4	-----Tetrachloroethene	24.	
79-34-5	-----1,1,2,2-Tetrachloroethane	24.	
108-88-3	-----Toluene	24.	
108-90-7	-----Chlorobenzene	24.	
100-41-4	-----Ethylbenzene	24.	
100-42-5	-----Styrene	24.	
133-02-7	-----Xylene (total)	24.	

11/21/92



9613497-2044

1A  
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015H1  
2/10-B-SOB 28-30.5

split

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

Matrix: (soil/water) SOIL

Lab Sample ID: 92-00358

Sample wt/vol: 0.9431 (g/mL) G

Lab File ID: >VB404

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec. 3.3

Date Analyzed: 10/14/91

Column: (pack/cap) CAP

Dilution Factor: 1.00000

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

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	55.	U
74-83-9	Bromomethane	55.	U
75-01-4	Vinyl Chloride	55.	U
75-00-3	Chloroethane	55.	U
75-09-2	Methylene Chloride	3 28.	U
67-64-1	Acetone	28.	JB
75-15-0	Carbon Disulfide	27.	U
75-35-4	1,1-Dichloroethane	27.	U
75-34-3	1,1-Dichloroethane	27.	U
540-59-0	1,2-Dichloroethane (total)	27.	U
67-66-3	Chloroform	27.	U
107-02-2	1,2-Dichloroethane	27.	U
78-93-3	2-Butanone	35.	JB
71-55-6	1,1,1-Trichloroethane	8.	J
56-23-5	Carbon Tetrachloride	27.	U
108-05-4	Vinyl Acetate	55.	U
75-27-4	Bromodichloromethane	27.	U
78-87-5	1,2-Dichloropropane	27.	U
10061-01-5	cis-1,3-Dichloropropene	27.	U
79-01-6	Trichloroethane	27.	U
124-48-1	Dibromochloromethane	27.	U
79-00-5	1,1,2-Trichloroethane	27.	U
71-43-2	Benzene	27.	U
10061-02-6	trans-1,3-Dichloropropene	27.	U
75-25-2	Bromoform	27.	U
108-10-1	4-Methyl-2-pentanone	55.	U
591-78-6	2-Hexanone	55.	U
127-18-4	Tetrachloroethane	27.	U
79-34-5	1,1,2,2-Tetrachloroethane	27.	U
108-88-3	Toluene	2 27.	J
108-90-7	Chlorobenzene	27.	U
100-41-4	Ethylbenzene	27.	U
100-42-5	Styrene	27.	U
133-02-7	Xylene (total)	27.	U

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9/11/92

9613497.2045

1A  
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: BATTELLE-PNL

Contract: -----

B015G9  
210-B-506 15.5-17.5

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

Matrix: (soil/water) SOIL

Lab Sample ID: 92-00306

Sample wt/vol: 1.121 (g/mL) G

Lab File ID: >VB408

Level: (low/med) LOW

Date Received: 10/08/91

% Moisture: not dec. 3.0

Date Analyzed: 10/14/91

Column: (pack/cap) CAP

Dilution Factor: 1.00000

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

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	46.	U
74-83-9	Bromomethane	46.	U
75-01-4	Vinyl Chloride	46.	U
75-00-3	Chloroethane	46.	U
75-09-2	Methylene Chloride	23.	U
67-64-1	Acetone	83.	U
75-15-0	Carbon Disulfide	23.	U
75-35-4	1,1-Dichloroethene	23.	U
75-34-3	1,1-Dichloroethane	23.	U
540-59-0	1,2-Dichloroethene (total)	23.	U
67-66-3	Chloroform	23.	U
107-02-2	1,2-Dichloroethane	23.	U
78-93-3	2-Butanone	53.	U
71-55-6	1,1,1-Trichloroethane	7.	J
56-23-5	Carbon Tetrachloride	23.	U
108-05-4	Vinyl Acetate	46.	U
75-27-4	Bromodichloromethane	23.	U
78-87-5	1,2-Dichloropropane	23.	U
10061-01-5	cis-1,3-Dichloropropane	23.	U
79-01-6	Trichloroethene	23.	U
124-48-1	Dibromochloromethane	23.	U
79-00-5	1,1,2-Trichloroethane	23.	U
71-43-2	Benzene	23.	U
10061-02-6	trans-1,3-Dichloropropane	23.	U
75-25-2	Bromoform	23.	U
108-10-1	4-Methyl-2-pentanone	46.	U
591-78-6	2-Hexanone	46.	U
127-18-4	Tetrachloroethane	23.	U
79-34-5	1,1,2,2-Tetrachloroethane	23.	U
108-88-3	Toluene	23.	U
108-90-7	Chlorobenzene	23.	U
100-41-4	Ethylbenzene	23.	U
100-42-5	Styrene	23.	U
133-02-7	Xylene (total)	23.	U

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FORM I VOA

1/89 Rev.

G 11/9/92

9613497.2046

1A  
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015K3  
216-B-50C 19-20.5

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

Matrix: (soil/water) SOIL

Lab Sample ID: 92-00921

Sample wt/vol: 1.5311 (g/mL) G

Lab File ID: >WA507

Level: (low/med) LOW

Date Received: 10/23/91

Moisture: not dec. 4.0

Date Analyzed: 11/05/91

Column: (pack/cap) CAP

Dilution Factor: 1.00000

CONCENTRATION UNITS:

CAS NO. COMPOUND (ug/L or ug/Kg) ug/Kg Q

74-87-3-----	Chloromethane	34.	U
74-83-9-----	Bromomethane	34.	U
75-01-4-----	Vinyl Chloride	34.	U
75-00-3-----	Chloroethane	34.	U
75-09-2-----	Methylene Chloride	17.	U
67-64-1-----	Acetone	34.	U
75-15-0-----	Carbon Disulfide	17.	U
75-35-4-----	1,1-Dichloroethene	17.	U
75-34-3-----	1,1-Dichloroethane	17.	U
540-59-0-----	1,2-Dichloroethene (total)	17.	U
67-66-3-----	Chloroform	17.	U
107-02-2-----	1,2-Dichloroethane	17.	U
78-93-3-----	2-Butanone	17.	JB-U
71-55-6-----	1,1,1-Trichloroethane	17.	U
56-23-5-----	Carbon Tetrachloride	17.	U
108-05-4-----	Vinyl Acetate	34.	U
75-27-4-----	Bromodichloromethane	17.	U
78-87-5-----	1,2-Dichloropropane	17.	U
10061-01-5-----	cis-1,3-Dichloropropene	17.	U
79-01-6-----	Trichloroethene	17.	U
124-48-1-----	Dibromochloromethane	17.	U
79-00-5-----	1,1,2-Trichloroethane	17.	U
71-43-2-----	Benzene	17.	U
10061-02-6-----	trans-1,3-Dichloropropene	17.	U
75-25-2-----	Bromoform	17.	U
108-10-1-----	4-Methyl-2-pentanone	34.	U
591-78-6-----	2-Hexanone	34.	U
127-18-4-----	Tetrachloroethene	17.	U
79-34-5-----	1,1,2,2-Tetrachloroethane	17.	U
108-88-3-----	Toluene	17.	U
108-90-7-----	Chlorobenzene	17.	U
100-41-4-----	Ethylbenzene	17.	U
100-42-5-----	Styrene	17.	U
133-02-7-----	Xylene (total)	17.	U

9613497-2047  
18

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

800X75  
210-6-494 (7-20)

Lab Name: BATTELLE-PNL Contract: -----  
 Lab Code: ----- Case No.: ----- SAS No.: ----- SDG No.: -----  
 Matrix: (soil/water) SOIL Lab Sample ID: 91-7815-E-1  
 Sample wt/vol: 30 (g/mL) G Lab File ID: >UA905  
 Level: (low/med) LOW Date Received: 88/08/91  
 % Moisture: not dec. 0.1 dec. 0.1 Date Extracted: 08/20/91  
 Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 9/09/91  
 GPC Cleanup: (Y/N) N pH: 6.4 Dilution Factor: 1.00000

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

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
108-95-2	Phenol	330.	IU J
111-44-4	bis(2-Chloroethyl)Ether	330.	IU
95-57-8	2-Chlorophenol	330.	IU
541-73-1	1,3-Dichlorobenzene	330.	IU
106-46-7	1,4-Dichlorobenzene	330.	IU
100-51-6	Benzyl_alcohol	330.	IU
95-50-1	1,2-Dichlorobenzene	330.	IU
95-48-7	2-Methylphenol	330.	IU
39638-32-9	bis(2-chloroisopropyl)ether	330.	IU
106-44-5	4-Methylphenol	330.	IU
621-64-7	N-Nitroso-Di-n-propylamine	330.	IU
67-72-1	Hexachloroethane	330.	IU
98-95-3	Nitrobenzene	330.	IU
78-59-1	Isophorone	330.	IU
88-75-5	2-Nitrophenol	330.	IU
105-67-9	2,4-Dimethylphenol	330.	IU
65-85-0	Benzoic_acid	1700.	IU
111-91-1	bis(2-Chloroethoxy)methane	330.	IU
120-83-2	2,4-Dichlorophenol	330.	IU
120-82-1	1,2,4-Trichlorobenzene	330.	IU
91-20-3	Naphthalene	330.	IU
106-47-8	4-Chloroaniline	330.	IU
87-68-3	Hexachlorobutadiene	330.	IU
59-50-7	4-Chloro-3-methylphenol	330.	IU
91-57-6	2-Methylnaphthalene	330.	IU
77-47-4	Hexachlorocyclopentadiene	330.	IU
88-06-2	2,4,6-Trichlorophenol	330.	IU
95-95-4	2,4,5-Trichlorophenol	1700.	IU
91-58-7	2-Chloronaphthalene	330.	IU
88-74-4	2-Nitroaniline	1700.	IU
131-11-3	Dimethylphthalate	330.	IU
208-96-8	Acenaphthylene	330.	IU
606-20-2	2,6-Dinitrotoluene	330.	IU

S. H. K. 1/92

1C  
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

800X75  
210-6-49A 17

Lab Name: BATTELLE-PNL Contract: -----  
 Lab Code: ----- Case No.: ----- SAS No.: ----- SDG No.: -----  
 Matrix: (soil/water) SOIL Lab Sample ID: 91-7815-E-1  
 Sample wt/vol: 30 (g/mL) G Lab File ID: >UA905  
 Level: (low/med) LOW Date Received: 08/08/91  
 % Moisture: not dec. 0.1 dec. 0.1 Date Extracted: 08/20/91  
 Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 9/09/91  
 GPC Cleanup: (Y/N) N pH: 6.4 Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
99-09-2	3-Nitroaniline	1700.	IU J
83-32-9	Acenaphthene	330.	IU
51-28-5	2,4-Dinitrophenol	1700.	IU
100-02-7	4-Nitrophenol	1700.	IU
132-64-9	Dibenzofuran	330.	IU
121-14-2	2,4-Dinitrotoluene	330.	IU
84-66-2	Diethylphthalate	620.	IJ
7005-72-3	4-Chlorophenyl-phenylether	330.	IUJ
86-73-7	Fluorene	330.	IU
100-01-6	4-Nitroaniline	1700.	IU
534-52-1	4,6-Dinitro-2-methylphenol	1700.	IU
86-30-6	N-Nitrosodiphenylamine (1)	330.	IU
101-55-3	4-Bromophenyl-phenylether	330.	IU
118-74-1	Hexachlorobenzene	330.	IU
87-86-5	Pentachlorophenol	1700.	IU
85-01-8	Phenanthrene	330.	IU
120-12-7	Anthracene	330.	IU
84-74-2	Di-n-butylphthalate	350.	IJ UJ
206-44-0	Fluoranthene	330.	IUJ
129-00-0	Pyrene	330.	IU
85-68-7	Butylbenzylphthalate	330.	IU
91-94-1	3,3'-Dichlorobenzidine	670.	IU
56-55-3	Benzo(a)anthracene	330.	IU
218-01-9	Chrysene	330.	IU
117-81-7	bis(2-Ethylhexyl)phthalate	330.	IJ
117-84-0	Di-n-octylphthalate	330.	IU UJ
205-99-2	Benzo(b)fluoranthene	330.	IU
207-08-9	Benzo(k)fluoranthene	330.	IU
50-32-8	Benzo(a)pyrene	330.	IU
193-39-5	Indeno(1,2,3-cd)pyrene	330.	IU
53-70-3	Dibenz(a,h)anthracene	330.	IU
191-24-2	Benzo(g,h,i)perylene	330.	IU

(1) - Cannot be separated from Diphenylamine

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9613497.2049

1F  
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET  
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

B00X75  
216-B-49A.17-2D

Name: BATTELLE-PNL

Contract: -----

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

Matrix: (soil/water) SOIL

Lab Sample ID: 91-7815-E-1

Sample wt/vol: 30 (g/mL) G

Lab File ID: >VA905

Level: (low/med) LOW

Date Received: 08/08/91

Moisture: not dec. 0.1 dec. 0.1

Date Extracted: 08/20/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 9/09/91

PC Cleanup: (Y/N) N pH: 6.4

Dilution Factor: 1.00000

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

Number TICs found: 4

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 123422	2-Pentanone, 4-hydroxy-4-met	4.20	110000.	AJB
2.	Unknown	4.76	3000.	JB
3.	Unknown	5.80	820.	JB
4.	Hexanedioic acid ester	33.83	8200.	JB
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1B  
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B00X77

216-B-57A 3A

Name: BATTELLE-PNL

Contract: -----

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

Matrix: (soil/water) SOIL

Lab Sample ID: 91-6421-E-1

Sample wt/vol: 30 (g/mL) G

Lab File ID: &gt;TD105

Level: (low/med) LOW

Date Received: 07/12/91

% Moisture: not dec. 0.1 dec. 0.1

Date Extracted: 07/16/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 7/31/91

GPC Cleanup: (Y/N) N pH: 6.6

Dilution Factor: 1.00000

## CONCENTRATION UNITS:

(ug/L or ug/Kg) ug/Kg

Q

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
108-95-2	Phenol	330.	IU
111-44-4	bis(2-Chloroethyl)Ether	330.	IU
95-57-8	2-Chlorophenol	330.	IU
541-73-1	1,3-Dichlorobenzene	330.	IU
106-46-7	1,4-Dichlorobenzene	330.	IU
100-51-6	Benzyl_alcohol	330.	IU
95-50-1	1,2-Dichlorobenzene	330.	IU
95-48-7	2-Methylphenol	330.	IU
39638-32-9	bis(2-chloroisopropyl)ether	330.	IU
106-44-5	4-Methylphenol	330.	IU
621-64-7	N-Nitroso-Di-n-propylamine	330.	IU
67-72-1	Hexachloroethane	330.	IU
98-95-3	Nitrobenzene	330.	IU
78-59-1	Isophorone	330.	IU
88-75-5	2-Nitrophenol	330.	IU
105-67-9	2,4-Dimethylphenol	330.	IU
65-85-0	Benzoic_acid	1700.	IU
111-91-1	bis(2-Chloroethoxy)methane	330.	IU
120-83-2	2,4-Dichlorophenol	330.	IU
120-82-1	1,2,4-Trichlorobenzene	330.	IU
91-20-3	Naphthalene	330.	IU
106-47-8	4-Chloroaniline	330.	IU
87-68-3	Hexachlorobutadiene	330.	IU
59-50-7	4-Chloro-3-methylphenol	330.	IU
91-57-6	2-Methylnaphthalene	330.	IU
77-47-4	Hexachlorocyclopentadiene	330.	IU
88-06-2	2,4,6-Trichlorophenol	330.	IU
95-95-4	2,4,5-Trichlorophenol	1700.	IU
91-58-7	2-Chloronaphthalene	330.	IU
88-74-4	2-Nitroaniline	1700.	IU
131-11-3	Dimethylphthalate	330.	IU
208-96-8	Acenaphthylene	330.	IU
606-20-2	2,6-Dinitrotoluene	330.	IU

9613497-2051  
1C

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

800X77  
214-B-57A 30-33

Name: BATTELLE-PNL Contract: -----  
 Lab Code: ----- Case No.: ----- SAS No.: ----- SDG No.: -----  
 Matrix: (soil/water) SOIL Lab Sample ID: 91-6421-E-1  
 Sample wt/vol: 30 (g/mL) G Lab File ID: >TD105  
 Level: (low/med) LOW Date Received: 07/12/91  
 Moisture: not dec. 0.1 dec. 0.1 Date Extracted: 07/16/91  
 Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 7/31/91  
 APC Cleanup: (Y/N) N pH: 6.6 Dilution Factor: 1.00000

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

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
99-09-2-----	3-Nitroaniline	1700.	H UJ
83-32-9-----	Acenaphthene	330.	IU
51-28-5-----	2,4-Dinitrophenol	1700.	H UJ
100-02-7-----	4-Nitrophenol	1700.	H UJ
132-64-9-----	Dibenzofuran	330.	IU
121-14-2-----	2,4-Dinitrotoluene	330.	IU
84-66-2-----	Diethylphthalate	330.	IU
7005-72-3-----	4-Chlorophenyl-phenylether	330.	IU
86-73-7-----	Fluorene	330.	IU
100-01-6-----	4-Nitroaniline	1700.	H UJ
534-52-1-----	4,6-Dinitro-2-methylphenol	1700.	IU
86-30-6-----	N-Nitrosodiphenylamine (1)	330.	IU
101-55-3-----	4-Bromophenyl-phenylether	330.	IU
118-74-1-----	Hexachlorobenzene	330.	IU
87-86-5-----	Pentachlorophenol	1700.	IU
85-01-8-----	Phenanthrene	330.	IU
120-12-7-----	Anthracene	330.	IU
84-74-2-----	Di-n-butylphthalate	22.44	IJ
206-44-0-----	Fluoranthene	330.	IU
129-00-0-----	Pyrene	330.	IU
85-68-7-----	Butylbenzylphthalate	330.	IU
91-94-1-----	3,3'-Dichlorobenzidine	670.	IU
56-55-3-----	Benzo(a)anthracene	330.	IU
218-01-9-----	Chrysene	330.	IU
117-81-7-----	bis(2-Ethylhexyl)phthalate	330.	IU
117-84-0-----	Di-n-octylphthalate	330.198	IU U
205-99-2-----	Benzo(b)fluoranthene	330.	IU
207-08-9-----	Benzo(k)fluoranthene	330.	IU
50-32-8-----	Benzo(a)pyrene	330.	IU
193-39-5-----	Indeno(1,2,3-cd)pyrene	330.	IU
53-70-3-----	Dibenz(a,h)anthracene	330.	IU
191-24-2-----	Benzo(g,h,i)perylene	330.	IU

(1) - Cannot be separated from Diphenylamine

1F  
 SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET  
 TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

800X77  
 210-B-57A 30-37

Lab Name: BATTELLE-PNL

Contract: -----

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

Matrix: (soil/water) SOIL

Lab Sample ID: 91-6421-E-1

Sample wt/vol: 30 (g/mL) G

Lab File ID: >TD105

Level: (low/med) LOW

Date Received: 07/12/91

% Moisture: not dec. 0.1 dec. 0.1

Date Extracted: 07/16/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 7/31/91

GPC Cleanup: (Y/N) N pH: 6.6

Dilution Factor: 1.00000

Number TICs found: 2

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

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	Unknown	4.15	2800	J
2. 123422	2-Pentanone, 4-hydroxy-4-met	4.38	49000.	JBA
3.	Unknown	5.04	1900.	38
4.	Unknown	5.34	390.	J
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1B

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: BATTELLE-PNL

Contract: -----

B015H1  
216-B-50B 29-30.5 split

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: B 12-29/104

Matrix: (soil/water) SOIL

Lab Sample ID: 92-358-E-1

Sample wt/vol: 29.7 (g/mL) G

Lab File ID: >XC405

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec. 3.4 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 8.5

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

UJ

UJ

FORM I SV-1

1/87 Rev.

5/11/01/92

1C  
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: BATTTELLE-PNL

Contract: -----

B015H1  
216-B-50B 25-30.5

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No: B 12-2-91 RAJ

Matrix: (soil/water) SOIL

Lab Sample ID: 92-358-E-1

Sample wt/vol: 29.7 (g/mL) G

Lab File ID: >XC405

Level: (low/med) LOW

Date Received: 10/11/91

Moisture: not dec. 3.4 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 8.5

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	410.	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	350.	U
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
193-19-5-----	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

UJ

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(1) - Cannot be separated from Diphenylamine

9613497 2055

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET  
TENTATIVELY IDENTIFIED COMPOUNDS

B015H1  
216B-506 28-30.5  
E 12-2-91

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

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

SDG No.: E 12-2-91

Matrix: (soil/water) SOIL

Lab Sample ID: 92-158-E-1

Sample wt/vol: 29.7 (g/mL) G

Lab File ID: >XC405

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec. 1.4 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 8.5

Dilution Factor: 1.00000

CONCENTRATION UNITS:

(ug/L or ug/Kg) ug/Kg

Number TICs found: 4

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	Unknown	4.39	1300.	<del>JB</del>
2.	Unknown	5.36	390.	<del>JB</del>
3. 791286	Phosphine oxide, triphenyl-	34.65	340.	<del>JB</del>
4.	Unknown	5.11	710.	<del>JB</del>
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9613497-2056  
18

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

B015G9  
210-B-50B 15.5-175

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

13-3-91

Matrix: (soil/water) SOIL

Lab Sample ID: 92-306-E-1

Sample wt/vol: 30.6 (g/mL) G

Lab File ID: >XC409

Level: (low/med) LOW

Date Received: 10/08/91

% Moisture: not dec.3 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 6.5

Dilution Factor: 2.00000

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

CAS NO. COMPOUND Q

108-95-2	Phenol	670.	D
111-44-4	bis(2-Chloroethyl) Ether	670.	D
95-57-8	2-Chlorophenol	670.	D
541-73-1	1,3-Dichlorobenzene	670.	D
106-46-7	1,4-Dichlorobenzene	670.	D
100-51-6	Benzyl alcohol	670.	D
95-50-1	1,2-Dichlorobenzene	670.	D
95-48-7	2-Methylphenol	670.	D
39638-32-9	bis(2-chloroisopropyl) ether	670.	D
106-44-5	4-Methylphenol	670.	D
621-64-7	N-Nitroso-Di-n-propylamine	670.	D
67-72-1	Hexachloroethane	670.	D
98-95-3	Nitrobenzene	670.	D
78-59-1	Isophorone	670.	D
88-75-5	2-Nitrophenol	670.	D
105-67-9	2,4-Dimethylphenol	670.	D
65-85-0	Benzoic acid	3400.	D
111-91-1	bis(2-Chloroethoxy)methane	670.	D
120-83-2	2,4-Dichlorophenol	670.	D
120-82-1	1,2,4-Trichlorobenzene	670.	D
91-20-3	Naphthalene	670.	D
106-47-8	4-Chloroaniline	670.	D
87-68-3	Hexachlorobutadiene	670.	D
59-50-7	4-Chloro-3-methylphenol	670.	D
91-57-6	2-Methylnaphthalene	670.	D
77-47-4	Hexachlorocyclopentadiene	670.	D
88-06-2	2,4,6-Trichlorophenol	670.	D
95-95-4	2,4,5-Trichlorophenol	3400.	D
91-58-7	2-Chloronaphthalene	670.	D
88-74-4	2-Nitroaniline	3400.	D
131-11-3	Dimethylphthalate	670.	D
208-96-8	Acenaphthylene	670.	D
606-20-2	2,6-Dinitrotoluene	670.	D

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FORM I SV-1

1/87 Rev.

8/11/1042

9613497C 2057

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

B015G9  
210-B-50B 15.5-17.5

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: 8-12-291 208

Matrix: (soil/water) SOIL

Lab Sample ID: 92-306-E-1

Sample wt/vol: 30.6 (g/mL) G

Lab File ID: >XC409

Level: (low/med) LOW

Date Received: 10/08/91

% Moisture: not dec.3 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 6.5

Dilution Factor: 2.00000

CONCENTRATION UNITS:

CAS NO.

COMPOUND

(ug/L or ug/Kg) ug/Kg

Q

CAS NO.	COMPOUND	(ug/L or ug/Kg) ug/Kg	Q
99-09-2	3-Nitroaniline	3400.	D
83-32-9	Acenaphthene	670.	D
51-28-5	2,4-Dinitrophenol	3400.	D
100-02-7	4-Nitrophenol	3400.	D
132-64-9	Dibenzofuran	670.	D
121-14-2	2,4-Dinitrotoluene	670.	D
84-66-2	Diethylphthalate	670.	D
7005-72-3	4-Chlorophenyl-phenylether	670.	D
86-73-7	Fluorene	670.	D
100-01-6	4-Nitroaniline	3400.	D
534-52-1	4,6-Dinitro-2-methylphenol	3400.	D
86-30-6	N-Nitrosodiphenylamine (1)	670.	D
101-55-3	4-Bromophenyl-phenylether	670.	D
118-74-1	Hexachlorobenzene	670.	D
87-86-5	Pentachlorophenol	3400.	D
85-01-8	Phenanthrene	670.	D
120-12-7	Anthracene	670.	D
84-74-2	Di-n-butylphthalate	740.	D
206-44-0	Fluoranthene	670.	D
129-00-0	Pyrene	670.	D
85-68-7	Butylbenzylphthalate	670.	D
91-94-1	3,3'-Dichlorobenzidine	1300.	D
56-55-3	Benzo(a)anthracene	670.	D
218-01-9	Chrysene	670.	D
117-81-7	bis(2-Ethylhexyl)phthalate	670.	D
117-84-0	Di-n-octylphthalate	47.	D
205-99-2	Benzo(b)fluoranthene	670.	D
207-08-9	Benzo(k)fluoranthene	670.	D
50-32-8	Benzo(a)pyrene	670.	D
193-39-5	Indeno(1,2,3-cd)pyrene	670.	D
53-70-3	Dibenz(a,h)anthracene	670.	D
191-24-2	Benzo(g,h,i)perylene	670.	D

(1) - Cannot be separated from Diphenylamine

FORM I SV-2

1/87 Rev.

8/11/042

9613497.2058

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET  
TENTATIVELY IDENTIFIED COMPOUNDS

B015G9  
216-B-50B 15.5-17.5

1P

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: 2-12-2-91 Rev

Matrix: (soil/water) SOIL

Lab Sample ID: 92-306-E-1

Sample wt/vol: 30.6 (g/mL) G

Lab File ID: >XC409

Level: (low/med) LOW

Date Received: 10/08/91

% Moisture: not dec.3 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 6.5

Dilution Factor: 2.00000

Number TICs found: 10

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

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	Unknown	4.37	1600.	<del>JB</del>
2.	Unknown	5.34	400.	<del>JB</del>
3.	Unknown	5.62	310.	J
4.	Unknown Alkane	12.58	330.	J
5.	Unknown Alkane	13.17	410.	J
6.	Unknown Alkane	14.76	460.	J
7.	Unknown Alkane	15.73	420.	J
8.	Unknown	19.56	1600.	J
9.	791286 Phosphine oxide, triphenyl-	34.64	430.	<del>JB</del>
10.	Unknown	5.10	860.	<del>JB</del>
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FORM I SV-TIC

1/87 Rev.

9613497.2059  
IB

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

B015K3  
216-B-50C 19-20,5

Name: BATTELLE-PNL

Contract: -----

Code: -----

Case No.: -----

SAS No.: -----

SDG No.: #9

Matrix: (soil/water) SOIL

Lab Sample ID: 92-921-E-1

Sample wt/vol: 30.1 (g/mL) G

Lab File ID: >XC509

Level: (low/med) LOW

Date Received: 10/23/91

Moisture: not dec. 4.7 dec. --

Date Extracted: 10/30/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/25/91

Cleanup: (Y/N) N pH: 7.5

Dilution Factor: 1.00000

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

CAS NO. COMPOUND 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

UJ

5/11/2/97

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

B015K3  
216-B-50C 19-20.5

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

Lab Code: ----- Case No.: ----- SAS No.: ----- SDG No.: #9

Matrix: (soil/water) SOIL Lab Sample ID: 92-921-E-1

Sample wt/vol: 30.1 (g/mL) G Lab File ID: >XC509

Level: (low/med) LOW Date Received: 10/23/91

Moisture: not dec. 4.7 dec. -- Date Extracted: 10/30/91

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 11/25/91

PC Cleanup: (Y/N) N pH: 7.5 Dilution Factor: 1.00000

CAS NO. COMPOUND CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg Q

99-09-2-----	3-Nitroaniline	1700.	B
83-32-9-----	Acenaphthene	350.	B
51-28-5-----	2,4-Dinitrophenol	1700.	B
100-02-7-----	4-Nitrophenol	1700.	B
132-64-9-----	Dibenzofuran	350.	B
121-14-2-----	2,4-Dinitrotoluene	350.	B
84-66-2-----	Diethylphthalate	350.	B
7005-72-3-----	4-Chlorophenyl-phenylether	350.	B
86-73-7-----	Fluorene	350.	B
100-01-6-----	4-Nitroaniline	1700.	B
534-52-1-----	4,6-Dinitro-2-methylphenol	1700.	B
86-30-6-----	N-Nitrosodiphenylamine (1)	350.	B
101-55-3-----	4-Bromophenyl-phenylether	350.	B
118-74-1-----	Hexachlorobenzene	350.	B
87-86-5-----	Pentachlorophenol	1700.	B
85-01-8-----	Phenanthrene	350.	B
120-12-7-----	Anthracene	350.	B
84-74-2-----	Di-n-butylphthalate	580.	B
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	350.	U
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

Handwritten notes: 'WJ' at the top, a vertical line with 'B' and 'U' markers, and 'WJ' at the bottom with an arrow pointing down.

(1) - Cannot be separated from Diphenylamine



1D  
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B00X75  
210-B-49A

Lab Name: Battelle PNL Contract: 17-20  
 Lab Code: PNL Case No.: SAS No.: SDG No.: 4  
 Matrix: (soil/water) SOIL Lab Sample ID: 91-07815-P-1  
 Sample wt/vol: 30.0 (g/mL) G Lab File ID: -----  
 Level: (low/med) LOW Date Received: 08/08/91  
 % Moisture: not dec. 4.0 dec. ---- Date Extracted: 08/20/91  
 Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/25/91  
 GPC Cleanup: (Y/N) N pH: 6.4 Dilution Factor: 1.00000

CAS NO. COMPOUND CONCENTRATION UNITS:  
(ug/L or ug/Kg) ug/Kg Q

319-84-6	alpha-BHC	8.0	UJ
319-85-7	beta-BHC	8.0	U
319-86-8	delta-BHC	8.0	U
58-89-9	gamma-BHC (Lindane)	8.0	U
76-44-8	Heptachlor	9.8	UJ
309-00-2	Aldrin	6.6 8.0	UJ
1024-57-3	Heptachlor epoxide	8.0	U
959-98-8	Endosulfan I	8.0	U
60-57-1	Dieldrin	16.0	U
72-55-9	4,4'-DDE	16.0	U
72-20-8	Endrin	16.0	U
33213-65-9	Endosulfan II	16.0	U
72-54-8	4,4'-DDD	16.0	U
1013-07-8	Endosulfan sulfate	16.0	U
50-29-3	4,4'-DDT	16.0	U
72-43-5	Methoxychlor	80.0	U
53494-70-5	Endrin ketone	16.0	U
5103-71-9	alpha-Chlordane	80.0	U
5103-74-2	gamma-Chlordane	80.0	U
8001-35-2	Toxaphene	160.0	U
12674-11-2	Arochlor-1016	80.0	U
11104-28-2	Arochlor-1221	80.0	U
11141-16-5	Arochlor-1232	90.0	J
53469-21-9	Arochlor-1242	80.0	UJ
12672-29-6	Arochlor-1248	80.0	U
11097-69-1	Arochlor-1254	160.0	U
11096-82-5	Arochlor-1260	160.0	U

1D  
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

216-B-57A

BOOX77

Lab Name: Battelle-PNL Contract: ---

Lab Code: --- Case No.: --- SAS No.: --- SDG No.: 3

Matrix: (soil/water) soil Lab Sample ID: 91-6421-P-1R

sample wt/vol: 30.3 (g/mL) g Lab File ID: ---

Level: (low/med) low Date Received: 7/10/91

% Moisture: not dec. 5.3 dec. --- Date Extracted: 10/30/91

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 12/06/91

GPC Cleanup: (Y/N) N pH: 6.6 Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>ug/Kg</u>	<u>Q</u>
319-84-6	alpha-BHC	8.0	U
319-85-7	beta-BHC	8.0	U
319-86-8	delta-BHC	8.0	U
58-89-9	gamma-BHC (Lindane)	8.0	U
76-44-8	Heptachlor	8.0	U
309-00-2	Aldrin	8.0	U
1024-57-3	Heptachlor epoxide	8.0	U
959-98-8	Endosulfan I	8.0	U
60-57-1	Dieldrin	16.0	U
72-55-9	4,4'-DDE	16.0	U
72-20-8	Endrin	16.0	U
33213-65-9	Endosulfan II	16.0	U
72-54-8	4,4'-DDD	16.0	U
1031-07-8	Endosulfan sulfate	16.0	U
50-29-3	4,4'-DDT	16.0	U
72-43-5	Methoxychlor	80.0	U
53494-70-5	Endrin ketone	16.0	U
5103-71-9	alpha-Chlordane	80.0	U
5103-74-2	gamma-Chlordane	80.0	U
8001-35-2	Toxaphene	160.0	U
12674-11-2	Aroclor-1016	80.0	U
11104-28-2	Aroclor-1221	80.0	U
11141-16-5	Aroclor-1232	80.0	U
53469-21-9	Aroclor-1242	80.0	U
12672-29-6	Aroclor-1248	80.0	U
11097-69-1	Aroclor-1254	160.0	U
11096-82-5	Aroclor-1260	160.0	U

9613497.2064

1D  
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015G9  
216-B-5DB 15.9-17.5

Lab Name: Battelle PNL

Contract:

Lab Code: PNL

Case No.:

SAS No.:

SDG No.: 8

Matrix: (soil/water) Soil

Lab Sample ID: 92-00306-P-1

Sample wt/vol: 30.6 (g/mL) g

Lab File ID: -----

Level: (low/med) LOW

Date Received: 10/08/91

Moisture: not dec. 3.01 dec. ----

Date Extracted: 10/17/91

Extraction: (SepF/Cont/Sonc) Sonc

Date Analyzed: 11/28/91

GPC Cleanup: (Y/N) N pH: 6.5

Dilution Factor: 1.00000

CAS NO. COMPOUND CONCENTRATION UNITS:  
(ug/L or ug/Kg) ug/Kg Q

319-84-6	alpha-BHC	8.0	R P
319-85-7	beta-BHC	8.0	
319-86-8	delta-BHC	8.0	
58-89-9	gamma-BHC (Lindane)	8.0	
76-44-8	Heptachlor	8.0	
309-00-2	Aldrin	8.0	
1024-57-3	Heptachlor epoxide	8.0	
959-98-8	Endosulfan I	8.0	
60-57-1	Dieldrin	16.0	
72-55-9	4,4'-DDE	16.0	
72-20-8	Endrin	16.0	
33213-65-9	Endosulfan II	17.1	
72-54-8	4,4'-DDD	16.0	
1013-07-8	Endosulfan sulfate	16.0	
50-29-3	4,4'-DDT	16.0	
72-43-5	Methoxychlor	80.0	
53494-70-5	Endrin ketone	16.0	
5103-71-9	alpha-Chlordane	80.0	
5103-74-2	gamma-Chlordane	80.0	
8001-35-2	Toxaphene	160.0	
12674-11-2	Arochlor-1016	80.0	
11104-28-2	Arochlor-1221	80.0	
11141-16-5	Arochlor-1232	80.0	
53469-21-9	Arochlor-1242	80.0	
12672-29-6	Arochlor-1248	80.0	
11097-69-1	Arochlor-1254	80.0	
11096-82-5	Arochlor-1260	160.0	

Handwritten vertical notes on the right side of the table, including "11/28" and "15/91".

Handwritten note: "ok 313.2754 313.2"

Handwritten note: "Sj 11/10/92"

Handwritten note: "215/93"

9613497.2065

1D  
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015H1  
216-B-50B 28-30.5  
split

Lab Name: Battelle PNL

Contract:

Lab Code: PNL

Case No.:

SAS No.:

SDG No.: 8

Matrix: (soil/water) Soil

Lab Sample ID: 92-00358-P-1

Sample wt/vol: 29.7 (g/mL) g

Lab File ID: -----

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec. 3.4 dec. ----

Date Extracted: 10/17/91

Extraction: (SepF/Cont/Sonc) Sonc

Date Analyzed: 11/28/91

GPC Cleanup: (Y/N) N pH: 8.5

Dilution Factor: 1.00000

CAS NO. COMPOUND CONCENTRATION UNITS:  
(ug/L or ug/Kg) ug/Kg Q

319-84-6	alpha-BHC	8.0	U
319-85-7	beta-BHC	8.0	U
319-86-8	delta-BHC	8.0	U
58-89-9	gamma-BHC (Lindane)	8.0	U
76-44-8	Heptachlor	8.0	U
309-00-2	Aldrin	8.0	U
1024-57-3	Heptachlor epoxide	8.0	U
959-98-8	Endosulfan I	8.0	U
60-57-1	Dieldrin	16.0	U
72-55-9	4,4'-DDE	16.0	U
72-20-8	Endrin	16.0	U
33213-65-9	Endosulfan II	16.0	U
72-54-8	4,4'-DDD	16.0	U
1013-07-8	Endosulfan sulfate	16.0	U
50-29-3	4,4'-DDT	16.0	U
72-43-5	Methoxychlor	80.0	U
53494-70-5	Endrin ketone	16.0	U
5103-71-9	alpha-Chlordane	80.0	U
5103-74-2	gamma-Chlordane	80.0	U
8001-35-2	Toxaphene	160.0	U
12674-11-2	Arochlor-1016	80.0	U
11104-28-2	Arochlor-1221	80.0	U
11141-16-5	Arochlor-1232	80.0	U
53469-21-9	Arochlor-1242	80.0	U
12672-29-6	Arochlor-1248	80.0	U
11097-69-1	Arochlor-1254	160.0	U
11096-82-5	Arochlor-1260	160.0	U

Handwritten notes: "U" and "45 U" with arrows pointing to the concentration column. A vertical line is drawn on the right side of the table. At the bottom right, there is a signature "at 5/93".

FORM I PEST

1/89 Rev.

Handwritten signature: "G 11/10/92"

1D  
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: Battelle-PNL Contract: --- B015K3  
211-B-50C  
 Lab Code: --- Case No.: --- SAS No.: --- SDG No.: 9 19-20.5  
 Matrix: (soil/water) soil Lab Sample ID: 92-00921-P-1  
 Sample wt/vol: 30.1 (g/mL) g Lab File ID: ---  
 Level: (low/med) low Date Received: 10/23/91  
 % Moisture: not dec. 4.7 dec. --- Date Extracted: 10/30/91  
 Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 12/06/91  
 GPC Cleanup: (Y/N) N pH: 7.5 Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS:	
		(ug/L or ug/Kg)	ug/Kg
319-84-6	alpha-BHC	8.0	U
319-85-7	beta-BHC	8.0	U
319-86-8	delta-BHC	8.0	U
58-89-9	gamma-BHC (Lindane)	8.0	U
76-44-8	Heptachlor	8.0	U
309-00-2	Aldrin	8.0	U
1024-57-3	Heptachlor epoxide	8.0	U
959-98-8	Endosulfan I	8.0	U
60-57-1	Dieldrin	16.0	U
72-55-9	4,4'-DDE	16.0	U
72-20-8	Endrin	16.0	U
33213-65-9	Endosulfan II	16.0	U
72-54-8	4,4'-DDD	16.0	U
1031-07-8	Endosulfan sulfate	16.0	U
50-29-3	4,4'-DDT	16.0	U
72-43-5	Methoxychlor	80.0	U
53494-70-5	Endrin ketone	16.0	U
5103-71-9	alpha-Chlordane	80.0	U
5103-74-2	gamma-Chlordane	80.0	U
8001-35-2	Toxaphene	160.0	U
12674-11-2	Aroclor-1016	80.0	U
11104-28-2	Aroclor-1221	80.0	U
11141-16-5	Aroclor-1232	80.0	U
53469-21-9	Aroclor-1242	80.0	U
12672-29-6	Aroclor-1248	80.0	U
11097-69-1	Aroclor-1254	160.0	U
11096-82-5	Aroclor-1260	160.0	U

UJ

9/11/13/92

1  
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

91-7815B1  
BOOK 75  
210-B-44A 17-20  
SDG No.: 1

Lab Name: BATTELLE\_PNL Contract: \_\_\_\_\_

Lab Code: ACL Case No.: 1 SAS No.: \_\_\_\_\_

Matrix (soil/water): SOIL Lab Sample ID: 91-7815B1

Level (low/med): MED Date Received: 08/30/91

% Solids: 96.1

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	7420	-	-	P
7440-36-0	Antimony	4.6	✓	N	P
7440-39-3	Barium	59.1	-	-	P
7440-41-7	Beryllium	0.45	B	-	P
7440-43-9	Cadmium	0.58	U	-	P
7440-70-2	Calcium	7290	-	-	P
7440-47-3	Chromium	8.8	-	-	P
7440-48-4	Cobalt	8.3	B	-	P
7440-50-8	Copper	18.3	✓	-	P
7439-89-6	Iron	14500	-	E	P
7439-95-4	Magnesium	4730	-	-	P
7439-96-5	Manganese	288	-	EN	P
7440-02-0	Nickel	14.2	-	-	P
7440-09-7	Potassium	1270	-	-	P
7440-23-5	Sodium	780	B	-	P
7440-00-2	Vanadium	24.8	-	-	P
7440-66-6	Zinc	36.6	Z	F	P

WJ  
KB 12/1/93  
U 3/27/92\*  
Jr. 3/27/92\*  
\*This qualifier does not apply to this sample.  
Guigan 3-27-92

Color Before: \_\_\_\_\_ Clarity Before: \_\_\_\_\_ Texture: \_\_\_\_\_

Color After: \_\_\_\_\_ Clarity After: \_\_\_\_\_ Artifacts: \_\_\_\_\_

Comments: ORIGINAL ANALYTICAL SAMPLE RUN (09/20/91) G 11/3/92



9613497.2069

U.S. EPA - CLP

1  
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

B015G9  
216 508 15.5-17.5

Lab Name: BATTELLE\_PNL \_\_\_\_\_

Contract: \_\_\_\_\_

Lab Code: \_\_\_\_\_

Case No.: \_\_\_\_\_

SAS No.: \_\_\_\_\_

SDG No.: 8,9,10

Matrix (soil/water): SOIL\_

Lab Sample ID: 92-0306B1\_

Level (low/med): LOW\_

Date Received: 12/03/91

% 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	8030	-		P
7440-36-0	Antimony	2.6	U	N	P
7440-39-3	Barium	78.6			P
7440-41-7	Beryllium	0.26	B		P
7440-43-9	Cadmium	2.0			P
7440-70-2	Calcium	7350			P
7440-47-3	Chromium	10.2			P
7440-48-4	Cobalt	7.3	B		P
7440-50-8	Copper	21.5			P
7439-89-6	Iron	22200			P
7439-95-4	Magnesium	4160			P
7439-96-5	Manganese	269			P
7440-02-0	Nickel	11.6			P
7440-09-7	Potassium	793	B		P
7440-23-5	Sodium	596	B		P
7440-62-2	Vanadium	52.1			P
7440-66-6	Zinc	44.1			P

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Color Before: \_\_\_\_\_

Clarity Before: \_\_\_\_\_

Texture: NON-HO

Color After: \_\_\_\_\_

Clarity After: \_\_\_\_\_

Artifacts: \_\_\_\_\_

Comments: ORIGINAL\_SOIL\_SAMPLE\_LEACHATE \_\_\_\_\_  
\_\_\_\_\_

9613497.2070

U.S. EPA - CLP

1  
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

B015H1  
216-B-50B 28-30.5

Lab Name: BATTELLE\_PNL Contract: \_\_\_\_\_

Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: 8,9,10

Matrix (soil/water): SOIL Lab Sample ID: 92-0358B1

Level (low/med): LOW Date Received: 12/03/91

% Solids: 96.1

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6010	/		P
7440-36-0	Antimony	2.8	B	N	P
7440-39-3	Barium	68.6			P
7440-41-7	Beryllium	0.26	B		P
7440-43-9	Cadmium	2.0			P
7440-70-2	Calcium	5670			P
7440-47-3	Chromium	10.3			P
7440-48-4	Cobalt	6.2	B		P
7440-50-8	Copper	18.6			P
7439-89-6	Iron	18600			P
7439-95-4	Magnesium	4240			P
7439-96-5	Manganese	269			P
7440-02-0	Nickel	12.9			P
7440-09-7	Potassium	838	B		P
7440-23-5	Sodium	1070			P
7440-62-2	Vanadium	33.8			P
7440-66-6	Zinc	34.2			P

J  
U  
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KIR  
J

Color Before: \_\_\_\_\_ Clarity Before: \_\_\_\_\_ Texture: NON-HO

Color After: \_\_\_\_\_ Clarity After: \_\_\_\_\_ Artifacts: \_\_\_\_\_

Comments:  
ORIGINAL\_SOIL\_SAMPLE\_LEACHATE  
\_\_\_\_\_



TABLE 8: Hg COLD VAPOR AA ANALYSIS DATA FOR TASKS 2 & 4  
SDG #4

SOLID SAMPLES

Sample ID#	PNL Log#	B1		B2		B1&B2 XRPD	B5		B3 (a)		B4 (b)	
		Sample mg/Kg	Flags C Q	Dupl. mg/Kg	C		Blank ug/L	C	Sample +Spike mg/Kg	Digest Spike %rec	LCS mg/Kg	LCS %rec
216 B-494 17-20 800X75	91-07815 10/16/91	0.14 (0.10)	R N R N	0.15		5.0%	0.04	U	0.23	71.3%	10.1	79.3%
NIST SRM2704											1.3	88.3%

5/11/3/92

- (a) B3 Predigestion Spike Level = 0.05 ug Hg
- (b) LCS 0287 Hg certified at 12.7 mg/Kg (Range 8.5 to 17.) mg/Kg)
- (c) 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 0.005 mg/kg -> 0.2g sample, 25 mL analysis aliquot]
- (f) CRDL = 0.2 ug/L [or 0.1 mg/kg -> 0.2g sample, 100 mL analysis aliquot]
- (g) Calibration standards NIST SRM3133, ICV/CCV standard Johnson-Matthey 14395
- (h) Values in ( ) were analyzed originally on the date indicated.

