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200-BP-1 SITE INVESTIGATION
ANALYTICAL CHEMISTRY SUPPORT PROJECT

TASKS 2 & 4

DATA PACKAGE/REPORT No. 10

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INTRODUCTION

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

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

The requested analyses for sample #'s 92-01246 and 92-01827 is the full suite of analysis as specified in the WHC SOW. The full suite of 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. Weight percent solid is also determined for soil samples. Ten samples were submitted for total cyanide and free cyandide analyses and one water sample (91-01247) was submitted for VOA analysis only. 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. Methods blank, matrix spikes, sample duplicates and/or matrix spike duplicates were analyzed. All QC data that exist 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

6-5-92
Date

TABLE 1: 200-BP-1 Sample Numbers

WHC Sample Number	PNL ALO Sample Number	Sample Type	*Analyses Requested
B015L0	92-01202	Soil	CN Suite
B015L2	92-01203	Soil	CN Suite
B015L4	92-01204	Soil	CN Suite
B015L5	92-01246	Soil	Full Suite
B015K4	92-01247	Water	VOA
B015J0	92-01248	Water	CN Suite
B015L8	92-01249	Soil	CN Suite
B015M0	92-01466	Soil	CN Suite
B015M2	92-01467	Soil	CN Suite
B015M6	92-01510	Soil	CN Suite
B015M4	92-01511	Soil	CN Suite
B015M9	92-01827	Soil	Full Suite

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

TABLE 2:

WEIGHT PERCENT SOLIDS SUMMARY SHEET

SAMPLE ID#	PNL LOG#	SAMPLE WT %	DUPLICATE WT %	AVERAGE SOLIDS WT %
B015L0	92-01202	96.53	96.67	96.6
B015L2	92-01203	95.40	95.59	95.5
B015L4	92-01204	96.13	96.50	96.3
B015L5	92-01246	95.89	95.80	95.8
B015L8	92-01249	95.72	96.21	96.0
B015M0	92-01466	96.84	96.91	96.9
B015M2	92-01467	96.14	96.27	96.2
B015M6	92-01510	97.34	97.40	97.4
B015M4	92-01511	94.60	94.70	94.7
B015M9	92-01827	97.82	97.91	97.9

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

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ANION ANALYSIS RESULTS

Ion Chromatography

The samples in this sample delivery group were extracted using procedure PNL-ALO-108 and were analyzed using procedure PNL-ALO-212, in accord 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 and 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 are 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

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

Values for liquids are in ug/L and those in mg/kg for solids. The IDL values for liquid samples have been derived from the standard deviations of

analyses of multiple sets of the lowest calibration standard, CAL 1. For solid samples, at an extract buffer weight to sample weight ratio of 10,the IDL values have been estimated to be 0.8xCRDL for NO2-N and NO3-N, 0.33xCRDL for PO4-P, and 0.2xCRDL for SO4.

Hold Times

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

Accuracy and Precision in IC results

The IC anions analysis system has been calibrated with six calibration standards ranging from 0.5 - 30 ppm for the oxy-anions (NO2, NO3, PO4, SO4). The accuracy of the calibration was checked by analyzing three independently derived verification standards at 17%, 50%, and 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 ±20%, has been met. The retention time (R.T.) window for all anions, set at ±10%, has been met.

A duplicate set of analyses, performed on 92-00358/B015H1 (not a sample in this SDG), was recovered with %RPD values within the appropriate windows for all anions.

The matrix spike and duplicate matrix spike recoveries, for 92-01246/B01515 were within ± 25% for NO2 and SO4 and considered acceptable. The erratic spike recovery results for NO3 (MS at -109%, MSD at 171%) cannot be considered meaningful, NO3 present in the samples exceeded the amount spiked by approximately 30x.

The low recovery of the PO4 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 SAMPLE (mg/kg)	C	C2 SAMPLE DUP (mg/kg)	C	RPD	C5 BLANK (mg/kg)	C	C3 SPIKE+SAMPLE (mg/kg)	C3 SPIKE (mg/kg)	C6 DUP+SPIKE (mg/kg)	C6 SPIKE (mg/kg)	% RECOVERIES C3 SAMPLE + SPIKE	% RECOVERIES C6 DUP+ SPIKE	% RECOVERIES C4 CONTROL	Q
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:

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
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 SPIKE+SAMPLE (mg/kg)	C3 SPIKE (mg/kg)	C6 DUP+SPIKE (mg/kg)	C6 SPIKE (mg/kg)	% RECOVERIES C3 SAMPLE + SPIKE	% RECOVERIES C6 DUP+ SPIKE	% RECOVERIES 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:

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

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

SOIL SAMPLES

SAMPLE ID#	PNL LOG#	C1 SAMPLE (mg/kg)	C	C2 SAMPLE DUP (mg/kg)	C	RPD	C5 BLANK (mg/kg)	C	C3 SPIKE+SAMPLE (mg/kg)	C3 SPIKE (mg/kg)	C6 DUP+SPIKE (mg/kg)	C6 SPIKE (mg/kg)	% RECOVERIES C3 SAMPLE + SPIKE	% RECOVERIES C6 DUP+ SPIKE	% RECOVERIES C4 CONTROL	Q
B015G9	92-00306+	2.5	B				1.7	U								N
B015H1	92-00358+	3.9	B	3.8	B											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:

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

TABLE 3: ANION IC ANALYSIS DATA
SULFATE (SO4)

SOIL SAMPLES

SAMPLE ID#	PNL LOG#	C1 SAMPLE (mg/kg)	C	C2 SAMPLE DUP (mg/kg)	C	RPD	C5 BLANK (mg/kg)	C	C3 SPIKE+SAMPLE (mg/kg)	C3 SPIKE (mg/kg)	C6 DUP+SPIKE (mg/kg)	C6 SPIKE (mg/kg)	% RECOVERIES C3 SAMPLE + SPIKE	% RECOVERIES C6 DUP+ SPIKE	% RECOVERIES C4 CONTROL	Q
B015G9	92-00306+	32					4	U								
B015H1	92-00358+	13	B	15	B											
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)

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

CYANIDE ANALYSIS RESULTS

Total cyanide analysis was performed in room 313 of building 325 in the Hanford Site 300 area. This data package includes cyanide results for 10 soil-sediment samples and one water sample. Soil-sediment samples 92-00977 and 92-01984 are not part of this sample delivery group. Cyanide results for Task 2&4 data package #10 are presented by colorimetric analysis run batch. Data package #10 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 except for sample 92-01827 and duplicates for 92-01202, 92-01249 and 92-01466. The water sample had a cyanide concentration below the IDL.

The 12 day hold time specified for cyanide analysis under the CLP protocol was met for all samples in this data package except 92-01202. The initial analysis of sample 92-01202 was done on 11-8-91, and met hold times. Unfortunately, the ICV exceeded the control limits and the sample was redistilled and reanalyzed. Cyanide values found in the initial and subsequent analyses of the sample were 0.6 and 0.7 mg/kg, respectively. Given the high sampling errors, these values are virtually identical, indicating no effect on data quality.

Average spiked soil-sediment sample cyanide recovery was 100% with a standard deviation of 6%. Spiked water sample recovery was 106%.

Average recovery of cyanide for the laboratory control /initial calibration verification sample (ICV-6) was 101% with a standard deviation of 4% in the case of the soil-sediment samples. ICV recovery was 109% for the water sample. 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 for analysis groups within the data package were below the IDL.

TABLE 4: TOTAL CYANIDE ANALYSIS DATA TASK 2&4
SDG #10

SOIL-SEDIMENT SAMPLES

Sample ID#	PNL Log#	Sample G1 (mg/kg)	C	Sample dup. G2 (mg/kg)	C	%RPD	Blank G5 (µg/L)	C	Spike added (µg)	Sample+ spike G3 (mg/kg)	sample G4 (ICV) (mg/L)	Sample+ spike G3 recovery(%)	sample G4 (ICV) recovery(%)	Flags Q	Footnote#
															1,2,3
B015L2	92-01203	0.6	U	0.6	U	N/A	5.9	U	49.4	11.0	10.0	107	106		(ALL)
B015L4	92-01204	0.6	U												
B015L8	92-01249	0.6	U	0.7	B	N/A	5.9	U	49.1	9.7	9.7	92	103		
B015L5	92-01246	0.6	U												
B015M0	92-01466	0.6	U	0.7	B	N/A	5.9	U	49.1	9.7	9.8	92	104		
B015M2	92-01467	0.6	U												
B015M6	92-01510	0.6	U	0.6	U	N/A	5.9	U	48.9	10.1	9.5	102	101		
B015M4	92-01511	0.6	U												
B015M8	92-01984*	0.6	U	0.6	U	N/A	5.9	U	48.9	10.7	8.6	106	92		4
B015M9	92-01827	14													
B015L0	92-01202	0.7	B	0.8	B	N/A	5.9	U	48.6	11.0	9.5	103	101		5
B015K8	92-00977*	1.2													4,5
B015L0	92-01202	0.6	U	1.5		N/A	5.9	U	49.4	11.7	11.1	113	118		6
B015K8	92-00977*	1.4													4,6
											Mean	100	101		
											Std. Dev.	6	4		

Footnotes
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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. Samples B015K8 and B015M8 are 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 115%
6. Initial analysis run for samples B015L0 and B015K8.

* Sample not in this SDG but reported for QC purposes

CLP FLAGS

U = Analyzed but not detected (less than IDL)
B = Less than CRDL but greater than IDL

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TABLE 4: TOTAL CYANIDE ANALYSIS DATA TASK 2&4
SDG #10

WATER SAMPLE

Sample ID#	PNL Log#	Sample G1 (µg/L)	C	Sample dup. G2 (µg/L)	C	%RPD	Blank G5 (µg/L)	C	Spike added (µg)	Sample+ spike G3 (µg/L)	sample G4 (ICV) (mg/L)	Sample+ spike G3 recovery(%)	sample G4 (ICV) recovery(%)	Flags Q
B015J0	92-01248	11.8	U	11.8	U	N/A	5.9	U	48.9	207	10.2	106.0	109.0	
											Mean	106.0	109.0	
											Std. Dev.	0.0	0.0	

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, G5 Blank used 500 mL volume.
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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FREE CYANIDE ANALYSIS RESULTS

The sample in this sample delivery group (92-01827/B015M9) was extracted using procedure PNL-ALO-107 and was analyzed using procedure PNL-ALO-271, which was derived from Dionex Application Update 107. The sample preparation and analysis were performed in the 325 building in the 300 area. Due to analyst error, this sample was identified as 91-01827 in the chromatograms and compiled data sheets. No corrections have been made to these documents.

Data presentation (see Table 5, and the notes below)

Each sample is listed on a separate line 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 are also reported. For soil samples, all analyte values, spike levels, and recoveries are based on dry weights.

The control standard is the spiked blank.

Concentration flags(C) and Quality control flags (Q) are also appended, where appropriate.

CRDL and IDL values

CRDL = 10 ug/L, 1 mg/kg; IDL = 5 ug/L, 0.05 mg/kg

Values in ug/L are for liquids and those in mg/Kg are for solids. The IDL values are estimated at 0.5 *CRDL in the liquid and assuming a 10-fold dilution during extraction for solid samples.

Hold Times

The hold time,analysis within 12 days following receipt, was met for the sample analysed.

Accuracy and Precision in results

The accuracy of reported values between 20-80% of the calibration maximum is estimated to be ±10%. This value may be used over the complete calibration range 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

The criterion for the acceptance of data, that the spiked blank value has been quantitated within ±20%, has been met. The retention time (R.T.) window for the anion of interest, set at ±10%, has been met.

A duplicate set of analyses, performed on 92-01827/B015M9, was recovered within the appropriate quantitation limits.

The matrix spike recovery, at 72% for sample 92-01827/B015M9, was not within ±25%. Based on the satisfactory recoveries for the verification standard and the spiked blank, calibration failure cannot be considered a cause for this observation. The cause for the low spike recovery could be the presence of matrix components which bind CN.