TABLE x: Hg COLL VAPOR AA ANALYSIS DATA

SOLID SAMPLES

Sample ID#	PNL Log#	B1		B2		B1&B2 %RPD	B5		B3		B4	
		Sample mg/Kg	Flags C Q	Dupl. mg/Kg	C		Blank ug/L	C	Sample +Spike mg/Kg	Digest Spike %rec	LCS mg/Kg	LCS %rec
B00X77	91-6421	0.1 <del>0.04</del>	<del>U</del> N R	0.05	U	N/A	0.20	U	0.06	7.3	12.9	102

216-B-57A  
30-33

cj 11/2/92

spike outside  
75-1258R

9613497-2073

- (a) B3 Predigestion Spike Level = 0.1 ug Hg
- (b) LCS 0287 Hg = 12.7 mg/Kg
- (c) RPD only calculated if both sample and duplicate are >IDL
- (d) IDL = 0.01 ug >>>>> or 0.05 mg/kg based on a 0.2g sample
- (e) CRDL = 0.2 ug/L >>>> or 0.1 mg/kg based on a 0.2g sample

C08-003

TABLE 8: Hg COLD VAPOR AA ANALYSIS DATA FOR TASKS 2 & 4  
SDG #8

SOLID SAMPLES

Sample ID#	PNL Log#	B1		B2		B5			B3 (a)		B4 (b,c)	
		Sample mg/Kg	Flags C Q	Dupl. mg/Kg	C	B1&B2 XRPD	Blank ug/L	C	Sample +Spike mg/Kg	Digest Spike %rec	LCS mg/Kg	LCS %rec
BOOX75 (h)	91-07815	0.14	N	0.15		5.0%	0.04	U	0.23	71.3%	10.1	79.3%
	10/16/91	(0.10)	N									
NIST SRM2704											1.3	66.3%
216-B-508 15.5-17.5 24	92-00306	0.25	J N									
	10/16/91	(0.10)	B N									
	11/04/91	(0.07)	B N	(0.11)	B							
216-B-508 28-30.5	92-00358	0.07	J N									
	10/16/91	(0.20)	N	(0.22)								
	11/04/91	(0.22)	N	(0.15)	B							

- (a) B3 Predigestion Spike Level = 0.05 ug Hg
- (b) LCS 0287 Hg certified at 12.7 mg/Kg (Range 8.5 to 17.0 mg/Kg)
- (c) 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 0.005 mg/kg -> 0.2g sample, 25 mL analysis aliquot]
- (f) CRDL = 0.2 ug/L [or 0.1 mg/kg -> 0.2g sample, 100 mL analysis aliquot]
- (g) Calibration standards NIST SRM3133, ICV/CCV standard Johnson-Matthey 14395
- (h) BOOX75 not part of SDG; sample used for QC during batch analysis.
- (i) Values in ( ) were analyzed originally on the date indicated.

5/11/92

9613497.2074

TABLE 8: Hg COLD VAPOR AA ANALYSIS DATA FOR TASKS 2 & 4  
SDG #9

SOLID SAMPLES

Sample ID#	PNL Log#	B1		B2		B5			B3 (a)		B4 (b,c)	
		Sample mg/Kg	Flags C Q	Dupl. mg/Kg	C	B1&B2 XRPD	Blank ug/L	C	Sample +Spike mg/Kg	Digest Spike %rec	LCS mg/Kg	LCS %rec
BOOX75 (h)	91-07815 10/16/91	0.14 (0.10)	N N	0.15		5.0%	0.04	U	0.23	71.3%	10.1	79.3%
NIST SRM2704											1.3	88.3%
BO15K3	92-00921 <del>11/04/91</del>	0.09 (0.06)	R B N									

216-B-50c 19-20.5

25

- (a) B3 Predigestion Spike Level = 0.05 ug Hg<sup>2+</sup>
- (b) LCS 0287 Hg certified at 12.7 mg/Kg (Range 8.5 to 17.0 mg/Kg)
- (c) 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 0.005 mg/kg -> 0.2g sample, 25 mL analysis aliquot]
- (f) CRDL = 0.2 ug/L [or 0.1 mg/kg -> 0.2g sample, 100 mL analysis aliquot]
- (g) Calibration standards NIST SRM3133, ICV/CCV standard Johnson-Matthey 14395
- (h) BOOX75 not part of SDG; sample used for QC during batch analysis.
- (i) Values in ( ) were analyzed originally on the date indicated.

CLP Forms

- N = Spiked sample recovery not within control limits
- U = Analyzed but not detected (less than IDL)
- B = Less than CRDL but greater than or equal to IDL

*g. Miller*

TABLE 7: GRAPHITE FURNACE AA ANALYSIS DATA

SOLID SAMPLES

216-B-49A  
17-20

Analyte	Sample ID#	PNL Log#	B1				B2				B5				B3		B4		
			Sample mg/Kg	Post Spike XRec	Flags C Q	Dupl. mg/Kg	Post Spike XRec	C	B1&B2 XRPD	Blank µg/L	Post Spike Xrec	C	Sample+ Spike µg/L	Digest Spike Xrec	LCS mg/Kg	LCS Xrec	Post Spike Xrec		
Ag	B00X75	91-7815	0.09	92	U	0.09	93	U	N/A	0.50	102	U	30.8	77	22.6	102	74		
As	B00X75	91-7815	2.30	86	J	2.30	101		0.0	0.60	99	U	49.6	93	721.7	78.7	85		
Pb	B00X75	91-7815	5.90	95		6.10	95		3.3	2.40	85	U	49.0	89	261.7	111	106.		
Se	B00X75	91-7815	0.14	86	U	0.14	96	U	N/A	0.80	100	U	8.3	83	39.5	101	98		
Tl	B00X75	91-7815	0.22	96	U	0.22	95	U	N/A	1.20	97	U	43.1	86	34.4	86	87		

OK  
11/14/92

21

Analyte	Sample ID#	PNL Log#	B1				B2				B5				B3		B6		
			Sample mg/Kg	Post Spike XRec	Flags C Q	Dupl. mg/Kg	Post Spike XRec	C	B1&B2 XRPD	Blank µg/L	Post Spike Xrec	C	Sample+ Spike µg/L	Digest Spike Xrec	LCS µg/L	LCS Xrec	Post Spike Xrec		
Bi	B00X75	91-7815	0.27	94	U	0.27	96	U	N/A	1.50	93	U	41.0	102.5	46.0	115	98		

no qual <IDL

11/14/92

- (a) CRDL (µg/L): Ag=10, As=10, Bi=60, Pb=3, Se=5, Tl=10
- (b) IDL (µg/L): [PE5000 7/10/91] Ag=0.5, As=0.6, Se=0.8; [PE5100 6/4/91] Bi=1.5, Pb=2.4, Tl=1.2
- (c) Analytical spike (µg/L): Ag=5, As=10, Bi=20, Pb=6, Se=10, Tl=20
- (d) Pre-digestion spike (µg/L): Ag=40, As=40, Bi=20, Pb=20, Se=10, Tl=50
- (e) LCS standard: Ag, As, Pb, Se, Tl -- ICF 0287; Bi -- NIST 3109
- (f) ICVV/CCV Used During Analysis: Ag, Pb&Tl -- ICF 0389; As&Se -- ICF 0590; Bi -- NIST 3106
- (g) RPD only calculated if both sample and duplicate are greater than IDL.

9/13/91: 2076

TABLE 6: GRAPHITE FURNACE AA ANALYSIS DATA

SOLID SAMPLES

216-B-57A  
30-33

Analyte	Sample ID#	PNL Log#	-----B1-----				-----B2-----			B1&B2 XRPD	-----B5-----			-----B3-----		-----B4-----		
			Sample mg/Kg	Post Spike XRec	Flags C Q	Dupl. mg/Kg	Post Spike Xrec	C	Blank µg/L		Post Spike Xrec	C	Sample+ Spike µg/L	Digest Spike Xrec	LCS mg/Kg	LCS Xrec	Post Spike Xrec	
Ag	B00X77	91-6421	10 0.09	101	U	0.09	108	U	N/A	0.50	98	U	32.3	82	23.5	106	102	
As	B00X77	91-6421	2.40	96	JB	2.30	101	U	4.3	0.60	102	U	49.3	89	930.1	101	95	
Pb	B00X77	91-6421	5.50	93	U	5.90	95	U	7.0	1.00	110	U	47.0	81	250.1	106	88	
Se	B00X77	91-6421	0.14	91	U	0.14	93	U	N/A	0.80	92	U	8.3	83	39.8	102	95	
Tl	B00X77	91-6421	1.00-18	94	U	0.18	96	U	N/A	1.00	95	U	47.4	93	40.8	105	71	
Bi	B00X77	6421	60		U													

Analyte	Sample ID#	PNL Log#	-----B1-----				-----B2-----			B1&B2 XRPD	-----B5-----			-----B3-----		-----B4-----		
			Sample mg/Kg	Post Spike XRec	Flags C Q	Dupl. mg/Kg	Post Spike Xrec	C	Blank µg/L		Post Spike Xrec	C	Sample+ Spike µg/L	Digest Spike Xrec	LCS µg/L	LCS Xrec	Post Spike Xrec	
Bi	B00X77	91-6421	0.29	98	U	0.29	92	U	N/A	1.5	99	U	39.0	97	38.4	96	99	

- (a) CRDL (µg/L): Ag=10, As=10, Bi=60, Pb=3, Se=5, Tl=10
- (b) IDL (µg/L): (PE5000 7/10/91) Ag=0.5, As=0.6, Bi=1.5, Pb=1.0, Se=0.8, Tl=1.0
- (c) Analytical spike (µg/L): Ag=5, As=10, Bi=20, Pb=6, Se=10, Tl=20
- (d) Pre-digestion spike (µg/L): Ag=40, As=40, Bi=20, Pb=20, Se=10, Tl=50
- (e) LCS standard: Ag, As, Pb, Se, Tl -- ICF 0287; Bi -- NIST 3109
- (f) ICSV/CCV Used During Analysis: Ag, Pb&Tl -- ICF 0389; As&Se -- ICF 0590; Bi -- NIST 3106
- (g) RPD only calculated if both sample and duplicate are greater than IDL.

C07-003

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LCS outside  
80-120  
limits  
qual. as  
UJ.  
8/11/92-

U.S.EPA-CLP

1  
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: BATTELLE/PNL Contract: BOISHI  
 Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: 214-B-503 28+30.5  
 Matrix (soil/water): SOIL Lab SAMPLE ID: 92-00358 split  
 Level (low/med): LOW Date Received: 10/11/91  
 % Solids: 97.0

Concentration Units (ug/L or mg/Kg dry weight) mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
17429-90-5	Aluminum				
17440-36-0	Antimony				
17440-38-2	Arsenic	5.44			F JB
17440-39-3	Barium				
17440-41-7	Beryllium				
17440-69-9	Bismuth	0.17	U		
17440-43-9	Cadmium				
17440-70-2	Calcium				
17440-47-3	Chromium				
17440-48-4	Cobalt				
17440-50-8	Copper				
17439-89-6	Iron				
17439-92-1	Lead	2.93			F JB
17439-95-4	Magnesium				
17439-96-5	Manganese				
17439-97-6	Mercury				
17440-02-0	Nickle				
17440-09-7	Potassium				
17782-49-2	Selenium	8.06 5	U		F
17440-22-4	Silver	0.04 10	U		F JJ U
17440-23-5	Sodium				
17440-28-0	Thallium	0.70	B		F
17440-62-2	Vanadium				
17440-66-6	Zinc				
	Cyanide				

Color Before: gray-brown Clarity Before: N/A Texture: heterogeneous  
 Color After: gray Clarity After: clear-digt Artifact: N/A

Comments:  
 These samples were undesirably heterogeneous.  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

9/11/92

U.S.EPA-CLP

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: BATTELLE/PNL Contract: 210-B-508 15.5-17.5  
 Lab Code:            Case No.:            SAS No.:            SDG No.:             
 Matrix (soil/water): SOIL Lab SAMPLE ID: 92-00306  
 Level (low/med): LOW Date Received: 10/08/91  
 % Solids: 97.0

Concentration Units (ug/L or ug/Kg dry weight) mg/Kg

CAS No.	Analyte	Concentration	C	D	M
17429-90-5	Aluminum				
17440-36-0	Antimony				
17440-38-2	Arsenic	6.47			F
17440-39-2	Barium				
17440-41-7	Beryllium				
17440-69-9	Bismuth	0.17	U		F
17440-43-9	Cadmium				
17440-70-2	Calcium				
17440-47-3	Chromium				
17440-48-4	Cobalt				
17440-50-8	Copper				
17439-89-6	Iron				
17439-92-1	Lead	3.11			F
17439-95-4	Magnesium				
17439-96-8	Manganese				
17439-97-6	Mercury				
17440-02-0	Nickel				
17440-09-7	Potassium				
17782-49-2	Selenium	0.05 5	U		F
17440-22-4	Silver	0.04 10	U		F
17440-23-5	Sodium				
17440-28-0	Thallium	0.13 10	U		F
17440-62-2	Vanadium				
17440-66-6	Zinc				
	Cyanide				

JB

GFU

Color Before: gray-brown Clarity Before: N/A Texture: heterogeneous  
 Color After: gray Clarity After: clear-digt Artifact: N/A

Comments:

These samples were Undesirably heterogeneous.

5/11/92

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: BATTTELLE/PNL Contract: BOISK3  
 Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: \_\_\_\_\_  
 Matrix (soil/water): SOIL Lab SAMPLE ID: 92-00921  
 Level (low/med): LOW Date Received: 10/23/91  
 % Solids: 97.0

Concentration Units (ug/L or mg/Kg dry weight) mg/Kg

CAS No.	Analyte	Concentration	C	D	M
17429-90-5	Aluminum				
17440-36-0	Antimony				
17440-38-2	Arsenic	8.22			F B
17440-39-3	Barium				
17440-41-7	Beryllium				
17440-69-9	Bismuth	0.17			F W U
17440-43-9	Cadmium				
17440-70-2	Calcium				
17440-47-3	Chromium				
17440-48-4	Cobalt				
17440-50-8	Copper				
17439-89-6	Iron				
17439-92-1	Lead	3.21			F
17439-95-4	Magnesium				
17439-96-5	Manganese				
17439-97-6	Mercury				
17440-02-0	Nickel				
17440-09-7	Potassium				
17782-49-2	Selenium	0.05 5	U		F
17440-22-4	Silver	0.04 10	X		F W U
17440-23-5	Sodium				
17440-28-0	Thallium	0.13 10	U		F
17440-62-2	Vanadium				
17440-66-6	Zinc				
	Cyanide				

Color Before: gray-brown Clarity Before: N/A Texture: heterogeneous  
 Color After: gray Clarity After: clear-digt Artifact: N/A

Comments:  
 These samples were undesirably heterogeneous.

03/11/92

TABLE 4: TOTAL CYANIDE ANALYSIS DATA FOR TASKS 2 AND 4  
SDG #4

SOIL-SEDIMENT SAMPLES

Sample ID#	PNL Log#	Sample G1 (mg/kg)	C	Sample dup. G2 (mg/kg)	C	XRPD	Blank G5 (µg/L)	C	Spike added (µg)	Sample+ spike G3 (mg/kg)	sample G4 (ICV) (mg/L)	Sample+ spike G3 recovery(%)	sample G4 (ICV) recovery(%)	Flags Q	Footnote#
14-B-49A 3-5-5 14-B-49A 4-5-11 BOOX68	91-7426	0.6	U	0.6	U	N/A	5.9	U	41.6	8.6	10.7	100	113		1,2,3 ALL
14-B-49A BOOX70	91-7427	0.6	U												
14-B-49A 82-84.5 BOOX72	91-7504	0.6	UJ	0.6	UJ	N/A	5.9	U	39.5	8.1	10.3	99	109		
14-B-57A 109.5-112 BOOX74	91-7623	0.6	U	0.6	U	N/A	5.9	U	39.5	8.3	9.1	103	97		
14-B-57A 131-141.5 BOOX90	91-7807	0.6	U	0.6	U	N/A	5.9	U	39.5	7.7	9.8	98	105		
14-B-57A 106.5-109 BOOX92	91-7875	0.6	U												
14-B-49A 17-20 BOOX75	91-7815	1.6		1.7		3.53	5.9	U	39.5	9.8	10.3	99	110		
												Mean	99.4	106.8	
												Std. Dev.	0.5	2.0	

Footnotes

1. Concentration of stock ICV-6=9.4 mg/L (9.4 µg of cyanide is added to each distillation flask and recovered in 250 mL of NaOH).
2. Contract required detection limit for soil-sediment = 1.0 mg/kg.
3. Duplicate precision under the CLP protocol must be within one CRDL when either sample or duplicate are below 5X CRDL.
4. Sample BOOX94 not part of this data package.

WATER SAMPLES

g 11/3/92

Sample ID#	PNL Log#	Sample G1 (µg/L)	C	Sample dup. G2 (µg/L)	C	XRPD	Blank G5 (µg/L)	C	Spike added (µg)	Sample+ spike G3 (µg/L)	sample G4 (ICV) (mg/L)	Sample+ spike G3 recovery(%)	sample G4 (ICV) recovery(%)	Flags Q	Footnote#
14-B-57A Trip blank BOOXCO	91-7505	5.9	U	5.9	U	N/A	5.9	U	41.6	85	11	103.0	117.0		1,2,4 ALL
14-B-57A Trip blank BOOX84	91-7624	5.9	U	5.9	U	N/A	5.9	U	39.5	157	10.8	96.0	115.0		3
												Mean	99.5	116.0	
												Std. Dev.	3.5	1.0	

Footnotes

1. Concentration of stock ICV-6=9.4 mg/L (9.4 µg of cyanide is added to each distillation flask and recovered in 250 mL of NaOH).
2. Contract required detection limit for water = 10 µg/L.
3. Used 250 mL of sample per distillation due to limited sample size of 1.5L of total sample.
4. Duplicate precision under the CLP protocol must be within one CRDL when either sample or duplicate are below 5X CRDL.

CLP FLAGS

U = Analyzed but not detected (less than IDL)

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9613497-2082

# REPORT OF ANALYSIS FOR TOTAL CYANIDE IN SOLID SAMF

Client : WHC, 200-BP-1  
 Project : 16772  
 Work order : M63023  
 Task-work package : Task 2&4,3  
 Test instruction : 200BP-1-66

Distillation analyst: Shawn Homi *SH* 12-3-91  
 Colorimetric analyst: James Robbins *J. Robbins* 12-3-91  
 Data reduction: James Robbins *J. Robbins* 12-3-91  
 Data Reviewer: Mike Urie *MU* 12-4-91

### Cyanide analysis results

Client sample I.D.#	PNL-ACL sample #	Total CN (mg/kg)	Date received	Date distilled	Date analyzed	CLP flags
BOOX64	91-6420-G1	0.6	7/10/91	7/22/91	7/22/91	U

*216-B-57A  
30-33*

### Cyanide analysis CLP quality assurance data

CLP data type	PNL-ACL sample #	Total CN (mg/kg)	Recovery (%)	Total CN (µg/l)	CLP flags	Sample QA identifiers
BOOX64	91-6420-G2	0.6			U	G1 = Sample
Sample RPD		N/A				G2 = sample duplicate
Method blank	91-6420-G5			5.9	U	G3 = Sample + CN spike
						G4 = LCS(ICV-6)
						G5 = method blank
Spiked sample	91-6420-G3	8.3				
Spike recovery	91-6420-G3		100			
ICV-6	91-6420-G4	10.39 mg/L				
ICV-6 recovery	91-6420-G4		111			

*JMR 12-20-91*

Contract required detection limit (mg/kg): 1  
 Instrument detection limit (mg/kg) [1]: 0.6

Analytical method: PNL-ALO-270  
 Distillation reference: LRB54027, pg. 106  
 Analysis reference: LRB54027, pg. 109  
 CN standardization ref: LRB54027, pg. 64  
 %solids reference: LRB54027, pg. 119

Instrumentation M&TE#: WA54726 Spectronic 21 colorimeter *g 11/2/92*  
WB 80669 Mettler AT400 analytical balance

[1] Instrument detection limit (IDL) based on the EPA CLP method for determining IDL. If the IDL were based on the standard deviation of laboratory control sample (ICV-6) recovery vs certified value for the period 9/90-9/91, the IDL would be 2 µg/L.  
 [2] QA data support accompanying backwash water sample distilled in the same run. *JMR 12-20-91*

**REPORT OF ANALYSIS FOR TOTAL CYANIDE IN SOLID SAMPLES**

Client : WHC, 200-BP-1  
 Project : 16772  
 Work order : M63023  
 Task-work package : Task 2&4,3  
 Test instruction : 200BP-1-63

Distillation analyst: Shawn Homi *SH* 12-3-91  
 Colorimetric analyst: Shawn Homi *SH* 12-3-91  
 Data reduction: James Robbins *J Robbins* 12-3-91  
 Data Reviewer: Mike Urie *M Urie* 12-4-91

**Cyanide analysis results**

Client sample I.D.#	PNL-ACL sample #	Total CN (mg/kg)	Date received	Date distilled	Date analyzed	CLP flags
<b>BOOX77</b>	91-6421-G1	<b>0.6</b>	7/10/91	8/13/91	8/15/91	<b>U R</b>

*210-B-57A  
30-3.3*

*gj 10/30  
HT out*

**Cyanide analysis CLP quality assurance data**

CLP data type	PNL-ACL sample #	Total CN (mg/kg)	Recovery (%)	Total CN (µg/l)	CLP flags	Sample QA identifiers
<b>BOOX77</b>	91-6421-G2	<b>0.6</b>			<b>U</b>	G1 = Sample
Sample RPD		N/A				G2 = sample duplicate
Method blank	91-6421-G5			<b>5.9</b>	<b>U</b>	G3 = Sample + CN spike
						G4 = LCS(ICV-6)
						G5 = method blank
Spiked sample	91-6421-G3	<b>7.8</b>				
Spike recovery	91-6421-G3		<b>94</b>			
ICV-6	91-6421-G4	<b>10.14 mg/L</b>		<i>JMR</i>	<b>12-20-91</b>	
ICV-6 recovery	91-6421-G4		<b>108</b>			

Contract required detection limit (mg/kg): **1**  
 Instrument detection limit (mg/kg) [1]: **0.6**

Analytical method: **PNL-ALO-270**  
 Distillation reference: **LRB54027, pg. 134**  
 Analysis reference: **LRB54341, pg. 7**  
 CN standardization ref: **LRB54174, pg. 48**  
 %solids reference: **LRB53930, pg. 31**

*gj 11/2/92*

Instrumentation M&TE#: **WA54726** Spectronic 21 colorimeter  
**WB 80669** Mettler AT400 analytical balance

[1] Instrument detection limit (IDL) based on the EPA CLP method for determining IDL. If the IDL were based on the standard deviation of laboratory control sample (ICV-6) recovery vs certified value for the period 9/90-9/91, the IDL would be 2 µg/L.  
 [2] QA data support accompanying backwash water sample distilled in the same run. *JMR 12-20-91*

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## REPORT OF ANALYSIS FOR TOTAL CYANIDE IN SOLID SAMPLES

page 1 (of 3)

Client : WHC, 200-BP-1  
 Project : 16772  
 Work order : M63023  
 Task-work package : Task 2&4,3  
 Test instruction : 200BP-1-72

Distillation analyst: Shawn Homi *A.J.L.* 12-3-91  
 Colorimetric analyst: James Robbins *J. Robbins* 12-3-91  
 Data reduction: James Robbins *J. Robbins* 12-3-91  
 Data Reviewer: Mike Urie *MU* 12-9-91

## Cyanide analysis results

Client sample I.D.#	PNL-ACL sample #	Total CN (mg/kg)	Date received	Date distilled	Date analyzed	CLP flags
BOOX66	91-6906-G1	<del>0.6</del> 1	7/19/91	7/22/91	7/22/91	U
BOOX78	91-6907-G1	<del>0.6</del> 1	7/19/91	7/22/91	7/22/91	U

## Cyanide analysis CLP quality assurance data

CLP data type	PNL-ACL sample #	Total CN (mg/kg)	Recovery (%)	Total CN (µg/l)	CLP flags	Sample QA identifiers
BOOX66 Sample RPD	91-6906-G2	0.6			U	G1 = Sample
Method blank	91-6906-G5			5.9	U	G2 = sample duplicate G3 = Sample + CN spike G4 = LCS(ICV-6) G5 = method blank
Spiked sample	91-6906-G3	8.0				
Spike recovery	91-6906-G3		91			
ICV-6	91-6906-G4	10.03 mg/L		<i>8mR</i>		12-20-91
ICV-6 recovery	91-6906-G4		107			

Contract required detection limit (mg/kg): 1  
 Instrument detection limit (mg/kg) [1]: 0.6

Analytical method: PNL-ALO-270  
 Distillation reference: LRB54027, pg. 107  
 Analysis reference: LRB54027, pg. 108  
 CN standardization ref: LRB54027, pg. 64  
 %solids reference: LRB54027, pg. 119

Instrumentation M&TE#: WA54726 Spectronic 21 colorimeter  
 WB 80669 Mettler AT400 analytical balance

[1] Instrument detection limit (IDL) based on the EPA CLP method for determining IDL. If the IDL were based on the standard deviation of laboratory control sample (ICV-6) recovery vs certified value for the period 9/90-9/91, the IDL would be 2 µg/L.

[2] QA data support accompanying backwash water sample distilled in the same run. *8mR* 12-20-91

C05-018

REPORT OF ANALYSIS FOR TOTAL C

LIQUID SAMPLES

Client : WHC, 200-BP-1  
 Project : 16772  
 Work order : M63023  
 Task-work package : Task 2&4,3  
 Test instruction : 200BP-1-71

Distillation analyst: Shawn Homi *A.H.* 12-3-91  
 Colorimetric analyst: Shawn Homi *A.H.* 12-3-91  
 Data reduction: James Robbins *J. Robbins* 12-3-91  
 Data Reviewer: Mike Urie *M.Urie* 12-4-91

Cyanide analysis results

Client	PNL	Total CN	Date	Date	Date	CLP flags
sample I.D. #	ACL sample #	(µg/l)	received	distilled	analyzed	
BOOX82	91-6693-G1	19.4	7/17/91	7/29/91	7/30/91	J 4/11/2/91 dup. RPD out
<i>216-B-57A equipment blank</i>						

Cyanide analysis CLP quality assurance data

CLP data type	PNL-ACL sample #	Total CN (µg/l)	Recovery (%)	CLP flags	Sample QA identifiers
0	91-6693-G2	10.2			G1 = Sample
Sample RPD		61.83	90	DMR 12-20-91	G2 = sample duplicate G3 = Sample + CN spike
Method blank	91-6693-G5	5.9		U	G4 = LCS(ICV-6) G5 = method blank
Spiked sample	91-6693-G3	168.0			
Spike recovery	91-6693-G3		89		
ICV-6	91-6693-G4	10.66			
ICV-6 recovery	91-6693-G4		113		

Contract required detection limit(µg/l): 10  
 Instrument detection limit in (µg/l) [1]: 5.9

Analytical method: PNL-ALO-270  
 Distillation reference: LRB54027, pg. 114  
 Analysis reference: LRB54027, pg. 117  
 CN standardization reference: LRB54027, pg.64

Instrumentation M&TE#: WA 54726 Spectronic 21 colorimeter  
 WB 80669 Mettler AT400 analytical balance

ANALYSIS NOTES:

[1] Instrument detection limit (IDL) based on the EPA CLP method for determining IDL. If the IDL were based on the standard deviation of laboratory control sample (ICV-6) recovery vs certified value for the period 9/90-9/91, the IDL would be 2 µg/L

TABLE 4: TOTAL CYANIDE ANALYSIS DATA FOR TASK 284  
SDG #8

SOIL-SEDIMENT SAMPLES

Sample ID#	PNL Log#	Sample G1 (mg/kg)	C	Sample dup. G2 (mg/kg)	C	XRPD	Blank G5 (µg/L)	C	Spike added (µg)	Sample+ spike G3 (mg/kg)	sample G4 (ICV) (mg/L)	Sample+ spike G3 recovery(%)	sample G4 (ICV) recovery(%)	Flags Q	Footnote 1,2,3 (ALL)	
16-B-49A 10A 5-107	B01564	0.8	UJ	0.8	B	N/A	5.9	U	48.55	10.5	10.1	98	107			
16-B-50B 3.5-6	B01568	0.8	UJ	0.8	U	N/A	5.9	U	48.55	10.1	10.3	100	109			
16-B-50B 12-16	B01568	0.8	UJ	0.8	U	N/A	5.9	U	48.55	10.1	10.3	100	109			
16-B-50B 15.5-17.5	B01569	0.8	UJ	0.8	U	N/A	5.9	U	48.55	9.3	10.5	100	112			
16-B-50B 28-30.5	B015H1	0.8	UJ	0.8	U	N/A	5.9	U	48.55	11.2	9.96	96	106			
16-B-50B 29-30.5	B015H4	0.8	UJ	0.8	U	N/A	5.9	U	48.55	11.2	9.96	96	106			
16-B-49A 135-137.5	B015H6	1.5		1.7		7.9	5.9	U	48.55	11.2	9.96	96	106			
												Mean	99	109		
												Std. Dev.	2	2		

Footnotes

1. Concentration of stock ICV-6-9.4 mg/L (9.4 µg of cyanide is added to each distillation flask and recovered in 250 mL of NaOH).
2. Contract required detection limit for soil-sediment = 1.0 mg/kg.
3. Duplicate precision under the CLP protocol must be within one CRDL when either sample or duplicate are below SX CRDL.

gillke

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TABLE 4a: TOTAL CYANIDE ANALYSIS DATA FOR TASK 2&4  
SDG #9

SOIL-SEDIMENT SAMPLES													
Sample ID#	PNL Log#	Sample G1 (mg/kg)	C	Sample dup. G2 (mg/kg)	C	XRPD	Blank G5 (µg/L)C	Spike added (µg)	Sample+ spike G3 (mg/kg)	sample G4 (ICV) (mg/L)	Sample+ spike G3 recovery(%)	sample G4 (ICV) recovery(%)	Flags Q Footnoted
													1,2,3 (ALL)
216-B-50C 3.5-6D	B015H8 92-00570	1.0 0.0	U	0.6	U	N/A	5.9 U	48.55	10.0	9.67	99	103	
216-B-50C 3.5-6D	B015J8 92-00571	1.0 0.6	U										
216-B-50C 11-15	B015K0 92-00572	1.0 0.0	U	0.6	U	N/A	5.9 U	48.55	9.7	9.59	95	102	
216-B-49A 10-24	B015K2 92-00922	0.8	B										
216-B-50C 29-30.5	B015K6 92-00931	1.0 0.0	U	0.6	U	N/A	5.9 U	48.55	10.1	10	101	106	
216-B-50C 19-20.5	B015K3 92-00921	1.0 0.0	U										
	<del>B015L0 92-01202*</del>	<del>0.7</del>	<del>B</del>	<del>0.0</del>	<del>B</del>	<del>N/A</del>	<del>5.9 U</del>	<del>48.6</del>	<del>11</del>	<del>9.5</del>	<del>103</del>	<del>101</del>	<del>4.6</del>
	<del>B015K8 92-00977</del>	<del>1.2</del>											<del>5</del>
	<del>B015L0 92-01202*</del>	<del>1.0 0.0</del>	<del>U</del>	<del>1.5</del>		<del>N/A</del>	<del>5.9 U</del>	<del>49.38</del>	<del>11.7</del>	<del>11.05</del>	<del>113</del>	<del>118</del>	<del>4.6</del>
	<del>B015K8 92-00977</del>	<del>1.2 1.4</del>	<del>J</del>										<del>8</del>
	Not samples in the SDG but reported for QC purposes												
									Mean		100	103	
									Std. Dev.		3	2	

15

216-B-49A  
190.5-193

9613497.2087

data not used  
HT exceeded

Footnotes

1. Concentration of stock ICV-6-9.4 mg/L (9.4 µg of cyanide is added to each distillation flask and recovered in 250 mL of NaOH).
2. Contract required detection limit for soil-sediment = 1.0 mg/kg.
3. Duplicate precision under the CLP protocol must be within one CRDL when either sample or duplicate are below 5X CRDL.
4. Sample B015L0 is not part of this data package.
5. Repeat of cyanide analyses for samples B015L0 and B015K8, as the ICV in initial analysis run (6) exceeded the CLP control limit of 115X
6. Initial analysis run for samples B015L0 and B015K8.

CLP Flags

- U = Analyzed but not detected (less than IOL)
- B = Less than CRDL but greater than or equal to IOL

g 11/11/92

TABLE 4b: TOTAL CYANIDE ANALYSIS DATA FOR TASK 284  
SDG #9

WATER SAMPLES

Sample ID#	PWL Log#	Sample G1 (µg/L)	Sample dup. G2 (µg/L)	C	XRPD	Blank G5 (µg/L)C	Spike added (µg)	Sample+ spike G3 (µg/L)	sample G4 (ICV) (mg/L)	Sample+ spike G3 recovery(%)	sample G4 (ICV) recovery(%)	Flags Q	Footnote#
BOOX88	92-00975	5.9	5.9	U	N/A	5.9 U	49.4	98.5	9.39	102.0	100.0		1,2,3
BO15H0	92-00976	5.9	5.9	U									1,2,3
										Mean	102.0	100.0	
										Std. Dev.	NA	NA	

10-B-50c  
1. Blank  
10-B-44A  
120 field blank

Footnotes

1. Concentration of stock ICV-6-9.4 mg/L (9.4 µg of cyanide is added to each distillation flask and recovered in 250 mL of NaOH).
2. Contract required detection limit for water = 10 µg/L.
3. Duplicate precision under the CLP protocol must be within one CRDL when either sample or duplicate are below 5X CRDL.

CLP Flags

- U = Analyzed but not detected (less than IDL)
- B = Less than CRDL but greater than or equal to IDL

15

5/11/02

9613497, 2088

TABLE 3: ANION IC ANALYSIS DATA

NITRATE (NO3-N)

SOLID SAMPLES

SAMPLE ID#	PNL LOG#	C1 SAMPLE (mg/Kg)	C2 SAMPLE DUP (mg/Kg)	Spike & Spk Dupl RPD	C5 BLANK (ug/mL)	C3			C6		% RECOVERIES			
						SPIKE+SAMPLE (mg/Kg)	SPIKE (mg/Kg)	DUP+SPIKE (mg/Kg)	SPIKE (mg/Kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE	C4 BLANK+ SPIKE		
BOOX77 (*)	91-8421	5.3	**		<IDL	1273	370	333.6	1302	415	384	116		
BOOX75	91-7815	887 200	**	2.4%	<IDL	207.0	83.4	204.0	86.9	104.3	108.2	98.2		
										C3 & C6 mean std. dev.		106.3 n/a		

210-B-46A  
17-20

02/14/93

IDL = 0.6 mg/Kg, 6.8 ug/L  
CRDL = 1 mg/Kg, 15 ug/L

\* Sample not part of data package

\*\* No sample duplicates analyzed; Spike duplicates MS(C3) and MSD(C6) used to evaluate precision.

9/11/192

9613497-2089

TABLE 3: ANION IC ANALYSIS DATA

NITRITE (NO2-N)

SOLID SAMPLES

SAMPLE ID#	PNL LOG#	C1 SAMPLE (mg/Kg)	C2 SAMPLE DUP (mg/Kg)	Spike & Spk Dupl RPD	C5 BLANK (ug/mL)	C3		C6		% RECOVERIES			
						SPIKE+SAMPLE (mg/Kg)	SPIKE (mg/Kg)	DUP+SPIKE (mg/Kg)	SPIKE (mg/Kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE	C4 BLANK+ SPIKE	
BOOX77 (*)	91-6421	<IDL	**										
BOOX75	91-7815	1.0	1.0	2.8%	<IDL	104.0	112.0	107.0	117.0	92.9	91.5	92.1	
										C3 & C6 mean std. dev.			
										92.2			n/a

216-B-49A  
17-20

2/4/93

IDL = 0.7 mg/Kg, 8.2 ug/L  
CRDL = 1 mg/Kg, 15 ug/L

\* Sample not part of data package

\*\* No sample duplicates analyzed; Spike duplicates MS(C3) and MSD(C6) used to evaluate precision.

5/11/4/92

5/11/4/92

9613497.2090

TABLE 3: ANION IC ANALYSIS DATA

PHOSPHATE (PO4-P)

SOLID SAMPLES

SAMPLE ID#	PNL LOG#	C1 SAMPLE (mg/Kg)	C2 SAMPLE DUP (mg/Kg)	Spike & Spk Dupl RPD	C5 BLANK (ug/mL)	C3		C6		X RECOVERIES		
						SPIKE+SAMPLE (mg/Kg)	SPIKE (mg/Kg)	DUP+SPIKE (mg/Kg)	SPIKE (mg/Kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE	C4 BLANK+ SPIKE
BOOX77 (*)	91-6421	<IDL	**		<IDL	104.0	120.0	107.0	126.0	86.7	84.9	87.7
BOOX75	91-7815	5 <IDL	45 **	2.8%	<IDL							
C3 & C6 mean										85.8		
std. dev.										n/a		

IDL = 1.6 mg/Kg, 29.7 ug/L

CRDL = 5 mg/Kg, 60 ug/L

\* Sample not part of data package

\*\* No sample duplicates analyzed; Spike duplicates MS(C3) and MSD(C6) used to evaluate precision.

216-B-49A  
17-20

11

5111462

9613497.2091

TABLE 3: ANION IC ANALYSIS DATA

SULFATE (SO4)

SOLID SAMPLES

SAMPLE ID#	PNL LOG#	C1 SAMPLE (mg/Kg)	C2 SAMPLE DUP (mg/Kg)	Spike & Spk Dupl RPD	C5 BLANK (ug/mL)	C3		C6		% RECOVERIES		
						SPIKE+SAMPLE (mg/Kg)	SPIKE (mg/Kg)	DUP+SPIKE (mg/Kg)	SPIKE (mg/Kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE	C4 BLANK+ SPIKE
BOOX77 (*)	91-6421	23.6	**		<IDL	537.0	369.0	573.0	385.0	101.6	106.8	100.2
BOOX75	91-7815	162	**	6.5%	<IDL							
C3 & C6 mean std. dev.										104.2	n/a	

IDL = 4.1 mg/Kg, 51 ug/L  
 CRDL = 20 mg/Kg, 250 ug/L

\* Sample not part of data package

\*\* No sample duplicates analyzed; Spike duplicates MS(C3) and MSD(C6) used to evaluate precision.

6 B-44A  
17-20

12

8/11/49

9613497.2092

8/27/91

JOC For 91-7815  
9613497-2093

Proc. # 7-40.37  
Rev. T. 15-11-88

Balance W860304 = 2.00007 g.

91-7815-T-1)	.04760g.	$\frac{mg}{g} = \frac{0.1K/mg \times 10^6}{46.2 - 21} = 529 \text{ ppm TOC}$
2)	.06462g.	$55.6 - 21 = 535 \text{ " "}$

Std. 91-7815-T-3) .00180g.  $677 - 21 \div 720 = 91\% R.$   
 3) .00324g.  $1215 - 21 \div 1296 = 92\% R.$

81K. 91-7815-T-4) 19.5 }  
 1) 22.4 } Ave: 21mg

End 8/27/91 *[Signature]* 9/19/91

200-BP-1 TOTAL ORGANIC CARBON RESULTS

216-B-49A  
17-20

WIC Sample #	PNL Sample #	Result	Analyzed
D00X75	91-7815-T-1	529. mg/kg	08-27-91
"	91-7815-T-2	515. mg/kg	08-27-91
"	91-7815-T-3	91.5 $\mu$	08-27-91
"	91-7815-T-4	21.0 ug	08-27-91
B00X77	91-6421-T-1	194. mg/kg	07-17-91
"	91-6421-T-2	168. mg/kg	07-17-91
"	91-6421-T-3	91.0 $\mu$	07-17-91
"	91-6421-T-4	22.0 ug	07-17-91

Parentetical results are below the reported detection limit of 50ppm.

Total Organic Carbon by PHL Procedure 7-40.37, on Instrument WA92040, 325 Bldg., rm 313. Data reported from LRN 52996, p 133.

BNW  
#52996

Data reported by *[Signature]* Date 8/27/91  
 Data reviewed by *[Signature]* Date 8/27/91

LRN 52996 p 133

Project No. \_\_\_\_\_ Date of Work \_\_\_\_\_  
 Entered By \_\_\_\_\_ Date \_\_\_\_\_  
 Disclosed To and Understood By \_\_\_\_\_  
 Signed *[Signature]* Date 8/27/91  
 \_\_\_\_\_ Date \_\_\_\_\_

BEST COPY AVAILABLE

8/11/91

TABLE 3: ANION IC ANALYSIS DATA

NITRATE (NO<sub>3</sub>-N)

SOLID SAMPLES

SAMPLE ID#	PHL LOG#	C1 SAMPLE (mg/Kg)	C2 SAMPLE DUP (mg/Kg)	Spike & Spk Dupl RPO	C5 BLANK (ug/mL)	C3		C6		% RECOVERIES		
						SPIKE+SAMPLE (mg/Kg)	SPIKE (mg/Kg)	DUP+SPIKE (mg/Kg)	SPIKE (mg/Kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE	C4 BLANK+ SPIKE
08-574 W-33 BOOK77 BOOK75 (*)	91-6421 91-7815	23/05-3 200	J J	2.4%	<IDL	287.0	83.4	294.0	86.9	104.3	108.2	98.2
									C3 & C6 mean std. dev.	106.3 n/a		

IDL = 0.6 mg/Kg, 6.8 ug/L  
 CRDL = 1 mg/Kg, 15 ug/L

\* Sample not part of data package, for QC only  
 \*\* No sample duplicates analyzed; Spike duplicates MS(C3) and MSD(C6) used to evaluate precision.

CO4-003

9613497-2094

TABLE 3: ANION IC ANALYSIS DATA

NITRITE (NO2-N)

SOLID SAMPLES

SAMPLE ID#	PHL LOG#	C1 SAMPLE (mg/Kg)	C2 SAMPLE DUP (mg/Kg)	Spike & Spk Dupl RPD	C5 BLANK (ug/mL)	C3		C6		% RECOVERIES		
						SPIKE+SAMPLE (mg/Kg)	SPIKE (mg/Kg)	DUP+SPIKE (mg/Kg)	SPIKE (mg/Kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE	C6 BLANK+ SPIKE
16-B-57A 30-33 BOOK77 BOOK75 (*)	91-6421 91-7815	1.0 <IDL 1.0 <IDL	1.0 <IDL 1.0 <IDL	2.8%	<IDL	106.0	112.0	107.0	117.0	92.9	91.5	92.1
C3 & C6 mean std. dev.										92.2	n/a	

IDL = 0.7 mg/Kg, 8.2 ug/L  
CRDL = 1 mg/Kg, 15 ug/L

\* Sample not part of data package, for OC only

\*\* No sample duplicates analyzed; Spike duplicates MS(C3) and MSD(C6) used to evaluate precision.

2/4/93

CO4-004

Wick

9613497.2095

TABLE 3: ANION IC ANALYSIS DATA

PHOSPHATE (PO<sub>4</sub>-P)

SOLID SAMPLES

SAMPLE ID#	PNL LOG#	C1 SAMPLE (mg/Kg)	C2 SAMPLE DUP (mg/Kg)	Spike & Spk Dupl RPO	C5 BLANK (ug/mL)	C3		C6		% RECOVERIES			
						SPIKE+SAMPLE (mg/Kg)	SPIKE (mg/Kg)	DUP+SPIKE (mg/Kg)	SPIKE (mg/Kg)	C3 SAMPLE + SPIKE	C6 DUP + SPIKE	C6 BLANK + SPIKE	
216-B-57A 30-33 BOOK77	91-6421	5	+IDL MS*										
BOOK75 (*)	91-7815	5	<IDL MS*	2.8%	<IDL	104.0	120.0	107.0	126.0	86.7	84.9	87.7	
								C3 & C6 mean std. dev.		85.8			

IDL = 1.6 mg/Kg, 29.7 ug/L

CRDL = 5 mg/Kg, 60 ug/L

\* Sample not part of data package, for OC only

\*\* No sample duplicates analyzed; Spike duplicates MS(C3) and MSD(C6) used to evaluate precision.

2/4/93

COA-005  
11/12/92

9613497-2096

TABLE 3: ANION IC ANALYSIS DATA

SULFATE (SO4)

SOLID SAMPLES

SAMPLE ID#	PHL LOG#	C1 SAMPLE (mg/Kg)	C2 SAMPLE DUP (mg/Kg)	Spike & Spk Dupl RPD	C5 BLANK (ug/mL)	C3		C6		% RECOVERIES			
						SPIKE+SAMPLE (mg/Kg)	SPIKE (mg/Kg)	DUP+SPIKE (mg/Kg)	SPIKE (mg/Kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE	C4 BLANK+ SPIKE	
216-8-57A 30-33 BOOK77	91-6421	23.6	**										
BOOK75 (*)	91-7815	162	**	6.5X	<IDL	537.0	369.0	573.0	385.0	101.6	106.8	100.2	
								C3 & C6 mean std. dev.		104.2 n/a			

IDL = 4.1 mg/Kg, 51 ug/L  
 CRDL = 20 mg/Kg, 250 ug/L

\* Sample not part of data package, for QC only

\*\* No sample duplicates analyzed; Spike duplicates MS(C3) and MSD(C6) used to evaluate precision.

CO4-006

9613497-2097

8/27/91  
CRW

TOC for 91-7815

Proc. # 7-40.37  
Run Time = 15 min.

Balance WB60304 = 2.00007 g.

91-7815-T-1)	.04760g.	$\frac{mgC - BK}{mg soil \times 10^6} = mg/kg$
		46.2 - 21 = 529 ppm TOC
2)	.06462g.	55.6 - 21 = 535 " "

Std. 91-7815-T-3)	.00180g.	677 - 21 ÷ 700 = 91 % R.
2)	.00324g.	1215 - 21 ÷ 1296 = 92 % R.

Glucan WPM 4852PX

BK. 91-7815-T-4)	19.5	} Avg: 21mgC
1)	22.4	

$\frac{mgC - BK}{mg soil} = \%$

End 8/27/91 *[Signature]* 9/19/91

200-BP-1 TOTAL ORGANIC CARBON RESULTS

WIC Sample #	PNL Sample #	Result	Analyzed
B00X75	91-7815-T-1	529. mg/kg	08-27-91
"	91-7815-T-2	535. mg/kg	08-27-91
"	91-7815-T-3	91.5 %	08-27-91
"	91-7815-T-4	21.0 ug	08-27-91
B00X77	91-6421-T-1	194. mg/kg	07-17-91
"	91-6421-T-2	168. mg/kg	07-17-91
"	91-6421-T-3	91.0 %	07-17-91
"	91-6421-T-4	22.0 ug	07-17-91

Parentetical results are below the reported detection limit of 50ppm.

Total Organic Carbon by MII, Procedure 7-40.37, on Instrument WA92040, 325 Bldg., rm 313. Data reported from LRB 52996, p 133.

Data reported by *[Signature]* Date 8/27/91  
 Data reviewed by *[Signature]* Date 8/27/91

LRB 52996 p 133

Project No. \_\_\_\_\_ Date of Work \_\_\_\_\_  
 Entered By \_\_\_\_\_ Date \_\_\_\_\_  
 Disclosed To and Underused By \_\_\_\_\_  
 Signed 1. *[Signature]* Date 8/27/91  
 2. \_\_\_\_\_ Date \_\_\_\_\_

BNW #52996

216-B-57A  
30-33

1304 = 91% Rec.  
1140 = 91% Rec.

194 ppm TOC  
168 ppm TOC

6.111111 = mg/kg

2/12/91  
2/12/91 2/12/91

TABLE 3: ANION IC ANALYSIS DATA  
NITRATE (NO3-N)

SOIL SAMPLES

SAMPLE ID#	PML LOG#	C1 SAMPLE (mg/kg)	C	C2 SAMPLE DUP (mg/kg)	C	RPD	C5 BLANK (mg/kg)	C	C3		C6		X RECOVERIES			
									SPIKE+SAMPLE (mg/kg)	SPIKE (mg/kg)	DUP+SPIKE (mg/kg)	SPIKE (mg/kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE	C4 CONTROL	Q
16-B-50B 15.5-125 17-B-50B 28-32.5 B015G9	92-00306	684.79	J				0.8	U								
B015H1	92-00358	16.237	J	17.5		17.7										
B015K3	92-00921	119.27	J						1475		1691					
B015L5	92-01246	646.362	J						349	11.9	382	11.7	(-109)	171	108	
B015M9	92-01827	178.30	J													

IDL= 0.8 (mg/Kg, solids)  
CRDL= 1.0 (mg/Kg, solids)

NOTES:

- Not samples in this SDG but reported for QC purposes
- 100% spike level in extract is expected to be 5ppm each for Nitrate, Nitrite, Phosphate, and Sulfate
- 5ppm X dil. factor / frac. solids = spike level (mg/Kg) in solid for Nitrate, Nitrite, Phosphate, and Sulfate
- 100% extraction efficiency assumed in defining dil. factor as (diluent vol) / (sample wt) X 1.00 gm/ml
- Method blank used for C5; nominal sample wt=2.00 gm

C FLAGS

B: IDL ≤ Analyte level < CRDL  
U: Analyte not detected; <IDL

Q FLAGS

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

*Sample value greatly exceeds spike value*

9613497.2099

TABLE 3: ANION IC ANALYSIS DATA  
NITRITE (NO2-N)

SOIL SAMPLES

SAMPLE ID#	PHL LOG#	C1 SAMPLE (mg/kg)	C2		C5 BLANK (mg/kg)	C3		C6		% RECOVERIES			Q	
			C	SAMPLE DUP (mg/kg)		RPD	SPIKE+SAMPLE (mg/kg)	SPIKE (mg/kg)	DUP+SPIKE (mg/kg)	SPIKE (mg/kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE		C4 CONTROL
01569	92-00306	1.0 0.8	UJ		0.8	U								
015H1	92-00358	1.0 0.8	UJ	0.8	U									
015K3	92-00921+	1.0 0.8	UJ											
015L5	92-01246+	1.0 0.8	UJ				12.8	16	12.5	15.7	80	80	82	
015M9	92-01827+	1.0 0.8	UJ											

IDL= 0.8 (mg/Kg, solids)  
CRDL= 1.0 (mg/Kg, solids)

NOTES:

- + Not samples in this SDG but reported for QC purposes
- 100% spike level in extract is expected to be 5ppm each for Nitrate, Nitrite, Phosphate, and Sulfate
- 5ppm X dil. factor / frac. solids = spike level (mg/Kg) in solid for Nitrate, Nitrite, Phosphate, and Sulfate
- 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml
- Method blank used for C5; nominal sample wt=2.00 gm

C FLAGS

B: IDL ≤ Analyte level < CRDL  
U: Analyte not detected; <IDL

Q FLAGS

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

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6/11/92

9613497.2100

TABLE 3: ANION IC ANALYSIS DATA  
PHOSPHATE (PO4-P)

SOIL SAMPLES

SAMPLE ID#	PNL LOG#	C1 SAMPLE (mg/kg)	C C	C2 SAMPLE DUP (mg/kg)	C C	C5 BLANK (mg/kg)	C C	C3		C6		% RECOVERIES			Q	
								SPIKE+SAMPLE (mg/kg)	SPIKE (mg/kg)	DUP+SPIKE (mg/kg)	SPIKE (mg/kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE	C4 CONTROL		
216-B-500-155-175 B01569	92-00306	7.9 2.9		8.5		1.7	U									N
216-B-500-28-5 B015H1	92-00358	12.2 3.0		8.5 12.3.0	B	2.8										N
B015K3	92-00921+13	4.2		8.5				37.6		3.0						N
B015L5	92-01246+23	3.4		8.5				2.2	17.1	8	16.8	25	16	94		N
B015M9	92-01827+35	11.2		8.5								85	77			N

IDL= 1.7 (mg/Kg, solids)  
CRDL= 5.0 (mg/Kg, solids)

NOTES:

1. + Not samples in this SDG but reported for QC purposes
2. 100% spike level in extract is expected to be 5ppm each for Nitrate, Nitrite, Phosphate, and Sulfate
3. 5ppm X dil. factor / frac. solids = spike level (mg/Kg) in solid for Nitrate, Nitrite, Phosphate, and Sulfate
4. 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml
5. Method blank used for C5; nominal sample wt=2.00 gm

C FLAGS

B: IDL ≤ Analyte level < CRDL  
U: Analyte not detected; <IDL

Q FLAGS

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

12

9613497.2101

TABLE 3: ANION IC ANALYSIS DATA  
SULFATE (SO<sub>4</sub>)

SOIL SAMPLES

SAMPLE ID#	PHL LOG#	C1 SAMPLE (mg/kg)	C2		C5 BLANK (mg/kg)	C3		C6		% RECOVERIES			Q
			C	SAMPLE DUP (mg/kg)		C	RPD	SPIKE+SAMPLE (mg/kg)	SPIKE (mg/kg)	DUP+SPIKE (mg/kg)	SPIKE (mg/kg)	C3 SAMPLE + SPIKE	
6-B-50B 15,5-17.5 B01569	92-00306	32	13	15	4	U							
6-B-50B 28-30.5 B015H1	92-00358	13	15	15	4	U							
B015K3	92-00921+	20											
B015L5	92-01246+	43	30	30			69.4	52.6	71.1	51.6	75	80	86
B015M9	92-01827+	101											

IDL = 4 (mg/Kg, solids)  
CRDL = 20 (mg/Kg, solids)

NOTES:

- + Not samples in this SDG but reported for QC purposes
- 100% spike level in extract is expected to be 5ppm each for Nitrate, Nitrite, Phosphate, and Sulfate
- 5ppm X dil. factor / frac. solids = spike level (mg/Kg) in solid for Nitrate, Nitrite, Phosphate, and Sulfate
- 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml
- Method blank used for C5; nominal sample wt=2.00 gm

C FLAGS

B: IDL ≤ Analyte level < CRDL  
U: Analyte not detected; <IDL

Q FLAGS

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

5/11/92

9613497.2102

TABLE 16: TOTAL ORGANIC CARBON ANALYSIS DATA FOR TASKS 2 & 4  
SDG #8

Soil Samples

WIC Sample #	PNL ALO #	Sample Type	Sample wt. g	ug C Results	ug C in Sample	mg/Kg Sample	RSD (%) Dups	% rec. spike	Date Received	Date Analyzed	
11a-B-50B 15.5-17.5	B01569	92-0306-1	Sample	0.471	65.5	50.2	1100	5		10-08-91	10-15-91
	B01569	92-0306-2	Duplicate	0.05347	76.4	61.1	1180			10-08-91	10-15-91
69	B01569	92-0306-3	Standard						96.8		10-15-91
	B01569	92-0306-4	Blank		15.3						10-15-91
21a-B-50B 28-30.5	B015H1	92-0358-1	Sample	0.04076	36.9	21.6	547	10		10-11-91	10-15-91
	B015H1	92-0358-2	Duplicate	0.0653	54.9	39.6	626			10-11-91	10-15-91
	B015H1	92-0358-3	Standard						96.8		10-15-91
	B015H1	92-0358-4	Blank		15.3						10-15-91

Total Organic Carbon by PNL Procedure 7-40.37, on Instrument WA92040,

325 Bldg., rm 701. Data reported from LRB 52996, pp 142-44 & 150.

9613497.2103

TABLE 3: ANION IC ANALYSIS DATA  
NITRATE (NO3-N)

SOIL SAMPLES

SAMPLE ID#	PNL LOG#	C1		C2		C5	C3		C6		X RECOVERIES					
		SAMPLE (mg/kg)	C	SAMPLE DUP (mg/kg)	C		RPD	BLANK (mg/kg)	C	SPIKE+SAMPLE (mg/kg)	SPIKE (mg/kg)	DUP+SPIKE (mg/kg)	SPIKE (mg/kg)	C3 SAMPLE + SPIKE	C6 DUP+SPIKE	C4 CONTROL
B01500	92-00300+	175				0.0		U								
B01501	92-00350+	3.7		4.4		17										
B015K3	92-00921 2  27.4 J															
B015L5	92-01246+	362					349		11.9		382	11.7	109	171	106	
B015M9	92-01027+	30.9														

IDL= 0.8 (mg/Kg, solids)  
CRDL= 1.0 (mg/Kg, solids)

NOTES:

- + Not samples in this SDG but reported for QC purposes
- 100% spike level in extract is expected to be 5ppm each for Nitrate, Nitrite, Phosphate, and Sulfate
- 5ppm X dil. factor / frac. solids = spike level (mg/Kg) in solid for Nitrate, Nitrite, Phosphate, and Sulfate
- 100% extraction efficiency assumed in defining dil. factor as (diluent vol) / sample wt) X 1.00 gm/ml
- Method blank used for C5; nominal sample wt=2.00 gm

C FLAGS

B: IDL ≤ Analyte level < CRDL  
U: Analyte not detected; <IDL

Q FLAGS

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

9613497.2104

16-B-SDC  
19-20.5

11

.5 11/12/92

TABLE 3: ANION IC ANALYSIS DATA  
NITRITE (NO2-N)

SOIL SAMPLES

SAMPLE ID#	PNL LOG#	C1		C2		RPD	C5 BLANK (mg/kg)	C3		C6		% RECOVERIES			
		SAMPLE (mg/kg)	C	SAMPLE DUP (mg/kg)	C			SPIKE+SAMPLE (mg/kg)	SPIKE (mg/kg)	DUP+SPIKE (mg/kg)	SPIKE (mg/kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE	C4 CONTROL	Q
001509	92-00300+	1.0	0.0	U			0.0	U							
001511	92-00350+	1.0	0.0	U	0.0	U									
0015K3	92-00921	1.0	0.0	UJ											
0015L5	92-01246+		0.0	U				12.8	10	12.5	15.7	80	80	82	
0015M9	92-01827+		0.0	U											

IDL= 0.8 (mg/Kg, solids)  
CRDL= 1.0 (mg/Kg, solids)

NOTES:

- + Not samples in this SDG but reported for QC purposes
- 100% spike level in extract is expected to be 5ppm each for Nitrate, Nitrite, Phosphate, and Sulfate
- 5ppm X dil. factor / frac. solids = spike level (mg/Kg) in solid for Nitrate, Nitrite, Phosphate, and Sulfate
- 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml
- Method blank used for C5; nominal sample wt=2.00 gm

C FLAGS

B: IDL ≤ Analyte level < CRDL  
U: Analyte not detected; <IDL

Q FLAGS

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

10

9613497-2105

5/11/12/98

TABLE 3: ANION IC ANALYSIS DATA  
PHOSPHATE (PO4-P)

SOIL SAMPLES

SAMPLE ID#	PWL LOG#	C1		C2		C5	C3		C6		% RECOVERIES			Q	
		SAMPLE (mg/kg)	C	SAMPLE DUP (mg/kg)	C		BLANK (mg/kg)	C	SPIKE+SAMPLE (mg/kg)	SPIKE (mg/kg)	DUP+SPIKE (mg/kg)	SPIKE (mg/kg)	C3 SAMPLE + SPIKE		C6 DUP+ SPIKE
<del>B015G9</del>	<del>92-00306+</del>	<del>2.5</del>	<del>B</del>			1.7	U								N
<del>B015H1</del>	<del>92-00358+</del>	<del>3.9</del>	<del>B</del>	<del>3.8</del>	<del>B</del>	2.0									N
B015K3	92-00921	12.7	B	12.2	B			27.0		36		85	77		N
B015L5	92-01246+	3.4	B					7.2	17.1	6	10.0	22	10	84	N
<del>B015M9</del>	<del>92-01827+</del>	<del>11.2</del>													N

IDL = 1.7 (mg/Kg, solids)  
CRDL = 5.0 (mg/Kg, solids)

NOTES:

- + Not samples in this SDG but reported for QC purposes
- 100% spike level in extract is expected to be 5ppm each for Nitrate, Nitrite, Phosphate, and Sulfate
- 5ppm X dil. factor / frac. solids = spike level (mg/Kg) in solid for Nitrate, Nitrite, Phosphate, and Sulfate
- 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml
- Method blank used for C5; nominal sample wt=2.00 gm

C FLAGS

B: IDL ≤ Analyte level < CRDL  
U: Analyte not detected; <IDL

Q FLAGS

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

12

5/11/12/192

9613497.2106

TABLE 3: ANION IC ANALYSIS DATA  
SULFATE (SO4)

SOIL SAMPLES

SAMPLE ID#	PNL LOG#	C1		C2		C5		C3		C6		X RECOVERIES			Q
		SAMPLE (mg/kg)	C	SAMPLE DUP (mg/kg)	C	BLANK (mg/kg)	RPD	SPIKE+SAMPLE (mg/kg)	SPIKE (mg/kg)	DUP+SPIKE (mg/kg)	SPIKE (mg/kg)	C3 SAMPLE + SPIKE	C6 DUP+SPIKE	C4 CONTROL	
B01503	92-00300+	32				4	U								
B015H1	92-00358+	13	B	15	B	14									
B015K3	92-00921	20	J												
B015L5	92-01246+	30						69.4	52.6	71.1	51.6	75	80	98	
B015M9	92-01827+	101													

IDL= 4 (mg/Kg, solids)  
CRDL= 20 (mg/Kg, solids)

NOTES:

- + Not samples in this SDG but reported for QC purposes
- 100% spike level in extract is expected to be 5ppm each for Nitrate, Nitrite, Phosphate, and Sulfate
- 5ppm X dil. factor / frac. solids = spike level (mg/Kg) in solid for Nitrate, Nitrite, Phosphate, and Sulfate
- 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml
- Method blank used for C5; nominal sample wt=2.00 gm

C FLAGS

B: IDL ≤ Analyte level < CRDL  
U: Analyte not detected; <IDL

Q FLAGS

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

216-B-30C  
19-20.5

13

S 11/12/97

9613497-2107

TABLE 16: TOTAL ORGANIC CARBON ANALYSIS DATA FOR TASK 2 & 4  
SDG #9

Soil Samples

WIC Sample #	PNL ALO #	Sample Type	Sample wt. g	ug C Results	ug C in Sample	mg/Kg Sample	RSD (%) Dups	% rec. spike	Date Received	Date Analyzed
216-B-50c 19-20.5	B015K3	92-0921-1	Sample	0.06100	45.5	35.4	579.0	3	10-23-91	11-4-91
	B015K3	92-0921-2	Duplicate	0.06316	45.1	34.9	553		10-23-91	11-4-91
	B015K3	92-0921-3	Standard					95.6		11-4-91
65	B015K3	92-0921-4	Blank		10.2					11-4-91

Total Organic Carbon by PNL Procedure 7-40.37 on Instrument WA92040,  
325 Bldg., rm 701. Data reported from LRB 52996, pp 151-152.

Silip/2/92

9613497.2108

Table 10: Gamma Energy Analysis of Soils

Batch 4

Diode L

(Radionuclide activity in pCi/g<sup>a</sup>)

Sample ID	LRB #	Collection Date	Weight (g)	Isotope		
				<sup>60</sup> Co	<sup>106</sup> Ru	<sup>137</sup> Cs
91-6421-L-1*	53944-63-A	7-9-91	13.9609	<0.46 ✓	<33 ✓	66990 ± 1.1% ✓
91-7815-L-1	53944-61-A	8-6-91	13.7647	1.23 ± 9.8% ✗	<32 ✓	21270 ± 1.3% ✗
91-7815-L-2	53944-61-B	8-6-91	13.9586	1.44 ± 15% ✗	<54 ✓	20330 ± 1.0% ✗
91-7815-L-5	53944-62-A	8-6-91	13.9	<0.28 ✓	<82	<0.26 ✓

<sup>a</sup> The one sigma uncertainties are based on counting statistics. All "<" values are detection limits associated with each "not detected" analysis.

The detection limits are determined from Sample 91-7815-L-5. The detection limits in pCi/g for <sup>60</sup>Co, <sup>106</sup>Ru, and <sup>137</sup>Cs at one sigma are <0.11, <33, and <0.10, respectively.

\* Sample not in this SDG but reported for QC purposes.

$$\text{Cs-137} \\ 91-7815 \text{ RPD} = \frac{21270 - 20330}{\left(\frac{21270 + 20330}{2}\right)} \times 100 = 4.5\%$$

$$\text{Co-60} \\ 91-7815 \text{ RPD} = \frac{1.23 - 1.44}{\left(\frac{1.23 + 1.44}{2}\right)} \times 100 = 16\%$$

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11/5/92

SOG: B00X68-PNL-050

TABLE 11: TOTAL ALPHA ANALYSIS DATA  
SOG #4

1/15/93

Sample #	Sample Type	Total Alpha (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Spike % Rec.
91-7815-A-1a	Average value	<del>49.0</del> 48.5	10.7 **				

Second Run

91-7815-A-1a	Soil	48.9	3.5				
91-7815-A-2a	Soil duplicate	63.7	4.0	26.3			
91-7815-A-3a	Matrix Spike	68.0	4.5		34.5	0.3	34
BL-6421-A-5a*	Blank	ND<0.4					
BL-6421-A-4a*	Blank Spike	53.5	4.2		48.0	0.5	111

First Run

91-7815-A-1a	Soil	48.1	3.2				
91-7815-A-2a	Soil duplicate	37.8	2.5	24			
91-7815-A-3a	Matrix Spike	49.4	3.2		35.3	0.3	18
BL-6421-A-5a*	Blank	ND<0.1					
BS-6421-A-4a*	Blank Spike	4.91	0.4		4.8	0.1	102

\*Reported for QC purposes

\*\*Standard deviation of 4 determinations

Detection limit 2.0 pCi/g

Error is based on the propagated error of volume and counting uncertainties.

9613497.2110

Reported

54

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1/15/93

Table 12:

TOTAL BETA ANALYSIS DATA

Total beta results are reported as Sr-90/Y-90

11/5/93  
②

Sample #	Sample Type	Total Beta (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Spike % Rec.
91-7815-A-1a	Soil	159330	2020				
91-7815-A-2a	Soil duplicate	114990	1500	32			
91-7815-A-3a	Matrix Spike	<del>149920</del> 147490	1910		13040	650	97.8
BL-7815-A-5a	Blank	0.48	0.12				
BS-7815-A-4a	Blank Spike	3.64	0.54		4.86	0.24	65.0

Minimum detectable activity for a 10g water sample is approximately 0.2 pCi/g.

9613497-2111

*[Signature]*  
11/5/93

SDG: B00X68-PNL-050

TABLE 13: Pu 238 and Pu 239/240 DATA ANALYSIS  
SDG #4

Program Sample ID	Sample Type	Pu-239+240 pCi/g	+/- 1 sigma	Pu-239+240 RPD	Pu-238 pCi/g	+/- 1 sigma	Pu-238 RPD	Pu-239 Spike pCi/g	+/- 1 sigma	% Recovery
91-7815-A-1c	Soil	3.23E+01	1.31E+00	RRR	8.4	4.28E-01	RRR			
91-7815-A-2c	Duplicate	2.97E+01	1.01E+00	RRR		3.54E-01	RRR			
91-7815-A-4c	Blank Spike	1.15E+00	4.11E-02	RRR		< 1E-03	RRR	1.20E+00	2.24E-02	95.8
91-7815-A-5c	Blank	<del>4.26E-03</del> 4.16E-03	1.63E-03	R		< 2.4E-03				

Pu-239+240 detection limit is approximately 3E-03 pCi/g.  
Pu-238 detection limit is approximately 2E-03 pCi/g.

Errors quoted are the propagated error of individual measurements.

2/22/93  
①

9613497.2112

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11/5/93

TABLE 14: STRONTIUM-90 DATA ANALYSIS RESULTS

SOILS									
Sample #	Sample Type	Total Beta (pCi/g)	+/- 1 sigma*	Spike Conc. RPD	+/- (pCi/g)	Spike 1 sigma*	Normalized % Rec.	% Yield**	
91-7815-A-b	Triplicate Avg	65850	3290						
91-7815-A-1b	Soil	62600	4570						
91-7815-A-2b	Soil Duplicate	69170	4980	10					
91-7815-A-3b	Matrix Spike	65840	4660		51.5	2.6	N/A		
BL-7815-A-5b	Blank	2.68pCi/ml	0.23						
BS-7815-A-4b	Blank Spike	2.64pCi/ml	0.30		2.42pCi/ml	0.12pCi/ml	109		
BL2-7815-A-5b	Second Blank	Used for X-ray Fluorescence Impurity assay							
91-7815-A-3b	Blank Soil Matrix Spike	Used to Determine Batch Yield						99.8	

Not Reported  
Reported  
19  
List 13

Minimum detectable activity for a sample is approximately 0.06 pCi/g.

\*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 blank soil spike recovery which has been normalized to 100% chemical recovery.

9613497.2113

SDG: B00X68-PNL-050

TABLE 15: TRITIUM DATA ANALYSIS RESULTS  
SDG #4

Project Sample ID	Sample Type	Tritium (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Recov. Corr. Factor, % Fs
91-6421-K-1**	Soil	16	7.8				
91-6421-K-2**	Duplicate	18	7	12			
91-6421-K-4	Method Spike Used to determine batch yield						75
91-6421-K-5	Blank	<18					
91-7815-K-1	Soil	39	11				

Approximate Detection Limit = 18 pCi/g (variations occur due to actual sample size)

\* Based on 0.1 g sample size

\*\* Included for QC purposes

9613497.2114

63

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11/5/93

Table 10: Gamma Energy Analysis of Soils

Batch 4

SOG:BOOK4-PNL-051

Diode L

(Radionuclide activity in pCi/g<sup>a</sup>)

Sample ID	LRB #	Collection Date	Weight (g)	Isotope		
				<sup>60</sup> Co	<sup>106</sup> Ru	<sup>137</sup> Cs
91-6421-L-1	53944-63-A	7-9-91	13.9609	<0.46	<33	67000 ± 1.1%
91-7815-L-1	53944-61-A	8-6-91	13.7647	1.23 ± 9.8%	<32	21300 ± 1.3%
91-7815-L-2	53944-61-B	8-6-91	13.9586	1.44 ± 15%	<54	20300 ± 1.0%
91-7815-L-5	53944-62-A	8-6-91	13.9	<0.28	<82	<0.26

The one sigma uncertainties are based on counting statistics. All "<" values are detection limits associated with each "not detected" analysis.

The detection limits are determined from Sample 91-7815-L-5. The detection limits in pCi/g for <sup>60</sup>Co, <sup>106</sup>Ru, and <sup>137</sup>Cs at one sigma are <0.11, <33, and <0.10, respectively.

*[Handwritten signature]*  
11/9/93

TABLE 11: TOTAL ALPHA ANALYSIS DATA  
SDG #3

Sample #	Sample Type	Total Alpha (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Spike % Rec.
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Not qualified / not reported

91-6421-A-1a	Average value	4.0	2.0				
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The third run data was included on the verification sheet and in the database.

Third run

91-6421-A-1a	Soil	6.3	1.0	26.3	34.5	0.3	34
91-7815-A-1a*	Soil	48.9	3.5				
91-7815-A-2a*	Soil duplicate	63.7	4.0				
91-7815-A-3a*	Matrix Spike	68.0	4.5				
BL-6421-A-5a	Blank	ND<0.4					
BS-6421-A-4a	Blank Spike	53.5	4.2		48.0	0.5	111

45444  
45444

58

Second run

91-6421-A-1a	Soil	3.2	0.6	26	35.3	0.3	18
91-7815-A-1a*	Soil	48.1	3.2				
91-7815-A-2a*	Soil duplicate	37.8	2.5				
91-7815-A-3a*	Matrix Spike	49.4	3.2				
BL-6421-A-5a	Blank	ND<0.1					
BS-6421-A-4a	Blank Spike	4.91	0.4		4.8	0.1	102

Not qualified and not reported  
11/5/93

First run

91-6421-A-1a	Soil	2.5	0.6	NA	61.8	0.4	47.5 45.2
91-6421-A-2a	Soil duplicate	ND<2.0					
91-6421-A-3a	Matrix Spike	29.2	2.2				
BL-6421-A-5a	Blank	ND<0.16					
BS-6421-A-4a	Blank Spike	3.46	0.2				

$$MS\%R = \left( \frac{29.2 - \left( \frac{2.5 + 0}{2} \right)}{61.8} \right) \times 100 = 45.2\%$$

\*Not a sample in this sample delivery group but reported for QC purposes

Detection limit 2.0 pCi/g

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

9613497.2116

11/5/93

Table 12:

**TOTAL BETA ANALYSIS DATA**

Total beta results are reported as Sr-90/Y-90

Sample #	Sample Type	Total Beta (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Spike % Rec.
91-6421-1a	Sample	47771	1047				
91-6421-1a	Duplicate	45055	1040	5.9 ✓			
91-6421-1a	Matrix Spike	46033	850		257	13	NA
91-6421-1a	Blank	0.50pCi/ml	0.1				
91-6421-1a	Blank Spike	4.74pCi/ml	0.6		4.89pCi/ml	0.2	86.7 ✓

Detection limit = 0.051 pCi/g

One sigma uncertainties are based on propagation of mass, volumetric and counting uncertainties

09

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1/5/76

SDG: B00X64-PNL-051

TABLE 13: Pu 238 and Pu 239/240 DATA ANALYSIS  
SDG #3

SOILS

Program Sample ID	Sample Type	pCi/g Pu 239+240	+/-1s error*	pCi/g Pu-238	+/-1s error*	Spike pCi/g Pu-239 added	+/-1s error*	% Recovery	RPD
91-6421-A-1c	Soil	3.25E-03	6.95E-04	6.23E-03	9.70E-04				78
91-6421-A-2c	Duplicate	1.43E-03	4.31E-04	4.66E-03	7.90E-04				
91-6421-A-4c	Blank Spike	1.090	0.025	1.25E-02	1.25E-03	1.197	0.013	91.1	
91-6421-A-5c	Blank	ND	<4E-04	3.60E-03	6.70E-04				

Pu-239+240 detection limit approximately 4E-04 pCi/g

\*The errors quoted (1 sigma) are the propagated error of individual measurements.

ND = Not detected

TABLE 14: STRONTIUM-90\* DATA ANALYSIS RESULTS  
SDG #3

SOILS

Sample #	Sample Type	Sr-90 pCi/g	+/- 1 sigma	RPD	Spike Conc. pCi/g	+/- 1 sigma	Spike % Recov.	+/- 1 sigma	Normalized % Yield (1)
91-6421-A-1b	Soil	1.2	0.1						
91-6421-A-2b	Duplicate	0.8	0.1	36					
91-6421-A-3b	Matrix Spike**	31	2		40.2	1.0	77	5	
91-6421-A-4b	Blank Spike	2.66	0.26		2.44	0.06	109	11	
91-6421-A-5b	Blank	5.6	0.4						
91-6421-A-6b	Blank Spike Dup Used to determine the batch yield								84

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

Detection limit = 0.06 pCi/g based on nominal sample aliquot of 10 g and worst case background and counting efficiency

\*This does not take into consideration Strontium-89.

\*\*A blank soil was used, not a replicate aliquot of 91-6421.

(1) All Sr-90 analyses are calculated on the basis of their ratio to the blank spike dup recovery which has been normalized to 100% chemical recovery.

*[Handwritten Signature]*  
11/8/93

TABLE 15: TRITIUM DATA ANALYSIS RESULTS  
SDG #3

Project Sample ID	Sample Type	Tritium (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Recov. Corr. Factor, % Fe
91-6421-K-1	Soil	16	5 7.8				
91-6421-K-2	Duplicate	18	5 7	12			
91-6421-K-4	Method Spike Used to determine batch yield						75
91-6421-K-5	Blank	<18	5				

Approximate Detection Limit = 18 pCi/g (variations occur due to actual sample size)

\* Based on 0.1 g sample size

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

9613497.2120

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11/9/13

Table 10: Gamma Energy Analysis of Soils

## Recommended Values

Batch 5

Diode L

(Radionuclide activity in pCi/g<sup>a</sup>)

Customer ID	Sample ID	Collection Date	Weight (g)	<sup>60</sup> Co	<sup>106</sup> Ru	<sup>137</sup> Cs
B015G9	92-00306-L-1	10/4/91 14:20	14.200	<8 ✓	<500 ✓	(5.72 ± 0.06) × 10 <sup>5</sup> ✓
B015H1	92-00358-L-1	10/9/91 10:45	14.205	<0.4 ✓	<18 ✓	1890 ± 20 ✓
B015H1	92-00358-L-2	10/9/91 10:45	14.201 ✓	<0.3 ✓	<15 ✓	2200 ± 20 ✓
B015H1	92-00358-L-5	11/8/91 11:06	14.212 ✓	<0.15 ✓	<1.6 ✓	<0.11 ✓
B015K3	92-00921-L-1*	10/22/91 11:31	13.975	28.6 ± 1.0 ✓	<280	(5.62 ± 0.06) × 10 <sup>5</sup> ✓
B015L5	92-01246-L-1*	11/6/91 11:44	1.8300	<30	<2300	(2.00 ± 0.02) × 10 <sup>6</sup> ✓
B015M9	92-01827-L-1*	11/14/91 14:06	1.5020	<20	<1200	(1.23 ± 0.01) × 10 <sup>6</sup> ✓

02/5/93

02/5/93

\* The one sigma uncertainties are based on counting statistics. All "<" values are detection limits associated with each "not detected" analysis.

The detection limits are determined from Sample 92-00358-L-5. The detection limits in pCi/g for <sup>60</sup>Co, <sup>106</sup>Ru, and <sup>137</sup>Cs at one sigma are < 0.06, <0.6, and <0.04. Note that the detection limits quoted above were calculated as if the isotope were present at a level that is 2.5 times the square root of twice the average background.

\* Samples not in SDG but reported as a part of analytical batch.

92-00358-L-5 is the Method Blank.

$$\text{Cs } 137 \text{ B015H1 RPD} = \frac{2200 - 1890}{\left(\frac{2200 + 1890}{2}\right)} \times 100 = 15.2\%$$

02/5/93

SOG: B015G4-PNL-052

TABLE 11: TOTAL ALPHA ANALYSIS DATA  
TASK 2 & 4 SOG #0

WIC Sample #	Sample #	Sample Type	Total Alpha (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Spike % Rec.
B015G0	92-00306-A-1a	Soil	107.5	6.9				
B015H1	92-00358-A-1a	Soil	2.9	0.7				
	92-00358-A-2a	Soil duplicate	2.5	0.6	15			
	92-00358-A-3a	Matrix Spike	12.79	1.3		9.08	0.09	111
	92-00358-A-3a	Matrix Spike	9.25	1.1		10.13	0.11	64.5
	BL-00306-A-5a	Blank	<0.56					
	BS-00358-A-4a	Blank Spike	10.9	1.1		9.57	0.1	114

Detection limit for 5g soil samples: 0.6 pCi/g

Error is based on the propagated error of volume and counting uncertainties.

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11/9/93

TABLE 12: TOTAL BETA ANALYSIS DATA  
TASK 2 & 4 SDG #8

WIC Sample #	Sample #	Sample Type	Total Beta (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Spike % Rec.
B015G9	92-00306-A-1a	Soil	622300	13300				
B015W1	92-00358-A-1a	Soil	2590	63				
	92-00358-A-2a	Soil duplicate	2440	62	6.1			
	92-00358-A-3a	Matrix Spike	2990	69		18.4	0.9	na
	BL-00306-A-5a	Blank	<7.7					
	BS-00306-A-4a	Blank Spike	22.1*	2.4		19.39	1.0	114

\*Average of 21.4 +/- 3.8 , 24.0 +/- 3.7, 21.8 +/- 4.0 and 21.1 +/- 7.1 pCi/g

Minimum detectable activity for a 5g soil sample is approximately 7.7 pCi/g.

Contract detection limits can be achieved by use of the low background beta counters; the results from this batch were counted on the regular background beta counters due to high sample activity.

Error is based on the propagated error of volume and counting uncertainties.

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11/3/92

SDG: B015G4-PNL-052

TABLE 13: Pu 238 and Pu 239/240 DATA ANALYSIS  
SDG #8

WIC Sample #	Program Sample ID	Sample Type	Pu-239+240 pCi/g	+/- 1 sigma	Pu-239+240 RPD	Pu-238 pCi/g	+/- 1 sigma	Pu-238 RPD	Pu-238 Spike pCi/g	+/- 1 sigma	% Recovery
B01569	92-00306-A-1c	Soil	1.21E+02	4.95E+00	R	1.87E+00	1.30E-01	R			
B015H1	92-00358-A-1c	Soil	2.39E-01	1.01E-02	R	<del>2.92E-03</del>	0.37E-04	R			
	92-00358-A-2c	Duplicate	2.68E-01	1.04E-02	R	4.03E-03	0.48E-04	R			
	92-00306-A-4c	Blank Spike	2.23E+00	7.61E-02		< 1E-03		R	2.35E+00	1.46E-02	95
	92-00306-A-5c	Blank	< 5E-04			< 1E-03		R			
						2.83E-03		R			

Pu-239+240 detection limit is approximately 5 E-04 pCi/g.  
Pu-238 detection limit is approximately 1 E-03 pCi/g.