Problems

The samples analyzed in this group were run at sample to extract ratios of about 10. Although this allows the IDL values to be considerably below the CRDL, this protocol extracts significant amounts of matrix components which could affect detector performance. A few more runs have to be carried out before the relative merits and demerits of this protocol can be defined adequately.

Sample 92-01984/B015M8 (not a sample in this sample delivery group) was analyzed in this set of runs. Though no evidence for CN was established by

the total CN analysis group, a peak eluting in the CN region was observed in this sample. Based on the quantitation, it would appear that CN was present in this sample.

This discrepancy between total and free cyanide measurements has not been resolved though compounds derived from the aging of eluant components may elute in the same region as free CN. This matter is being studied on the basis of the availability of funds and the investigations are being carried out after notification of project management.

TABLE 5: FREE CYANIDE ANALYSIS FOR TASKS 2 & 4
SDG #10

Sample ID#	PNL Log#	Sample J1 mg/kg	C	Sample dup. J2 mg/kg	C	RPD	J5 Matrix Blank ug/L	C	J3 Sample+ Spike mg/kg	Spike Added mg/kg	J4 Control Std. mg/kg	Standard Added mg/kg	J6 Dup. + Spike mg/kg	Spike Added mg/kg	% Recovery J3 Spike Rec.	% Recovery J6 Dup. + Spike Rec.	% Recovery J4 Control Std. Rec.	Flags
B015M9	92-01827	0.29	B	0.24	B		5	U	0.66	0.51	0.47	0.50			72		94	N

Concentration Flags [C]

U : Analyzed but not detected (less than or equal to IDL)
B : Result is greater than IDL but less than or equal to CRDL.

CRDL = 1.0 mg/kg
Estimated IDL = 5 ug/L , 0.05 mg/kg

Quality Flags [Q]

H: Hold time not met
E: Estimated Value
N: Spike recovery not within control limits
* : Duplicate Analysis not within control limits

NOTES:

1. 100% spike level is expected to be 50 ug/L in the extract and 0.5 mg/kg in a 2 gm sample containing no moisture.
2. 100 % extraction efficiency is assumed in defining the extraction dilution as (diluent vol / sample wt) x 1.00 gm/ml .
3. J5 The method blank value has been used to this column.
4. No RPD value has been calculated for this SDG.

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COMPLEX CYANIDE ANALYSIS RESULTS

The complex cyanide results are calculated from the difference in the total cyanide results and the free cyanide results. A "ferrocyanide" result is not obtained nor calculated since the amount of the complex cyanide being ferrocyanide is indeterminant.

Samples are analyzed for free cyanide based on first determining that the total cyanide result is greater than 2 mg/Kg. Samples below 2 mg/Kg total cyanide are typically not analyzed for free cyanide to save on analysis cost. Attempting to perform free cyanide analysis near the Contract Required Detection Limit of total cyanide is not meaningful.

TABLE 6: COMPLEX CYANIDE DETERMINATION
FOR TASKS 2 & 4 SDG #10

Sample ID#	PNL Log#	Total CN mg/Kg	Free CN mg/Kg	Complex CN mg/Kg (1)
B015M9	92-01827	14	0.29	14

(1) Results calculated by subtracting the Free cyanide results from the total cyanide results.

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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 are consistent with CLP SOW 788 GFAA Methods. Digestion of samples and GFAA analysis were performed in building 325. The CLP SOW 7/88 and contract required holding times of 180 days and 120 days, respectively, were met.

All GFAA analyses were conducted on a Perkin-Elmer 5100 AA instrument except Ag and Se analyses which were performed on the Perkin-Elmer 5000Z AA. The quarterly IDLs for these two instruments are indicated in Table 7.

The analytical accuracy can be estimated by the pooled average of the post spike recoveries and their standard deviation. Those values are presented below.

	Ag	As	Bi	Pb	Se	Tl
Ave Analytical Spike % Recovery :	94%	95%	91%	90%	92%	98%
Standard Deviation:	±8%	±4%	±10%	±7%	±4%	±9%

Precision of sample duplicates (i.e., RPD) was omitted for Ag, Se, and Tl since the measured concentrations were below the instrument detection limits. The RPD for As, Bi and Pb was 1.5%, 1.4% and 2.7% respectively.

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

Slightly low % recoveries for the pre-digestion spikes of Ag and Pb were observed and can not be explained. Also no remedial action is required in this case.

TABLE 7: GRAPHITE FURNACE AA ANALYSIS DATA FOR TASKS 2 & 4
SDG #10

			B1				B2				B5			B3		*B6 B4		
Analyte	Sample ID#	PNL Log#	Sample mg/Kg	Post Spike %Rec	Flags C	Flags Q	Dupl. mg/Kg	Post Spike %rec	C	B1&B2 %RPD	Blank mg/Kg	Post Spike %rec	C	Sample+ Spike µg/L	Digest Spike %rec	LCS mg/Kg	LCS %rec	Post Spike %rec
Ag	B015L5	92-01246	0.04	93	U		0.04	104	U	N/A	0.04	96	U	32.1	80	21.8	81	80
As	B015L5	92-01246	3.32	101			3.27	91		1.5	0.13	93	U	61.6	112	946.5	86	97
Bi	B015L5	92-01246	0.73	86			0.74	85		1.4	0.17	93	U	34.8	78	40.9	92	90
Pb	B015L5	92-01246	4.06	88			4.17	96		2.7	0.29	100	U	40.4	98	238.2	98	97
Se	B015L5	92-01246	0.06	91	U		0.06	88	U	N/A	0.08	90	B	9.4	94	40.0	105	100
Tl	B015L5	92-01246	0.13	104	U		0.13	86	U	N/A	0.13	104	U	44.8	90	33.8	90	108
Ag	B015M9	92-01827	0.04	94	U													
As	B015M9	92-01827	2.66	96														
Bi	B015M9	92-01827	4.69	85														
Pb	B015M9	92-01827	2.87	91														
Se	B015M9	92-01827	0.08	91	B													
Tl	B015M9	92-01827	0.18	101	B													
Ag	B015P1*	92-02332	0.04	99	U													
As	B015P1*	92-02332	3.88	93														
Bi	B015P1*	92-02332	0.17	85	U													
Pb	B015P1*	92-02332	3.01	86														
Se	B015P1*	92-02332	0.06	89	U													
Tl	B015P1*	92-02332	0.13	88	U													

* Sample not in this SDG
*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.
The analytical reduced results shows that all of the LCS,ICV,CCV,ICB,CCB
had met the CLP requirement.