Errors quoted are the propagated error of individual measurements.

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11/3/93

TABLE 14: STRONTIUM-90 ANALYSIS DATA FOR TASK 2 & 4  
SOG #8

Parameters of Interest

MHC Sample #	Sample #	Sample Type	Strontium (pCi/g)	+/- 1 sigma*	RPD	Spike Conc. (pCi/g)	+/- 1 sigma*	Spike % Rec.	Normalized % Yield**
B015G9	92-00306-A-1b	Soil	67700	4900					
B015H1	92-00358-A-1b	Soil	452	33					
	92-00358-A-2b	Soil Duplicate	461	34	1.8				
	92-00306-A-3b	Matrix Spike	46.3	3.6		49.5	2.5	93.5	
	BL-00306-A-5b	Blank	0.1	0.02					
	BL-00306-A-5b	Blank duplicate	0.3	0.04					
	BS-00306-A-4b	Blank Spike	Used to determine batch yield						103.5

Minimum detectable activity for a sample is approximately 0.06 pCi/g.

\* 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 blank spike recovery which has been normalized to 100% chemical recovery.

The MSR is not applicable since the <sup>Ⓢ 1/14/93</sup> sample result ~~spike concentration~~ is greater than the spike conc. by a factor greater than four.

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1/14/93

SOG: B015G4-PNL-052

TABLE 15: TRITIUM ANALYSIS FOR TASK 2 & 4  
SDG #8

WIC Sample #	Project Sample ID	Sample Type	Tritium (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Recov. Corr. Factor, % F <sub>s</sub>	
B015G9	92-00306-K-1	Soil	18	3					
B015H1	92-00358-K-1	Soil	23	3					
B015K3	92-00921-K-1*	Soil	56	4					
	92-00921-K-2*	Duplicate	37	3	41				
	92-00921-K-5*	Blank	<4 *						
	92-00921-K-4*	Method Spike Used to Determine Batch Yield							75

Approximate Detection Limit = 10 pCi/g (variations occur due to actual sample size)

\* Not samples in the SDG but reported for QC purposes

\* Based on 0.3 g sample size

63

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11/4/93

Table 10: Gamma Energy Analysis of Soils

Recommended Values

Batch 5

Diode L

(Radionuclide activity in pCi/g<sup>a</sup>)

Client ID	Sample ID	Collection Date	Weight (g)	<sup>60</sup> Co	<sup>106</sup> Ru	<sup>137</sup> Cs
B015G9	92-00306-L-1*	10/4/91 14:20	14.200	<8 /	<500 /	(5.72 ± 0.06) × 10 <sup>5</sup> J
B015H1	92-00358-L-1*	10/9/91 10:45	14.205	<0.4 /	<18 /	1890 ± 20 J
B015H1	92-00358-L-2*	10/9/91 10:45	14.201	<0.3 /	<15 /	2200 ± 20 J
B015H1	92-00358-L-5*	11/8/91 11:06	14.212	<0.15 /	<1.6 /	<0.11 /
B015K3	92-00921-L-1	10/22/91 11:31	13.975	28.6 ± 1.6 J	<280 /	(5.62 ± 0.06) × 10 <sup>5</sup> J
B015L5	92-01246-L-1*	11/6/91 11:44	1.6300	<30	<2300	(2.00 ± 0.02) × 10 <sup>6</sup> J
B015M9	92-01827-L-1*	11/14/91 14:06	1.5020	<20	<1200	(1.23 ± 0.01) × 10 <sup>6</sup> J

02/5/93

02/5/93

The one sigma uncertainties are based on counting statistics. All "<" values are detection limits associated with each "not detected" analysis.

The detection limits are determined from Sample 92-00358-L-5. The detection limits in pCi/g for <sup>60</sup>Co, <sup>106</sup>Ru, and <sup>137</sup>Cs at one sigma are < 0.06, <0.6, and <0.04. Note that the detection limits quoted above were calculated as if the isotope were present at a level that is 2.5 times the square root of twice the average background.

Samples not in the SDG but reported for QC purposes.

$$^{137}\text{Cs B015H1 RPD} = \frac{(2200 - 1890)}{\left(\frac{2200 + 1890}{2}\right)} \times 100 = 15.16 = 15.2 \text{ RPD}$$

02/5/93  
11/4/93

TABLE 11: TOTAL ALPHA ANALYSIS DATA FOR TASKS 2 & 4  
SDG #9

SOIL SAMPLES

Client #	Sample #	Sample Type	Total Alpha (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Spike % Rec.
B015K3	92-00921-A-1a	Soil	25.7	5.8				
B015K3	92-00921-A-2a	Duplicate	23.9	5.7	7			
	92-00306-A-5a*	Blank	<4.7					
	92-00921-A-4a	Blank Spike	57.1	8.4		54.8	0.6	104.0
	92-00921-A-3a	Matrix Spike	66.7	4.6		45.4	0.5	92.3

Average % recovery 98 +/- 8

\* Not samples in the SDG but reported for QC purposes  
The detection limit for soil samples of this size is approximately 5 pCi/g.  
Contract detection limits can be achieved by use of a larger sample size and longer counting time. Due to the high activity of the samples in this batch, a smaller sample size and shorter counting time were used.

Error is based on the propagated error of volume and counting uncertainties.

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1/4/93

SOG: ~~A~~ B015HB-PNL-05  
 @ 1/21/93

TABLE 12: TOTAL BETA ANALYSIS RESULTS FOR TASKS 2 & 4  
 SDG #9

SOIL SAMPLES

MHC #	Sample #	Sample Type	Total Beta (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Spike % Rec.
B015K3	92-00921-A-1a	Soil	64500	1990				
B015K3	92-00921-A-2a	Soil	60600	1880	6			
	92-00358-A-3a*	Matrix Spike	4790	145		1536	78	100-1142
	92-00921-A-5a	Blank	97	21				
	92-00921-A-4 a	Blank Spike	491	29		477	29	83

@ 1/14/93

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\* Not samples in the SDG but reported for QC purposes  
 The detection limit for soil samples of this size is approximately 36 pCi/g.  
 Contract detection limits can be achieved by use of a larger sample size and longer counting time. Due to the high activity of the samples in this batch, a smaller sample size and shorter counting time were used.

Error is based on the propagated error of volume and counting uncertainties.

$$MSR = \left( \frac{4790 - 3036}{1536} \right) \times 100 = 114\%$$

The original result for the spiked sample is 3036 pCi/g.

*[Signature]*  
 1/14/93

TABLE 13: Pu 238 and Pu 239/240 DATA ANALYSIS  
SOG #9

WIC Sample #	Program Sample ID	Sample Type	Pu-239+240 pCi/g	+/- 1 sigma	Pu-239+240 RPD	Pu-238 pCi/g	+/- 1 sigma	Pu-238 RPD	Pu-238 Spike pCi/g	+/- 1 sigma	% Recovery
B015H1	92-00358-A-1c*	Soil	2.39E-01	1.01E-02	R	2.92E-03	8.37E-04	R	32-35		
	92-00358-A-2c*	Duplicate	2.68E-01	1.04E-02	R	4.03E-03	8.48E-04	R			
B015K3	92-00921-A-1c	Soil	2.96E+00	1.06E-01	R	4.42E-02	7.65E-03	R			
	92-00306-A-4c*	Blank Spike	2.23E+00	7.61E-02	R	< 1E-03		R	2.35E+00	1.46E-02	95
	92-00306-A-5c*	Blank	< 5E-04		R	< 1E-03		R			
						4.46E-02		R			
						2.83E-03		R			

Pu-239+240 detection limit is approximately 5 E-04 pCi/g.  
Pu-238 detection limit is approximately 1 E-03 pCi/g.

Errors quoted are the propagated error of individual measurements.

\* Samples not in the SOG but reported for QC purposes

1/14/93

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$$B015H1 \text{ RPD} = \frac{((4.03E-03) - (2.83E-03))}{\left(\frac{((4.03E-03) + (2.83E-03))}{2}\right)} \times 100 = 34.99 = 35\%$$

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1/14/93

TABLE 14: STRONTIUM-90 ANALYSIS DATA FOR TASK 2 & 4  
SOG #9

		Parameters of Interest								
MHC Sample #	Sample #	Sample Type	Strontium (pCi/g)	+/- 1 sigma*	RPD	Spike Conc. (pCi/g)	+/- 1 sigma*	Spike % Rec.	Normalize % Yield**	
B015H1	92-00358-A-1b+	Soil	452	J 33						
	92-00358-A-2b+	Soil Duplicate	461	J 34	1.8					
In this SOG	<u>B015K3</u>	92-00921-A-1b	Soil	7750	J 570					
	92-00306-A-3b+	Matrix Spike	48.3	J 3.6		49.5	2.5	93.5		
	BL-00306-A-5b+	Blank	0.1	R 0.02						
	BL-00306-A-5b+	Blank duplicate	0.3	R 0.04						
	BS-00306-A-4b+	Blank Spike	Used to determine batch yield						103.5	

@ 11/9/93

Minimum detectable activity for a sample is approximately 0.06 pCi/g.

+ Sample not in the SOG but reported for QC purposes

\* 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 blank spike recovery which has been normalized to 100% chemical recovery.

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11/5/93

SOG: 8015H8-PNL-053

TABLE 15: TRITIUM ANALYSIS FOR TASK 2 & 4  
SOG #9

WIC Sample #	Project Sample ID	Sample Type	Tritium (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Recov. Corr. Factor, % Fs
B015K3	92-00921-K-1	Soil	56 ✓	4				
	92-00921-K-2	Duplicate	37 ✓	3	41			
	92-00921-K-5	Blank	<4 ** ✓					
	92-00921-K-4	Method Spike Used to Determine Batch Yield						75

Approximate Detection Limit = 10 pCi/g (variations occur due to actual sample size)

\* Not samples in the SOG but reported for QC purposes

\*\* Based on 0.3 g sample size

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11/4/93

SDG: 800X68-PNL-050

TABLE 9: TECHNIITIUM 200-BP-1 SOILS ANALYSIS: Sample 91-7815  
Tc-99 and Uranium Determinations by ICP - Mass Spectrometry

All values corrected for 1% HNO3 diluent blank contribution

PNL sample I.D. Number (a)	DRY WEIGHT	DILUTION FACTOR (b)	ICP/MS Analysis No.	Tc-99, ng/ml solution analyzed	Tc-99, ng/g soil (c,d)	Tc-99, ng/g spiked (d)	Tc-99, spike recovery, % (e)	Tc-99, pCi/g, %dry soil analyzed (f)	U, ng/ml solution analyzed (f)	U, ng/g soil (c,d)	U, ng/g spiked (d)	U, spike recovery, % (e)	U, pCi/g (total), dry soil (g)
91-7815-B1	1.0626	941.1	8	0.003	2.8			48 <del>TR</del>	62.4	58700			41.0
91-7815-B2	1.0086	991.5	10	0.002±.001	2±1			34±17 <del>TR</del>	59.6	59100			41.3
91-7815-B3	1.1016	907.8	12	0.013	11.8	7.2	125 ±2	200 <del>TR</del>	66.6	60500	7.22	103	42.3
91-7815-B5	N/A	1000.0	12	<0.001	<1			N/A	0.001	1.2			N/A
91-7815-B6	N/A	1000.0	5	0.010	10.0	8.0	125 ±1	N/A	0.009	9.5	7.95	103	N/A
0.00988ppb Tc	N/A	N/A	4	0.010				⊙ 1/21/93					
0.0494ppb Tc	N/A	N/A	10	0.048									
3.0 pCi/L U in water (EPA)			7						2.95 pCi/L				
20.0 pCi/L U in water (EPA)			15						20.4 pCi/L				

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- (a) Sample types:  
 B1 = sample  
 B2 = sample, duplicate  
 B3 = sample + Tc/U spike  
 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; includes 5X addition dil.  
 (c) leachate concentration corrected for preparation dilution factor and additional dilution for analysis (5X).  
 (d) -B3 reported in units of ng/g; -B6 reported in ng  
 (e) Spike Recovery Formula: [Spiked Sample]/([Sample] + [Spike])  
 (f) Samples were re-analyzed for uranium under procedure 1a21q. See LRB 54321 page 66.  
 (g) total uranium activity calculated using natural isotopic abundance for soil leachate [U] < 200 ppb: pCi = [U]\*0.000336/0.481

Tc-99 91-7815-B3    %R =  $\frac{11.8 - 2.8}{7.2} \times 100 = 125.2$

RPO: Tc-99:  $\frac{2.8 \pm 2}{(\frac{2.8 + 2}{2})} \times 100 = 33.3\%$     ⊙ 1/20/93

Tc-99 91-7815-B6    %R =  $\frac{10 - 0}{8} \times 100 = 125.2$

RPO U:  $\frac{58700 - 59100}{(\frac{58700 + 59100}{2})} \times 100 = 1.2$

⊙ 1/21/93

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1/20/93

TABLE 9: TECHNETIUM 200-BP-1 SOILS ANALYSIS: Sample 91-6421  
Tc-99 and Uranium Determinations by ICP - Mass Spectrometry

All values corrected for 1% HNO3 diluent blank contribution

PNL sample I.D. Number (a)	DRY WEIGHT	DILUTION FACTOR (b)	ICP/MS Analysis No.	Tc-99, ng/ml solution analyzed	Tc-99, ng/g soil (c,d)	Tc-99, ng/g spiked (d)	Tc-99, spike recovery, %	Tc-99, pCi/g, Xdry soil	U, ng/ml solution analyzed	U, ng/g soil (c,d)	U, ng/g spiked (d)	U, spike recovery, %	U, pCi/g (total dry soil (f))
91-6421-B1	1.1246	1778.5	12	0.002±0.001	4.2	3.91		66±30	0.30	535			0.4
91-6421-B2	1.1177	1789.4	13	0.0017	3.0			52	0.32	576			0.4
91-6421-B3	1.1248	1778.1	14	0.0061	10.8	7.1	103	N/A	0.52	926	7.07	(e)	N/A
91-6421-B4	1.1808	1693.8	5	0.0013	2.2			37	9.9	16700			11.7
91-6421-B5	N/A	2000.0	16	<0.001	<2			N/A	0.003	6.6			N/A
91-6421-B6	N/A	2000.0	17	0.0045	9.0	8.0	113	N/A	0.012	24.2	7.95	(e)	N/A
0.0997ppb Tc/0.994ppb U S	N/A	N/A	15	0.094					0.995				
0.499ppb Tc/4.97ppb U STD	N/A	N/A	8	0.501					4.930				

- (a) Sample types:  
 B1 = sample  
 B2 = sample, duplicate  
 B3 = sample + Tc/U spike  
 B4 = laboratory control sample (ICF LCS-0287, no Tc or U data available)  
 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; includes 10X addition dil.  
 (c) leachate concentration corrected for preparation dilution factor and additional dilution for analysis (10X).  
 (d) -B3 reported in units of ng/g; -B6 reported in ng  
 (e) Uranium yields not applicable: for sample spike, [U] of added spike << [U] in leachate, thus invalidating recovery data; for blank spike, [U] in diluted sample approached LLD.  
 (f) total uranium activity calculated using natural isotopic abundance for soil leachate [U] < 200 ppb: pCi = [U]\*0.000336/0.481

$$MSR = \frac{10.8 - \left( \frac{3.91 + 3.0}{2} \right)}{7.1} \times 100 = 103\%$$

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1/19/93

SOG: 8015G4-PNL-052

TABLE 9: ICP-MS ANALYSIS DATA FOR TASKS 2 & 4  
SDG #8

Spike recovery values corrected for contributions from blank or sample

PNL sample I.D. Number (a)	DRY WEIGHT	DILUTION FACTOR (b)	ICP/MS Analysis No.	Tc-99, ng/ml solution analyzed	Tc-99, ng/g soil (c,d)	Tc-99, ng/g spiked (d)	Tc-99, spike recovery, % (e,f)	Tc-99, pCi/g, dry soil (f)	U, ng/ml solution analyzed	U, ng/g soil (c,d)	U, ng/g spiked (d)	U, spike recovery, % (e,g)	U, pCi/g (total), dry soil (h)
92-00306-B1	1.0165	2007.6	8	0.001	2.0			34	1.1860	2380			1.7
92-00306-B2	1.0223	1996.3	8	0.001 ± 0.001	10.0			170 ± 35	1.0640	2120			1.5
92-00306-B3	1.0205	1999.8	10	0.0114	22.8	7.8	25 ± 105	386	0.9810	1960	7.70	87	1.4
92-00306-B5	N/A	1000.0	4	0.0012	1.2			20	0.0040	4.0			0.0
92-00306-B6	N/A	1000.0	3	0.0084	8.4	8.0	91	142	0.0078	7.8	7.95	47.8 ± 5	N/A
92-00358-B1	1.1623	894.8	12	0.010 ± 0.004	9.2			160 ± 70	1.973	1770			1.2
92-00921-B1*	1.1150	1899.0	14	0.0041	7.8			132	18.984	32300			22.8

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(a) Sample types:

- B1 = sample
- B2 = sample, duplicate
- B3 = sample + Tc/U spike
- B5 = procedural blank
- B6 = procedural blank + Tc/U spike

\* Not samples in the SDG but reported for QC purposes

(b) units of mL/g dry soil except for -B5 and -B6 samples (blank/blank spike) units of mL; includes 5X or 10X addition dil.

(c) leachate concentration corrected for preparation dilution factor and additional dilution for analysis (5X or 10X).

(d) -B3 reported in units of ng/g; -B6 reported in ng

(e) Recovery = [Spiked Sample]/([Sample]+[Spike])

(f) Despite positive values obtained for Tc, only spike samples had an observable Tc peak. Values >LLD are due to an increased background observed for soil digestate samples.

(g) For blank spike, [U] in diluted sample approached LLD.

(h) total uranium activity calculated using natural isotopic abundance for soil leachate [U] < 200 ppb: pCi = [U]\*0.000336/0.481

DL= Detection Limit is dependent on sample weight and dilution volume (see footnote C).

$$Tc-99 \text{ MS } ZR = \frac{22.8 - \left(\frac{2+10}{2}\right)}{7.8} \times 100 = 215\%$$

$$Tc-99 \text{ RPD} = \frac{10 - 2}{\left(\frac{10+2}{2}\right)} \times 100 = 133\%$$

Total-U

$$\text{Blank Spike } ZR = \frac{7.8 - 4.0}{7.95} \times 100 = 47.8\%$$

$$U \text{ RPD} = \frac{2380 - 2120}{\left(\frac{2380+2120}{2}\right)} \times 100 = 11.6\%$$

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1/20/92

TABLE 9: ICP-MS ANALYSIS DATA FOR TASKS 2 & 4  
SDG #9

Spike recovery values corrected for contributions from blank or sample

PNL sample I.D. Number (a)	DRY WEIGHT	DILUTION FACTOR (b)	ICP/MS Analysis No.	Tc-99, ng/ml solution analyzed	Tc-99, ng/g soil (c,d)	Tc-99, ng/g spiked (d)	Tc-99, spike recovery, % (e,f)	Tc-99, pCi/g dry soil (f)	U, ng/ml solution analyzed	U, ng/g soil (c,d)	U, ng/g spiked (d)	U, spike recovery, % (e,g)	U, pCi/g (total), dry soil (h)
92-00306-B1	1.0185	2007.8	10	0.001	2.0	2.0	34	34	1.1860	2380			1.7-R
92-00306-B2	1.0223	1996.3	8	0.005 ± 0.001	10.0			170 ± 35	1.0640	2120			1.5-R
92-00306-B3	1.0205	1999.8	10	0.0114	22.8	7.8	215	185	0.9810	1960	7.79	87	1.4-R
92-00306-B5	N/A	1000.0	5	0.0012	1.2			20	0.0040	4.0			0.0-R
92-00306-B6	N/A	1000.0	3	0.0084	8.4	8.0	91	142	0.0078	7.8	7.95	47.8	N/A
92-00358-B1	1.1623	894.8	5	0.010 ± 0.004	9.2			160 ± 70	1.973	1770			1.2-J
92-00921-B1	1.1159	1899.0	10	0.0041	7.8			132	16.984	32300			22.6-J

(a) Sample types:

- B1 = sample
  - B2 = sample, duplicate
  - B3 = sample + Tc/U spike
  - B5 = procedural blank
  - B6 = procedural blank + Tc/U spike
- \* Not samples in the SDG but reported for QC purposes

(b) units of mL/g dry soil except for -B5 and -B6 samples (blank/blank spike) units of mL; includes 5X or 10X addition dil.

(c) leachate concentration corrected for preparation dilution factor and additional dilution for analysis (5X or 10X).

(d) -B3 reported in units of ng/g; -B6 reported in ng

(e) Recovery = [Spiked Sample]/([Sample]+[Spike])

(f) Despite positive values obtained for Tc, only spike samples had an observable Tc peak. Values >LLD are due to an increased background observed for soil digestate samples.

(g) For blank spike, [U] in diluted sample approached LLD.

(h) total uranium activity calculated using natural isotopic abundance for soil leachate [U] < 200 ppb: pCi = [U]\*0.000336/0.481

LLD- Detection Limit is dependent on sample weight and dilution volume (see footnote C).

Sample 92-00921 (B015K3) is in this SDG. Samples 92-00306 (B015G9) and 92-00358 (B015H1) are not in this SDG.

$$TC-99 \text{ MSR} = \frac{22.8 - \left(\frac{10 + 2.0}{2}\right)}{7.8} = 215\%$$

$$TC-99 \text{ RPO} = \frac{10 - 2.0}{\left(\frac{10 + 2.0}{2}\right)} \times 100 = 133\%$$

$$U \text{ BSZR} = \frac{7.8 - 4}{7.95} \times 100 = 30.2\%$$

$$U \text{ RPO} = \frac{2380 - 2120}{\left(\frac{2380 + 2120}{2}\right)} \times 100 = 11.6\%$$

*Handwritten signature and date: 1/21/93*

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APPENDIX D

DATA VALIDATION SUPPORTING DOCUMENTATION

~~SDG B015G4-PNL-052~~

VOLATILE ORGANIC DATA VALIDATION CHECKLIST - FORM A-1

PROJECT: 200BPI	REVIEWER: g	DATE: 11/9/92
LABORATORY: PNL	CASE:	SDG: 801564 @ 2/5/93
SAMPLES/MATRIX: solo		
BD1541, BD1569		

1. DATA PACKAGE COMPLETENESS

Review the data package for completeness and check off the items below. If any data review elements are missing contact the laboratory for submittal.

Data Package Item	Present?:	Yes	No	N/A
Case Narrative		/	—	—
Data Summary		/	—	—
Chain-of-Custody		/	—	—
QC Summary		/	—	—
Surrogate report		/	—	—
MS/MSD report		/	—	—
Blank summary report		/	—	—
GC/MS tuning report		/	—	—
Internal standard summary report		/	—	—
Sample Data		/	—	—
Sample reports		/	—	—
TIC reports for each sample		/	—	—
RIC reports for all samples		/	—	—
Raw and corrected spectra for all detected results		/	—	—
Raw and corrected library search data for all reported TIC		/	—	—
Quantitation and calculation data for all TIC		/	—	—
Standards Data		/	—	—
Initial calibration report		/	—	—
RIC and quantitation reports for initial calibration		/	—	—
Continuing calibration reports		/	—	—
RIC and quantitation reports for cont. calibrations		/	—	—
Internal standard summary report		/	—	—
Raw QC Data		/	—	—
Tuning report, spectra and mass lists		/	—	—
Blank analysis reports		/	—	—
TIC reports for all blanks		/	—	—
RIC and quantitation reports for blanks		/	—	—
Raw and corrected spectra for all detected results in blanks		/	—	—
Raw and corrected library search data for all reported TIC		/	—	—

<u>Data Package Item</u>	<u>Present?:</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>
Quantitation and calculation data for all TIC MS/MSD report forms	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RIC and quantitation reports for MS/MSD	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Additional Data</b>				
Moisture/% solids data sheets	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reduction formulae	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Instrument time logs	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chemist notebook pages	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sample preparation sheets	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. HOLDING TIMES

Complete the holding time summary form listing all samples and dates of collection and analysis.

Were all samples analyzed within holding time?  Yes  No  N/A

ACTION: If any holding times were exceeded, but not by greater than a factor of two, qualify associated samples as estimated (J for detects or UJ for nondetects), otherwise reject all nondetects (R) and qualify all associated detects as estimated (J).

3. INSTRUMENT CALIBRATION, TUNING AND PERFORMANCE CHECKS

3.1 GC/MS TUNING AND PERFORMANCE CHECKS

- Is a bromofluorobenzene tune report present for each applicable 12-h period?  Yes  No  N/A
- Do all tunes on all instruments meet the tuning criteria?  Yes  No  N/A
- Do all tunes on all instruments meet the expanded criteria?  Yes  No  N/A
- Has the laboratory made any calculation or transcription errors?  Yes  No  N/A
- Have the proper significant figures been reported?  Yes  No  N/A

ACTION: If the mass calibration is out of specification but within the expanded criteria, qualify associated data as estimated (J for detects or UJ for nondetects). If all tuning criteria are missed, qualify all associated data as unusable (R).

3.2 INITIAL CALIBRATION

- Is an initial calibration report provided for all instruments?  Yes  No  N/A
- Are all RSD values  $\leq 30\%$  (2/88 SOW)?  Yes  No  N/A
- Are all RRF values  $\geq 0.05$  (2/88 SOW)?  Yes  No  N/A

5/11/92

Are all applicable RSD values $\leq 20.5\%$ (3/90 SOW)?	Yes	No	<input checked="" type="radio"/> N/A
Are all applicable RSD values $\leq 40\%$ (3/90 SOW)?	Yes	No	<input checked="" type="radio"/> N/A
Are all applicable RRF values within SOW limits (3/90 SOW)?	Yes	No	<input checked="" type="radio"/> N/A
Are all erratic performance compound RRF values $\geq 0.01$ (3/90 SOW)?	Yes	No	<input checked="" type="radio"/> N/A

**ACTION:** With the exception of compounds that exhibit erratic performance and making allowances for up to two TCL compounds, if any RRF value is out of specification qualify all detected results for the particular compound as estimated (J) and all nondetects as unusable (R). Making allowances for up to two TCL compounds, if any RSD value is out of specification qualify all associated data as estimated (J for detects or UJ for nondetects).

**3.3. CONTINUING CALIBRATION**

Is a continuing calibration report present for all 12-h periods in which associated samples were analyzed?	<input checked="" type="radio"/> Yes	No	N/A
Are all RRF values $\geq 0.05$ (2/88 SOW)?	<input checked="" type="radio"/> Yes	No	N/A
Are all %D values $\leq 25\%$ (2/88 or 3/90 SOW)?	<input checked="" type="radio"/> Yes	No	N/A
Are all %D values $\leq 40\%$ (3/90 SOW)?	Yes	No	<input checked="" type="radio"/> N/A
Are all RRF values within SOW limits (3/90 SOW)?	Yes	No	<input checked="" type="radio"/> N/A
Are all erratic performance compound RRF values $\geq 0.01$ (3/90 SOW)?	Yes	No	<input checked="" type="radio"/> N/A

**ACTION:** With the exception of compounds that exhibit erratic performance and making allowances for up to two TCL compounds, if any RRF value is out of specification qualify all associated detected results as estimated and all nondetects as unusable (R). Making allowances for up to two TCL compounds, if any %D is out of specification, qualify all associated results as estimated (J for detects or UJ for nondetects).

**4. BLANKS**

**4.1 LABORATORY BLANKS**

Has the laboratory conducted a method blank analysis per matrix for every 12-h period in which samples were analyzed?	<input checked="" type="radio"/> Yes	No	N/A
Are TCL compounds present in the laboratory blanks?	<input checked="" type="radio"/> Yes	No	N/A

**ACTION:** Qualify all sample results  $\leq 10$  time the highest blank concentration for the common laboratory contaminants, as nondetects (U) or at the SQL if the result is  $< CRQL$ . Qualify all remaining sample results  $\leq 5$  times the blank concentration in similar fashion.

## 4.2. FIELD BLANKS

Are TCL compounds present in the field blanks?

Yes

No

 N/A

**ACTION:** Qualify all detected sample results  $\leq 5$  times the amount in any valid field blank as nondetects (U) and note the field blank results in the validation narrative.

## 5. ACCURACY

## 5.1 SURROGATE/SYSTEM MONITORING COMPOUND RECOVERY

Are any surrogate recoveries out of specification?

Yes

 No

N/A

Are any surrogate recoveries  $< 10\%$ ?

Yes

 No

N/A

Are any method blank surrogate recoveries out of specification?

Yes

 No

N/A

**ACTION:** Qualify all associated sample results as estimated (J for detects or UJ for nondetects) for surrogates out of specification but  $> 10\%$ . Qualify all associated positive sample results as estimated (J) and all nondetect results as unusable (R) for all surrogates below  $10\%$ . If method blank surrogates are out of specification and the associated sample surrogates are acceptable no qualification is necessary, however, the laboratory should be contacted for an explanation.

## 5.2 MATRIX SPIKE RECOVERY

Has an MS/MSD analysis been conducted per matrix in the sample group?

 Yes

No

N/A

Are MS/MSD recoveries within specification?

 Yes

No

N/A

*See comment 1*

Are there any calculation errors?

Yes

 No

N/A

**ACTION:** If an MS/MSD analysis has not been conducted contact the laboratory for an explanation. Review the MS/MSD recoveries in conjunction with other QC data such as surrogate recoveries and note the results in the validation narrative. If MS/MSD recoveries are out of specification and sample concentration is  $> 5$  times the spike concentration, no qualification is required, otherwise qualify results as follows: Qualify positive results for the specific class of compound (aromatics and non-aromatics) as estimated (J) in all samples if associated surrogates are also out of specification. The qualification shall only be done on samples of similar matrix as the MS/MSD samples. If it is determined from the review that only the spiked samples are affected by low recoveries, qualify only the results for the spiked sample as described above. If it is determined from the review that out of specification MS/MSD recoveries are indicative of systematic problems in the laboratory such as sample preparation or sample-specific matrix interferences this must be noted in the validation narrative along with the potential affect on the sample results.

5.3 PERFORMANCE AUDIT SAMPLES

Are the performance audit sample results within the acceptance limits?

Yes No **N/A**

ACTION: Note the results of the performance audit sample in the validation narrative.

6. PRECISION

6.1 MATRIX SPIKE/MATRIX SPIKE DUPLICATES

Are RPD values within specification?

**Yes** No N/A

Are there any calculation errors?

Yes **No** N/A

ACTION: Review the MS/MSD results in conjunction with other QC data such as field duplicates and note the results in the validation narrative. If MS/MSD RPDs are out of specification and sample results are > 5xCRQL qualify positive results for the specific class of compound (aromatics and non-aromatics) as estimated (J). If it is determined from the review that out of specification MS/MSD results are indicative of systematic problems in the laboratory such as sample preparation or sample-specific matrix interferences this must be noted in the validation narrative along with the potential affect on the sample results.

6.2 FIELD DUPLICATE SAMPLES

Are field duplicate RPD values acceptable?

Yes No **N/A**

*See comment 2*

ACTION: Note the results of the field duplicate samples in the validation narrative.

6.3 FIELD SPLIT SAMPLES

Are field split RPD values acceptable?

Yes No **N/A**

ACTION: Note the results of the field split samples in the validation narrative.

7. SYSTEM PERFORMANCE

7.1 INTERNAL STANDARDS PERFORMANCE

Are any internal standard area counts outside the acceptance limits?

Yes **No** N/A

Are retention times for any internal standard outside the ±30 second windows established by the most recent calibration check?

*See comment 3*  
**Yes** No N/A

ACTION: If the area counts are outside the acceptance limits qualify all associated results as estimated (J for detects or UJ for nondetects). If it is determined from the review that out of specification area counts and relative retention times are indicative of systematic problems within the laboratory the reviewer may consider rejection of all affected sample data (R).

8. COMPOUND IDENTIFICATION AND QUANTITATION

8.1 COMPOUND IDENTIFICATION

Are detected compounds within $\pm 0.06$ relative retention time units of the associated calibration standard?	<input checked="" type="radio"/> Yes	No	N/A
Are all ions at a relative intensity of $\geq 10\%$ in the standard spectra present in the sample spectra?	<input checked="" type="radio"/> Yes	No	N/A
Do the relative intensities between the standard and sample spectra agree within 20%?	<input checked="" type="radio"/> Yes	No	N/A
Have all ions $> 10\%$ in the sample spectra that are not present in the standard spectra been reviewed for possible background contamination?	<input checked="" type="radio"/> Yes	No	N/A
Are molecular ions present in the reference spectrum present in the sample spectrum?	<input checked="" type="radio"/> Yes	No	N/A

ACTION: If compound identification is in error and retention time and mass spectral criteria are exceeded qualify all affected positive results as unusable (R). If cross-contamination between analyses is suspected, qualify affected data as unusable (R). Note the results in the validation narrative.

8.2 REPORTED RESULTS AND QUANTITATION LIMITS

Has the laboratory used the correct RRF values and internal standard(s) for quantitation?	Yes	No	N/A
		<i>See comment 4.</i>	
Are results and quantitation limits calculated properly?	Yes	<input checked="" type="radio"/> No	N/A
Has the laboratory reported the sample quantitation limits within 5xCRQL values?	<input checked="" type="radio"/> Yes	No	N/A

ACTION: If the results and quantitation limits are in error contact the laboratory for clarification and note in the validation narrative.

8.3 TENTATIVELY IDENTIFIED COMPOUNDS (TIC)

Has the laboratory conducted a spectral library search on all candidate TIC peaks in accordance with the analytical SOW?	<input checked="" type="radio"/> Yes	No	N/A
Has the laboratory properly identified and coded all TIC?	Yes	No	<input checked="" type="radio"/> N/A

ACTION: If the laboratory has failed to search the minimum number of TIC peaks in the chromatogram contact the laboratory for submittal of the required data. Qualify as nondetects (U) all TIC compounds present in samples and blanks using the review criteria specified in the validation requirements. If TIC identification is in error sample results should be qualified as nondetects (U) or unusable (R). If TIC identifications are judged valid, qualify the results as presumptive and estimated (JN).

9. OVERALL ASSESSMENT AND SUMMARY

Has the laboratory conducted the analysis in accordance with the analytical SOW?

See comment 5  
Yes  No N/A

Were project specific data quality objectives met for this analysis?

Yes No N/A

**ACTION:** Summarize all the data qualifications recommended in the foregoing sections, and complete the data validation narrative according to the requirements of Section 10.0 of the data validation requirements.



## COMMENTS (attach additional sheets as necessary):

1. Spiking amount is 5x the normal spiking amount. Laboratory used 1 g sample instead of 5 g.

2. Laboratory analyzed a lab. dup: sample B015H Dup. Results are as follows

Compound	B015H1	B015H1D	% RPD
Carbon Tet Methyl	3J	3J	=
MTCA	8J	26	105
Toluene	2J	1J	116

Results are acceptable because the sample results are  $\leq$  CRDL

3. Internal Standard BCPM RT was outside 13.19 window by .22. Data not qualified due to this.

4. Laboratory did not include a few compounds at low concentrations. Added in on Form 15.

5. Laboratory used 1 g sample instead of 5 g as specified in 2/08 SOW.

2. (Continued) Lab. also ran another dup:

Compound	B015B9	B01569 Dup	% RPD
Acetone	83B	110 B	27
MTCA	7J	4J	54
Toluene	2J	-	-

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1A  
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015H1  
216-B-S013 28-30.5

split

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

Matrix: (soil/water) SOIL

Lab Sample ID: 92-00358

Sample wt/vol: 0.9431 (g/mL) G

Lab File ID: >VB404

Level: (low/med) LOW

Date Received: 10/11/91

Moisture: not dec. 3.3

Date Analyzed: 10/14/91

Column: (pack/cap) CAP

Dilution Factor: 1.00000

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

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	55.	U
74-83-9	Bromomethane	55.	U
75-01-4	Vinyl Chloride	55.	U
75-00-3	Chloroethane	55.	U
75-09-2	Methylene Chloride	3 28.	U
67-64-1	Acetone	28.	JB
75-15-0	Carbon Disulfide	27.	U
75-35-4	1,1-Dichloroethene	27.	U
75-34-3	1,1-Dichloroethane	27.	U
540-59-0	1,2-Dichloroethene (total)	27.	U
67-66-3	Chloroform	27.	U
107-02-2	1,2-Dichloroethane	27.	U
78-93-3	2-Butanone	35.	JB
71-55-6	1,1,1-Trichloroethane	8.	J
56-23-5	Carbon Tetrachloride	27.	U
108-05-4	Vinyl Acetate	55.	U
75-27-4	Bromodichloromethane	27.	U
78-87-5	1,2-Dichloropropane	27.	U
10061-01-5	cis-1,3-Dichloropropene	27.	U
79-01-6	Trichloroethene	27.	U
124-48-1	Dibromochloromethane	27.	U
79-00-5	1,1,2-Trichloroethane	27.	U
71-43-2	Benzene	27.	U
10061-02-6	trans-1,3-Dichloropropene	27.	U
75-25-2	Bromoform	27.	U
108-10-1	4-Methyl-2-pentanone	55.	U
591-78-6	2-Hexanone	55.	U
127-18-4	Tetrachloroethene	27.	U
79-34-5	1,1,2,2-Tetrachloroethane	27.	U
108-88-3	Toluene	2 27.	U
108-90-7	Chlorobenzene	27.	U
100-41-4	Ethylbenzene	27.	U
100-42-5	Styrene	27.	U
133-02-7	Xylene (total)	27.	U

J

U

J

9/11/92



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1A  
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015G9  
210-A-506 15.5-17.5

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

Matrix: (soil/water) SOIL

Lab Sample ID: 92-00306

Sample wt/vol: 1.121 (g/mL) G

Lab File ID: >VB408

Level: (low/med) LOW

Date Received: 10/08/91

% Moisture: not dec. 3.0

Date Analyzed: 10/14/91

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	46.	U
74-83-9	-----Bromomethane	46.	U
75-01-4	-----Vinyl Chloride	46.	U
75-00-3	-----Chloroethane	46.	U
75-09-2	-----Methylene Chloride	23.	U
67-64-1	-----Acetone	83.	U
75-15-0	-----Carbon Disulfide	23.	U
75-35-4	-----1,1-Dichloroethane	23.	U
75-34-3	-----1,1-Dichloroethane	23.	U
540-59-0	-----1,2-Dichloroethane (total)	23.	U
67-66-3	-----Chloroform	23.	U
107-02-2	-----1,2-Dichloroethane	23.	U
78-93-3	-----2-Butanone	53.	U
71-55-6	-----1,1,1-Trichloroethane	7.	J
56-23-5	-----Carbon Tetrachloride	23.	U
108-05-4	-----Vinyl Acetate	46.	U
75-27-4	-----Bromodichloromethane	23.	U
78-87-5	-----1,2-Dichloropropane	23.	U
10061-01-5	-----cis-1,3-Dichloropropene	23.	U
79-01-6	-----Trichloroethene	23.	U
124-48-1	-----Dibromochloromethane	23.	U
79-00-5	-----1,1,2-Trichloroethane	23.	U
71-43-2	-----Benzene	23.	U
10061-02-6	-----trans-1,3-Dichloropropene	23.	U
75-25-2	-----Bromoform	23.	U
108-10-1	-----4-Methyl-2-pentanone	46.	U
591-78-6	-----2-Hexanone	46.	U
127-18-4	-----Tetrachloroethene	23.	U
79-34-5	-----1,1,2,2-Tetrachloroethane	23.	U
108-88-3	-----Toluene	23.	U
108-90-7	-----Chlorobenzene	23.	U
100-41-4	-----Ethylbenzene	23.	U
100-42-5	-----Styrene	23.	U
133-02-7	-----Xylene (total)	23.	U

ttB

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J

5/11/92

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1A  
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: BATTELLE-PNL

Contract: -----

BO15H1 DUP  
216-B-50B 28

-30.5 d  
split

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

Matrix: (soil/water) SOIL

Lab Sample ID: 92-00358DUP

Sample wt/vol: 1.0080 (g/mL) G

Lab File ID: >VB405

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec. 3.3

Date Analyzed: 10/14/91

Column: (pack/cap) CAP

Dilution Factor: 1.00000

CONCENTRATION UNITS:

CAS NO. COMPOUND (ug/L or ug/Kg) ug/Kg Q

74-87-3	-----Chloromethane	51.	U
74-83-9	-----Bromomethane	51.	U
75-01-4	-----Vinyl Chloride	51.	U
75-00-3	-----Chloroethane	51.	U
75-09-2	-----Methylene Chloride	26.	U
67-64-1	-----Acetone	26.24	JB
75-15-0	-----Carbon Disulfide	26.	U
75-35-4	-----1,1-Dichloroethene	26.	U
75-34-3	-----1,1-Dichloroethane	26.	U
540-59-0	-----1,2-Dichloroethene (total)	26.	U
67-66-3	-----Chloroform	26.	U
107-02-2	-----1,2-Dichloroethane	26.	U
78-93-3	-----2-Butanone	35.	JB
71-55-6	-----1,1,1-Trichloroethane	26.	U
56-23-5	-----Carbon Tetrachloride	26.	U
108-05-4	-----Vinyl Acetate	51.	U
75-27-4	-----Bromodichloromethane	26.	U
78-87-5	-----1,2-Dichloropropane	26.	U
10061-01-5	-----cis-1,3-Dichloropropene	26.	U
79-01-6	-----Trichloroethene	26.	U
124-48-1	-----Dibromochloromethane	26.	U
79-00-5	-----1,1,2-Trichloroethane	26.	U
71-43-2	-----Benzene	26.	U
10061-02-6	-----trans-1,3-Dichloropropene	26.	U
75-25-2	-----Bromoform	26.	U
108-10-1	-----4-Methyl-2-pentanone	51.	U
591-78-6	-----2-Hexanone	51.	U
127-18-4	-----Tetrachloroethene	26.	U
79-34-5	-----1,1,2,2-Tetrachloroethane	26.	U
108-88-3	-----Toluene	26.	U
108-90-7	-----Chlorobenzene	26.	U
100-41-4	-----Ethylbenzene	26.	U
100-42-5	-----Styrene	26.	U
133-02-7	-----Xylene (total)	26.	U

u

u

J

J

FORM I VOA

1/89 Rev.

5/11/92

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1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BLANK

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

Matrix: (soil/water) SOIL

Lab Sample ID: BLANK

Sample wt/vol: 5 (g/mL) G

Lab File ID: >VB403

Level: (low/med) LOW

Date Received: 10/14/91

% Moisture: not dec. 100

Date Analyzed: 10/14/91

Column: (pack/cap) CAP

Dilution Factor: 1.00000

CONCENTRATION UNITS:

CAS NO. COMPOUND (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-Dichloroethane	5.	U
75-34-3	1,1-Dichloroethane	5.	U
540-59-0	1,2-Dichloroethane (total)	5.	U
67-66-3	Chloroform	5.	U
107-02-2	1,2-Dichloroethane	5.	U
78-93-3	2-Butanone	10.	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

*Blank qualification*

*X10 = 80*

*X10 = 100*

*5/11/91*

9613497.2152

1A  
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: BATTELLE-PNL

Contract: -----

B015G9 DUP  
210-B-50B 15.5-17.5 0

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

Matrix: (soil/water) SOIL

Lab Sample ID: 92-00306 DU

Sample wt/vol: 1.129 (g/mL) G

Lab File ID: >VB409

Level: (low/med) LOW

Date Received: 10/08/91

Moisture: not dec. 3.0

Date Analyzed: 10/14/91

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	46.	U
74-83-9	Bromomethane	46.	U
75-01-4	Vinyl Chloride	46.	U
75-00-3	Chloroethane	46.	U
75-09-2	Methylene Chloride	23.	U
67-64-1	Acetone	110.	B
75-15-0	Carbon Disulfide	23.	U
75-35-4	1,1-Dichloroethene	23.	U
75-34-3	1,1-Dichloroethane	23.	U
540-59-0	1,2-Dichloroethene (total)	23.	U
67-66-3	Chloroform	23.	U
107-02-2	1,2-Dichloroethane	23.	U
78-93-3	2-Butanone	38.	U
71-55-6	1,1,1-Trichloroethane	23.	U
56-23-5	Carbon Tetrachloride	23.	U
108-05-4	Vinyl Acetate	46.	U
75-27-4	Bromodichloromethane	23.	U
78-87-5	1,2-Dichloropropane	23.	U
10061-01-5	cis-1,3-Dichloropropene	23.	U
79-01-6	Trichloroethene	23.	U
124-48-1	Dibromochloromethane	23.	U
79-00-5	1,1,2-Trichloroethane	23.	U
71-43-2	Benzene	23.	U
10061-02-6	trans-1,3-Dichloropropene	23.	U
75-25-2	Bromoform	23.	U
108-10-1	4-Methyl-2-pentanone	46.	U
591-78-6	2-Hexanone	46.	U
127-18-4	Tetrachloroethene	23.	U
79-34-5	1,1,2,2-Tetrachloroethane	23.	U
108-88-3	Toluene	23.	U
108-90-7	Chlorobenzene	23.	U
100-41-4	Ethylbenzene	23.	U
100-42-5	Styrene	23.	U
133-02-7	Xylene (total)	23.	U

FORM I VOA

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<u>Data Package Item</u>	<u>Present?:</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>
RIC and quantitation reports for MS/MSD		/	—	—
Additional Data			/	
Moisture/% solids data sheets		—	/	—
Reduction formulae		—	/	—
Instrument time logs		—	/	—
Chemist notebook pages		/	—	—
Sample preparation sheets		/	—	—

2. HOLDING TIMES

Were all samples extracted within holding time?  Yes No N/A

Were all samples analyzed within holding time?  Yes No N/A

ACTION: If any holding times were exceeded, but not by greater than a factor of two, qualify associated samples as estimated (J for detects or UJ for nondetects), otherwise reject all nondetects (R) and qualify all associated detects as estimated (J).

3. INSTRUMENT CALIBRATION, TUNING AND PERFORMANCE CHECKS

3.1 GC/MS TUNING AND PERFORMANCE CHECKS

Is a DFTPP tune report present for each applicable 12h period?  Yes No N/A

Do all tunes on all instruments meet the tuning criteria?  Yes No N/A

Do all tunes on all instruments meet the expanded criteria? Yes No  N/A

Has the laboratory made any calculation or transcription errors? Yes  No N/A

Have the proper significant figures been reported?  Yes No N/A

ACTION: If the mass calibration is out of specification but within the expanded criteria, qualify associated data as estimated (J for detects and UJ for nondetects). If all tuning criteria are not met, qualify all associated data as unusable (R).

3.2 INITIAL CALIBRATION

Is an initial calibration report provided for all instruments?  Yes No N/A

Are all RSD values  $\leq 30\%$  (2/88 SOW)?  Yes No N/A

Are all RRF values  $\geq 0.05$  (2/88 SOW)?  Yes No N/A

Are all applicable RSD values  $\leq 20.5\%$  (3/90 SOW)? Yes No  N/A

Are all applicable RSD values  $\leq 40\%$  (3/90 SOW)? Yes No  N/A

SEMI-VOLATILE ORGANIC DATA VALIDATION CHECKLIST - FORM A-2

PROJECT: 200BPI	REVIEWER: y	DATE: 11/10/92
LABORATORY: PNL	CASE:	SDG: %B01564 @ 2/5/93
SAMPLES/MATRIX: soils B01541, B01569		

1. DATA PACKAGE COMPLETENESS

Review the data package for completeness and check off the items below. If any data review elements are missing contact the laboratory for submittal.

Data Package Item	Present?:	Yes	No	N/A
Case Narrative		/		
Data Summary		/		
Chain-of-Custody			/	
QC Summary				
Surrogate report		/		
MS/MSD report		/		
Blank summary report		/		
GC/MS tuning report		/		
Internal standard summary report		/		
Sample Data				
Sample reports		/		
TIC reports for each sample		/		
RIC reports for all samples		/		
Raw and corrected spectra for all detected results		/		
Raw and corrected library search data for all reported TIC		/		
Quantitation and calculation data for all TIC		/		
Standards Data				
Initial calibration report		/		
RIC and quantitation reports for initial calibration			/	
Continuing calibration reports		/		
RIC and quantitation reports for cont. calibrations		/		
Internal standard summary report		/		
Raw QC Data				
Tuning report, spectra and mass lists		/		
Blank analysis reports		/		
TIC reports for all blanks		/		
RIC and quantitation reports for blanks		/		
Raw and corrected spectra for all detected results in blanks		/		
Raw and corrected library search data for all reported TIC		/		
Quantitation and calculation data for all TIC		/		
MS/MSD report forms		/		

Are all applicable RRF values within SOW limits (3/90 SOW)? Yes No  N/A

Are all erratic performance compound RRF values  $\geq 0.01$  (3/90 SOW)? Yes No  N/A

**ACTION:** With the exception of compounds that exhibit erratic performance and making allowances for up to four TCL compounds or surrogates, if any RRF value is out of specification qualify all detected results for the particular compound as estimated (J) and all nondetects as unusable (R). Making allowances for up to four TCL compounds or surrogates, if any RSD value is out of specification qualify all associated data as estimated (J for detects or UJ for nondetects).

3.3. CONTINUING CALIBRATION

Is a continuing calibration report present for all 12-h periods in which associated samples were analyzed?  Yes No N/A

Are all RRF values  $\geq 0.05$  (2/88 SOW)?  Yes No N/A

Are all %D values  $\leq 25\%$  (2/88 or 3/90 SOW)? Yes  No N/A

Are all %D values  $\leq 40\%$  (3/90 SOW)? Yes No  N/A

Are all RRF values within SOW limits (3/90 SOW)? Yes No  N/A

Are all erratic performance compound RRF values  $\geq 0.01$  (3/90 SOW)? Yes No  N/A

**ACTION:** With the exception of compounds that exhibit erratic performance and making allowances for up to four TCL compounds or surrogates, if any RRF value is out of specification qualify all associated detected results as estimated and all nondetects as unusable (R). Making allowances for up to four TCL compounds or surrogates, if any %D is out of specification, qualify all associated results as estimated (J for detects or UJ for nondetects).

4. BLANKS

4.1 LABORATORY BLANKS

Has the laboratory conducted a method blank analysis per matrix for every extraction batch?  Yes No N/A

Are compounds reported in the laboratory blanks?  Yes No N/A

**ACTION:** Qualify all sample results  $< 10$  times the highest blank concentration for the common laboratory contaminants, as nondetects (U) or at the SQL if the result is  $< CRQL$ . Qualify all remaining sample results  $< 5$  times the blank concentration in similar fashion.

**4.2. FIELD BLANKS**

Are compounds reported in the field blanks? Yes No  N/A

**ACTION:** Qualify all detected sample results  $\leq 5$  times the amount in any valid field blank as nondetects (U) and note the results of the field blanks in the validation narrative.

**5. ACCURACY**

**5.1 SURROGATE RECOVERY/SYSTEM MONITORING COMPOUND RECOVERY**

Are any surrogate recoveries out of specification?  Yes No N/A

Are any surrogate recoveries  $< 10\%$ ?  Yes No N/A

Are any method blank surrogate recoveries out of specification? Yes  No N/A

**ACTION:** Qualify all associated data as estimated (J for detects and UJ for nondetects) if at least two semivolatile surrogates are out of specification. If any surrogate is below 10% recovery qualify associated detected results as estimated (J) and associated nondetect results as unusable (R). If method blank surrogates are out of specification and associated sample surrogates are acceptable no qualification is required, however, the laboratory should be contacted for an explanation.

**5.2 MATRIX SPIKE RECOVERY**

Has an MS/MSD analysis been conducted per matrix in the sample group?  Yes No N/A

Are MS/MSD recoveries within specification?  Yes No N/A

Are there any calculation errors? Yes  No N/A

**ACTION:** If an MS/MSD analysis has not been conducted contact the laboratory for an explanation. Review the MS/MSD recoveries in conjunction with other QC data such as surrogate recoveries and note the results in the validation narrative. If MS/MSD recoveries are out of specification and sample concentration is  $> 5$  times the spike concentration, no qualification is required, otherwise qualify results as follows: Qualify positive results for the specific class of compound (aromatics and non-aromatics) as estimated (J) in all samples if associated surrogates are also out of specification. The qualification shall only be done on samples of similar matrix as the MS/MSD samples. If it is determined from the review that only the spiked samples are affected by low recoveries, qualify only the results for the spiked sample as described above. If it is determined from the review that out of specification MS/MSD recoveries are indicative of systematic problems in the laboratory such as sample preparation or sample-specific matrix interferences this must be noted in the validation narrative along with the potential affect on the sample results.

5.3 PERFORMANCE AUDIT SAMPLES

Are the results for the performance audit samples within the acceptance limits? Yes No N/A

ACTION: Note the results of the performance audit samples in the validation narrative.

6. PRECISION

6.1 MATRIX SPIKE/MATRIX SPIKE DUPLICATES

Are all RPD values within specification? Yes No N/A

Are there any calculation errors? Yes No N/A

ACTION: Review the MS/MSD results in conjunction with other QC data such as field duplicates and note the results in the validation narrative. If MS/MSD RPDs are out of specification and sample results are > 5xCRQL qualify positive results for the specific class of compound (aromatics and non-aromatics) as estimated (J). If it is determined from the review that out of specification MS/MSD results are indicative of systematic problems in the laboratory such as sample preparation or sample-specific matrix interferences this must be noted in the validation narrative along with the potential affect on the sample results.

6.2 FIELD DUPLICATE SAMPLES

Are field duplicate RPD values acceptable? Yes No N/A

ACTION: Note the results of the field duplicate samples in the validation narrative.

6.3 FIELD SPLIT SAMPLES

Are field split RPD values acceptable? Yes No N/A

ACTION: Note the results of the field split samples in the validation narrative.

7. SYSTEM PERFORMANCE

7.1 INTERNAL STANDARDS PERFORMANCE

Are any internal standard area counts outside the acceptance limits? Yes No N/A

Are retention times for any internal standard outside the ±30 second windows established by the most recent calibration check? *See comment*  
Yes No N/A

ACTION: If the area counts are outside the acceptance limits qualify all associated results as estimated (J for detects and UJ for nondetects. If it is determined from the review that out of specification area counts and relative retention times are indicative of systematic problems within the laboratory the reviewer may consider rejection of all affected sample data (R).

## 8. COMPOUND IDENTIFICATION AND QUANTITATION

## 8.1 COMPOUND IDENTIFICATION

Are detected compounds within  $\pm 0.06$  relative retention time units of the associated calibration standard?

Yes No N/A

Are all ions at a relative intensity of  $\geq 10\%$  in the standard spectra present in the sample spectra?

Yes No N/A

Do the relative intensities between the standard and sample spectra agree within 20%?

Yes No N/A

Have all ions  $> 10\%$  in the sample spectra that are not present in the standard spectra been reviewed for possible background contamination?

Yes No N/A

Are molecular ions in the reference spectrum present in the sample spectrum?

Yes No N/A

**ACTION:** If compound identification is in error and retention time and mass spectral criteria are exceeded qualify all affected positive results as unusable (R). If cross-contamination between analyses is suspected, qualify affected data as unusable (R).

## 8.2 REPORTED RESULTS AND QUANTITATION LIMITS

Has the laboratory used the correct RRF values and internal standards for quantitation?

Yes No N/A

Are results and quantitation limits calculated properly?

Yes No N/A

Has the laboratory reported the sample quantitation limits within  $5 \times \text{CRQL}$  values?

Yes No N/A

**ACTION:** If the quantitation limits are in error contact the laboratory for clarification and note in the validation narrative.

## 8.3 TENTATIVELY IDENTIFIED COMPOUNDS

Has the laboratory conducted a spectral library search on all candidate TIC peaks in accordance with the analytical SOW?

Yes No N/A

Has the laboratory properly identified and coded all TIC?

Yes No N/A

**ACTION:** If the laboratory has failed to search the minimum number of TIC peaks in the chromatogram contact the laboratory for submittal of the required data. Qualify as nondetects (U) all TIC compounds present in samples and blanks using the review criteria specified in the validation requirements. If TIC identification is in error sample results should be qualified as nondetects (U) or unusable (R). If TIC identifications are judged valid, qualify the results as presumptive and estimated (JN).

**9. OVERALL ASSESSMENT AND SUMMARY**

**Has the laboratory conducted the analysis in accordance with the analytical SOW?**

Yes    No    N/A

**Were project specific data quality objectives met for this analysis?**

Yes    No    N/A

**ACTION:** Summarize all the data qualifications and complete the data validation narrative as specified in Section 10.0 of the data validation requirements.

COMMENTS (attach additional sheets as necessary):

1. The RTs for acenaphthene-d10 are slightly out however, data was not requalified based on this.



9613497.2162  
2D

SOIL SEMIVOLATILE SURROGATE RECOVERY

Lab Name:BATTELLE-PNL

Contract:-----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: 8 12-2-91 *PLU*

Level:(low/med) LOW

	EPA SAMPLE NO.	S1 (NBZ) #	S2 (FBP) #	S3 (TPH) #	S4 (PHL) #	S5 (2FP) #	S6 (TBP) #	OTHER	TOT OUT
01	SBLKX1	82	80	82	90	76	80		0
02	B015H1	76	78	74	86	66	82		0
03	B015H1 D	84	82	88	86	74	76		0
04	B015H1MS	84	82	88	88	66	90		0
05	B015H1MSD	80	76	80	86	68	82		0
06	B015G9	90	88	92	104	100	96		0
07	B015G9	88	90	90	104	(0)*	100		1
08									
09									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

- QC LIMITS
- S1 (NBZ) = Nitrobenzene-d5 (22-120)
  - S2 (FBP) = 2-Fluorobiphenyl (30-115)
  - S3 (TPH) = Terphenyl-d14 (18-137)
  - S4 (PHL) = Phenol-d5 (24-113)
  - S5 (2FP) = 2-Fluorophenol (25-121)
  - S6 (TBP) = 2,4,6-Tribromophenol (19-122)

# Column to be used to flag recovery values  
 \* Values outside of contract required QC limits  
 D Surrogates diluted out

*9/11/82*  
 E05-026



9613497.2164

1B  
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: BATTELLE-PNL

Contract: -----

B015H1

216-B-50B 25-30.5 split

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

B 12-2-91/104

Matrix: (soil/water) SOIL

Lab Sample ID: 92-358-E-1

Sample wt/vol: 29.7 (g/mL) G

Lab File ID: &gt;XC405

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec. 3.4 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 8.5

Dilution Factor: 1.00000

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

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

UJ

UJ

FORM I SV-1

1/87 Rev.

S11/10/92

9613497.2165

1C  
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name:BATTELLE-PNL

Contract:-----

BO15H1  
216 B-50B 25-30.5

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: 12-2-91 PA

Matrix: (soil/water) SOIL

Lab Sample ID: 92-358-E-1

Sample wt/vol: 29.7 (g/mL) G

Lab File ID: >XC405

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec.3.4 dec. --

Date Extracted:10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH:8.5

Dilution Factor: 1.00000

CAS NO. COMPOUND CONCENTRATION UNITS:  
(ug/L or ug/Kg) ug/Kg Q

99-09-2-----	3-Nitroaniline	1700.	U	UJ
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	410.	B	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	350.	U	
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

FORM I SV-2

1/87 Rev.

9613497-2166

1F

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET  
TENTATIVELY IDENTIFIED COMPOUNDS

B015H1  
216-B-506 28-30.5

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

11-2-91

Matrix: (soil/water) SOIL

Lab Sample ID: 92-358-E-1

Sample wt/vol: 29.7 (g/mL) G

Lab File ID: >XC405

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec. 3.4 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 8.5

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.	Unknown	4.39	1300.	JB
2.	Unknown	5.36	390.	JB
3. 791286	Phosphine oxide, triphenyl-	34.65	340.	JB
4.	Unknown	5.11	710.	JB
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9613497.2167

1B  
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: BATTELLE-PNL

Contract: -----

B015G9  
210-B-50B 15.5-175

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: 8-132-91

Matrix: (soil/water) SOIL

Lab Sample ID: 92-306-E-1

Sample wt/vol: 30.6 (g/mL) G

Lab File ID: >XC409

Level: (low/med) LOW

Date Received: 10/08/91

% Moisture: not dec.3 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 6.5

Dilution Factor: 2.00000

CONCENTRATION UNITS:

CAS NO. COMPOUND (ug/L or ug/Kg) ug/Kg Q

108-95-2-----	Phenol	670.	U	D
111-44-4-----	bis(2-Chloroethyl) Ether	670.	U	D
95-57-8-----	2-Chlorophenol	670.	U	D
541-73-1-----	1,3-Dichlorobenzene	670.	U	D
106-46-7-----	1,4-Dichlorobenzene	670.	U	D
100-51-6-----	Benzyl alcohol	670.	U	D
95-50-1-----	1,2-Dichlorobenzene	670.	U	D
95-48-7-----	2-Methylphenol	670.	U	D
39638-32-9-----	bis(2-chloroisopropyl) ether	670.	U	D
106-44-5-----	4-Methylphenol	670.	U	D
621-64-7-----	N-Nitroso-Di-n-propylamine	670.	U	D
67-72-1-----	Hexachloroethane	670.	U	D
98-95-3-----	Nitrobenzene	670.	U	D
78-59-1-----	Isophorone	670.	U	D
88-75-5-----	2-Nitrophenol	670.	U	D
105-67-9-----	2,4-Dimethylphenol	670.	U	D
65-85-0-----	Benzoic acid	3400.	U	D
111-91-1-----	bis(2-Chloroethoxy)methane	670.	U	D
120-83-2-----	2,4-Dichlorophenol	670.	U	D
120-82-1-----	1,2,4-Trichlorobenzene	670.	U	D
91-20-3-----	Naphthalene	670.	U	D
106-47-8-----	4-Chloroaniline	670.	U	D
87-68-3-----	Hexachlorobutadiene	670.	U	D
59-50-7-----	4-Chloro-3-methylphenol	670.	U	D
91-57-6-----	2-Methylnaphthalene	670.	U	D
77-47-4-----	Hexachlorocyclopentadiene	670.	U	D
88-06-2-----	2,4,6-Trichlorophenol	670.	U	D
95-95-4-----	2,4,5-Trichlorophenol	3400.	U	D
91-58-7-----	2-Chloronaphthalene	670.	U	D
88-74-4-----	2-Nitroaniline	3400.	U	D
131-11-3-----	Dimethylphthalate	670.	U	D
208-96-8-----	Acenaphthylene	670.	U	D
606-20-2-----	2,6-Dinitrotoluene	670.	U	D

FORM I SV-1

1/87 Rev.

8/11/04

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015G9  
210-B-508.15-17.5

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: 2-12-241 04

Matrix: (soil/water) SOIL

Lab Sample ID: 92-306-E-1

Sample wt/vol: 30.6 (g/mL) G

Lab File ID: >XC409

Level: (low/med) LOW

Date Received: 10/08/91

% Moisture: not dec.3 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 6.5

Dilution Factor: 2.00000

CAS NO. COMPOUND CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg Q

99-09-2-----	3-Nitroaniline	3400.	# D
83-32-9-----	Acenaphthene	670.	U D
51-28-5-----	2,4-Dinitrophenol	3400.	U D
100-02-7-----	4-Nitrophenol	3400.	U D
132-64-9-----	Dibenzofuran	670.	U D
121-14-2-----	2,4-Dinitrotoluene	670.	U D
84-66-2-----	Diethylphthalate	670.	U D
7005-72-3-----	4-Chlorophenyl-phenylether	670.	U D
86-73-7-----	Fluorene	670.	U D
100-01-6-----	4-Nitroaniline	3400.	U D
534-52-1-----	4,6-Dinitro-2-methylphenol	3400.	U D
86-30-6-----	N-Nitrosodiphenylamine (1)	670.	U D
101-55-3-----	4-Bromophenyl-phenylether	670.	U D
118-74-1-----	Hexachlorobenzene	670.	U D
87-86-5-----	Pentachlorophenol	3400.	U D
85-01-8-----	Phenanthrene	670.	U D
120-12-7-----	Anthracene	670.	U D
84-74-2-----	Di-n-butylphthalate	740.	BD
206-44-0-----	Fluoranthene	670.	U D
129-00-0-----	Pyrene	670.	U D
85-68-7-----	Butylbenzylphthalate	670.	U D
91-94-1-----	3,3'-Dichlorobenzidine	1300.	U D
56-55-3-----	Benzo(a)anthracene	670.	U D
218-01-9-----	Chrysene	670.	U D
117-81-7-----	bis(2-Ethylhexyl)phthalate	670.	U D
117-84-0-----	Di-n-octylphthalate	47.	U D
205-99-2-----	Benzo(b)fluoranthene	670.	U D
207-08-9-----	Benzo(k)fluoranthene	670.	U D
50-32-8-----	Benzo(a)pyrene	670.	U D
193-39-5-----	Indeno(1,2,3-cd)pyrene	670.	U D
53-70-3-----	Dibenz(a,h)anthracene	670.	U D
191-24-2-----	Benzo(g,h,i)perylene	670.	U D

(1) - Cannot be separated from Diphenylamine

8/11/04Z

9613497.2169

1F

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET  
TENTATIVELY IDENTIFIED COMPOUNDS

B015G9  
216-B-50B 15.5-17.5

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: 2-12-91 PNL

Matrix: (soil/water) SOIL

Lab Sample ID: 92-306-E-1

Sample wt/vol: 30.6 (g/mL) G

Lab File ID: >XC409

Level: (low/med) LOW

Date Received: 10/08/91

% Moisture: not dec.3 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 6.5

Dilution Factor: 2.00000

Number TICs found: 10

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

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	Unknown	4.37	1600.	<del>JB</del>
2.	Unknown	5.34	400.	<del>JB</del>
3.	Unknown	5.62	310.	J
4.	Unknown Alkane	12.58	330.	J
5.	Unknown Alkane	13.17	410.	J
6.	Unknown Alkane	14.76	460.	J
7.	Unknown Alkane	15.73	420.	J
8.	Unknown	19.56	1600.	J
9.	791286 Phosphine oxide, triphenyl-	34.64	430.	<del>JB</del>
10.	Unknown	5.10	860.	<del>JB</del>
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1B

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: BATTTELLE-PNL

Contract: -----

B015H1 D  
216-B-50B 35 905 dup  
E 12-2-91 221

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

Matrix: (soil/water) SOIL

Lab Sample ID: 92-358-E-1D

Sample wt/vol: 30 (g/mL) G

Lab File ID: >XC406

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec.3.4 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 8.5

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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FORM I SV-1

1/87 Rev.

S 11/10/92

9613497.2171

1C

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

B015H1 D  
716-B-505 25-39.5 dup

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: @ 12-1-91

Matrix: (soil/water) SOIL

Lab Sample ID: 92-358-E-1D

Sample wt/vol: 30 (g/mL) G

Lab File ID: >XC406

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec. 3.4 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 8.5

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	460.	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	350.	U
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

FORM I SV-2

1/87 Rev.

11/10/92

9613497.2172  
1F

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET  
TENTATIVELY IDENTIFIED COMPOUNDS

B015H1 D  
216-4-506 28-30 5 dup  
8 12-2-91 Ely

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

Matrix: (soil/water) SOIL

Lab Sample ID: 92-358-E-1D

Sample wt/vol: 30 (g/mL) G

Lab File ID: >XC406

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec. 3.4 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 8.5

Dilution Factor: 1.00000

Number TICs found: 5

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

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	Unknown	4.40	1400.	JB
2.	Unknown	5.35	390.	JB
3.	4337659 HEXANEDIOIC ACID, MONO(2-ETH	33.12	210.	J
4.	791286 Phosphine oxide, triphenyl-	34.63	290.	JB
5.	Unknown	5.11	740.	JB
6.				
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1B SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: BATTELLE-PNL

Contract: -----

8015HMS  
216-16-505 28-30-5 175  
B 12-2-91 2114

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

SDG No.: -----

Matrix: (soil/water) SOIL

Lab Sample ID: 92-358-E-2

Sample wt/vol: 30.2 (g/mL) G

Lab File ID: >XC407

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec. 3.4 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 8.5

Dilution Factor: 1.00000

CAS NO. COMPOUND CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg Q

108-95-2-----	Phenol	5000.	
111-44-4-----	bis(2-Chloroethyl) Ether	340.	U
95-57-8-----	2-Chlorophenol	4700.	
541-73-1-----	1,3-Dichlorobenzene	340.	U
106-46-7-----	1,4-Dichlorobenzene	2500.	
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	3200.	
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	2600.	
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	6100.	E
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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FORM I SV-1

1/87 Rev.

S 11/6/92

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EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

B015H1MS  
210-B-52B 28-30.5MS

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: B-12-2-91

Matrix: (soil/water) SOIL

Lab Sample ID: 92-358-E-2

Sample wt/vol: 30.2 (g/mL) G

Lab File ID: >XC407

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec. 3.4 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 8.5

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	2800.	
51-28-5-----	2,4-Dinitrophenol	1700.	U
100-02-7-----	4-Nitrophenol	6400.	E
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	350.	U
206-44-0-----	Fluoranthene	340.	U
129-00-0-----	Pyrene	2700.	
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	340.	U
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

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(1) - Cannot be separated from Diphenylamine

FORM I SV-2

1/87 Rev.

8.11/10/92

9613497.2175

1B  
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: BATTELLE-PNL

Contract: -----

B015H1MSD  
216-B-50B 28-30.5 MSD  
B 12-2-91 214 8/91

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

SDG No.: B 12-2-91 214 8/91

Matrix: (soil/water) SOIL

Lab Sample ID: 92-358-E-3

Sample wt/vol: 30.4 (g/mL) G

Lab File ID: >XC408

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec. 3.4 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 8.5

Dilution Factor: 1.00000

CAS NO. COMPOUND CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg Q

108-95-2	Phenol	4800.	
111-44-4	bis(2-Chloroethyl) Ether	340.	U
95-57-8	2-Chlorophenol	4500.	
541-73-1	1,3-Dichlorobenzene	340.	U
106-46-7	1,4-Dichlorobenzene	2300.	
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	2400.	
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	5800.	E
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

UJ  
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UJ

FORM I SV-1

1/87 Rev.

8/11/92

9613497.2176  
IC

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: BATTELLE-PNL

Contract: -----

B015H1MSD  
210-B-50B 28-30.5 MSO  
E-11-2-91 RW Split

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

SDG No.: E-11-2-91 RW

Matrix: (soil/water) SOIL

Lab Sample ID: 92-358-E-3

Sample wt/vol: 30.4 (g/mL) G

Lab File ID: >XC408

Level: (low/med) LOW

Date Received: 10/11/91

Moisture: not dec. 3.4 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 8.5

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	2500.	U
51-28-5	2,4-Dinitrophenol	1700.	U
100-02-7	4-Nitrophenol	5900.	E
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	4900.	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	2600.	U
85-68-7	Butylbenzylphthalate	340.	U
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	340.	U
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

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(1) - Cannot be separated from Diphenylamine

FORM I SV-2

1/87 Rev.

11/20/92...



9613497 2178  
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: BATTELLE-PNL

Contract: -----

B015G9 D  
210-B-50B 15.5-17.5 dup

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: B 12-2-91

Matrix: (soil/water) SOIL

Lab Sample ID: 92-306-E-1D

Sample wt/vol: 30.0 (g/mL) G

Lab File ID: >XC410

Level: (low/med) LOW

Date Received: 10/08/91

% Moisture: not dec.3 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 6.5

Dilution Factor: 2.00000

CAS NO. COMPOUND CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg Q

99-09-2-----3-Nitroaniline	3400.	U D
83-32-9-----Acenaphthene	690.	U D
51-28-5-----2,4-Dinitrophenol	3400.	U D
100-02-7-----4-Nitrophenol	3400.	U D
132-64-9-----Dibenzofuran	690.	U D
121-14-2-----2,4-Dinitrotoluene	690.	U D
84-66-2-----Diethylphthalate	690.	U D
7005-72-3-----4-Chlorophenyl-phenylether	690.	U D
86-73-7-----Fluorene	690.	U D
100-01-6-----4-Nitroaniline	3400.	U D
534-52-1-----4,6-Dinitro-2-methylphenol	3400.	U D
86-30-6-----N-Nitrosodiphenylamine (1)	690.	U D
101-55-3-----4-Bromophenyl-phenylether	690.	U D
118-74-1-----Hexachlorobenzene	690.	U D
87-86-5-----Pentachlorophenol	3400.	U D
85-01-8-----Phenanthrene	690.	U D
120-12-7-----Anthracene	690.	U D
84-74-2-----Di-n-butylphthalate	350.	JSD
206-44-0-----Fluoranthene	690.	U D
129-00-0-----Pyrene	690.	U D
85-68-7-----Butylbenzylphthalate	690.	U D
91-94-1-----3,3'-Dichlorobenzidine	1400.	U D
56-55-3-----Benzo(a)anthracene	690.	U D
218-01-9-----Chrysene	690.	U D
117-81-7-----bis(2-Ethylhexyl)phthalate	690.	U D
117-84-0-----Di-n-octylphthalate	46.	J D
205-99-2-----Benzo(b)fluoranthene	690.	U D
207-08-9-----Benzo(k)fluoranthene	690.	U D
50-32-8-----Benzo(a)pyrene	690.	U D
193-39-5-----Indeno(1,2,3-cd)pyrene	690.	U D
53-70-3-----Dibenz(a,h)anthracene	690.	U D
191-24-2-----Benzo(g,h,i)perylene	690.	U D

(1) - Cannot be separated from Diphenylamine

FORM I SV-2

1/87 Rev.

8/11/10/92

9613497.2179

EPA SAMPLE NO.

1F  
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET  
TENTATIVELY IDENTIFIED COMPOUNDS

BO15G9 Dup  
216-B-506 V5.5-175 di

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: 2-11-91 124

Matrix: (soil/water) SOIL

Lab Sample ID: 92-306-E-1D

Sample wt/vol: 30.0 (g/mL) G

Lab File ID: >XC410

Level: (low/med) LOW

Date Received: 10/08/91

% Moisture: not dec.3 dec. --

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH: 6.5

Dilution Factor: 2.00000

Number TICs found: 10

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

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	Unknown	4.38	1800.	<del>JB</del> u
2.	Unknown	5.35	450.	<del>JB</del> u
3.	Unknown	5.62	330.	J
4.	Unknown Alkane	12.58	280.	J
5.	Unknown Alkane	13.17	330.	J
6.	Unknown Alkane	14.76	410.	J
7.	Unknown Alkane	15.73	390.	J
8.	Unknown	19.56	1600.	J
9.	791286 Phosphine oxide, triphenyl-	34.64	390.	<del>JB</del> u
10.	Unknown	5.10	1100.	<del>JB</del> u
11.				
12.				
13.				
14.				
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FORM I SV-TIC

1/87 Rev.

9613497-2180  
1B

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

SBLKX1

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: 8 12-2-91 LWS

Matrix: (soil/water) SOIL

Lab Sample ID: 92306/358E4

Sample wt/vol: 30 (g/mL) G

Lab File ID: >XC403

Level: (low/med) LOW

Date Received: 10/08/91

% Moisture: not dec. 0.1 dec. 0.1

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH:--

Dilution Factor: 1.00000

CAS NO. COMPOUND CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg Q

108-95-2-----	Phenol	330.	U
111-44-4-----	bis(2-Chloroethyl) Ether	330.	U
95-57-8-----	2-Chlorophenol	330.	U
541-73-1-----	1,3-Dichlorobenzene	330.	U
106-46-7-----	1,4-Dichlorobenzene	330.	U
100-51-6-----	Benzyl alcohol	330.	U
95-50-1-----	1,2-Dichlorobenzene	330.	U
95-48-7-----	2-Methylphenol	330.	U
39638-32-9-----	bis(2-chloroisopropyl) ether	330.	U
106-44-5-----	4-Methylphenol	330.	U
621-64-7-----	N-Nitroso-Di-n-propylamine	330.	U
67-72-1-----	Hexachloroethane	330.	U
98-95-3-----	Nitrobenzene	330.	U
78-59-1-----	Isophorone	330.	U
88-75-5-----	2-Nitrophenol	330.	U
105-67-9-----	2,4-Dimethylphenol	330.	U
65-85-0-----	Benzoic acid	1700.	U
111-91-1-----	bis(2-Chloroethoxy) methane	330.	U
120-83-2-----	2,4-Dichlorophenol	330.	U
120-82-1-----	1,2,4-Trichlorobenzene	330.	U
91-20-3-----	Naphthalene	330.	U
106-47-8-----	4-Chloroaniline	330.	U
87-68-3-----	Hexachlorobutadiene	330.	U
59-50-7-----	4-Chloro-3-methylphenol	330.	U
91-57-6-----	2-Methylnaphthalene	330.	U
77-47-4-----	Hexachlorocyclopentadiene	330.	U
88-06-2-----	2,4,6-Trichlorophenol	330.	U
95-95-4-----	2,4,5-Trichlorophenol	1700.	U
91-58-7-----	2-Chloronaphthalene	330.	U
88-74-4-----	2-Nitroaniline	1700.	U
131-11-3-----	Dimethylphthalate	330.	U
208-96-8-----	Acenaphthylene	330.	U
606-20-2-----	2,6-Dinitrotoluene	330.	U

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8/11/91

9613497-2181

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

SBLKX1

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: B-12-2-91 *Red*

Matrix: (soil/water) SOIL

Lab Sample ID: 92306/358E4

Sample wt/vol: 30 (g/mL) G

Lab File ID: >XC403

Level: (low/med) LOW

Date Received: 10/08/91

% Moisture: not dec.0.1 dec. 0.1

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH:--

Dilution Factor: 1.00000

CAS NO. COMPOUND CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg Q.

99-09-2-----	3-Nitroaniline	1700.	#
83-32-9-----	Acenaphthene	330.	U
51-28-5-----	2,4-Dinitrophenol	1700.	U
100-02-7-----	4-Nitrophenol	1700.	U
132-64-9-----	Dibenzofuran	330.	U
121-14-2-----	2,4-Dinitrotoluene	330.	U
84-66-2-----	Diethylphthalate	330.	U
7005-72-3-----	4-Chlorophenyl-phenylether	330.	U
86-73-7-----	Fluorene	330.	U
100-01-6-----	4-Nitroaniline	1700.	U
534-52-1-----	4,6-Dinitro-2-methylphenol	1700.	U
86-30-6-----	N-Nitrosodiphenylamine (1)	330.	U
101-55-3-----	4-Bromophenyl-phenylether	330.	U
118-74-1-----	Hexachlorobenzene	330.	U
87-86-5-----	Pentachlorophenol	1700.	U
85-01-8-----	Phenanthrene	330.	U
120-12-7-----	Anthracene	330.	U
84-74-2-----	Di-n-butylphthalate	300.	JE
206-44-0-----	Fluoranthene	330.	U
129-00-0-----	Pyrene	330.	U
85-68-7-----	Butylbenzylphthalate	330.	U
91-94-1-----	3,3'-Dichlorobenzidina	670.	U
56-55-3-----	Benzo(a)anthracene	330.	U
218-01-9-----	Chrysene	330.	U
117-81-7-----	bis(2-Ethylhexyl)phthalate	330.	U
117-84-0-----	Di-n-octylphthalate	330.	U
205-99-2-----	Benzo(b)fluoranthene	330.	U
207-08-9-----	Benzo(k)fluoranthene	330.	U
50-32-8-----	Benzo(a)pyrene	330.	U
193-39-5-----	Indeno(1,2,3-cd)pyrene	330.	U
53-70-3-----	Dibenz(a,h)anthracene	330.	U
191-24-2-----	Benzo(g,h,i)perylene	330.	U

UJ

Blank qual.  
300 x 10 = 3000

(1) - Cannot be separated from Diphenylamine

8/11/01/92

9613497.2182

1F

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET  
TENTATIVELY IDENTIFIED COMPOUNDS

SBLKX1

Lab Name: BATTELLE-PNL

Contract: -----

Lab Code: -----

Case No.: -----

SAS No.: -----

SDG No.: -----

B 12-2-91 244

Matrix: (soil/water) SOIL

Lab Sample ID: 92306/358E4

Sample wt/vol: 30 (g/mL) G

Lab File ID: >XC403

Level: (low/med) LOW

Date Received: 10/08/91

% Moisture: not dec. 0.1 dec. 0.1

Date Extracted: 10/17/91

Extraction: (Sepf/Cont/Sonc) SONC

Date Analyzed: 11/24/91

GPC Cleanup: (Y/N) N pH:--

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.	Unknown	4.44	1300.	J
2.	Unknown	5.42	440.	J
3. 791286	Phosphine oxide, triphenyl-	34.71	450.	J
4.	Unknown	5.18	670.	J
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FORM I SV-TIC

1/87 Rev.

9613497-2183  
**PESTICIDE/PCB DATA VALIDATION CHECKLIST - FORM A-3**

PROJECT: 2006PI	REVIEWER: G	DATE: 11/16/92
LABORATORY: PNL	CASE:	SDG: B01564
SAMPLES/MATRIX:		@d15/93
B015H1, B01569		

**1. DATA PACKAGE COMPLETENESS**

Review the data package for completeness and check off the items below. If any data review elements are missing contact the laboratory for resubmittal.

<u>Data Package Item</u>	<u>Present?:</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>
Case Narrative		/	—	—
Data Summary		/	—	—
Chain-of-Custody		/	—	—
QC Summary		/	—	—
Surrogate report		/	—	—
MS/MSD report		/	—	—
Blank summary report		/	—	—
Sample Data		/	—	—
Sample reports		/	—	—
Chromatograms		/	—	—
GC integration reports		/	—	—
Worksheets		—	/	—
UV traces from GPC		—	/	—
GC/MS confirmation spectra		—	/	—
Standards Data		/	—	—
Pesticides Evaluation Standards Summary		/	—	—
Pesticides/PCB Standards Summary		/	—	—
Pesticides/PCB identification		/	—	—
Pesticides standard chromatograms		/	—	—
Raw QC Data		/	—	—
Blank analysis report forms and chromatograms		/	—	—
MS/MSD report forms and chromatograms		/	—	—

<u>Data Package Item</u>	<u>Present?:</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>
<b>Additional Data</b>				
Moisture/% solids data sheets	Sjll/v42	<del>—</del>	ⓓ	—
Reduction formulae		—	—	—
Instrument time logs		—	—	—
Chemist notebook pages		—	—	—
Sample preparation sheets		—	—	—

2. HOLDING TIMES

Were all samples extracted within holding time?

2/25/93  
 Yes  No N/A

Were all samples analyzed within holding time?

Yes  No N/A

**ACTION:** If any holding times were exceeded, but not by greater than a factor of two, qualify associated samples as estimated (J for detects or UJ for nondetects), otherwise reject all nondetects (R) and qualify all associated detects as estimated (J).

3. INSTRUMENT PERFORMANCE AND CALIBRATIONS

3.1 INSTRUMENT PERFORMANCE (2/88 SOW)

Are DDT retention times greater than 12 minutes?

Yes  No N/A

**ACTION:** If DDT retention time is  $\leq 12$  minutes and resolution is  $< 25\%$  qualify associated data as unusable (R).

Is resolution between DDT peaks acceptable?

Yes  No N/A

**ACTION:** If resolution between DDT peaks is unacceptable qualify associated data as unusable (R).

Do all pesticide standards elute within the established retention time windows?

Yes  No N/A

**ACTION:** If the standards do not meet the retention time criteria and peaks are not present near or within the retention time windows no sample qualification is necessary. If peaks are near or within the retention time windows and the standards and matrix spikes do not fall within the expanded retention time windows calculated according to the validation requirements, qualify all associated sample results from the last in-control point as unusable (R).

Are DDT breakdowns  $\leq 20\%$ ?

Yes  No N/A

**ACTION:** If the DDT percent breakdown exceeds 20%, qualify all detected results for DDT as estimated (J) and all nondetects as unusable (R) if DDD and DDE are detected. In addition qualify all results for DDD or DDE as presumptive and estimated (NJ).

Are endrin breakdowns  $\leq 20\%$ ?

Yes  No N/A

**ACTION:** If the endrin breakdown exceeds 20%, qualify all detected results for endrin as estimated (J) and all nondetects as unusable (R) if endrin aldehyde or endrin ketone are detected. In addition, qualify all results for endrin ketone as presumptive and estimated (NJ).

Are DBC retention time differences within specification?  Yes No N/A

**ACTION:** If DBC %D values are outside the limits and the shift is occurring repeatedly in samples and standards, qualify affected sample results as unusable (R).