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

91 2607 2825

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 7/88 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 11/8/91 and 11/18/91; with the initial analysis being performed on 11/14/91 and 12/04/91, respectively, and followup analysis being performed on 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. 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. The modifications to the procedure were implemented through an ICN and are now an integral part of the Hg procedure.

The CVAA Hg analyses were conducted on a Perkin-Elmer 5000 AA instrument. The results for the samples (B015L5 and B015M9) are reported in Table 8, along with the QC spike and duplicate from BOOX75, ICV/CCV and LCS recoveries. Results from both the 2/28/92 analysis and the 11/14/91 and 12/04/91 analysis 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 analysis.

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 1σ of 7.1%. The analysis of the LSC (0287) sample was 10.1 mg/kg (within the 8.5-12.7 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 #10

SOLID SAMPLES

Sample ID#	PNL Log#	B1 Sample mg/Kg	B1 Flags C	B1 Flags Q	B2 Dupl. mg/Kg	B2 C	B1&B2 %RPD	B5 Blank ug/L	B5 C	B3 (a) Sample +Spike mg/Kg	B3 (a) Digest Spike %rec	B4 (b) LCS mg/Kg	B4 (b) LCS %rec
B00X75 (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%
B015L5	92-01246	0.20		N									
	11/14/91	(0.15)		N	(0.12)								
B015M9	92-01827	0.14		N									
	12/04/91	(0.08)	B	N	(0.12)								

(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) B00X75 not part of SDG; sample used for QC during batch analysis.
(i) Values in ( ) were analyzed originally on the date indicated.

CLP FLAGS
U = Analyzed but not detected (less than IDL)
B = Less than CRDL but greater than or equal to IDL
N = Spike recovery not within control limits

INDUCTIVELY COUPLED PLASMA ATOMIC EMISSION SPECTROPHOTOMETRIC

ANALYSIS RESULTS

Samples and their accompanying quality control samples were prepared following acid digestion by procedure PNL-ALO-101, Acid Digestion for Metal Analysis. The methodology is consistent with the CLP procedure for the acid digestion of waters and sediments. Digestates were then analyzed by Inductively Coupled Plasma Atomic Emission Spectrophotometry (ICP-AES) following procedure PNL-ALO-211. This method is comparable to EPA method 200.7 CLP-M. 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.

U.S. EPA - CLP

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

B015L5

Lab Name: BATTELLE_PNL Contract: _____

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

Matrix (soil/water): SOIL_ Lab Sample ID: 92-1246B1_

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

% Solids: _95.5

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	9370			P
7440-36-0	Antimony	2.7	U	N	P
7440-39-3	Barium	128			P
7440-41-7	Beryllium	0.29	B		P
7440-43-9	Cadmium	1.8			P
7440-70-2	Calcium	5840			P
7440-47-3	Chromium	12.5			P
7440-48-4	Cobalt	7.2	B		P
7440-50-8	Copper	18.5			P
7439-89-6	Iron	19900			P
7439-95-4	Magnesium	4250			P
7439-96-5	Manganese	275			P
7440-02-0	Nickel	21.4			P
7440-09-7	Potassium	861	B		P
7440-23-5	Sodium	618	B		P
7440-62-2	Vanadium	45.6			P
7440-66-6	Zinc	46.9			P

Color Before: _____ Clarity Before: _____ Texture: NON-HO

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:
ORIGINAL_SOIL_SAMPLE_LEACHATE

9713507.2831

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

B015M9

Lab Name: BATTELLE_PNL Contract: _____

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

Matrix (soil/water): SOIL_ Lab Sample ID: 92-1827B1_

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

% Solids: _97.8

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	6190			P
7440-36-0	Antimony_	2.7	U	N	P
7440-39-3	Barium___	83.6			P
7440-41-7	Beryllium	0.24	B		P
7440-43-9	Cadmium__	3.3			P
7440-70-2	Calcium__	7370			P
7440-47-3	Chromium_	26.1			P
7440-48-4	Cobalt___	9.2	B		P
7440-50-8	Copper___	26.0			P
7439-89-6	Iron____	26600			P
7439-95-4	Magnesium	3960			P
7439-96-5	Manganese	318			P
7440-02-0	Nickel___	35.8			P
7440-09-7	Potassium	771	B		P
7440-23-5	Sodium___	905	B		P
7440-62-2	Vanadium_	63.9			P
7440-66-6	Zinc_____	47.7			P

Color Before: _____ Clarity Before: _____ Texture: NON-HO

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

ORIGINAL_SOIL_SAMPLE_LEACHATE

FORM I - IN

3/90

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

B015M9

Lab Name: BATTELLE_PNL Contract: 200BP1

Lab Code: Case No.: 1 SAS No.: SDG No.: 8,9,10

Matrix (soil/water): SOIL Lab Sample ID: 92-1827B1

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

% Solids: 97.8

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony	2.7	U		P
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7440-23-5	Sodium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

ORIGINAL SAMPLE (POST DIGESTION SPIKE TEST FOR ANTIMONY [SB])
ANALYZED: 01/06/92

FORM I - IN

3/90

ICP/MS ANALYSIS RESULTS

The samples and accompanying QC samples 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. Due to the relatively high level of radioactivity observed (1000 - 4000 cpm on the Geiger-Müller counter), the resulting digestates were diluted an additional 100X (with the exception of 92-01246-B5 and B6, which were not diluted) and analyzed by inductively coupled plasma mass spectrometry (ICP/MS) according to procedures PNL-ALO-280 Inductively Coupled Plasma Mass Spectrometric (ICP/MS) Analysis. Technetium was determined using procedure PNL-ALO-281 (ICP/MS Determination of Tc-99), 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 Tc-99 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 screening 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 U-235 agreed well with that based on U-238, therefore natural isotopic abundance was assumed, and the uranium activity was calculated from the relative activity of the U-238 isotope (48.1% for natural uranium).