**3.2 CALIBRATIONS (2/88 SOW)**

Are RSD values for aldrin, endrin, DDT and DBC  $\leq 10\%$ ?  Yes No N/A

Have all standards been analyzed within 72 h of any sample?  Yes No N/A

Has a 3-point calibration been conducted for DDT or toxaphene? Yes  No N/A

Have all standards been analyzed at the start of each 72-h sequence?  Yes No N/A

Have evaluation standards A, B, and C been analyzed within 72 h of any sample?  Yes No N/A

Has the confirmation standard mix been analyzed after every five samples?  Yes No N/A

Has evaluation standard B analyzed every 10 samples?  Yes No N/A

Are %D values for initial and subsequent standards  $\leq 15\%$  for quantitation standards and  $\leq 20\%$  for confirmation standards? Yes  No N/A *See comment 1.*

**ACTION:** If the RSD criteria were exceeded or three point calibrations not conducted qualify associated detects as estimated (J). If all standards were not analyzed at the beginning of each 72-h sequence qualify associated data as unusable (R). If the confirmation standards were not analyzed properly qualify associated detects as estimated (J). If the continuing calibration criteria were not met qualify associated quantitation data as estimated (J).

**3.3 INSTRUMENT PERFORMANCE AND INITIAL CALIBRATION (3/90 SOW)**

Is peak resolution acceptable?

Yes

No

 N/A

**ACTION:** If the resolution criteria are not met, reject positive sample results generated after initial calibration (R).

Are DDT and endrin breakdowns  $\leq 20.0\%$ 

Yes

No

 N/A

**ACTION:** If the breakdown criteria are not met qualify sample results as described in Section 5.3.1 of the validation requirements.

Are single component target compounds in the PEMs, INDA, INDB and the calibration standards within the retention time windows?

Yes

No

 N/A

**ACTION:** If the retention time criteria are not met and no peaks are present in the samples within two times the retention time windows ( $\pm 0.04$ ,  $\pm 0.05$  for methoxychlor), no qualification is necessary. If peaks are present in samples within the retention time window a review is made of the raw data to determine expanded retention time windows (see Section 5.3.1 of the validation requirements). If all standards and matrix spikes fall within the expanded windows then no qualification of sample results is necessary. If all standards and matrix spikes do not fall within the expanded windows then all affected sample results are qualified as unusable (R).

Are the RPDs acceptable for the PEMs?

Yes

No

 N/A

**ACTION:** If the RPD criteria are not met qualify associated positive sample results as estimated (J).

Are the RSDs for the calibration factors  $< 10.0\%$  ( $< 15.0\%$  for the BHC series, DDT, endrin, and methoxychlor)?

Yes

No

 N/A

**ACTION:** If the RSD criteria are not met qualify associated positive sample results as estimated (J).

**3.4 CALIBRATION VERIFICATION (3/90 SOW)**

Have the analytical sequence requirements been met for the analysis of instrument blanks, PEMs, INDA and INDB mixes?

Yes

No

 N/A

**ACTION:** If the analytical sequence requirements are not followed and any of the resolution or retention time criteria listed below are exceeded, reject associated positive results (R).

Is peak resolution acceptable for PEMs, INDA and INDB mixes?

Yes

No

 N/A

**ACTION:** If the resolution criteria are not met reject positive sample results generated after a noncompliant standard analysis (R).

Are single component target compounds in the PEMs, INDA and INDB mixes within the retention time windows?

Yes

No

 N/A

**ACTION:** If the retention time criteria are not met and no peaks are present in the samples analyzed after the noncompliant standard within two times the retention time windows ( $\pm 0.04$ ,  $\pm 0.05$  for methoxychlor), no qualification is necessary. If peaks are present in samples within the expanded windows rejected associated positive and nondetect results (R).

Are RPDs between the calculated and true amounts in the PEMs, INDA and INDB mixes  $\leq 25.0\%$ ? Yes No N/A

**ACTION:** If the RPD criteria are not met qualify associated positive sample results as estimated (J).

Are DDT and endrin breakdowns in the PEMs  $\leq 20.0\%$  ( $\leq 30.0\%$  total combined)? Yes No N/A

**ACTION:** If the breakdown criteria are not met qualify associated positive sample results in accordance with the criteria specified in Section 5.3.1.

#### 4. BLANKS

##### 4.1 LABORATORY BLANKS

Has the laboratory analyzed the method blanks at the required frequency? Yes No N/A

Has the laboratory analyzed a sulfur clean-up blank if required? Yes No N/A

Has the laboratory analyzed instrument blanks at the required frequency? Yes No N/A

Are target compounds present in the blanks? Yes No N/A

**ACTION:** Qualify all associated positive results as nondetects (U) that are  $< 5$  times the highest concentration in any acceptable blank.

##### 4.2 FIELD BLANKS

Are target compounds present in the field blanks? Yes No N/A

**ACTION:** If target compounds are present in the field blanks qualify all positive sample results  $< 5$  times the highest valid field blank concentrations as nondetects (U) and note the results in the validation narrative.

### 5. ACCURACY

#### 5.1 SURROGATE RECOVERY

Are any surrogate recoveries out of specification? Yes  No N/A

Do any samples show nondetects for surrogates? Yes  No N/A

Are any method blank surrogates out of specification? Yes  No N/A

**ACTION:** Qualify all associated sample results as estimated (J for detects and UJ for nondetects) for surrogates out of specification. If the surrogate was not detected (0% recovery) in the sample qualify associated nondetects as unusable (R). If method blank surrogates are out of specification and sample surrogates are acceptable, no qualification is required however, the laboratory should be contacted for an explanation.

#### 5.2 MATRIX SPIKE RECOVERY

Has the laboratory analyzed a MS/MSD per matrix for the the sample group?  Yes No N/A

Are MS/MSD recoveries within specification?  Yes No N/A

Are there any calculation or transcription errors? Yes  No N/A

**ACTION:** If MS/MSD analyses have not been conducted contact the laboratory for clarification. Review the MS/MSD recoveries in conjunction with other QC data such as surrogate recoveries and note the results in the validation narrative. If MS/MSD recoveries are out of specification and sample concentration is > 5 times the spike concentration, no qualification is required, otherwise qualify results as follows: Qualify positive results as estimated (J) in all samples if associated surrogates are also out of specification. The qualification shall only be done on samples of similar matrix as the MS/MSD samples. If it is determined from the review that only the spiked samples are affected by the low recoveries, qualify only the results for the spiked sample as described above. If it is determined from the review that out of specification MS/MSD recoveries are indicative of systematic problems in the laboratory such as sample preparation or sample-specific matrix interferences this must be noted in the validation narrative along with the potential affect on the sample results.

#### 5.3 PERFORMANCE AUDIT SAMPLES

Are performance audit sample results within the acceptance limits? Yes No  N/A

**ACTION:** Note the results of the performance audit samples in the validation narrative.

6. PRECISION

6.1 MATRIX SPIKE/MATRIX SPIKE DUPLICATE SAMPLES

Are the RPD values within specification?  Yes No  N/A

ACTION: Review the MS/MSD results in conjunction with other QC data such as field duplicates and note the results in the validation narrative. If MS/MSD RPD values are out of specification and sample results are > 5xCRQL qualify positive results as estimated (J). If it is determined from the review that out of specification MS/MSD results are indicative of systematic problems in the laboratory such as sample preparation or sample-specific matrix interferences this must be noted in the validation narrative along with the potential affect on the sample results.

6.2 FIELD DUPLICATE SAMPLES

Are field duplicate RPD values acceptable? Yes No  N/A

ACTION: Note the results of the field duplicate samples in the validation narrative.

6.3 FIELD SPLIT SAMPLES

Are field split RPD values acceptable? Yes No  N/A

ACTION: Note the results of the field split samples in the validation narrative.

7. COMPOUND IDENTIFICATION AND QUANTITATION

7.1 COMPOUND IDENTIFICATION

Do positive results meet the retention time window criteria?  Yes No  N/A

Were positive results analyzed on dissimilar columns?  Yes No  N/A

If dieldrin and DDE were reported was a 3% OV-1 column used for confirmation (2/88 SOW data only)? Yes No  N/A

Do retention times and relative peak height ratios match the expected patterns for multippeak compounds (PCB, toxaphene or chlordane)?  Yes No  N/A

Has GC/MS confirmation been conducted on sample extract concentrations > 10 ppm? Yes No  N/A

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**ACTION:** If positive results do not meet the retention time criteria qualify all detected results as nondetects as follows: If the misidentified peak is outside the retention time windows and no interferences are noted report the CRQL and if the misidentified peak interferes with a target peak then the report value is qualified as estimated and nondetected (UJ). If positive results were not confirmed on dissimilar columns, reject affected results (R). If a 3% OV-1 was used to confirm dieldrin and DDE, reject the affected data (R). If PCB, chlordane or toxaphene identification is questionable qualify the results as presumptive and estimated (NJ). If GC/MS confirmation was not conducted contact the laboratory for explanation and note in the validation narrative.

**7.2 REPORTED RESULTS AND QUANTITATION LIMITS**

- Are results and quantitation limits calculated properly?  Yes    No    N/A
- Has the laboratory reported the sample quantitation limits within 5xCRQL values?  Yes    No    N/A

**ACTION:** If results and quantitation limits are in error contact the laboratory for clarification and note in the validation narrative.

**8. OVERALL ASSESSMENT AND SUMMARY**

- Has the laboratory conducted the analysis in accordance with the analytical SOW?  Yes    No    N/A
- Were project specific data quality objectives met for this analysis?  Yes    No    N/A

**ACTION:** Summarize all the data qualifications and complete the data validation narrative as specified in Section 10.0 of the data validation requirements.

COMMENTS (attach additional sheets as necessary):

1. Methoxychlor %D for TND AB is > 20%.  
affects samples HI AUP, MS, MSD but not  
actual samples.







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1D  
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: Battelle PNL

Contract:

B015H1

216-B-50B 28-30.5  
split

Lab Code: PNL

Case No.:

SAS No.:

SDG No.: 8

Matrix: (soil/water) Soil

Lab Sample ID: 92-00358-P-1

Sample wt/vol: 29.7 (g/mL) g

Lab File ID: -----

Level: (low/med) LOW

Date Received: 10/11/91

% Moisture: not dec. 3.4 dec. ----

Date Extracted: 10/17/91

Extraction: (SepF/Cont/Sonc) Sonc

Date Analyzed: 11/28/91

GPC Cleanup: (Y/N) N pH: 8.5

Dilution Factor: 1.00000

CAS NO. COMPOUND CONCENTRATION UNITS:  
(ug/L or ug/Kg) ug/Kg Q

319-84-6	alpha-BHC	8.0	U
319-85-7	beta-BHC	8.0	U
319-86-8	delta-BHC	8.0	U
58-89-9	gamma-BHC (Lindane)	8.0	U
76-44-8	Heptachlor	8.0	U
309-00-2	Aldrin	8.0	U
1024-57-3	Heptachlor epoxide	8.0	U
959-98-8	Endosulfan I	8.0	U
60-57-1	Dieldrin	16.0	U
72-55-9	4,4'-DDE	16.0	U
72-20-8	Endrin	16.0	U
33213-65-9	Endosulfan II	16.0	U
72-54-8	4,4'-DDD	16.0	U
1013-07-8	Endosulfan sulfate	16.0	U
50-29-3	4,4'-DDT	16.0	U
72-43-5	Methoxychlor	80.0	U
53494-70-5	Endrin ketone	16.0	U
5103-71-9	alpha-Chlordane	80.0	U
5103-74-2	gamma-Chlordane	80.0	U
8001-35-2	Toxaphene	160.0	U
12674-11-2	Arochlor-1016	80.0	U
11104-28-2	Arochlor-1221	80.0	U
11141-16-5	Arochlor-1232	80.0	U
53469-21-9	Arochlor-1242	80.0	U
12672-29-6	Arochlor-1248	80.0	U
11097-69-1	Arochlor-1254	160.0	U
11096-82-5	Arochlor-1260	160.0	U

Handwritten notes and a vertical line on the right side of the table, including "US" at the top and "at 1/93" at the bottom.

FORM I PEST

1/89 Rev.

Handwritten signature or date: 11/10/92

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1D

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

PBlank

Lab Name: Battelle PNL Contract:  
 Lab Code: PNL Case No.: SAS No.: SDG No.: 8  
 Matrix: (soil/water) Soil Lab Sample ID: 92-00358-P-4  
 Sample wt/vol: 30.0 (g/mL) g Lab File ID: -----  
 Level: (low/med) LOW Date Received: 10/17/91  
 % Moisture: not dec.----- dec. ----- Date Extracted: 10/17/91  
 Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 11/28/91  
 GPC Cleanup: (Y/N) N pH: --- Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
319-84-6-----	alpha-BHC	8.0	U
319-85-7-----	beta-BHC	8.0	U
319-86-8-----	delta-BHC	8.0	U
58-89-9-----	gamma-BHC (Lindane)	8.0	U
76-44-8-----	Heptachlor	8.0	U
309-00-2-----	Aldrin	8.0	U
1024-57-3-----	Heptachlor epoxide	8.0	U
959-98-8-----	Endosulfan I	8.0	U
60-57-1-----	Dieldrin	16.0	U
72-55-9-----	4,4'-DDE	16.0	U
72-20-8-----	Endrin	16.0	U
33213-65-9-----	Endosulfan II	16.0	U
72-54-8-----	4,4'-DDD	16.0	U
1013-07-8-----	Endosulfan sulfate	16.0	U
50-29-3-----	4,4'-DDT	16.0	U
72-43-5-----	Methoxychlor	80.0	U
53494-70-5-----	Endrin ketone	16.0	U
5103-71-9-----	alpha-Chlordane	80.0	U
5103-74-2-----	gamma-Chlordane	80.0	U
8001-35-2-----	Toxaphene	160.0	U
12674-11-2-----	Arochlor-1016	80.0	U
11104-28-2-----	Arochlor-1221	80.0	U
11141-16-5-----	Arochlor-1232	80.0	U
53469-21-9-----	Arochlor-1242	80.0	U
12672-29-6-----	Arochlor-1248	80.0	U
11097-69-1-----	Arochlor-1254	160.0	U
11096-82-5-----	Arochlor-1260	160.0	U

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST - FORM A-6

PROJECT: 200 BPI	REVIEWER: CJ	DATE: 11/6/92
LABORATORY: PNL	CASE:	SDG: 8/ B01564
SAMPLES/MATRIX: soils		
<del>B01564, B01566, B01568, B01569, B015H4, B015H6, B015K3,</del>		
<del>B015L5, B015M8, B015G9, B015H1</del>		
5/11/92		

2/5/93

1. COMPLETENESS AND CONTRACT COMPLIANCE

Review the data package for completeness and check off the items below. If any data review elements are missing contact the laboratory for submittal of the omitted data.

Data Package Item	Present?:	Yes	No	N/A
Case Narrative		/	—	—
Cover Page		/	—	—
Traffic Reports		/	—	—
Sample Data		—	—	—
Inorganic Analysis Data Sheets		/	—	—
Standards Data		—	—	—
Initial and Continuing Calibration Verification		/	—	—
CRDL Standard for AA and ICP		/	—	—
QC Summary		—	—	—
Blanks		/	—	—
ICP Interference Check Summary		/	—	—
Spike Sample Recovery		/	—	—
Post-Digestion Spike Sample Recovery		/	—	—
Duplicate		/	—	—
Laboratory Control Sample		—	—	/
Standard Addition Results		/	—	—
ICP Serial Dilutions		/	—	—
Instrument Detection Limits		/	—	—
ICP Interelement Correction Factors		/	—	—
ICP Linear Ranges		/	—	—
Preparation Log		/	—	—
Analysis Run Log		/	—	—
Raw Data		—	—	—
ICP Raw Data		/	—	—
Furnace AA Raw Data		/	—	—
Mercury Raw Data		/	—	—
Cyanide Raw Data		/	—	—
Additional Data		—	—	—
Internal laboratory chain-of-custody		/	—	—
Laboratory Sample Preparation Records		/	—	—

<u>Data Package Item</u>	<u>Present?:</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>
Percent Solids Analysis Records		/	—	—
Reduction Formulae		/	—	—
Instrument Run Logs		/	—	—
Chemist Notebook Pages		/	—	—

2. HOLDING TIMES

Have all samples been analyzed within holding times? Yes  No N/A

ACTION: If any holding times have been exceeded qualify all affected results as estimated (J for detects and UJ for nondetects).

3. INITIAL CALIBRATIONS

Were all instruments calibrated daily, each set-up time and were the proper number of standards used? Yes No N/A

Are the correlation coefficients  $\geq 0.995$ ? Yes No N/A

Was a midrange cyanide standard distilled? Yes  No *See comments* N/A

ACTION: Qualify all data as unusable if reported from an analysis in which an instrument was not calibrated or was calibrated with less than the minimum number of standards. Qualify associated sample results >IDL as estimated (J) and results <IDL as estimated (UJ), if the correlation coefficient is <0.995 or the laboratory did not distill the midrange cyanide standard.

4. INITIAL AND CONTINUING CALIBRATION VERIFICATION

Are ICV and CCV percent recoveries within control?  Yes No N/A

Are there calculation errors? Yes  No N/A

ACTION: Qualify all affected data in accordance with Section 8.3 of the validation requirements. If calculation errors are noted, contact the laboratory for clarification.

5. ICP INTERFERENCE CHECK SAMPLE

Has an ICS sample been analyzed at the proper frequency?  Yes No N/A

Are the AB solution %R values within control?  Yes No N/A

Are there calculation errors? Yes  No N/A

ACTION: Qualify all affected data in accordance with Section 8.3 of the validation requirements. If calculation errors are noted, contact the laboratory for clarification.

6. LABORATORY BLANKS

Are target analytes present in the laboratory blanks?  Yes  No  N/A

**ACTION:** Qualify all associated sample results for any analyte <5 times the amount in any laboratory blank as nondetected (U). If analyte concentrations in the blank are >CRDL or below the negative CRDL, verify the laboratory has redigested and reanalyzed associated samples with analyte concentrations < 10 times the blank concentration. If the laboratory has not redigested and reanalyzed the samples, note in the validation narrative.

7. FIELD BLANKS

Are target analytes present in the field blanks?  Yes  No  N/A

**ACTION:** Qualify all sample results for any analyte <5 times the amount in any valid field blank as nondetected (U).

8. MATRIX SPIKE SAMPLE ANALYSIS

Are spike recoveries within the control limits?  Yes  No  N/A

**ACTION:** Qualify the affected sample data according to the following requirements:

If spike recovery is > 125% and sample results are <IDL no qualification is required. If spike recovery is > 125% or <75% qualify all positive results as estimated (J). If spike recovery is 30% to 74% qualify all nondetects as estimated (UJ). If spike recovery is <30%, reject all nondetects (R). If the field blank has been used for spike analysis, note in the validation narrative.

9. LABORATORY CONTROL SAMPLE

Are percent recoveries within the acceptance limits?  Yes  No  N/A

Are there calculation errors?  Yes  No  N/A

**ACTION:** Qualify the sample data according to the following requirements:

**AQUEOUS LCS** - Qualify as estimated (J), all sample results >IDL, for which the LCS %R falls within the range 50-79% or > 120%. Qualify as estimated (UJ), all sample results <IDL, for which the LCS falls within the range of 50-79%. Qualify as unusable (R) all sample results, for which the LCS %R <50%.

**SOLID LCS** - Qualify as estimated (J), all sample results > IDL for which the LCS result is outside the established control limits. Qualify as estimated (UJ), all sample results < IDL for which the LCS %R are lower than the established control limits.

10. PERFORMANCE AUDIT ANALYSES

Are the performance audit sample results within the acceptance limits? Yes No **N/A**

ACTION: Note the results of the performance audit sample analyses in the data validation narrative.

11. DUPLICATE SAMPLE ANALYSIS

Are RPD values acceptable? **Yes** No N/A

ACTION: Qualify the results for all associated samples of the same matrix as estimated (J) if the RPD results fall outside the appropriate control limits. If field blanks were used for laboratory duplicates, note in the validation narrative.

12. ICP SERIAL DILUTION

Are the serial dilution results acceptable? **Yes** No N/A

Is there evidence of negative interference? Yes **No** N/A

ACTION: Qualify the associated data as estimated (J) for those analytes in which the %D is outside the control limits. If evidence of negative interference is found, use professional judgment to qualify the data.

13. FIELD DUPLICATE SAMPLES

Do the RPD values exceed the control limits? Yes No **N/A**

ACTION: Note the results of the field duplicate samples in the validation narrative.

14. FIELD SPLIT SAMPLES

Do the RPD values exceed the control limits? Yes No **N/A**

ACTION: Note the results of the field split samples in the validation narrative.

1516. FURNACE ATOMIC ABSORPTION QUALITY CONTROL

Do all applicable analyses have duplicate injections? **Yes** No N/A

Are applicable duplicate injection RSD values within control? **Yes** No N/A

If no, were samples rerun once as required? Yes No **N/A**

Does the RSD for the rerun fall within the control limits? Yes No **N/A**

Were analytical spike recoveries within the control limits? **Yes** No N/A

- If no, were MSA analyses performed when required? Yes No  N/A
- Are MSA correlation coefficients  $\geq 0.995$ ? Yes No  N/A
- If no, was a second MSA analysis performed? Yes No  N/A

**ACTION:** If duplicate injections are outside the acceptance limits and the sample has not been reanalyzed or the reanalysis is outside the acceptance limits, qualify the associated data as estimated (J for detects and UJ for nondetects). If the analytical spike recovery is  $< 40\%$  qualify detects as estimated (J). If the analytical spike recovery is  $\geq 10\%$  but  $< 40\%$ , qualify all nondetects as estimated (UJ) and if the analytical spike recovery is  $< 10\%$ , reject all nondetects (R). If the sample absorbance is  $< 50\%$  of the analytical spike absorbance and the analytical spike recovery is  $< 85\%$  or  $> 115\%$ , qualify all results as estimated (J for detects and UJ for nondetects). If method of standard additions (MSA) was required but was not performed, the MSA samples were spiked incorrectly, or the MSA correlation coefficient was  $< 0.995$ , qualify the associated detected results as estimated (J).

17. ANALYTE QUANTITATION AND DETECTION LIMITS

- Have results been reported and calculated correctly?  Yes No N/A
- Are results within the calibrated range of the instruments and within the linear range of the ICP?  Yes No N/A
- Are all detection limits below the CRQL? Yes No N/A

**Action:** If analyte quantitation is in error, contact the laboratory for explanation. If errors or deficiencies can not be resolved with the laboratory, qualify associated data as unusable (R).

18. OVERALL ASSESSMENT AND SUMMARY

- Has the laboratory conducted the analysis in accordance with the analytical SOW?  Yes No N/A
- Were project specific data quality objectives met for this analysis?  Yes No N/A

**ACTION:** Summarize all the data qualifications and complete the data validation narrative as specified in Section 10.0 of the data validation requirements.

COMMENTS (attach additional sheets as necessary):

① An IGV was distilled instead of a mid-range standard.

HOLDING TIME SUMMARY - FORM B-1

SDG: 8	REVIEWER: C Jensen	DATE: 11/6/98	PAGE 1 OF 1				
COMMENTS: Anorganics							
FIELD SAMPLE ID	ANALYSIS TYPE	DATE SAMPLED	DATE PREPARED	DATE ANALYZED	PREP. HOLDING TIME, DAYS	ANALYSIS HOLDING TIME, DAYS	QUALIFIER
B01564	Cu	9/30/91	10/15/91	10/16/91	15	1	J
B01566	Cu	10/2/91	10/15/91	10/16/91	14	1	J
B01568	Cu	10/2/91	10/16/91	10/21/91	14	5	J
B01569	Metals	10/4/91	12/3/91	12/20/91	57	17 days	none
B015H4	Cu	10/9/91	10/12/91	10/21/91	8	4	none
B015H6	Cu	10/9/91	10/18/91	10/21/91	9	3	none
B01569	<sup>Cu</sup> Metals	10/4/91	10/10/91	10/21/91	12	5	J
B015H1	Cu	10/9/91	10/17/91	10/21/91	8	4	none

B-1

9613497 WHICSD-EN-SPP-002, Rev. 1



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7

LABORATORY CONTROL SAMPLE

Lab Name: BATTELLE\_PNL \_\_\_\_\_

Contract: \_\_\_\_\_

Lab Code: \_\_\_\_\_

Case No.: \_\_\_\_\_

SAS No.: \_\_\_\_\_

SDG No.: 8,9,10

Solid LCS Source: US-EPA \_\_\_\_\_

Aqueous LCS Source: \_\_\_\_\_

Analyte	Aqueous (ug/L)			Solid (mg/kg)				tR
	True	Found	tR	True	Found	C	Limits	
Aluminum				325.0	254.6	-	225.0 424.0	78.3
Antimony				211.0	215.2	-	127.0 294.0	102.0
Barium				4.8	5.1	B	0.0 40.0	106.7
Beryllium				19.4	18.6	-	16.5 22.3	96.1
Cadmium				45.4	47.3	-	35.7 55.1	104.1
Calcium								
Chromium				99.6	95.8	-	79.2 120.0	96
Cobalt				144.0	142.6	-	125.0 162.0	99.0
Copper				6910.0	7064.2	-	6006.0 7820.0	102.2
Iron				22430.0	21835.8	-	17770.0 27080.0	97.4
Magnesium				118100.0	104709.2	-	100400.0 129900.0	88.7
Manganese				208.0	197.8	-	177.0 239.0	95.1
Nickel				60.9	59.7	-	49.2 72.6	98.0
Potassium				50.0	206.4	U	0.0 1000.0	0.0
Sodium				50.0	230.9	B	0.0 1000.0	461.7
Vanadium				65.8	60.5	-	51.7 79.9	91.9
Zinc				187.0	172.5	-	138.0 236.0	92.2

Gill/9/92







TABLE 4: TOTAL CYANIDE ANALYSIS DATA FOR TASK 2&4  
SDG #8

SOIL-SEDIMENT SAMPLES

Sample ID#	PNL Log#	Sample G1 (mg/kg)	C	Sample dup. G2 (mg/kg)	C	XRPD	Blank G5 (µg/L)	C	Spike added (µg)	Sample+ spike G3 (mg/kg)	sample G4 (ICV) (mg/L)	Sample+ spike G3 recovery(%)	sample G4 (ICV) recovery(%)	Flags Q	Footnote 1,2,3 (ALL)	
6-B-49A 104.5-107	B015G4 92-00019	0.8	U	0.8	B	N/A	5.9	U	48.55	10.5	10.1	98	107			
6-B-50B 3.5-6	B015G6 92-00116	0.6	U	0.6	U	N/A	5.9	U	48.55	10.1	10.3	100	109			
6-B-50B 12-16	B015G8 92-00117	0.6	U	0.6	U	N/A	5.9	U	48.55	10.1	10.3	100	109			
6-B-50B 15.5-17.5	B015G9 92-00306	0.6	U	0.6	U	N/A	5.9	U	48.55	9.3	10.5	100	112			
6-B-50B 28-30.5	B015H1 92-00358	0.6	U	0.6	U	N/A	5.9	U	48.55	11.2	9.96	96	106			
6-B-50B 29-30.5	B015H4 92-00356	0.6	U	0.6	U	N/A	5.9	U	48.55	11.2	9.96	96	106			
6-B-49A 15 135-137.5	B015H6 92-00357	1.5		1.7		7.9	5.9	U	48.55	11.2	9.96	96	106			
												Mean	99	109		
												Std. Dev.	2	2		

Footnotes

1. Concentration of stock ICV-6-9.4 mg/L (9.4 µg of cyanide is added to each distillation flask and recovered in 250 mL of NaOH).
2. Contract required detection limit for soil-sediment = 1.0 mg/kg.
3. Duplicate precision under the CLP protocol must be within one CRDL when either sample or duplicate are below 5X CRDL.

g/11/6/92

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U.S.EPA-CLP

1  
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: BATTELLE/PNL Contracts: BOISHI  
Lab Code: Case No.: SAS No.: SDG No.: 216-B-50B 28+30.5  
Matrix (soil/water): SOIL Lab SAMPLE ID: 92-00358 split  
Level (low/med): LDW Date Received: 10/11/91  
% 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				
7440-36-0	Antimony				
7440-38-2	Arsenic	5.44			F JB
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-69-9	Bismuth	0.17	U		
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead	2.93			F JB
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickle				
7440-09-7	Potassium				
7782-49-2	Selenium	0.05 5	U		F
7440-22-4	Silver	0.04 10	U		F JJ U
7440-23-5	Sodium				
7440-28-0	Thallium	0.70	B		F
7440-62-8	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: gray-brown Clarity Before: N/A Texture: heterogeneous  
Color After: gray Clarity After: clear-digst Artifact: N/A

Comments:

These samples were undesirably heterogeneous.

9/11/92

C08-006

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1  
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: BATTELLE/PNL Contract: 801589  
 Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: 1210-B-508 15.5-17.5  
 Matrix (soil/water): SOIL Lab SAMPLE ID: 92-00306  
 Level (low/med): LOW Date Received: 10/08/91  
 % Solid: 97.0

Concentration Units (ug/L or mg/Kg dry weight) mg/Kg

CAS No.	Analyte	Concentration	C	D	M
17429-90-5	Aluminum				
17440-36-0	Antimony				
17440-38-2	Arsenic	6.47			F
17440-39-3	Barium				
17440-41-7	Beryllium				
17440-69-9	Bismuth	0.17	U		F
17440-43-9	Cadmium				
17440-70-2	Calcium				
17440-47-3	Chromium				
17440-48-4	Cobalt				
17440-50-8	Copper				
17439-89-6	Iron				
17439-92-1	Lead	3.11			F
17439-95-4	Magnesium				
17439-96-3	Manganese				
17439-97-6	Mercury				
17440-02-0	Nickle				
17440-09-7	Potassium				
17782-49-2	Selenium	0.06 <u>5</u>	U		F
17440-22-4	Silver	0.04 <u>10</u>	U		F
17440-23-5	Sodium				
17440-28-0	Thallium	0.13 <u>10</u>	U		F
17440-62-2	Vanadium				
17440-66-6	Zinc				
	Cyanide				

JB

U

Color Before: gray-brown Clarity Before: N/A Texture: heterogeneous  
 Color After: gray Clarity After: clear-digt Artifact: N/A

Comments:

These samples were undesirably heterogeneous.

5/11/92

C08-005

TABLE 8: Hg COLD VAPOR AA ANALYSIS DATA FOR TASKS 2 & 4  
SDG #8

SOLID SAMPLES

Sample ID#	PNL Log#	B1		B2		B5			B3 (a)		B4 (b,c)	
		Sample mg/Kg	Flags C Q	Dupl. mg/Kg	C	B1&B2 XRPD	Blank ug/L	C	Sample +Spike mg/Kg	Digest Spike %rec	LCS mg/Kg	LCS %rec
BOOX75 (h)	91-07815	0.14	N	0.15		5.0%	0.04	U	0.23	71.3%	10.1	79.3%
	10/16/91	(0.10)	N									
NIST SRM2704											1.3	88.3%
216-B-508 15.5-17.5 24	92-00306	0.25	J N									
	10/16/91	(0.10)	B N									
	11/04/91	(0.07)	B N	(0.11)	B							
216-B-508 28-30.5	92-00358	0.07	J N									
	10/16/91	(0.20)	N	(0.22)								
	11/04/91	(0.22)	N	(0.15)	B							

- (a) B3 Predigestion Spike Level = 0.05 ug Hg
- (b) LCS 0287 Hg certified at 12.7 mg/Kg (Range 8.5 to 17.0 mg/Kg)
- (c) 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 0.005 mg/kg -> 0.2g sample, 25 mL analysis aliquot]
- (f) CRDL = 0.2 ug/L [or 0.1 mg/kg -> 0.2g sample, 100 mL analysis aliquot]
- (g) Calibration standards NIST SRM3133, ICV/CCV standard Johnson-Matthey 14395
- (h) BOOX75 not part of SDG; sample used for QC during batch analysis.
- (i) Values in ( ) were analyzed originally on the date indicated.

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WET CHEMISTRY DATA VALIDATION CHECKLIST - FORM A-7

PROJECT: 200 BPI	REVIEWER: G	DATE: 11/9/92
LABORATORY: PNL	CASE:	SDG: 8 B01564
SAMPLES/MATRIX: Sub: B01569, B01541, B015K3, B015L5, B015M9 - ANIONS		
TOC Analysis B01569, B01541		

@2/5/93

1. DATA PACKAGE COMPLETENESS

Review the data package for completeness and check off the items below. If any data review elements are missing contact the laboratory for submittal of the omitted data.

Data Package Item	Present?:	Yes	No	N/A
Case Narrative		/	—	—
Cover Page		/	—	—
Traffic Reports/Chain-of-Custody	see comment 1	/	—	—
Sample Analysis Data Report Forms		/	—	—
Standards Data		/	—	—
QC Summary		/	—	—
Blanks Summary Report Forms		/	—	—
Spike Sample Recovery Report Forms		/	—	—
Duplicate Sample Analysis Report Forms		/	—	—
Laboratory Control Sample Report Forms		/	—	—
Raw Data		/	—	—
Ion Chromatograph Chromatograms		/	—	—
TOC and TOX Instrument Printouts		—	/	—
Laboratory Bench Sheets		/	—	—
Additional Data		/	—	—
Laboratory Sample Preparation Logs		/	—	—
Instrument Run Logs		—	/	—
Internal Laboratory Chain-of-Custody		—	/	—
Percent Solids Analysis Records		/	—	—
Reduction Formulae		—	/	—
Chemist Notebook Pages		—	/	—

2. HOLDING TIMES

Were all samples analyzed within holding times?

Yes  No  N/A

Action: If any holding times were exceeded qualify all affected results as estimated (J for detects and UJ for nondetects).

3. INITIAL CALIBRATIONS

Were all instruments calibrated daily, each set-up time and were the proper number of standards used?

Yes    No    N/A

Are the correlation coefficients  $\geq 0.995$ ?

Yes    No    N/A

Was a balance check conducted prior to the TDS analysis?

Yes    No     N/A

Was the titrant normality checked?

Yes    No     N/A

ACTION: Qualify all data as unusable (R) if reported from an analysis in which the above criteria were not met.

4. INITIAL AND CONTINUING CALIBRATION VERIFICATION

*See comment 2*

Have ICV and CCV been analyzed at the proper frequency?

Yes    No    N/A

Are ICV and CCV percent recoveries within control?

Yes    No    N/A

Are there calculation errors?

Yes     No    N/A

ACTION: Qualify all affected data in accordance with the validation requirements.

5. LABORATORY BLANKS

Are target analytes present in the laboratory blanks?

Yes     No    N/A

ACTION: Qualify all associated sample results for any analyte  $< 5$  times the amount in any laboratory blank as nondetected (U) and list the affected samples and analytes below.

6. FIELD BLANKS

Are target analytes present in the field blanks?

Yes    No     N/A

ACTION: Qualify all sample results for any analyte  $< 5$  times the amount in any valid field blank as nondetected (U).

7. MATRIX SPIKE SAMPLE ANALYSIS

Are spike recoveries within the acceptance limits?

Yes    No    N/A

ACTION: If the sample concentration exceeds the spike concentration by a factor of 4 or more, and spike recoveries are outside the acceptance limits, no qualification is necessary. If spike recovery is outside the control limits and the sample results are  $> CRQL$ , qualify the data as estimated (J). If the spike recovery is  $< 30\%$  and the sample results are less than the IDL qualify the data as unusable (R).

**8. LABORATORY CONTROL SAMPLE**

Are percent recoveries within the acceptance limits?  Yes  No  N/A

Are there calculation errors?  Yes  No  N/A

**ACTION:** Qualify the affected results according to the following requirements:

**AQUEOUS LCS** - Qualify as estimated (J), all sample results >IDL, for which the LCS %R falls within the range 50-79% or > 120%. Qualify as estimated (UJ), all sample results <IDL, for which the LCS falls within the range of 50-79%. Qualify as unusable (R) all sample results, for which the LCS %R < 50%.

**SOLID LCS** - Qualify as estimated (J), all sample results >IDL for which the LCS %R is outside the established control limits. Qualify as estimated (UJ), all sample results <IDL for which the LCS %R are lower than the established control limits.

**9. PERFORMANCE AUDIT ANALYSES**

Are the performance audit sample results within the acceptance limits?  Yes  No  N/A

**ACTION:** Note the results of the performance audit samples in the validation narrative.

**10. DUPLICATE SAMPLE ANALYSIS**

Are RPD values within the acceptance limits?  Yes  No  N/A

**Action:** Qualify the results for all associated samples of the same matrix as estimated (J) if the RPD falls outside the acceptance limits.

**11. FIELD DUPLICATE SAMPLES**

Do RPD values exceed the acceptance limits?  Yes  No  N/A

**ACTION:** Note the results of the field duplicate samples in the validation narrative.

**12. FIELD SPLIT SAMPLES**

Do RPD values exceed the acceptance limits?  Yes  No  N/A

**ACTION:** Note the results of the field split samples in the validation narrative.



COMMENTS (attach additional sheets as necessary):

1. C-D-C was not provided for samples B015K3, B015L5 and B015M9.

2. Verification standards were analyzed at 3 levels.





TABLE 3: ANION IC ANALYSIS DATA  
NITRATE (NO3-N)

SOIL SAMPLES

SAMPLE ID#	PNL LOG#	C1 SAMPLE (mg/kg)	C	C2 SAMPLE DUP (mg/kg)	C	RPD	C5 BLANK (mg/kg)	C	C3		C6		% RECOVERIES			Q	
									SPIKE+SAMPLE (mg/kg)	SPIKE (mg/kg)	DUP+SPIKE (mg/kg)	SPIKE (mg/kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE	C4 CONTROL		
216-B-50B 15.5-17.5 16-B-50B 28-30.5	92-00306	684.179	J				0.8	U									
	92-00358	16.237	J	19.5		17											
	92-00921	119.274	J						1475		1691						
	92-01246	1466.362	J						349	11.9	382	11.7	(-109)	171	108		
	92-01827	178.309	J														

IDL= 0.8 (mg/Kg, solids)  
CRDL= 1.0 (mg/Kg, solids)

NOTES:

1. + Not samples in this SDG but reported for QC purposes
2. 100% spike level in extract is expected to be 5ppm each for Nitrate, Nitrite, Phosphate, and Sulfate
3. 5ppm X dil. factor / frac. solids = spike level (mg/Kg) in solid for Nitrate, Nitrite, Phosphate, and Sulfate
4. 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml
5. Method blank used for C5; nominal sample wt=2.00 gm

C FLAGS

B: IDL ≤ Analyte level < CRDL  
U: Analyte not detected; <IDL

Q FLAGS

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

*Sample value greatly exceeds spike value*

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TABLE 3: ANION IC ANALYSIS DATA  
PHOSPHATE (PO4-P)

SOIL SAMPLES

SAMPLE ID#	PNL LOG#	C1 SAMPLE (mg/kg)	C C	C2 SAMPLE DUP (mg/kg)	C C	RPD	C5 BLANK (mg/kg)	C C	C3		C6		% RECOVERIES			Q	
									SPIKE+SAMPLE (mg/kg)	SPIKE (mg/kg)	DUP+SPIKE (mg/kg)	SPIKE (mg/kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE	C4 CONTROL		
10-B-50B-155-175 B015G9	92-00306	7.9 2.5		8.5			1.7	U									N
10-B-50B-28-5 B015H1	92-00358	12.2 3.9		8.5 12.3.8	B	2.8											N
B015K3	92-00921+13	4.2		8.5					37.6		3.0						N
B015L5	92-01246+23	3.4		8.5					2.2	17.1	8	16.8	22	18	94		N
B015M9	92-01827+35	11.2		8.5									85	77			N

IDL= 1.7 (mg/Kg, solids)  
CRDL= 5.0 (mg/Kg, solids)

NOTES:

- + Not samples in this SDG but reported for QC purposes
- 100% spike level in extract is expected to be 5ppm each for Nitrate, Nitrite, Phosphate, and Sulfate
- 5ppm X dil. factor / frac. solids = spike level (mg/Kg) in solid for Nitrate, Nitrite, Phosphate, and Sulfate
- 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml
- Method blank used for C5; nominal sample wt=2.00 gm

C FLAGS

B: IDL ≤ Analyte level < CRDL  
U: Analyte not detected; <IDL

Q FLAGS

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

TABLE 3: ANION IC ANALYSIS DATA  
SULFATE (SO4)

SOIL SAMPLES

SAMPLE ID#	PNL LOG#	C1 SAMPLE (mg/kg)	C2 SAMPLE DUP		C5 BLANK (mg/kg)	C3		C6		% RECOVERIES			Q	
			C	(mg/kg)		C	RPD	SPIKE+SAMPLE (mg/kg)	SPIKE (mg/kg)	DUP+SPIKE (mg/kg)	SPIKE (mg/kg)	C3 SAMPLE + SPIKE		C6 DUP+ SPIKE
12-B-50B 15.5-17.5 B015G9	92-00306	32			4									
16-B-50B 26-30.5 B015H1	92-00358	13	B	15	B	14.3								
B015K3	92-00921+	20												
B015L5	92-01246+ 43 30-30	30					69.4	52.6	71.1	51.6	75	80	98	
B015M9	92-01827+	101												

IDL= 4 (mg/Kg, solids)  
CRDL= 20 (mg/Kg, solids)

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NOTES:

1. + Not samples in this SDG but reported for QC purposes
2. 100% spike level in extract is expected to be 5ppm each for Nitrate, Nitrite, Phosphate, and Sulfate
3. 5ppm X dil. factor / frac. solids = spike level (mg/Kg) in solid for Nitrate, Nitrite, Phosphate, and Sulfate
4. 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml
5. Method blank used for C5; nominal sample wt=2.00 gm

C FLAGS

B: IDL ≤ Analyte level < CRDL  
U: Analyte not detected; <IDL

Q FLAGS

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

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TABLE 3: ANION IC ANALYSIS DATA  
NITRITE (NO2-N)

SOIL SAMPLES

SAMPLE ID#	PNL LOG#	C1		C2		C5	C3		C6		X RECOVERIES			Q
		SAMPLE (mg/kg)	C	SAMPLE (mg/kg)	DUP C		BLANK (mg/kg)	SPIKE+SAMPLE (mg/kg)	SPIKE (mg/kg)	DUP+SPIKE (mg/kg)	SPIKE (mg/kg)	C3 SAMPLE + SPIKE	C6 DUP+ SPIKE	
16-B-50B-154-175 16-B-50B-28-30.5 B01569	92-00306	1.0 0.8	UJ			0.8								
B015H1	92-00358	1.0 0.8	UJ	0.8	U									
B015K3	92-00921+	1.0 0.8	UJ											
B015L5	92-01246+	1.0 0.8	UJ				12.8	16	12.5	15.7	80	80	82	
B015M9	92-01827+	1.0 0.8	UJ											

IDL= 0.8 (mg/Kg, solids)  
CRDL= 1.0 (mg/Kg, solids)

NOTES:

- + Not samples in this SDG but reported for QC purposes
- 100% spike level in extract is expected to be 5ppm each for Nitrate, Nitrite, Phosphate, and Sulfate
- 5ppm X dil. factor / frac. solids = spike level (mg/Kg) in solid for Nitrate, Nitrite, Phosphate, and Sulfate
- 100% extraction efficiency assumed in defining dil. factor as (diluent vol / sample wt) X 1.00 gm/ml
- Method blank used for C5; nominal sample wt=2.00 gm

C FLAGS

B: IDL ≤ Analyte level < CRDL  
U: Analyte not detected; <IDL

Q FLAGS

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

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TABLE 16: TOTAL ORGANIC CARBON ANALYSIS DATA FOR TASKS 2 & 4  
SDG #8

Soil Samples

WMC Sample #	PNL ALO #	Sample Type	Sample wt. g	ug C Results	ug C in Sample	mg/Kg Sample	RSD (%) Dups	% rec. spike	Date Received	Date Analyzed
216-B-50B 15.5-17.5	B015G9	92-0306-1	Sample	0.471	65.5	50.2	1100	5	10-08-91	10-15-91
	B015G9	92-0306-2	Duplicate	0.05347	76.4	61.1	1180		10-08-91	10-15-91
68	B015G9	92-0306-3	Standard					96.8		10-15-91
	B015G9	92-0306-4	Blank		15.3					10-15-91
216-B-50B 28-30.5	B015H1	92-0358-1	Sample	0.04076	36.9	21.6	547	10	10-11-91	10-15-91
	B015H1	92-0358-2	Duplicate	0.0653	54.9	39.6	626		10-11-91	10-15-91
	B015H1	92-0358-3	Standard					96.8		10-15-91
	B015H1	92-0358-4	Blank		15.3					10-15-91

Total Organic Carbon by PNL Procedure 7-40.37, on Instrument WA92040,

325 Bldg., rm 701. Data reported from LRB 52996, pp 142-44 & 150.

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RADIOCHEMISTRY DATA VALIDATION CHECKLIST

Data Package ID: BOISG4-PNL-052 Laboratory: PNL

Data Validator: [Signature] Date: 1/13/93

Analysis/Sample Identification/Matrix: Gross alpha, gross beta, Sr-90, plutonium-238 & 239, gamma spec, and tritium.

1. Completeness

1.1 Completeness Checklist (Complete the appropriate checklist for each analysis type and attach).

2. Calibration

2.1 Initial Calibration

Was instrument calibrated within specified time period or annually? (Y/N/NA)

If NO, qualify all associated data as unusable (R).

Was each detector used for the associated data calibrated? (Y/N/NA)

If NO, qualify all associated data as unusable (R).

Are calibration standards NIST traceable or equivalent? (Y/N/NA)

If NO, qualify all associated data as unusable (R).

Were calibration standards expired? (Y/N/NA)

If YES, qualify all associated data as unusable (R).

Comments/Qualified Results:

The raw data for the initial calibration was not submitted with the data package. However, <sup>since</sup> the calibration information was present, but was not detector specific - the associated results for gross alpha, gross beta, Sr-90, and tritium have been qualified as estimated (Y/N) 1/25/93

2.2 Continuing Calibration 2226

Is check source identified by activity and radionuclides? (Y/N/NA) (Y/N/NA)

If NO, qualify all associated data as estimated (E).

Has check source been counted daily? (Y/N/NA) (Y/N/NA) Pu-238 & 239

If NO, qualify all associated data as unusable (R).

Are check source counts within  $\pm 3S$  control limits? (Y/N/NA) (Y/N/NA) Tritium & Gross B

If NO, qualify all associated data as unusable (R).

Have background counts been performed at least weekly and before and after all field and QC samples associated with the SDG? (Y/N/NA) (Y/N/NA) Pu-238 & 239

If NO, qualify all associated results as unusable (R).

Are background counts within  $\pm 3S$  control limits? (Y/N/NA) (Y/N/NA)

If NO, qualify all associated results as unusable (R).

Comments/Qualified Results: \_\_\_\_\_

The plutonium 238 & 239 sample runs are not bracketed by CCV samples. Therefore, the assoc. results have been qualified as rejected (R).

The associated CCV for tritium is out of the control limits. Therefore, the associated results have been qualified as rejected (R).

The SS-90 counter control and Wgd data assoc with detectors 1, 2, and 3 were not included in this SDG. And the CCV data for SS in other SDGs of this data set do not include the associated date of analysis. Therefore, the associated results have been qualified as rejected (R).

The gross beta CCV sample assoc with B015H1-Dup (92-00358-A-2a) was out of the control limits. The assoc. result has been qualified as rejected (R).

3. Blanks

Have reagent/method/field blanks been analyzed with the SDG? (Y/N/NA) \_\_\_\_\_

If NO, qualify all results >LLD as estimated (J).

Are positive results reported in the reagent/method/field blanks? (Y/N/NA) Sc-90

If YES, qualify positive results less than the MDA as nondetects (U). Qualify sample results <10X the blank value but greater than the MDA as estimated (J).

Can blank results be verified/calculated properly? (Y/N/NA): \_\_\_\_\_

Comments/Notes/Qualified Results: \_\_\_\_\_

Positive results are reported in the blanks for the following parameters causing the associated positive results to be qualified as estimated (J):  
Sc-90



5. Radiometric and Gravimetric Yields

Were spikes/tracers/chemical yields analyzed in each SDG and/or sample as appropriate for the analytical method? (Y/N/NA) \_\_\_\_\_

If NO or if inappropriate tracers were used qualify associated results as unusable (R).

Was a field blank used for the spike/tracer/chemical yield analysis? (Y/N/NA) \_\_\_\_\_

If YES, note in the validation narrative.

Is spike/tracer/chemical yield recovery within the limits of 30-105% for sample results <4X the spike activity? (Y/N/NA) \_\_\_\_\_

Verify the spike recoveries and qualify associated results as follows:

%R: <30% 30-105% >105% >115%

<LLD R acceptable UJ R

>LLD R acceptable J R

Comments/Notes/Qualified Results: \_\_\_\_\_

Chemical yields:  
The Sr-90 chemical yields are within control limits.

MS 2R

Parameter	MS % R	Blank Spike 2R	Qualifier
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1/19/93

~~Cs-137~~

Gross A	111% and 64.5%	114%	J/UJ
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Gross B	NA	114%	J/UJ
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Pu-239	95% NA 1/19/93	95%	None
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Sr-90	NA	NA	NA
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8. Holding Times

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Have all samples/analyses been completed within 5 half-lives or 180 days, whichever comes first? (Y/N/NA):

If NO, qualify all associated results >LLD as estimated detects (J) and all associated results <LLD as estimated non-detects (U). For gross exceedances (>2X criteria) qualify all associated results as unusable (R).

Comments/Notes/Qualified Results:

See the following inserts for parameter specific holding times.

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200-BP-1 RADIOCHEMISTRY DATA VALIDATION						PAGE 1	OF 3
DATA PACKAGE ID: B015G4-PNL-052				REVIEWER: <i>[Signature]</i>	DATE: 11/19/93		
COMMENTS: PNL Log # 92-00306							
HEIS SAMPLE#	SAMPLE DATE	ANALYSIS DATE	HOLDING TIME, DAYS	NUCLIDE	HALF LIVE DAYS	FIVE TIMES HALF LIFE	QUALIFIER
B015G9	10/04/91	11/20/91	47	TC-99	7.77E+07	3.89E+08	<i>none</i>
		10/24/91	20	GR-A	N/A	N/A	
		10/24/91	20	GR-B	N/A	N/A	
		11/18/91	45	SR-90	1.04E+04	5.20E+04	
		NA	NA	BE-7	53	266	
				K-40	1.30E+09	6.50E+09	
				MN-54	312	1560	
				CO-58	71	355	
				FE-59	44	220	
		11/06/91	33	CO-60	365	1825	
		NA	---	ZN-65	244	1220	
				ZR-95	64	320	
				RU-103	39	195	
		11/06/91	33	RU-106	365	1825	
		NA	---	CS-134	730	3650	
		11/06/91	33	CS-137	1.09E+04	5.48E+04	
		NA	NA	BA-140	13	64	
				CE-141	33	165	
				CE-144	285	1425	
				RA-226	5.84E+05	2.92E+06	
				TH-228	694	3470	
		11/20/91	47	TOTAL-U	1.63E+12	8.14E+12	
		11/19/91	46	PU-238	3.20E+04	1.60E+05	
		11/19/91	46	PU-239	8.80E+06	4.40E+07	
		NA	NA	U-235	2.57E+11	1.28E+12	
				U-238	1.63E+12	8.15E+12	
∇	∇	12/13/91	70	H-3			∇

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200-BP-1 RADIOCHEMISTRY DATA VALIDATION					PAGE 2	OF 3	
DATA PACKAGE ID: B015G4-PNL-052				REVIEWER: <i>[Signature]</i>	DATE: 11/19/93		
COMMENTS: PNL Log # 92-00358							
HEIS SAMPLE#	SAMPLE DATE	ANALYSIS DATE	HOLDING TIME, DAYS	NUCLIDE	HALF LIFE DAYS	FIVE TIMES HALF LIFE	QUALIFIER
B015H1	10/09/91	11/20/91	42	TC-99	7.77E+07	3.89E+08	NSR
		10/24/91	15	GR-A	N/A	N/A	
		10/24/91	15	GR-B	N/A	N/A	
		11/18/91	40	SR-90	1.04E+04	5.20E+04	
		NA	NA	BE-7	53	266	
				K-40	1.30E+09	6.50E+09	
				MN-54	312	1560	
				CO-58	71	355	
				FE-59	44	220	
		11/06/91	28	CO-60	365	1825	
		NA	NA	ZN-65	244	1220	
				ZR-95	64	320	
				RU-103	39	195	
		11/06/91	28	RU-106	365	1825	
		NA		CS-134	730	3650	
		11/06/91	28	CS-137	1.09E+04	5.48E+04	
		NA	NA	BA-140	13	64	
				CE-141	33	165	
				CE-144	285	1425	
				RA-226	5.84E+05	2.92E+06	
				TH-228	694	3470	
		11/20/91	42	TOTAL-U	1.63E+12	8.14E+12	
		11/19/91	41	PU-238	3.20E+04	1.60E+05	
		11/19/91	41	PU-239	8.80E+06	4.40E+07	
		NA	NA	U-235	2.57E+11	1.28E+12	
				U-238	1.63E+12	8.15E+12	
▽	▽	12/13/91	65	H-3			▽

9613497.2235

200-BP-1 RADIOCHEMISTRY DATA VALIDATION					PAGE 3 OF 3		
DATA PACKAGE ID: B015G4-PNL-052				REVIEWER: <i>[Signature]</i>	DATE: 1/19/93		
COMMENTS: PNL Log # 92-00358 Dup							
HEIS SAMPLE#	SAMPLE DATE	ANALYSIS DATE	HOLDING TIME, DAYS	NUCLIDE	HALF LIVE DAYS	FIVE TIMES HALF LIFE	QUALIFIER
B015H1	10/09/91	11/20/91	42	TC-99	7.77E+07	3.89E+08	none
Dup		10/24/91	15	GR-A	N/A	N/A	
		10/24/91	15	GR-B	N/A	N/A	
		11/18/91	40	SR-90	1.04E+04	5.20E+04	
		NA	NA	BE-7	53	266	
				K-40	1.30E+09	6.50E+09	
				MN-54	312	1560	
				CO-58	71	355	
				FE-59	44	220	
		11/07/91	29	CO-60	365	1825	
		NA	NA	ZN-65	244	1220	
				ZR-95	64	320	
				RU-103	39	195	
		11/07/91	29	RU-106	365	1825	
		NA	NA	CS-134	730	3650	
		11/07/91	29	CS-137	1.09E+04	5.48E+04	
		NA	NA	BA-140	13	64	
				CE-141	33	165	
				CE-144	285	1425	
				RA-226	5.84E+05	2.92E+06	
				TH-228	694	3470	
		11/20/91	42	TOTAL-U	1.63E+12	8.14E+12	
		11/19/91	41	PU-238	3.20E+04	1.60E+05	
		11/19/91	41	PU-239	8.80E+06	4.40E+07	
		NA	NA	U-235	2.57E+11	1.28E+12	
				U-238	1.63E+12	8.15E+12	
▽	▽	12/13/91	65	H-3			▽



9.2 Alpha Spectroscopy

Has detector system been calibrated across the energy range of interest? (Y/N/NA): \_\_\_\_\_

If NO, qualify all results as unusable (R).

Is detector resolution adequate to identify each peak centroid? (Y/N/NA) \_\_\_\_\_

If NO or if resolution cannot be determined, qualify all results as unusable (R).

Is resolution at least 20 keV FWHM? (Y/N/NA) \_\_\_\_\_

If NO, qualify all results as estimated (J).

Do check source efficiencies agree within 5% of initial calibration efficiencies or are they within the control limits or  $\pm 3S$  of the mean? (Y/N/NA): Qualify as R.

If NO, qualify all associated results as unusable (R).

Was each sample spiked with a tracer? (Y/N/NA): \_\_\_\_\_

If NO, qualify all associated results as unusable (R).

Are tracer recoveries within the control limits of 30 to 105%? (Y/N/NA) \_\_\_\_\_

If NO, qualify all results as follows:

%R: \_\_\_\_\_ <30% 30-105% >105% >115%

Results <LLD: R acceptable UJ R

Results >LLD: R acceptable J R

Comments/Notes/Qualified Results: \_\_\_\_\_

Multiple horizontal lines for handwritten notes and qualified results.







9613497 2241

9.6 Tritium Analysis by Liquid Scintillation Counting

Do calibration standard matrices match the sample matrices? (Y/N/NA): \_\_\_\_\_

If NO, qualify associated results as estimated (J).

Has at least one calibration standard been processed with the samples (Y/N/NA): \_\_\_\_\_

If NO, qualify results associated with runs lacking calibration standards as unusable (R).

Have results for counting efficiency determination been provided? (Y/N/NA): \_\_\_\_\_

If NO, qualify all associated results as unusable (R).

Do tritium levels in the blanks exceed the MDA? (Y/N/NA): \_\_\_\_\_

If YES, qualify associated results less than 10X the background tritium level (blanks) as estimated (J).

Have blanks been analyzed with each sample run to check for potential contamination in the chemical reagents? (Y/N/NA): \_\_\_\_\_

If NO, qualify associated results as estimated (J).

Comments/Notes/Qualified Results: \_\_\_\_\_

The assoc. civ sample was out of control limits. Therefore the assoc. results have been qualified as rejected (R).

9.7 Fluorometric Analysis of Uranium

Has the laboratory provided evidence that cation and anion interferences are negligible for the matrix or that matrix interferences have been accounted for? (Y/N/NA): NA

If NO, qualify associated results as estimated (J).

Has the laboratory provided a description of the method of fusion standardization or provided data supporting fusion standardization? (Y/N/NA): NA

If NO, qualify associated results as estimated (J).

Was calibration performed immediately prior to sample analysis? (Y/N/NA): NA

If NO, qualify associated results as estimated (J).

Comments/Notes/Qualified Results: \_\_\_\_\_

Total Uranium was performed by ICP/MS.

9613497-2243

GAS PROPORTIONAL COUNTERS  
LOW BACKGROUND BETA COUNTERS

Data Package ID: B015G4-PNL-052

Analysis: Gross alpha, gross beta, Sr-90

A.0 Completeness Checklist

Analysis Results

- Results Report for Sample Analyses and Reanalyses
- Raw Data (Counting Logs, Printouts, Notebook Pages)
- Calculation Sheets
- Sample Identifications
- Detector Identification
- Analysis Date and Initials of Analyst
- Amounts of Samples Prepared or Counted
- Weights of Solids Counted

Initial and Continuing Calibration

1/19/93  
⊕

- No detector ID for ICV
- Detector Identification for CCV
- Calibration Date(s) and Initials of Analyst
- Identification of Calibration and Check Standards including Radionuclide, Certification, Expiration Date, and Activity
- Amount of Check Standard Used
- Raw Data including Counts and Count Duration for Standards
- Weights of Preparations
- Efficiencies
- Weights of Carriers Added, If Applicable
- Results of Statistical Tests Used to Evaluate Instrument Reliability and Efficiency Checks
- Raw Data of Background Counts and Count Duration
- Results of Statistical Test Used to Evaluate Instrument Background
- Control Limits for Check Source and Background Counts

Blanks

- Detector Identification
- Date of Analysis
- MDA of Method
- Amounts of Reagents Used in Blank

Radiometric and Gravimetric Yields

- Amounts (Volumes, Concentrations, Activity) of Spikes, Tracers, or Carriers Used
- Weights of Precipitates or Solids Counted
- Calculated Recoveries



Data Package ID: B015G4-PNL-052Analysis: Pu-238 & 239**B.0 Completeness Checklist**Analysis Results

- Results Report for Sample Analyses and Reanalyses
- Raw Data (Spectra, Printouts, Notebook Pages)
- Calculation Sheets
- Sample Identifications
- Detector Identification
- Analysis Date and Initials of Analyst
- Amounts of Samples Counted (Precipitated or Deposited)

Initial and Continuing Calibration

- Detector Identification
- Calibration Date(s) and Initials of Analyst
- Identification of Calibration and Check Standards including Radionuclide, Certification, Expiration Date, and Activity
- Amount of (Check) Standard Used
- Raw Data including Spectra or Counts per Channel
- Kev/channel
- Count Duration for Standards
- Efficiencies
- Raw Data of Background Counts, Dates Counted, and Duration of Counts

Blanks

- Detector Identification
- Date of Analysis
- MDA of Method
- Amounts of Reagents Used in Blank

Duplicates

- Detector Identification
- Date of Analysis
- Amounts of Samples Counted
- Count Durations
- Sample Identifications
- Calculated Precision

Radiometric and Gravimetric Yields

- Amounts (Volumes, Concentrations, Activity) or Spikes, Tracers, or Carriers Used
- NIST Traceability of Spikes, Tracers or Carriers
- Weights of Precipitates or Solids Counted
- Calculated Recoveries



Data Package ID: B015G4-PNL-052

## C.0 Completeness Checklist

Analysis Results

- Results Report for Sample Analyses and Reanalyses
- Raw Data (Spectra, Printouts of Counts per Channel, Notebook Pages)
- Calculation Sheets
- Sample Identifications
- Detector Identification and Counting Position
- Analysis Date and Initials of Analyst
- Amounts of Samples Counted

Initial and Continuing Calibration

- Detector Identification
- Calibration Date(s) and Initials of Analyst
- Identification of Calibration and Check Standards including Radionuclides, Certification, Expiration Date, and Activity
- Amount of (Check) Standard Used
- Raw Data including Counts and Count Duration for Standards
- Efficiencies and/or Geometry and Matrix Factors
- Raw Data of Background Counts, Count Dates, and Duration of Counts
- KeV/Channel
- FWHM

Blanks

- Detector Identification
- Date of Analysis
- MDA of Method
- Amounts of Reagents Used in Blank
- Raw Data

Duplicates

- Detector Identification
- Date of Analysis
- Amounts of Samples
- Count Durations
- Sample Identifications
- Results of Analyses and Calculated Precision
- Raw Data

Radiometric and Gravimetric Yields

- Amounts (Volumes, Concentrations, Activity) of Spikes, Tracers or Carriers Used
- Weights of Precipitates or Solids Counted
- Calculated Recoveries



9613497 2249  
TRITIUM ANALYSIS USING  
LIQUID SCINTILLATION COUNTING

Data Package ID: 801564-PNL-052

F.0 Completeness Checklist

Analysis Results

- Results Report for Sample Analyses and Reanalyses
- Raw Data (Gross Counts, Count Duration, Background Count, and Background Count Duration)
- Calculation Sheets
- Sample Identifications
- Instrument Identification
- Analysis Date and Analyst Initials
- Sample Weight

Initial and Continuing Instrument Calibration

- Instrument Identification
- Identification of Calibration Standards including Radionuclides, Certification, Issue or Expiration Date and Activity
- Raw Data (Gross Counts, Count Duration, Background Count, and Background Count Duration)
- Counting Efficiency Determination Method and Results
- Quench Correction Method

Blanks

- Instrument Identification
- Date of Analysis
- MDA of Method
- Amounts of Reagents Used
- Lot Numbers of Reagents Used
- Raw Data (Gross Counts, Count Duration, Background Count, Background Count Duration)
- Tritium Levels in Background Water

Duplicates

- Instrument Identification
- Date of Analysis
- Amounts of Samples
- Amount of Spike for Spiked Duplicates
- Raw Data (Gross Counts, Count Duration, Background Counts, and Background Count Duration)



DATA QUALIFICATION SUMMARY - FORM B-7

09/1/91

2/5/93

SDG: B-5G4 REVIEWER: [Signature] DATE: 1/25/93 PAGE 5 OF 6

COMMENTS: Radio Chemistry

COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Gross α	J/US	All	CCV raw data missing
Gross β	↓	↓	↓
Sr-90	↓	↓	↓
Tritium	↓	↓	↓
Pu-238 & 239	R	All	CCV sample not run after samples
Tritium	R	All	CCV out of CL
Sr-90	R	Blank	CCV data is missing
↓	↓	Blank Dup.	↓
Gross β	R	Boisht Dup	CCV out of C.L.
Sr-90	J	All	present in blanks
Gross α	J/US	All	MS & BS 2R > 10520 and < 11520
Gross β	J/US	All	BS 2R > 10520 and < 11520
Tritium	J/US	All	RPO is out of C.L.
All	J	All	LCS not performed
Sr-90	R	Blank (BL-00306)	No CCV raw data
↓	↓	Blank Dup (BL-00306) Dup	↓

2/5/93

Table 10: Gamma Energy Analysis of Soils

Recommended Values

Batch 5

Diode L

(Radionuclide activity in pCi/g<sup>a</sup>)

Customer ID	Sample ID	Collection Date	Weight (g)	<sup>60</sup> Co	<sup>106</sup> Ru	<sup>137</sup> Cs
B01569	92-00306-L-1	10/4/91 14:20	14.200	<8 ✓	<500 ✓	(5.72 ± 0.06) × 10 <sup>5</sup> ✓
B015H1	92-00358-L-1	10/9/91 10:45	14.205	<0.4 ✓	<18 ✓	1890 ± 20 ✓
B015H1	92-00358-L-2	10/9/91 10:45	14.201 ✓	<0.3 ✓	<15 ✓	2200 ± 20 ✓
B015H1	92-00358-L-5	11/8/91 11:06	14.212 ✓	<0.15 ✓	<1.6 ✓	<0.11 ✓
B015K3	92-00921-L-1*	10/22/91 11:31	13.975	28.6 ± 1.0 ✓	<280	(5.62 ± 0.06) × 10 <sup>5</sup> ✓
B015L5	92-01246-L-1*	11/6/91 11:44	1.6300	<30	<2300	(2.00 ± 0.02) × 10 <sup>6</sup> ✓
B015M9	92-01827-L-1*	11/14/91 14:06	1.5020	<20	<1200	(1.23 ± 0.01) × 10 <sup>6</sup> ✓

<sup>a</sup> The one sigma uncertainties are based on counting statistics. All "<" values are detection limits associated with each "not detected" analysis.

The detection limits are determined from Sample 92-00358-L-5. The detection limits in pCi/g for <sup>60</sup>Co, <sup>106</sup>Ru, and <sup>137</sup>Cs at one sigma are < 0.06, <0.6, and <0.04. Note that the detection limits quoted above were calculated as if the isotope were present at a level that is 2.5 times the square root of twice the average background.

\* Samples not in SDG but reported as a part of analytical batch.

92-00358-L-5 is the method blank.

$$\text{Cs } ^{137} \text{ B015H1 RPD} = \frac{2200 - 1890}{\left(\frac{2200 + 1890}{2}\right)} \times 100 = 15.2\%$$

*[Handwritten signature]*  
11/3/93

TABLE 11: TOTAL ALPHA ANALYSIS DATA  
TASK 2 & 4 SDG #8

WMC Sample #	Sample #	Sample Type	Total Alpha (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Spike % Rec.
B015G9	92-00306-A-1a	Soil	107.5	6.9				
B015H1	92-00358-A-1a	Soil	2.9	0.7	15			
	92-00358-A-2a	Soil duplicate	2.5	0.6				
	92-00358-A-3a	Matrix Spike	12.79	1.3		9.08	0.09	111
	92-00358-A-3a	Matrix Spike	9.25	1.1		10.13	0.11	64.5
	BL-00306-A-5a	Blank	<0.56					
BS-00358-A-4a	Blank Spike	10.9	1.1		9.57	0.1	114	

Detection limit for 5g soil samples: 0.6 pCi/g

Error is based on the propagated error of volume and counting uncertainties.

*[Handwritten Signature]*  
11/9/93

SOG: 8015G4-PNL-052

TABLE 12: TOTAL BETA ANALYSIS DATA  
TASK 2 & 4 SDG #8

WMC Sample #	Sample #	Sample Type	Total Beta (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Spike % Rec.
8015G9	92-00306-A-1a	Soil	622300	<i>J</i> 13300				
8015H1	92-00358-A-1a	Soil	2590	<i>J</i> 63				
	92-00358-A-2a	Soil duplicate	2440	<i>R</i> 62	6.1			
	92-00358-A-3a	Matrix Spike	2990	<i>J</i> 69		18.4	0.9	na
	BL-00306-A-5a	Blank	<7.7	<i>LT</i>				
	BS-00306-A-4a	Blank Spike	22.1	<i>J</i> 2.4		19.39	1.0	114

\*Average of 21.4 +/- 3.8 , 24.0 +/- 3.7, 21.8 +/- 4.0 and 21.1 +/- 7.1 pCi/g

Minimum detectable activity for a 5g soil sample is approximately 7.7 pCi/g.

Contract detection limits can be achieved by use of the low background beta counters; the results from this batch were counted on the regular background beta counters due to high sample activity.

Error is based on the propagated error of volume and counting uncertainties.

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*Delbert*  
11/3/93

TABLE 13: Pu 238 and Pu 239/240 DATA ANALYSIS  
SDG #8

MHC Sample #	Program Sample ID	Sample Type	Pu-239+240 pCi/g	+/- 1 sigma	Pu-239+240 RPD	Pu-238 pCi/g	+/- 1 sigma	Pu-238 RPD	Pu-239 Spike pCi/g	+/- 1 sigma	% Recovery
B01569	92-00306-A-1c	Soil	1.21E+02	4.95E+00	R	1.87E+00	1.30E-01	R			
B015H1	92-00358-A-1c	Soil	2.39E-01	1.01E-02	RR	<del>2.92E-03</del>	8.37E-04	R	32-35 @ 11/9/93		
	92-00358-A-2c	Duplicate	2.68E-01	1.04E-02	R	4.03E-03	8.48E-04	R			
	92-00306-A-4c	Blank Spike	2.23E+00	7.61E-02	RR	< 1E-03		R	2.35E+00	1.48E-02	95
	92-00306-A-5c	Blank	< 5E-04		RR	< 1E-03		R			
						2.83E-03		R			

Pu-239+240 detection limit is approximately 5 E-04 pCi/g.  
Pu-238 detection limit is approximately 1 E-03 pCi/g.

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Errors quoted are the propagated error of individual measurements.

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11/3/93

SOG: B015G4-PNL-052

TABLE 14: STRONTIUM-90 ANALYSIS DATA FOR TASK 2 & 4  
SDG #8

Parameters of Interest

WHC Sample #	Sample #	Sample Type	Strontium (pCi/g)	+/- 1 sigma*	RPD	Spike Conc. (pCi/g)	+/- 1 sigma*	Spike % Rec.	Normalized % Yield**
B015G9	92-00306-A-1b	Soil	67700	4900					
B015H1	92-00358-A-1b	Soil	452	33					
	92-00358-A-2b	Soil Duplicate	461	34	1.8				
	92-00306-A-3b	Matrix Spike	46.3	3.6		49.5	2.5	93.5	
	BL-00306-A-5b	Blank	0.1	0.02					
	BL-00306-A-5b	Blank duplicate	0.3	0.04					
	BS-00306-A-4b	Blank Spike	Used to determine batch yield						103.5

Minimum detectable activity for a sample is approximately 0.06 pCi/g.

\* 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 blank spike recovery which has been normalized to 100% chemical recovery.

The MSR is not applicable since the <sup>Ⓢ 1/14/93</sup> sample result ~~spike concentration~~ is greater than the spike conc. by a factor greater than four.

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1/14/93

SDG: B015G4-PNL-052

TABLE 15: TRITIUM ANALYSIS FOR TASK 2 & 4  
SDG #8

W/C Sample #	Project Sample ID	Sample Type	Tritium (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Recov. Corr. Factor, % F <sub>s</sub>	
B01569	92-00306-K-1	Soil	18 ✓	3					
B015H1	92-00358-K-1	Soil	23 ✓	3					
B015K3	92-00921-K-1*	Soil	56 ✓	4					
	92-00921-K-2*	Duplicate	37 ✓	3					
	92-00921-K-5*	Blank	<4 *		41 ✓				
	92-00921-K-4*	Method Spike Used to Determine Batch Yield							75

Approximate Detection Limit = 10 pCi/g (variations occur due to actual sample size)  
 \* Not samples in the SDG but reported for QC purposes  
 \* Based on 0.3 g sample size

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*[Handwritten Signature]*  
11/4/93

## LABORATORY: BATTELLE-PACIFIC NORTHW EST LABORATORIES

SAMPLE ID	HEIS#	LAB ID	DET ID	DATE ANALYZED	GROSS COUNTS	COUNT TIME	BKG CPM	DETECT EFF	LEACH VOLUME	SAMPLE AMOUNT	VOLUME ANALYZED
SDG B00X64-PNL-050											
91-6421-A-1a	B00X77	91-6421	2	08/30/91	94	100	0.188	14.0532	10	3.9144	1.9432
91-7815-A-1a	QC SAMPLE	91-7815	2	08/30/91	720	100	0.188	11.3273	10	3.7659	1.9432
91-7815-A-2a	QC DUP	91-7815D	1	08/30/91	1143	100	0.11	6.7164	10	2.767	1.9432
91-7815-A-3a	QC MS	91-7815MS	3	08/30/91	1130	100	0.1	9.3668	10	3.5771	1.9432
BL-6421-A-5a	BLANK	BL-6421	4	08/30/91	9	100	0.049	3.0575	8	1	1.9432
BS-6421-A-4a	BLANK SPIKE	BS-6421	1	08/30/91	761	100	0.11	3.0754	10	1	1.9432
SDG B00X68-PNL-050											
91-7815-A-1a	B00X75	91-7815	2	08/30/91	720	100	0.188	11.3273	10	3.7659	1.9432
91-7815-A-2a	B00X75 DUP	91-7815D	1	08/30/91	1143	100	0.11	6.7164	10	2.767	1.9432
91-7815-A-3a	B00X75 MS	91-7815MS	3	08/30/91	1130	100	0.1	9.3668	10	3.5771	1.9432
BL-6421-A-5a	BLANK	BL-6421	4	08/30/91	9	100	0.049	3.0575	8	1	1.9432
BL-6421-A-4a	BLANK SPIKE	BS-6421	1	08/30/91	761	100	0.11	3.0754	10	1	1.9432
SDG: B015G4-PNL-052											
92-00306-A-1a	B015G9	92-00306	1	10/24/91	1014	100	0.114	4.108	40	3.483	1.9828
92-00358-A-1a	B01GH1	92-00358	2	10/24/91	58	100	0.186	4.1017	40	5.029	1.9828
92-00358-A-2a	B01GH1 DUP	92-00358A	3	10/24/91	38	100	0.101	4.4751	40	4.524	1.9828
92-00358-A-3a	B01GH1 MS	92-00358MS	2	10/24/91	183	100	0.186	4.3795	40	5.114	1.9828
92-00358-A-3a	B01GH1 MSD	92-00358MST	2	10/24/91	130	100	0.186	4.316	40	4.725	1.9828
92-00306-A-5a	BLANK	92-00306BL	1	10/24/91	14	100	0.114	3.016	40	5	1.9828
92-00358-A-4a	BLANK SPIKE	92-00358BS	3	10/24/91	209	100	0.101	3.016	40	5	1.9828

## LABORATORY: BATTELLE-PACIFIC NORTHW EST LABORATORIES

SAMPLE ID	HEIS#	LAB ID	DET ID	DATE ANALYZED	GROSS COUNTS	COUNT TIME	BKG CPM	DETECT EFF	LEACH VOLUME	SAMPLE AMOUNT	VOLUME ANALYZED
SDG: B015H8-PNL-053											
92-00306-A-5a	BLANK	BL-00306	3	11/22/91	6	30	0.117	3.0101	40	1.1	1.972
92-009219-A-1	B015K3	92-00921	1	11/22/91	33	30	0.147	3.1708	40	1.075	1.972
92-009219-A-2	B015K3 DUP	92-00921D	2	11/22/91	35	30	0.216	3.1947	40	1.159	1.972
92-00921-A-4a	BLANK SPIKE	BS-00921	1	11/22/91	72	30	0.147	3.0516	40	1.1	1.972
92-00921-A-3a	MATRIX SPIKE	MS-00921	1	11/22/91	3039	1000	0.147	3.3509	40	1.328	1.972

FILE: PNL-GRA.WK1

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## LABORATORY: BATTELLE-PACIFIC NORTHW

SAMPLE ID	HEIS#	LAB ID	CALC. RESULT	RPTD RESULT	CALC. MDA	RPTD MDA	UNITS
SDG B00X64-PNL-050							
91-6421-A-1a	B00X77	91-6421	6.26	6.258	1.08	NR	pCi/g
91-7815-A-1a	QC SAMPLE	91-7815	48.89	48.89	0.91	NR	pCi/g
91-7815-A-2a	QC DUP	91-7815D	63.69	63.69	0.56	NR	pCi/g
91-7815-A-3a	QC MS	91-7815MS	67.98	67.98	0.58	NR	pCi/g
BL-6421-A-5a	BLANK	BL-6421	0.23	0.22	0.38	0.35	pCi/g
BS-6421-A-4a	BLANK SPIKE	BS-6421	53.47	53.47	0.71	NR	pCi/g
SDG B00X68-PNL-050							
91-7815-A-1a	B00X75	91-7815	48.9	48.9	0.9	NR	pCi/g
91-7815-A-2a	B00X75 DUP	91-7815D	63.7	63.7	0.6	NR	pCi/g
91-7815-A-3a	B00X75 MS	91-7815MS	68.0	68.0	0.6	NR	pCi/g
BL-6421-A-5a	BLANK	BL-6421	0.2	0.2	0.4	0.4	pCi/g
BL-6421-A-4a	BLANK SPIKE	BS-6421	53.5	53.5	0.7	NR	pCi/g
SDG: B015G4-PNL-052							
92-00306-A-1a	B015G9	92-00306	107.46	107.46	1.09	NA	pCi/g
92-00358-A-1a	B01GH1	92-00358	2.92	2.92	0.96	NA	pCi/g
92-00358-A-2a	B01GH1 DUP	92-00358A	2.508	2.508	0.86	NA	pCi/g
92-00358-A-3a	B01GH1 MS	92-00358MS	12.794	12.794	1.01	NA	pCi/g
92-00358-A-3a	B01GH1 MSD	92-00358MST	9.247	9.247	1.07	NA	pCi/g
92-00306-A-5a	BLANK	92-00306BL	0.143	0.143	0.555	0.555	pCi/g
92-00358-A-4a	BLANK SPIKE	92-00358BS	10.902	10.902	0.523	NA	pCi/g

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**LABORATORY: BATTELLE-PACIFIC NORTHW**

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<b>SAMPLE ID</b>	<b>HEIS#</b>	<b>LAB ID</b>	<b>CALC. RESULT</b>	<b>RPTD RESULT</b>	<b>CALC. MDA</b>	<b>RPTD MDA</b>	<b>UNITS</b>
<b>SDG: B015H8-PNL-053</b>							
92-00306-A-5a	BLANK	BL-00306	2	2	4.7	4.7	pCi/g
92-009219-A-1	B015K3	92-00921	25.7	25.7	6	NR	pCi/g
92-009219-A-2	B015K3 DUP	92-00921D	23.9	23.9	6	NR	pCi/g
92-00921-A-4a	BLANK SPIKE	BS-00921	57.1	57.1	5	NR	pCi/g
92-00921-A-3a	MATRIX SPIKE	MS-00921	66.7	66.7	1	NR	pCi/g

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## LABORATORY: BATTELLE-PACIFIC NORTH WEST LABORATORIES

SAMPLE ID	HEIS#	LAB ID	DET. DATE ID	COUNTED	GROSS COUNTS	COUNT TIME	BKG CPM	EFF.	LEACH VOLUME	SAMPLE AMOUNT	VOLUME ANALYZED
SDG: B00X64-PNL-051											
91-6421-1a	B00X77	91-6421	66	08/09/91	162548	10	15.7	2.6524	10	2.022	2.0086
91-6421-1a	B00X77 DUP	91-6421D	67	08/09/91	207118	10	14.8	2.7054	10	2.787	2.0086
91-6421-1a	B00X77 MS	91-6421MS	68	08/09/91	157245	10	14.6	2.5086	10	1.92	2.0086
91-6421-1a	BLANK	BL-6421	LB1	08/09/91	52	30	0.623	1.9975	10	10	2.0086
91-6421-1a	BLANK SPIKE	BS-6421	69	08/09/91	909	30	19.7	1.9926	10	10	2.0086
SDG: B00X68-PNL-050											
91-7815-A-1a	B00X75	91-7815	66	08/27/91	66337	10	17	1.9426	10	3.667	0.0991
91-7815-A-2a	B00X75 DUP	91-7815D	67	08/27/91	43680	10	15.3	1.922	10	3.307	0.0991
91-7815-A-3a	B00X75 MS	91-7815MSB	68	08/27/91	32585	10	14.9	1.9426	10	0.1886	1.0037
BL-7815-A-4a	BLANK SPIKE	BS-7815B	69	08/27/91	817	30	18.9	1.9483	10	10	2.0074
BL-7815-A-5a	BLANK	BL-7815B	LB1	08/27/91	49	30	0.536	1.9575	10	10	2.0074
NONE	DL TEST	DL TEST	LB1	08/27/91	5	30	0.536	1.9575	10	10	2.0074
SDG: B015G4-PNL-052											
92-00306-A-1a	B015G9	92-00306	66	10/24/91	6352	1	16.4	1.9005	40	3.483	0.1001
92-00358-A-1a	B015H1	92-00358	67	10/24/91	3788	10	16.8	1.9786	40	5.029	0.9914
92-00358-A-2a	B015H1 DUP	92-00358D	68	10/24/91	3195	10	14.7	1.9891	40	4.524	0.9914
92-00358-A-3a	B015H1 MS	92-00358MS	69	10/24/91	4502	10	16.2	1.9975	40	5.272	0.9914
	BLANK SPIKE	92-00306BS	66	10/24/91	851	30	16.4	1.8976	40	5	1.9828
BL-00306-A-5a	BLANK	92-00306BL	67	10/24/91	537	30	16.8	1.894	40	5	1.9828
SDG: B015H8-PNL-053											

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LABORATORY: BATTTELLE-PACIFIC NORTH WEST LABORATORIES

SAMPLE ID	HEIS#	LAB ID	DET. ID	DATE COUNTED	GROSS COUNTS	COUNT TIME	BKG CPM	EFF.	LEACH VOLUME	SAMPLE AMOUNT	VOLUME ANALYZED
92-00921-A-1a	B015K3	TB921	66	12/09/91	6664	30	17.9	1.9319	40	1.119	0.09856
92-00921-A-2a	B015K3 DUP	TB921D	67	12/09/91	6610	30	17.7	1.922	40	1.174	0.09856
92-00921-A-5a	BLANK	TB921BL	66	12/09/91	703	30	17.9	1.9119	40	1	1.96
92-00921-A-4a	BLANK SPIKE	BS-921	67	12/09/91	1372	30	17.7	1.9062	40	1	1.96
		TB358	68	12/09/91	5701	30	15.3	1.9638	40	1.039	1.96
92-00358-A-3a	MATRIX SPIKE	TB358MS	69	12/09/91	7939	30	17.6	1.9624	40	0.931	1.96

9613497.2263

## LABORATORY: BATTTELLE-PACIFIC NORTH

SAMPLE ID	HEIS#	LAB ID	CALC. RESULT	RPTD RESULT	CALC. MDA	RPTD MDA	UNITS
SDG: B00X64-PNL-051							
91-6421-1a	B00X77	91-6421	47772	47772	11		NA pCi/g
91-6421-1a	B00X77 DUP	91-6421D	45056	45056	8		NA pCi/g
91-6421-1a	B00X77 MS	91-6421MS	46032	46032	11		NA pCi/g
91-6421-1a	BLANK	BL-6421	0.50	0.5	0.2		NA pCi/mL
91-6421-1a	BLANK SPIKE	BS-6421	4.74	4.74	1		NA pCi/mL pCi
SDG: B00X68-PNL-050							
91-7815-A-1a	B00X75	91-7815	159326	159326	94		NR pCi/g
91-7815-A-2a	B00X75 DUP	91-7815D	114988	114985	98		NR pCi/g
91-7815-A-3a	B00X75 MS	91-7815MSB	149938	149919	169		NR pCi/g
BL-7815-A-4a	BLANK SPIKE	BS-7815B	3.64	3.64	1		NR pCi/mL
BL-7815-A-5a	BLANK	BL-7815B	0.48	0.48	0.2		NR pCi/mL
NONE	DL TEST	DL TEST	-0.16	-0.16	0.18	0.18	pCi/g
SDG: B015G4-PNL-052							
92-00306-A-1a	B015G9	92-00306	622265	622254	1193		NA pCi/g
92-00358-A-1a	B015H1	92-00358	2588	2588	28		NA pCi/g
92-00358-A-2a	B015H1 DUP	92-00358D	2436	2436	29		NA pCi/g
92-00358-A-3a	B015H1 MS	92-00358MS	2989	2989	26		NA pCi/g
	BLANK SPIKE	92-00306BS	41	41	8		NA pCi/g
BL-00306-A-5a	BLANK	92-00306BL	3.79	3.79	7.73	7.73	pCi/g
SDG: B015H8-PNL-053							