For technetium, the only sample that had a spectrum with an observable peak at mass 99 was the spiked blank; the 100x additional dilution required to reduce the activity of the soil digestates (as explained above) effectively, reduced the Tc-99 concentration to below the instrument detection limit. The recovery for the blank

spike is acceptable (122%). These samples will be reanalyzed for technetium after the glove-boxed ICP/MS instrument has been approved for radiological use.

Quality control measures included the analysis of blind standards, duplicate analyses, and analysis of spiked samples. Results for check standards are given in the Tc and U data tables, and are in good agreement with standard values. Precision estimates for Tc are based on duplicate analyses are difficult to estimate due to the detection limit values obtained in most cases for these samples; precision for uranium is conservatively estimated at $\leq\pm$ 10% based on the standard deviation of duplicated analyses for 1246-B1 and B2.

TABLE 9: ICP-MS ANALYSIS DATA FOR TASKS 2&4, SDG #10
Tc-99 and Uranium Determinations

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 (f)	U, ng/ml solution analyzed	U, ng/g soil (c,d)	U, ng/g spiked (d)	U, spike recovery, % (e)	U, pCi/g (total) dry soil (g)
92-01246-B1	1.0433	19170	5	<0.001	<20			<340	0.475	9110			6.4
92-01246-B2	1.0030	19940	8	<0.001	<20			<340	0.440	8770			6.1
92-01246-B3	1.0199	19610	9	<0.001	<20	16.0		<340	0.531	10400	152.9	955	7.3
92-01246-B5	N/A	204.1	2	0.013	2.7			45	0.008	1.6			0.0
92-01246-B6	N/A	204.1	3	0.113	23.1	16.3	122	391	1.005	205	162.3	125	N/A
92-01827-B1	1.1139	17955	11	<0.001	<20			<340	6.480	116000			81.0
92-02332-B1*	1.1079	18052	15	<0.001	<20			<340	1.491	26900			18.8

Spike recovery values corrected for contributions from blank or sample

(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 including 100X additional dil.; -B5 and -B6 samples (blank/blank spike) are undiluted and in units of mL.
(c) leachate concentration corrected for preparation dilution factor and additional dilution for analysis (100X).
(d) -B3 reported in units of ng/g; -B6 reported in ng
(e) Recovery = [Spiked sample]/[sample]+[Spike]
(f) With the exception of samples 1246-B5 and B6 (which were not diluted), the additional dilution of 100X brought the [Tc] down below the LLD.
(g) total uranium activity calculated using natural isotopic abundance for soil leachate [U] < 200 ppb: pCi = [U]*0.000336/0.481
(*) sample not in this SDG but reported for analytical batch purposes.

Note: Due to limitation of paper width, client's sample numbers are not furnished. See Table 1 for cross reference to ACL number.

9713507.2835

GAMMA ENERGY ANALYSIS RESULTS

Five soil samples were received between October 4, 1991 and November 14, 1991 consisting of three sample Delivery Groups 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 in this analytical batch. 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 (Samples 92-00358* and 92-00921*). Samples 92-00306*, 92-01246, and 92-01827 had too much activity to be counted in this position and the holder was raised to shelf 5. Even in this position, the detector dead time was too high for samples 92-01246 and 92-01827. A smaller aliquot was then taken (about 1.5 g) and contained in a 2/5th dram polyvial and counted on shelf 4 to obtain a reasonable dead time for the analyzer.

The aliquots taken used the "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 six samples are as follows:

ALO No.	WHC No.	% Solids
92-00306*	B015G9	96.89
92-00358*	B015H1	96.65
92-00921*	B015K3	95.38
92-01246	B015L5	95.84
92-01827	B015M9	97.86

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

* Sample not a part of this reporting SDG.

The calibration standard used for calibrating the glass scintillation vial on shelf 2 was also used to calibrate the vial on shelf 5. In addition, another calibration standard was prepared for a 2/5th dram polyvial container containing about 1.5 g sample.

The samples were then analyzed by gamma-ray spectroscopy to determine the quantities of Co-60, Ru-106, and Cs-137 present. This portion of the work was performed following PNL-ALO-464 and PNL-ALO-470. The samples were counted on diode L which is a lithium-drifted germanium [Ge(Li)] detector. Table 10 presents the measured quantities for Co-60, Ru-106, and Cs-137 in the soils. The detection limits quoted are calculated as if the isotope was present at a level that is 2.5 times the square root of twice the average background. In most cases, two counts were taken of the sample. A short count of 10 minutes was taken to obtain a peak for Cs-137 that did not overflow the analyzer and a longer count to obtain better numbers for Ru-106 and Co-60 where the peak for Cs-137 may have overflowed the analyzer. Therefore, both counts were used to obtain the recommended values for each isotope in each sample.

Two aliquots of sample 92-00358* were measured. For Cs-137, the counting errors are 1.1% and 0.9% and the mean and standard deviation for the two analyses are 2045 ± 219 (11%). This is below the required precision for soils of ± 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 Co-60, Ru-106, and Cs-137. The detection limits at one sigma are 0.06, 0.6, and 0.04 pCi/g, respectively.

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* Sample not a part of this reporting SDG but included for QC purposes.

Table 10: Gamma Energy Analysis of Soils

Recommended Values

Batch 5

Diode L

(Radionuclide activity in pCi/g[a])

Sample ID	PNL ID	Collection Date	Weight (g)	^{60}Co	^{106}Ru	^{137}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 ± 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 ± 1.6	<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	$(1.23 \pm 0.01) \times 10^6$

Footnotes

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

The detection limits are determined from Sample 92-00358-L-5. The detection limits in pCi/g for Co-60, Ru-106, and Cs-137 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 this SDG but reported for QC purposes.

TOTAL ALPHA ANALYSIS RESULTS

The soil samples 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-460, Source Preparation for Gross Alpha Analyses, and PNL-ALO-461, Alpha Counting Procedure. All analytical work and calculation were performed in Building 329 and 329T5 in the 300 Area.

An appropriate aliquot (ranging from a nominal 1g to 2.5g) was sub-sampled from each received sample. The blank spike consisted of 10ml 8M HNO_3 with a known amount of ^{239}Pu spike. The matrix spike consisted of the sample spiked with a known amount of ^{239}Pu spike. The blank consisted of 10ml 8M HNO_3.

The blank spike recovery is 104% and the matrix spike recovery is 92%. These recoveries average 98% ±8% and indicate an average bias of -2%. The precision reflected in the relative percent difference (RPD) of sample number 92-00921 (sample not in this SDG but reported for QC purposes), is 7.3%. These meet the target values in the QAPP of ± 50% accuracy and ± 35% precision. The blank result was low; a minimum activity was detected. The results are reported per received sample weight (not corrected for weight percent solids).

No hold times are defined for total alpha analysis.

TABLE 11: TOTAL ALPHA ANALYSIS DATA FOR TASKS 2 & 4
SDG #10

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
B015L5	92-01246-A-1a	Soil	333	28				
B015M9	92-01827-A-1a	Soil	803	55				
						Average % recovery		98 +/- 8

* Not samples in the SDG

The detection limit for soil samples of this size is approximatedly 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.

TOTAL BETA ANALYSIS RESULTS

The soil samples were prepared and analyzed with their corresponding QC samples. Analyses were performed as directed by the test instructions according to procedures PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis, PNL-ALO-462, Source preparation for Gross Beta Analyses, and PNL-ALO-463, Beta Counting Procedure. All analytical work was performed in the 329 building in the 300 area.

An appropriate aliquot (nominally 1 g) was sub-sampled from each received sample. The blank spike consisted of 10 ml 8M HNO_3 with a known amount of Sr/Y-90 spike. The matrix spike consisted of a previously analyzed sample containing a relatively low level beta activity, with a known amount of Sr/Y-90 spike added. The blank consisted of 10 ml 8M HNO_3.

The blank spike recovery is 83% and the matrix spike recovery is 108%. These recoveries average 95% ±8%. The precision, reflected in the relative percent difference (RPD) of sample number 92-00921 (sample not in this SDG but reported for QC purposes), is 6%. These meet the target values in the QAPP of ± 50% accuracy and ± 35% precision. The blank results was negligible compared to the sample value but higher than normal due to contamination from the very high activity level of the samples in this set. With samples of this activity level handling samples greater distances from each other would be needed. The results are reported per received sample weight (not corrected for weight percent solids).

No hold times are defined for total beta analysis.

TABLE 12: TOTAL BETA ANAYSIS RESULTS FOR TASKS 2 & 4
SDG #10

SOIL SAMPLES

WHC #	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			
B015H1	92-00358-A-3a*	Matrix Spike	4790	145		1536	78	108
B015L5	92-01246-A-1a	Soil	2980000	83100				
B015M9	92-01827-A-1a	Soil	4830000	134000				
	92-00921-A-5a*	Blank	97	21				
	92-00921-A-4a*	Blank Spike	491	29		477	29	83

* Not samples in the SDG but reported for QC purposes

The detection limit for soil samples of this size is approximatedly 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.

PLUTONIUM ANALYSIS RESULTS

The soil samples were prepared and analyzed with their corresponding QC samples. A nominal 1 gram sample was leached and an aliquot of this sample leachate was taken for analysis. This was necessary due to the relatively high level of activity in the samples. The leach procedure used was PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis. This was followed by Procedure PNL-ALO-466, Plutonium Separation, PNL-ALO-468, Electroplating, and PNL-ALO-469, Alpha Energy Analysis. All work was performed in building 329 and 329T5 of the 300 area.

All samples, after leaching, were spiked with Pu-242 tracer which was used to correct for chemical yield of each individual sample. Samples are not spiked with the Pu-242 tracer before leaching as activity levels are so great that the stock of Pu-242 spike would be depleted in a short period of time if samples are spiked at these large activity levels. The blank spike Pu-239 recovery is good at 90% (within the +/-25% target accuracy) indicating an overall bias of -10%. The relative percent difference (RPD) for Pu-239+240 is 2.0% and for Pu-238 is 8.6%. This is within the target precision of +/-35%. The blank Pu result is below detectable activity; it is less than the target detection limit of 0.5pCi/g.

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

No hold times are defined for plutonium analysis.

TABLE 13: PLUTONIUM ANALYSIS DATA FOR TASKS 2 & 4
SDG #10

WHC #	Sample #	Sample Type	Pu-239+240 (pCi/g)	+/- 1 sigma*	Pu-239+240 RPD	Pu-238 (pCi/g)	+/- 1 sigma*	Pu-238 RPD	Spike Conc. (pCi/g)	+/- 1 sigma*	Spike % Rec.
B015L5	92-01246-A-1c	Soil	2.49E+02	8.31E+00		5.06E+00	3.80E-01				
B015M9	92-01827-A-1c	Soil	5.88E+02	1.91E+01		1.08E+01	6.95E-01				
B015M9	92-01827-A-2c	Soil Duplicate	6.00E+02	1.98E+01	2.0	9.91E+00	7.34E-01	8.6			
	BL-01827-A-5c	Blank	<6.9E-02			<1.6E-01					
	BS-01827-A-4c	Blank Spike	3.54E+02	1.16E+01		<1.3E-01			3.93E+02	8.50E+00	90

Minimum detectable activity is approximately 0.07 pCi Pu-239+240 per 1g sample, and approximately 0.2 pCi Pu-238 per 1g sample.

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

9713507.2844

STRONTIUM ANALYSIS RESULTS

An aliquot of sample leachate was taken from samples 92-01246, 92-01827, 92-01827 duplicate, and the blank and blank spike previously leached. 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.

The analysis for strontium-90 proceeded smoothly; all QC criteria were met. The matrix spike was used to determine the batch yield (84%). The blank spike resulted in 107% recovery indicating a method bias of +7%. The precision, estimated by the relative percent difference of the duplicates, is 9%. The blank result was hardly detectable at 4 pCi/g. Results are reported per received sample weight (i.e. not corrected for weight percent solids).