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**LABORATORY: BATTTELLE-PACIFIC NORTH**

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<b>SAMPLE ID</b>	<b>HEIS#</b>	<b>LAB ID</b>	<b>CALC. RESULT</b>	<b>RPTD RESULT</b>	<b>CALC. MDA</b>	<b>RPTD MDA</b>	<b>UNITS</b>
92-00921-A-1a	B015K3	TB921	64460	64460	731	NR	pCi/g
92-00921-A-2a	B015K3 DUP	TB921D	60646	60644	690	NR	pCi/g
92-00921-A-5a	BLANK	TB921BL	97	97	41	NR	pCi/g
92-00921-A-4a	BLANK SPIKE	BS-921	491	491	40	NR	pCi/g
		TB358	3036	3036	37	NR	pCi/g
92-00358-A-3a	MATRIX SPIKE	TB358MS	4787	4787	45	NR	pCi/g

9613497-2265

LABORATORY: BATTELLE-PACIFIC NOR THWEST LABORATORIES

SAMPLE ID	HEIS #	LAB ID	DET ID	DATE COUNTED	SAMPLE AMOUNT	LEACH VOLUME	DIL. ALIQ.	DILUTED TO, ML	ALIUQUOT ML	PU-242 DPM	PU-242 COUNTS	PU-239 COUNTS	PU-239 BKGD	PU-238 COUNTS
SDG: B00X64-PNL-051														
91-6421-A-1c	B00X77	91-6421	C5	08/19/91	10.36	1	1	1	1	21.72	6781	24	1	46
91-6421-A-2c	B00X77 DUP	91-6421D	C6	08/19/91	10.38	1	1	1	1	21.72	7274	11	0	36
91-6421-A-5c	BLANK	91-6421BL	C7	08/19/91	10	1	1	1	1	21.72	7888	2	0	29
91-6421-A-4c	BLANK SPIKE	91-6421BS	C8	08/19/91	1	1	1	1	1	21.72	9467	10550	0	131
SDG: B00X68-PNL-050														
91-7815-A-1c	B00X75	91-7815	C5	09/12/91	10.031	1	1	1	1	22.41	1370	44009	0	582
91-7815-A-2c	B00X75 DUP	91-7815D	C6	09/12/91	10.037	1	1	1	1	22.41	2744	80947	1	966
91-7815-A-5c	BLANK	BL-7815	C8	09/12/91	10	1	1	1	1	22.41	1943	9	1	3
91-7815-A-4c	BLANK SPIKE	BS-7815	C7	09/12/91	10	1	1	1	1	22.41	3659	4156	0	3
SDG: B015G4-PNL-052														
92-00306-A-1	B015G9	92-00306	C5	11/19/91	0.37	1	1	1	1	21.32	4340	20280	0	312
92-00358-A-1	B015H1	92-00358	C6	11/19/91	10.1	1	1	1	1	21.32	4366	1097	1	14
92-00358-A-2	B015H1DUP	92-00358D	C7	11/19/91	10.63	1	1	1	1	21.32	5158	1531	0	23
92-00306-A-5	BLANK	BL-00306	C5	11/20/91	10	1	1	1	1	21.32	3559	1	0	4
92-00306-A-4	BLANK SPIKE	BS-00306	C6	11/20/91	10	1	1	1	1	21.32	2811	6521	1	2
SDG: B015H8-PNL-053														
92-00358-A-1	B015H1	92-00358	C6	11/19/91	10.1	1	1	1	1	21.32	4365	1097	1	14
92-00358-A-2	B015H1DUP	92-00358D	C7	11/19/91	10.63	1	1	1	1	21.32	5158	1531	0	23
92-00921-A-1	B015K3	92-00921	C8	11/19/91	1.58	1	1	1	1	21.32	5312	2591	0	41
92-00306-A-5	BLANK	BL-00306	C5	11/20/91	10	1	1	1	1	21.32	3559	1	0	4
92-00306-A-4	BLANK SPIKE	BS-00306	C6	11/20/91	10	1	1	1	1	21.32	2810	6521	1	2

9613497.2266

LABORATORY: BATTELLE-PACIFIC NOR

SAMPLE ID	HEIS #	LAB ID	PU-238 BKGD	PU-239 CALC	PU-239 RPTD	PU-239 MDA CALC	PU-239 MDA RPTD	PU-238 CALC	PU-238 RPTD	PU-238 MDA CALC	PU-238 MDA RPTD	UNITS
SDG: B00X64-PNL-051												
91-6421-A-1c	B00X77	91-6421	1	3.20E-03	3.25E-03	4.18E-04		NR 6.27E-03	6.23E-03	4.18E-04		NR pCi/g
91-6421-A-2c	B00X77 DUP	91-6421D	0	1.43E-03	1.43E-03	0.00E+00		NR 4.66E-03	4.66E-03	0.00E+00		NR pCi/g
91-6421-A-5c	BLANK	91-6421BL	0	2.48E-04	2.48E-04	0.00E+00	<4E-04	3.60E-03	3.60E-03	0.00E+00		NR pCi/g
91-6421-A-4c	BLANK SPIKE	91-6421BS	8	1.09E+01	1.09E+01	0.00E+00		NR 1.27E-01	1.27E-01	8.77E-03		NR pCi/g
SDG: B00X68-PNL-050												
91-7815-A-1c	B00X75	91-7815	0	3.23E+01	3.23E+01	0.00E+00		NR 4.28E-01	4.28E-01	0.00E+00		NR pCi/g
91-7815-A-2c	B00X75 DUP	91-7815D	0	2.97E+01	2.97E+01	1.10E-03		NR 3.54E-01	3.54E-01	0.00E+00		NR pCi/g
91-7815-A-5c	BLANK	BL-7815	2	4.16E-03	4.26E-03	1.56E-03		NR 5.20E-04	2.94E-04	2.20E-03	2.43E-03	pCi/g
91-7815-A-4c	BLANK SPIKE	BS-7815	0	1.15E+00	1.15E+02	0.00E+00		NR 8.28E-04	8.28E-04	1.10E-03	1.10E-03	pCi/g
SDG: B015G4-PNL-052												
92-00306-A-1	B015G9	92-00306	0	1.21E+02	1.21E+02	0.00E+00		NR 1.87E+00	1.87E+00	0.00E+00		NR pCi/g
92-00358-A-1	B015H1	92-00358	1	2.39E-01	2.39E-01	6.53E-04		NR 2.83E-03	2.92E-03	6.53E-04		NR pCi/g
92-00358-A-2	B015H1DUP	92-00358D	0	2.68E-01	2.68E-01	0.00E+00		NR 4.03E-03	4.03E-03	0.00E+00		NR pCi/g
92-00306-A-5	BLANK	BL-00306	0	2.70E-04	2.70E-04	5.40E-04	5.40E-04	1.08E-03	1.08E-03	1.08E-03	1.08E-03	pCi/g
92-00306-A-4	BLANK SPIKE	BS-00306	1	2.23E+00	2.23E+00	1.02E-03		NR 3.42E-04	5.03E-04	1E-03	1E-03	pCi/g
SDG: B015H8-PNL-053												
92-00358-A-1	B015H1	92-00358	1	2.39E-01	2.39E-01	6.54E-04		NR 2.83E-03	2.92E-03	6.54E-04		NR pCi/g
92-00358-A-2	B015H1DUP	92-00358D	0	2.68E-01	2.68E-01	0.00E+00		NR 4.03E-03	4.03E-03	0.00E+00		NR pCi/g
92-00921-A-1	B015K3	92-00921	2	2.96E+00	2.96E+00	0.00E+00		NR 4.46E-02	4.42E-02	4.85E-03		NR pCi/g
92-00306-A-5	BLANK	BL-00306	0	2.70E-04	2.70E-04	5.40E-04	5.40E-04	1.08E-03	1.08E-03	1.08E-03	1.08E-03	pCi/g
92-00306-A-4	BLANK SPIKE	BS-00306	1	2.23E+00	2.23E+00	1.03E-03		NR 3.42E-04	5.03E-04	1E-03	1E-03	pCi/g

9613497-2267

LABORATORY: BATTELLE-PACIFIC NORTHWEST LABORATORIES

SAMPLE ID	HEIS #	LAB ID	DET ID	DATE COUNTED	SR90 SPK YLD	THEOR. YIELD	YIELD MG	COUNT TOTAL	COUNT TIME	MIDPOINT TIME,HR	BKG CPM	NET CPM	D/C
SDG: B00X64-PNL-051													
91-6421-A-3b	MATRIX SPIKE	91-6421-MS	66	08/21/91	0.843	66.69	57.5	7329	30	5.32	16.2	228	2.846
91-6421-A-4b	BLANK SPIKE	BS-6421	68	08/21/91	0.843	66.69	69.4	965	30	3.48	14.4	18	3.025
91-6421-A-Xb	B00X77 DL	91-6421-DL	1	08/21/91	0.843	66.69	76	1	30	3.40	0.603	-0.57	3.124
91-6421-A-5b	BLANK	BL-6421	3	08/21/91	0.843	66.69	66	1099	30	3.40	0.516	36	2.974
91-6421-A-1b	B00X77	91-6421	1	08/21/91	0.843	66.69	43.6	182	30	3.40	0.603	5	2.636
91-6421-A-2b	B00X77 DUP	91-6421D	2	08/21/91	0.843	66.69	68.6	231	30	3.40	0.472	7.23	3.013
91-6421-A-6b	BLANK SPIKE DU	91-6421-BS2	66	08/21/91	0.843	66.69	75.8	10954	30	3.40	16.2	348.93	3.121
SDG: B00X68-PNL-050													
91-7815-1b	B00X75	91-7815	68	09/13/91	0.9979	68.42	53.8	460242	1	3.25	14.5	460227	2.79
91-7815-2b	B00X75 DUP	91-7815D	69	09/13/91	0.9979	68.42	43.7	383711	1	3.25	18	383693	2.638
91-7815-3b	B00X75 MS	MS2-7815	69	09/13/91	0.9979	68.42	24.7	221651	1	3.35	18	221633	2.352
91-7815-5b	BLANK	BL-7815	1	09/13/91	0.9979	68.42	53.7	539	30	3.88	0.547	17.42	2.768
91-7815-1b	BLANK SPIKE	BS-7815	66	09/13/91	0.9979	68.42	46.7	961	30	3.88	16.5	15.53	2.683
91-7815-1b	BLANK SPIKE 2	BS2-7815	68	09/13/91	0.9979	68.42	75.4	2838	10	3.58	14.5	269.3	3.115
91-7815-3b	B00X75	91-7815	67	09/13/91	0.9979	68.42	42.1	2837	10	3.42	17.2	266.5	2.614
SDG: B015G4-PNL-052													
92-00358-A-1b	B015H1	92-00358	69	11/18/91	1.035	67.98	57.1	15121	10	4.25	16.9	1495.2	2.84
92-00358-A-2b	B015H1 DUP	92-00358D	69	11/18/91	1.035	67.98	53.6	13330	10	4.45	16.9	1316.1	2.787
92-00306-A-1b	B015G9 DUP	92-00306D	66	11/18/91	1.035	67.98	49.6	14580	10	4.45	17	1441	2.727
92-00306-A-3b	B015G9 MS	MS-00306	66	11/18/91	1.035	67.98	59.7	5149	100	5.62	17	34.49	2.879
BS-00306-A-4b	BLANK SPIKE	BS-00306	67	11/18/91	1.035	67.98	56.7	10880	30	4.42	17	345.67	2.834

9613497-2268

LABORATORY: BATTELLE-PACIFIC NORTHWEST LABORATORIES

SAMPLE ID	HEIS #	LAB ID	DET ID	DATE COUNTED	SR90 SPK YLD	THEOR. YIELD	YIELD MG	COUNT TOTAL	COUNT TIME	MIDPOINT TIME,HR	BKG CPM	NET CPM	D/C
BL-00306-A-5b	BLANK	BL-00306	1	11/18/91	1.035	67.98	51.5	271	100	5.45	0.524	2.19	2.755
BL-00306-A-5b	BLANK DUP	BL-00306D	2	11/18/91	1.035	67.98	57.3	117	100	5.45	0.475	0.70	2.843
SDG: B015H8-PNL-053													
92-00921-A-1b	B015K3	92-00921	66	11/18/91	1.035	67.98	56.3	73371	10	4.25	17	7320.1	2.828
92-00358-A-1b	B015H1	92-00358	69	11/18/91	1.035	67.98	57.1	15121	10	4.25	16.9	1495.2	2.84
92-00358-A-2b	B015H1 DUP	92-00358D	69	11/18/91	1.035	67.98	53.6	13330	10	4.45	16.9	1316.1	2.787
92-00306-A-1b	B015G9 DUP	92-00306D	66	11/18/91	1.035	67.98	49.6	14580	10	4.45	17	1441	2.727
92-00306-A-3b	B015G9 MS	MS-00306	66	11/18/91	1.035	67.98	59.7	5149	100	5.62	17	34.49	2.879
BS-00306-A-4b	BLANK SPIKE	BS-00306	67	11/18/91	1.035	67.98	56.7	10880	30	4.42	17	345.67	2.834
BL-00306-A-5b	BLANK	BL-00306	1	11/18/91	1.035	67.98	51.5	271	100	5.45	0.524	2.19	2.755
BL-00306-A-5b	BLANK DUP	BL-00306D	2	11/18/91	1.035	67.98	57.3	117	100	5.45	0.475	0.70	2.843

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LABORATORY: BATTELLE-PACIFIC NORTHWEST

SAMPLE ID	HEIS #	LAB ID	SAMPLE AMOUNT	CALC SR-90	RPTD SR-90	CALC MDA	RPTD MDA	UNITS	DPM SR-90	SR-90 YIELD
SDG: B00X64-PNL-051										
91-6421-A-3b	MATRIX SPIKE	91-6421-MS	12.262	30.977	30.973	0.122		NR pCi/g	NA	NA
91-6421-A-4b	BLANK SPIKE	BS-6421	10	2.658	2.66	0.122		NR pCi/g	NA	NA
91-6421-A-Xb	B00X77 DL	91-6421-DL	10	-0.080	-0.08	0.023		0.062 pCi/g	NA	NA
91-6421-A-5b	BLANK	BL-6421	10	5.590	5.589	0.024		NR pCi/g	NA	NA
91-6421-A-1b	B00X77	91-6421	9.298	1.220	1.221	0.040		NR pCi/g	NA	NA
91-6421-A-2b	B00X77 DUP	91-6421D	12.9	0.845	0.845	0.017		NR pCi/g	NA	NA
91-6421-A-6b	BLANK SPIKE DU	91-6421-BS2	NA	NA	NA	NA		NA	1096	0.843
SDG: B00X68-PNL-050										
91-7815-1b	B00X75	91-7815	11.368	62602	62600	0.135		NR pCi/g		
91-7815-2b	B00X75 DUP	91-7815D	9.984	69175	69171	0.206		NR pCi/g		
91-7815-3b	B00X75 MS	MS2-7815	9.548	65837	65834	0.359		NR pCi/g		
91-7815-5b	BLANK	BL-7815	10	2.66	2.68	0.030		NR pCi/mL		
91-7815-1b	BLANK SPIKE	BS-7815	10	2.64	2.64	0.185		NR pCi/mL		
91-7815-1b	BLANK SPIKE 2	BS2-7815	10	33	33	0.116		NR pCi/mL		
91-7815-3b	B00X75	91-7815	NA	NA	NA	NA		NA	1093	0.9982
SDG: B015G4-PNL-052										
92-00358-A-1b	B015H1	92-00358	4.652	452	452	0.337		NR pCi/g	NA	NA
92-00358-A-2b	B015H1 DUP	92-00358D	4.185	461	461	0.395		NR pCi/g	NA	NA
92-00306-A-1b	B015G9 DUP	92-00306D	0.033	67692	67681	53.672		NR pCi/g	NA	NA
92-00306-A-3b	B015G9 MS	MS-00306	1	46.3	46.3	1.502		NR pCi/g	NA	NA
BS-00306-A-4b	BLANK SPIKE	BS-00306	NA	NA	NA	NA		NA	1082	1.035

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LABORATORY: BATTELLE-PACIFIC NORTHWEST

SAMPLE ID	HEIS #	LAB ID	SAMPLE AMOUNT	CALC SR-90	RPTD SR-90	CALC MDA	RPTD MDA	UNITS	DPM SR-90	SR-90 YIELD
BL-00306-A-5b	BLANK	BL-00306	10	0.326	0.326	0.030		NR pCi/g	NA	NA
BL-00306-A-5b	BLANK DUP	BL-00306D	10	0.096	0.096	0.026		NR pCi/g	NA	NA
SDG: B015H8-PNL-053										
92-00921-A-1b	B015K3	92-00921	1.34	7754	7752	1.187		NR pCi/g		
92-00358-A-1b	B015H1	92-00358	4.652	452	452	0.337		NR pCi/g	NA	NA
92-00358-A-2b	B015H1 DUP	92-00358D	4.185	461	461	0.395		NR pCi/g	NA	NA
92-00306-A-1b	B015G9 DUP	92-00306D	0.033	67692	67681	53.672		NR pCi/g	NA	NA
92-00306-A-3b	B015G9 MS	MS-00306	1	46.3	46.3	1.502		NR pCi/g	NA	NA
BS-00306-A-4b	BLANK SPIKE	BS-00306	NA	NA	NA	NA		NA NA	1082	1.035
BL-00306-A-5b	BLANK	BL-00306	10	0.326	0.326	0.030		NR pCi/g	NA	NA
BL-00306-A-5b	BLANK DUP	BL-00306D	10	0.096	0.096	0.026		NR pCi/g	NA	NA

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LABORATORY: BATTELLE-PACIFIC NORTHWEST LABORATORIES

SAMPLE ID	HEIS #	LAB ID	DATE COUNTED	SAMPLE CPM - 1	SAMPLE CPM - 2	SAMPLE CPM-AVG	BKG CPM	VOLUME ALIQ.	BSC SOLN +FLSK, g	DRIED SOL +FLSK, g	COUNT EFF.	VOLUME LEACH.
SDG: B00X64-PNL-051												
91-6421-K-1	B00X77	91-6421	08/26/91	13.83	14.5	14.17	13.1	4.0153	143.06	120.37	3.492	175
91-6421-K-2	B00X77 DUP	91-6421D	08/26/91	14.05	14.53	14.29	13.1	4.0153	140.71	117.05	3.492	170
91-6421-K-5	BLANK	BL-6421	08/26/91	13.81	13.47	13.64	13.1	4.0153	136.52	112.78	3.492	165
		91-7015	08/26/91	15.21	15.25	15.23	13.1	4.0153	137.8	114.58	3.492	200
91-6421-K-4	B00X77 MS	91-6421MS	08/26/91	50.15	50.41	50.28	13.1	4.0153	137.32	114.72	3.492	250
SDG: B00X68-PNL-050												
91-7815-K-1	B00X75	91-7815	08/26/91	15.21	15.25	15.23	13.1	4.0153	137.8	114.58	3.492	200
91-6421-K-1	B00X77	91-6421	08/26/91	13.83	14.5	14.17	13.1	4.0153	143.06	120.37	3.492	175
91-6421-K-2	B00X77 DUP	91-6421D	08/26/91	14.05	14.53	14.29	13.1	4.0153	140.71	117.05	3.492	170
91-6421-K-5	BLANK	BL-6421	08/26/91	13.81	13.47	13.64	13.1	4.0153	136.52	112.78	3.492	165
SDG: B015G4-PNL-052												
92-00306-K-1	B015G9	92-00306	12/13/91	15.02	14.41	14.72	12.3	3.9977	110.048	85.658	3.269	70
92-00358-K-1	B015H1	92-00358	12/13/91	16.28	16.98	16.63	12.3	3.9977	108.986	85.89	3.269	60
92-00921-K-1	B015K3	92-00921	12/13/91	21.48	20.54	21.01	12.3	3.9977	112.646	87.263	3.269	75
92-00921-K-2	B015K3 DUP	92-00921D	12/13/91	17.51	17.22	17.37	12.3	3.9977	113.084	88.969	3.269	70
92-00921-K-5	BLANK	BL-921	12/13/91	12.74	13.24	12.99	12.3	3.9977	108.436	84.294	3.269	35
92-00921-K-4	BLANK SPIKE MS-921		12/13/91	120.9	121.96	121.43	12.3	NA	NA	NA	3.269	NA
SDG: B015H8-PNL-053												
92-00921-K-1	B015K3	92-00921	12/13/91	21.48	20.54	21.01	12.3	3.9977	112.646	87.263	3.269	75
92-00921-K-2	B015K3 DUP	92-00921D	12/13/91	17.51	17.22	17.37	12.3	3.9977	113.084	88.969	3.269	70
92-00921-K-5	BLANK	BL-921	12/13/91	12.74	13.24	12.99	12.3	3.9977	108.436	84.294	3.269	35
92-00921-K-4	BLANK SPIKE MS-921		12/13/91	120.9	121.96	121.43	12.3	NA	NA	NA	3.269	NA

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LABORATORY: BATTELLE-PACIFIC NOR

SAMPLE ID	HEIS #	LAB ID	ALIQOT DISTILLED	RECOV. FACTOR	SAMPLE WEIGHT	CALC H3	RPTD H3	CALC MDA	RPTD MDA	SPIKE ACTIVITY	F8 VALUE	
SDG: B00X64-PNL-051												
91-6421-K-1	B00X77	91-6421	25	0.7479	5.055	16.046	16.046	18	NR	pCl/g	NA	NA
91-6421-K-2	B00X77 DUP	91-6421D	25	0.7479	5.078	18.255	18.254	18	NR	pCl/g	NA	NA
91-6421-K-5	BLANK	BL-6421	25	0.7479	5	7.386	7.386	18	18	pCl/g	NA	NA
		91-7015	25	0.7479	5.05	39.305	39.304	21	NR	pCl/g	NA	NA
91-6421-K-4	B00X77 MS	91-6421MS	25	0.7479	0.998	NA	NA	NA	NA	NA	173.2	0.7478
SDG: B00X68-PNL-050												
91-7815-K-1	B00X75	91-7815	25	0.747	5.05	39	39	21	NR	pCl/g	NA	NA
91-6421-K-1	B00X77	91-6421	25	0.747	5.055	16	16	18	NR	pCl/g	NA	NA
91-6421-K-2	B00X77 DUP	91-6421D	25	0.747	5.078	18	18	18	NR	pCl/g	NA	NA
91-6421-K-5	BLANK	BL-6421	25	0.747	5	7	7	18	18	pCl/g	NA	NA
SDG: B015G4-PNL-052												
92-00306-K-1	B015G9	92-00306	25	0.7537	4.856	16.43	16.43	7	NR	pCl/g	NA	NA
92-00358-K-1	B015H1	92-00358	25	0.7537	5.002	23.31	23.32	6	NR	pCl/g	NA	NA
92-00921-K-1	B015K3	92-00921	26	0.7537	5.513	56.37	56.38	7	NR	pCl/g	NA	NA
92-00921-K-2	B015K3 DUP	92-00921D	25	0.7537	4.529	36.72	36.73	8	NR	pCl/g	NA	NA
92-00921-K-5	BLANK	BL-921	25	0.7537	5	2.20	2.2	3.5	4	pCl/g	NA	NA
92-00921-K-4	BLANK SPIKE MS-921		NA	0.7537	NA	NA	NA	NA	NA	NA	473.3	0.7536
SDG: B015H8-PNL-053												
92-00921-K-1	B015K3	92-00921	26	0.7537	5.513	56.37	56.38	7	NR	pCl/g	NA	NA
92-00921-K-2	B015K3 DUP	92-00921D	25	0.7537	4.529	36.72	36.73	8	NR	pCl/g	NA	NA
92-00921-K-5	BLANK	BL-921	25	0.7537	5	2.20	2.2	3.5	4	pCl/g	NA	NA
92-00921-K-4	BLANK SPIKE MS-921		NA	0.7537	NA	NA	NA	NA	NA	NA	473.3	0.7536

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INORGANIC ANALYSIS DATA VALIDATION CHECKLIST - FORM A-6

PROJECT: 200-BP-1	REVIEWER: [Signature]	DATE: 1/20/93
LABORATORY: PNL	CASE: B015G4	SDG: B015G4PN-052
SAMPLES/MATRIX: B015G9 & B015H1 / Soils		
TC-99 & Total Uranium		
B015G9 - PNL ID 92-00306		
B015H1 - PNL ID 92-00358		

1. COMPLETENESS AND CONTRACT COMPLIANCE

Review the data package for completeness and check off the items below. If any data review elements are missing contact the laboratory for submittal of the omitted data.

Data Package Item	Present?:	Yes	No	N/A
Case Narrative		✓		
Cover Page		✓		
Traffic Reports		✓		
Sample Data		✓		
Inorganic Analysis Data Sheets		✓		
Standards Data		✓		
Initial and Continuing Calibration Verification		✓		
CRDL Standard for AA and ICP		✓		
QC Summary		✓		
Blanks		✓		
ICP Interference Check Summary		✓		
Spike Sample Recovery		✓		
Post-Digestion Spike Sample Recovery		✓		
Duplicate		✓		
Laboratory Control Sample		✓		
Standard Addition Results		✓		
ICP Serial Dilutions		✓		
Instrument Detection Limits		✓		
ICP Interelement Correction Factors		✓		
ICP Linear Ranges		✓		
Preparation Log		✓		
Analysis Run Log		✓		
Raw Data		✓		
ICP Raw Data		✓		
Furnace AA Raw Data		✓		
Mercury Raw Data		✓		
Cyanide Raw Data		✓		
Additional Data		✓		
Internal laboratory chain-of-custody		✓		
Laboratory Sample Preparation Records		✓		

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Data Package Item	Present?:	Yes	No	N/A
Percent Solids Analysis Records		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reduction Formulae		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Instrument Run Logs		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Chemist Notebook Pages		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

## 2. HOLDING TIMES

Have all samples been analyzed within holding times?  Yes  No  N/A

**ACTION:** If any holding times have been exceeded qualify all affected results as estimated (J for detects and UJ for nondetects).

## 3. INITIAL CALIBRATIONS

Were all instruments calibrated daily, each set-up time and were the proper number of standards used?  Yes  No  N/A

Are the correlation coefficients  $\geq 0.995$ ?  Yes  No  N/A U-234

Was a midrange cyanide standard distilled?  Yes  No  N/A

**ACTION:** Qualify all data as unusable if reported from an analysis in which an instrument was not calibrated or was calibrated with less than the minimum number of standards. Qualify associated sample results  $> IDL$  as estimated (J) and results  $< IDL$  as estimated (UJ), if the correlation coefficient is  $< 0.995$  or the laboratory did not distill the midrange cyanide standard.

## 4. INITIAL AND CONTINUING CALIBRATION VERIFICATION

Are ICV and CCV percent recoveries within control?  Yes  No  N/A

Are there calculation errors?  Yes  No  N/A

**ACTION:** Qualify all affected data in accordance with Section 8.3 of the validation requirements. If calculation errors are noted, contact the laboratory for clarification.

## 5. ICP INTERFERENCE CHECK SAMPLE

Has an ICS sample been analyzed at the proper frequency?  Yes  No  N/A

Are the AB solution %R values within control?  Yes  No  N/A

Are there calculation errors?  Yes  No  N/A

**ACTION:** Qualify all affected data in accordance with Section 8.3 of the validation requirements. If calculation errors are noted, contact the laboratory for clarification.

## 6. LABORATORY BLANKS

Are target analytes present in the laboratory blanks?

Yes No N/A

**ACTION:** Qualify all associated sample results for any analyte < 5 times the amount in any laboratory blank as nondetected (U). If analyte concentrations in the blank are > CRDL or below the negative CRDL, verify the laboratory has redigested and reanalyzed associated samples with analyte concentrations < 10 times the blank concentration. If the laboratory has not redigested and reanalyzed the samples, note in the validation narrative.

## 7. FIELD BLANKS

Are target analytes present in the field blanks?

Yes No N/A

**ACTION:** Qualify all sample results for any analyte < 5 times the amount in any valid field blank as nondetected (U).

## 8. MATRIX SPIKE SAMPLE ANALYSIS

Are spike recoveries within the control limits?

Yes No N/A

**ACTION:** Qualify the affected sample data according to the following requirements:

If spike recovery is > 125% and sample results are < IDL no qualification is required. If spike recovery is > 125% or < 75% qualify all positive results as estimated (J). If spike recovery is 30% to 74% qualify all nondetects as estimated (UJ). If spike recovery is < 30%, reject all nondetects (R). If the field blank has been used for spike analysis, note in the validation narrative.

## 9. LABORATORY CONTROL SAMPLE

Are percent recoveries within the acceptance limits?

Yes No N/A

Are there calculation errors?

Yes No N/A

**ACTION:** Qualify the sample data according to the following requirements:

**AQUEOUS LCS** - Qualify as estimated (J), all sample results > IDL, for which the LCS %R falls within the range 50-79% or > 120%. Qualify as estimated (UJ), all sample results < IDL, for which the LCS falls within the range of 50-79%. Qualify as unusable (R) all sample results, for which the LCS %R < 50%.

**SOLID LCS** - Qualify as estimated (J), all sample results > IDL for which the LCS result is outside the established control limits. Qualify as estimated (UJ), all sample results < IDL for which the LCS %R are lower than the established control limits.

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## 10. PERFORMANCE AUDIT ANALYSES

Are the performance audit sample results within the acceptance limits?

Yes No **N/A**

**ACTION:** Note the results of the performance audit sample analyses in the data validation narrative.

## 11. DUPLICATE SAMPLE ANALYSIS

Are RPD values acceptable?

Yes **No** N/A

**ACTION:** Qualify the results for all associated samples of the same matrix as estimated (J) if the RPD results fall outside the appropriate control limits. If field blanks were used for laboratory duplicates, note in the validation narrative.

## 12. ICP SERIAL DILUTION

Are the serial dilution results acceptable?

Yes No **N/A**

Is there evidence of negative interference?

Yes No **N/A**

**ACTION:** Qualify the associated data as estimated (J) for those analytes in which the %D is outside the control limits. If evidence of negative interference is found, use professional judgment to qualify the data.

## 13. FIELD DUPLICATE SAMPLES

Do the RPD values exceed the control limits?

Yes No **N/A**

**ACTION:** Note the results of the field duplicate samples in the validation narrative.

## 14. FIELD SPLIT SAMPLES

Do the RPD values exceed the control limits?

Yes No **N/A**

**ACTION:** Note the results of the field split samples in the validation narrative.

## 1516. FURNACE ATOMIC ABSORPTION QUALITY CONTROL

Do all applicable analyses have duplicate injections?

Yes No **N/A**

Are applicable duplicate injection RSD values within control?

Yes No **N/A**

If no, were samples rerun once as required?

Yes No **N/A**

Does the RSD for the rerun fall within the control limits?

Yes No **N/A**

Were analytical spike recoveries within the control limits?

Yes No **N/A**

If no, were MSA analyses performed when required? Yes No  N/A

Are MSA correlation coefficients  $\geq 0.995$ ? Yes No  N/A

If no, was a second MSA analysis performed? Yes No  N/A

**ACTION:** If duplicate injections are outside the acceptance limits and the sample has not been reanalyzed or the reanalysis is outside the acceptance limits, qualify the associated data as estimated (J for detects and UJ for nondetects). If the analytical spike recovery is  $< 40\%$  qualify detects as estimated (J). If the analytical spike recovery is  $\geq 10\%$  but  $< 40\%$ , qualify all nondetects as estimated (UJ) and if the analytical spike recovery is  $< 10\%$ , reject all nondetects (R). If the sample absorbance is  $< 50\%$  of the analytical spike absorbance and the analytical spike recovery is  $< 85\%$  or  $> 115\%$ , qualify all results as estimated (J for detects and UJ for nondetects). If method of standard additions (MSA) was required but was not performed, the MSA samples were spiked incorrectly, or the MSA correlation coefficient was  $< 0.995$ , qualify the associated detected results as estimated (J).

**17. ANALYTE QUANTITATION AND DETECTION LIMITS**

Have results been reported and calculated correctly? Yes  No N/A

Are results within the calibrated range of the instruments and within the linear range of the ICP?  Yes No N/A

Are all detection limits below the CRQL?  Yes No N/A

**Action:** If analyte quantitation is in error, contact the laboratory for explanation. If errors or deficiencies can not be resolved with the laboratory, qualify associated data as unusable (R).

**18. OVERALL ASSESSMENT AND SUMMARY**

Has the laboratory conducted the analysis in accordance with the analytical SOW?  Yes No N/A

Were project specific data quality objectives met for this analysis?  Yes No N/A

**ACTION:** Summarize all the data qualifications and complete the data validation narrative as specified in Section 10.0 of the data validation requirements.

COMMENTS (attach additional sheets as necessary):

The correlation factor for U-234 is below 0.995. However, this does not concern the associated sample results. Therefore, no qualification is req'd.

The TC-99 method blank contains 20 ppb TC-99. Therefore, the assoc. results less than  $5 \times 10^2$  ppb have been qualified as undetectable (U).

TC-99 MS%R is 215%. Qualify assoc. results as estimated (T/U).

Total U ASSOC. BS%R is 47.8%. Qualify assoc. results as estimated (T/U).

TC-99 RPD is 133%. Qualify assoc. results as estimated (T/U).

The Uranium sample results for B01SG9, B01SG9 Dup, and B01SG9MS (92-00306) have been rejected since the results cannot be verified.

LCS samples were run with this SDG - however, the true values are unknown.

*[Signature]*  
11/21/93.

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200-BP-1 RADIOCHEMISTRY DATA VALIDATION					PAGE	1	OF	3
DATA PACKAGE ID: B015G4-PNL-052				REVIEWER	DATE: 1/19/93			
COMMENTS: PNL Log # 92-00306								
HEIS SAMPLE#	SAMPLE DATE	ANALYSIS DATE	HOLDING TIME, DAYS	NUCLIDE	HALF LIVE DAYS	FIVE TIMES HALF LIFE	QUALIFIER	
B015G9	10/04/91	11/20/91	47	TC-99	7.77E+07	3.89E+08	NSR	
		10/24/91	20	GR-A	N/A	N/A		
		10/24/91	20	GR-B	N/A	N/A		
		11/18/91	45	SR-90	1.04E+04	5.20E+04		
		NA	NA	BE-7	53	266		
				K-40	1.30E+09	6.50E+09		
				MN-54	312	1560		
				CO-58	71	355		
				FE-59	44	220		
		11/06/91	33	CO-60	365	1825		
		NA	---	ZN-65	244	1220		
			---	ZR-95	64	320		
			---	RU-103	39	195		
		11/06/91	33	RU-106	365	1825		
		NA	---	CS-134	730	3650		
		11/06/91	33	CS-137	1.09E+04	5.48E+04		
		NA	NA	BA-140	13	64		
				CE-141	33	165		
				CE-144	285	1425		
				RA-226	5.84E+05	2.92E+06		
				TH-228	694	3470		
		11/20/91	47	TOTAL-U	1.63E+12	8.14E+12		
		11/19/91	46	PU-238	3.20E+04	1.60E+05		
		11/19/91	46	PU-239	8.80E+06	4.40E+07		
		NA	NA	U-235	2.57E+11	1.28E+12		
				U-238	1.63E+12	8.15E+12		
▽	▽	12/13/91	70	H-3			▽	

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200-BP-1 RADIOCHEMISTRY DATA VALIDATION					PAGE 2	OF 3	
DATA PACKAGE ID: B015G4-PNL-052				REVIEWER: <i>[Signature]</i>	DATE: 11/19/93		
COMMENTS: PNL Log # 92-00358							
HEIS SAMPLE#	SAMPLE DATE	ANALYSIS DATE	HOLDING TIME, DAYS	NUCLIDE	HALF LIVE DAYS	FIVE TIMES HALF LIFE	QUALIFIER
B015H1	10/09/91	11/20/91	42	TC-99	7.77E+07	3.89E+08	NSR
		10/24/91	15	GR-A	N/A	N/A	
		10/24/91	15	GR-B	N/A	N/A	
		11/18/91	40	SR-90	1.04E+04	5.20E+04	
		NA	NA	BE-7	53	266	
				K-40	1.30E+09	6.50E+09	
				MN-54	312	1560	
				CO-58	71	355	
				FE-59	44	220	
		11/06/91	28	CO-60	365	1825	
		NA	NA	ZN-65	244	1220	
				ZR-95	64	320	
				RU-103	39	195	
		11/06/91	28	RU-106	365	1825	
		NA	—	CS-134	730	3650	
		11/06/91	28	CS-137	1.09E+04	5.48E+04	
		NA	NA	BA-140	13	64	
				CE-141	33	165	
				CE-144	285	1425	
				RA-226	5.84E+05	2.92E+06	
				TH-228	694	3470	
		11/20/91	42	TOTAL-U	1.63E+12	8.14E+12	
		11/19/91	41	PU-238	3.20E+04	1.60E+05	
		11/19/91	41	PU-239	8.80E+06	4.40E+07	
		NA	NA	U-235	2.57E+11	1.28E+12	
				U-238	1.63E+12	8.15E+12	
▽	▽	12/13/91	65	H-3			▽

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200-BP-1 RADIOCHEMISTRY DATA VALIDATION						PAGE 3	OF 3
DATA PACKAGE ID: B01SG4-PNL-052				REVIEWER: <i>[Signature]</i>	DATE: 1/19/93		
COMMENTS: PNL Log # 92-00358 Dup							
HEIS SAMPLE#	SAMPLE DATE	ANALYSIS DATE	HOLDING TIME, DAYS	NUCLIDE	HALF LIVE DAYS	FIVE TIMES HALF LIFE	QUALIFIER
B015#1	10/09/91	11/20/91	42	TC-99	7.77E+07	3.89E+08	none
Dup		10/24/91	15	GR-A	N/A	N/A	
		10/24/91	15	GR-B	N/A	N/A	
		11/18/91	40	SR-90	1.04E+04	5.20E+04	
		NA	NA	BE-7	53	266	
				K-40	1.30E+09	6.50E+09	
				MN-54	312	1560	
				CO-58	71	355	
				FE-59	44	220	
		11/07/91	29	CO-60	365	1825	
		NA	NA	ZN-65	244	1220	
				ZR-95	64	320	
				RU-103	39	195	
		11/07/91	29	RU-106	365	1825	
		NA	NA	CS-134	730	3650	
		11/07/91	29	CS-137	1.09E+04	5.48E+04	
		NA	NA	BA-140	13	64	
				CE-141	33	165	
				CE-144	285	1425	
				RA-226	5.84E+05	2.92E+06	
				TH-228	694	3470	
		11/20/91	42	TOTAL-U	1.63E+12	8.14E+12	
		11/19/91	41	PU-238	3.20E+04	1.60E+05	
		11/19/91	41	PU-239	8.80E+06	4.40E+07	
		NA	NA	U-235	2.57E+11	1.28E+12	
				U-238	1.63E+12	8.15E+12	
▽	▽	12/13/91	65	H-3			▽



SOG: B015G4-PNL-052

TABLE 9: ICP-MS ANALYSIS DATA FOR TASKS 2 & 4  
SDG #8

Spike recovery values corrected for contributions from blank or sample

PNL sample I.D. Number (a)	DRY WEIGHT	DILUTION FACTOR (b)	ICP/MS Analysis No.	Tc-99, ng/ml solution analyzed	Tc-99, ng/g soil (c,d)	Tc-99, ng/g spiked (d)	Tc-99, spike recovery, % (e,f)	Tc-99, pCi/g, dry soil (f)	U, ng/ml solution analyzed	U, ng/g soil (c,d)	U, ng/g spiked (d)	U, spike recovery, % (e,g)	U, pCi/g (total), dry soil (h)
92-00306-B1	1.0165	2007.8	8	0.001	2.0			34	1.1860	2380			1.7
92-00306-B2	1.0223	1996.3	8	0.005 ± 0.001	10.0			170 ± 35	1.0640	2120			1.5
92-00306-B3	1.0205	1999.8	10	0.0114	22.8	7.8	25-105	386	0.9810	1960	7.79	87	1.4
92-00306-B5	N/A	1000.0	4	0.0012	1.2			20	0.0040	4.0			0.0
92-00306-B6	N/A	1000.0	3	0.0084	8.4	8.0	91	142	0.0078	7.8	7.95	47.865	N/A
92-00358-B1	1.1623	894.8	12	0.010 ± 0.004	9.2			160 ± 70	1.973	1770			1.2
92-00921-B1*	1.1159	1899.0	14	0.0041	7.8			132	16.984	32300			22.6

Handwritten notes and corrections on the right side of the table, including '1.7', '1.5', '1.4', '0.0', '1.2', '22.6' and 'N/A'.

(a) Sample types:

- B1 = sample
- B2 = sample, duplicate
- B3 = sample + Tc/U spike
- B5 = procedural blank
- B6 = procedural blank + Tc/U spike

\* Not samples in the SDG but reported for QC purposes

(b) units of mL/g dry soil except for -B5 and -B6 samples (blank/blank spike) units of mL; includes 5X or 10X addition dil.

(c) leachate concentration corrected for preparation dilution factor and additional dilution for analysis (5X or 10X).

(d) -B3 reported in units of ng/g; -B6 reported in ng

(e) Recovery = [Spiked Sample]/([Sample]+[Spike])

(f) Despite positive values obtained for Tc, only spike samples had an observable Tc peak. Values >LLD are due to an increased background observed for soil digestate samples.

(g) For blank spike, [U] in diluted sample approached LLD.

(h) total uranium activity calculated using natural isotopic abundance for soil leachate [U] < 200 ppb: pCi = [U]\*0.000336/0.481

DL= Detection Limit is dependent on sample weight and dilution volume (see footnote C).

$$Tc-99 \text{ MS } ZR = \frac{22.8 - \left(\frac{2+10}{2}\right)}{7.8} \times 100 = 215\%$$

$$Tc-99 \text{ RPD} = \frac{10 - 2}{\left(\frac{10+2}{2}\right)} \times 100 = 133\%$$

Total - U

$$\text{Blank Spike } ZR = \frac{7.8 - 4.0}{7.95} \times 100 = 47.8\%$$

$$U \text{ RPD} = \frac{2380 - 2120}{\left(\frac{2380+2120}{2}\right)} \times 100 = 116\%$$

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