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 TASKS 2 & 4
SDG #10

WHC #	Sample #	Sample Type	Strontium (pCi/g)	+/- 1 sigma*	RPD	Spike Conc. (pCi/g)	+/- 1 sigma*	Spike % Rec.	Normalized % Yield**
B015L5	92-01246-A-1b	Soil	5.70E+05	4.37E+04					
B015M9	92-01827-A-1b	Soil	1.95E+06	1.54E+05					
B015M9	92-01827-A-2b	Soil Duplicate	1.78E+06	1.41E+05	9				
	92-01827-A-3b	Matrix Spike	Used to determine batch yield						83.7
	BL-01827-A-5b	Blank	<4E+00						
	BS-01827-A-4b	Blank Spike	5.25E+05	6.61E+04		4.88E+05	2.44E+04	107	

Minimum detectable activity for a sample is approximately 0.06 pCi/g.
Under analysis conditions for this set, the minimum detectable activity is approximately 4 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 matrix spike recovery which has been normalized to 100% chemical recovery.

9214907.2846

TRITIUM ANALYSIS RESULTS

The soil samples and their corresponding QC samples were prepared and analyzed according to procedures PNL-ALO-441, Radionuclide Separation and Analysis Procedure for Tritium, and PNL-ALO-443, Liquid Scintillation Counting Procedure for Tritium. The 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 is 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 ± 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 meaningful.

Activities for the soil samples analyzed in this batch ranged from 8 to 56 pCi/g. 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 #10

Customer Sample ID	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				
B015K3	92-00921-K-2**	Duplicate	37	3	41			
B015K3	92-00921-K-5**	Blank	<4 *					
B015K3	92-00921-K-4**	Method Spike Used to Determine Batch Yield						75
B015L5	92-01246-K-1	Soil	32	3				
B015M9	92-01827-K-1	Soil	8	3				

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 92-01246 (B015L5) and 92-01827 (B015M9) 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_2 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 reported in this data package. This "method detection limit," defined as three times the standard deviation of the blank values, is less than 1 ug of total organic carbon in the analytical sample. 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.

Samples were analyzed in duplicate as specified in TI-200BP-1-112 and TI-200BP-1-120. The relative standard deviations were 6% and 9%. This variability is mostly attributed to the inherent heterogeneity of the soil samples received.

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 99.2%, 92.1%, and 96.0%. The average recovery was 95.8% with a standard deviation of 4%. The conclusion is that precision from this set of data is ± 4% relative and a bias (accuracy) of -4% on the average. The reported values <u>are</u> 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 these samples.

TABLE 16: TOTAL ORGANIC ANALYSIS RESULTS TASKS 2 & 4
SDG #10

Soil Samples

WHC Sample #	PNL ALO #	Sample Type	Sample wt. g	ug C Results	ug C in Sample	mg/Kg Sample	RSD (%) Dups	% Std. rec.	Date Received	Date Analyzed
B015L5	92-1246-1	Sample	0.05511	31.1	26.6	503	6		11-08-91	11-19-91
B015L5	92-1246-2	Duplicate	0.06493	38.6	34.1	548			11-08-91	11-19-91
B015L5	92-1246-3	Standard						95.8		11-19-91
B015L5	92-1246-4	Blank		4.6						11-19-91
B015M9	92-1827-1	Sample	0.06065	54.2	49.6	854	9		11-18-91	11-19-91
B015M9	92-1827-2	Duplicate	0.05416	54.9	50.4	971			11-18-91	11-19-91
B015M9	92-1827-3	Standard						95.8		11-19-91
B015M9	92-1827-4	Blank		4.6						11-19-91

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

325 Bldg., rm 701. Data reported from LRB 52821, pp 13-14.

VOLATILE ORGANIC COMPOUND ANALYSIS REPORT

Each of the three samples in this SDG were analyzed as a separate analytical batch due to hold time requirements. A separate narrative report and CLP forms set were prepared for each batch analysis.

SAMPLE ANALYSIS REPORTED -- 92-01246

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

SAMPLE DESCRIPTION

Sample ID	ACL Lab Number
B015L5	92-01246

The sample, B015L5, was received in the 325 Building on 11/08/91.

SAMPLE PREPARATION

One gram aliquots of the sample were transferred to twenty mL pre-cleaned VOA vials, and accurately weighed. Each aliquot was transferred with 5mL of lab water 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 in soils.

ANALYSIS METHOD

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

QUALITY CONTROL

Quality control procedures specified for this method were followed. These forms are all included with this report (see appendix E4), and the quality assurance performance requirements are summarized as follows:

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

Sample was analyzed within required 10 day hold time.

DATA

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

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

File Name	Sample Number	Sample Analyzed
>WB501		Mass Calibration/Tune Check
>WB502		Daily Calibration
>WB503		Method Blank
>WB504		Holding Blank
>WB505	92-01246	B015L5
>WB506	92-01246 DUPE	B015L5 DUPE
>WB507	92-01246 MS	B015L5 MS
>WB508	92-01246 MSD	B015L5 MSD

Lab data are also maintained as follows:

Activity	LRB Number	Page Number
GC/MS injection log	BNW-52907	90-93

RESULTS

CLP Target Compounds: The attached 1A Forms show that volatile target compounds, **Acetone and 2-Butanone**, were observed in the BLANK, but they were below the Contract Required Quantitation Limits, (CRQL's). Hence, these compounds are "B-flagged". **Acetone** was observed below the CRQL in sample 92-01246.

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

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

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

Tentatively Identified Compounds: As shown in the attached 1E Forms, no non-EPA target compounds were observed in the blank or the samples.

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1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

92-01246 SOIL

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

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: 10_VOLOW

Matrix: (soil/water) SOIL Lab Sample ID: B015L5

Sample wt/vol: 1.057 (g/mL) G Lab File ID: >WB505

Level: (low/med) LOW Date Received: 11/08/91

% Moisture: not dec. 4.2 Date Analyzed: 11/15/91

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	49.	U
74-83-9	Bromomethane	49.	U
75-01-4	Vinyl Chloride	49.	U
75-00-3	Chloroethane	49.	U
75-09-2	Methylene Chloride	25.	U
67-64-1	Acetone	27.	JB
75-15-0	Carbon Disulfide	25.	U
75-35-4	1,1-Dichloroethene	25.	U
75-34-3	1,1-Dichloroethane	25.	U
540-59-0	1,2-Dichloroethene (total)	25.	U
67-66-3	Chloroform	25.	U
107-02-2	1,2-Dichloroethane	25.	U
78-93-3	2-Butanone	49.	U
71-55-6	1,1,1-Trichloroethane	25.	U
56-23-5	Carbon Tetrachloride	25.	U
108-05-4	Vinyl Acetate	49.	U
75-27-4	Bromodichloromethane	25.	U
78-87-5	1,2-Dichloropropane	25.	U
10061-01-5	cis-1,3-Dichloropropene	25.	U
79-01-6	Trichloroethene	25.	U
124-48-1	Dibromochloromethane	25.	U
79-00-5	1,1,2-Trichloroethane	25.	U
71-43-2	Benzene	25.	U
10061-02-6	trans-1,3-Dichloropropene	25.	U
75-25-2	Bromoform	25.	U
108-10-1	4-Methyl-2-pentanone	49.	U
591-78-6	2-Hexanone	49.	U
127-18-4	Tetrachloroethene	25.	U
79-34-5	1,1,2,2-Tetrachloroethane	25.	U
108-88-3	Toluene	25.	U
108-90-7	Chlorobenzene	25.	U
100-41-4	Ethylbenzene	25.	U
100-42-5	Styrene	25.	U
133-02-7	Xylene (total)	25.	U

9713507.2856

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

92-01246 SOIL

L Name: BATTELLE-PNL Contract: ------

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: LC24K44

Matrix: (soil/water) SOIL Lab Sample ID: B015L5

Sample wt/vol: 1.057 (g/mL) g Lab File ID: >WB505

Level: (low/med) LOW Date Received: 11/08/91

% Moisture: not dec. 4.2 Date Analyzed: 11/15/91

Column: CAP Dilution Factor: 1.00

Number TICs found: 0

CONCENTRATION UNITS: (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.					

VOLATILE ORGANIC COMPOUND ANALYSIS

SAMPLE ANALYSIS REPORTED -- 92-01247

Analysis of one water sample for volatile organic compounds by gas chromatography/mass spectrometry (GC/MS) is the subject of this report.

SAMPLE DESCRIPTION

Sample ID	ACL Lab Number
B015K4	92-01247

The sample, B015K4, was received in the 325 Building on 11/08/91.

SAMPLE PREPARATION

Five mL aliquots of the sample were transferred to a purge vessel attached to a Tekmar Liquid Sample Concentrator.

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

ANALYSIS METHOD

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

QUALITY CONTROL

Quality control procedures specified for this method were followed. These forms are all included with this report (see appendix E4), and the quality assurance performance requirements are summarized as follows:

Form	Information	Comments
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.

Sample was analyzed within the required 10 day hold time.

DATA

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

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

File Name	Sample Number	Sample Analyzed
>WB301		Mass Calibration/Tune Check
>WB3B2		Daily Calibration
>WB303		Method Blank
>WB304		Holding Blank
>WB305	92-01247	B015K4
>WB306	92-01247 DUPE	B015K4 DUPE
>WB307	92-01247 MS	B015K4 MS
>WB308	92-01247 MSD	B015K4 MSD

Lab data are also maintained as follows:

Activity	LRB Number	Page Number
GC/MS injection log	BNW-52907	90-91

RESULTS

CLP Target Compounds: The attached 1A Forms show that no volatile target compounds were observed in the BLANK.

No target compounds were observed in 92-01247. **Acetone, and 2-Butanone** were observed in sample 92-01247 DUPE, but they were below the Contract Required Quantitation Limit (CRQL).

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

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

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

Tentatively Identified Compounds: As shown in the attached 1E Forms, no non-EPA target compounds were observed in the blank or the samples.

9713507.2860

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

92-01247

L. . Name: BATTELLE-PNL Contract: ------

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: 10 11/13/91 [illegible]

Matrix: (soil/water) WATER Lab Sample ID: B015K4

Sample wt/vol: 5 (g/mL) mL Lab File ID: >WB305

Level: (low/med) LOW Date Received: 11/08/91

% Moisture: not dec.---- Date Analyzed: 11/13/91

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

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

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1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

92-01247

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

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: 10 [illegible]

Matrix: (soil/water) WATER Lab Sample ID: B015K4

Sample wt/vol: 5 (g/mL) mL Lab File ID: >WB305

Level: (low/med) LOW Date Received: 11/08/91

% Moisture: not dec.---- Date Analyzed: 11/13/91

Column: CAP Dilution Factor: 1.00

Number TICs found: 0

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

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
2.				
3.				
4.				
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27.				
28.				
29.				
0.				

VOLATILE ORGANIC COMPOUND ANALYSIS

SAMPLE ANALYSIS REPORTED -- 92-01827

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

SAMPLE DESCRIPTION

Sample ID	ACL Lab Number
B015M9	92-01827

The sample, B015M9, was received in the 325 Building on 11/18/91.

SAMPLE PREPARATION

One gram aliquots of the sample were transferred to twenty mL pre-cleaned VOA vials, and accurately weighed. The samples were transferred with 5mL of lab water 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 in soils.

ANALYSIS METHOD

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

QUALITY CONTROL

Quality control procedures specified for this method were followed. These forms are all included with this report (see appendix E4), and the quality assurance performance requirements are summarized as follows:

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

Sample was analyzed within the required 10 day hold time.

DATA

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

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

File Name	Sample Number	Sample Analyzed
>WC501		Mass Calibration/Tune Check
>WC502		Daily Calibration
>WC503		Method Blank
>WC504	92-01827	B015M9
>WC505	92-01827 DUPE	B015M9 DUPE
>WC506	92-01827 MS	B015M9 MS
>WC508	92-01827 MSD	B015M9 MSD

Lab data are also maintained as follows:

Activity	LRB Number	Page Number
GC/MS injection log	BNW-52907	92-93

RESULTS

CLP Target Compounds: The attached 1A Forms show that volatile target compounds, Acetone and 2-Butanone, were observed in the BLANK, but they were

below the Contract Required Quantitation Limits, (CRQL's). Hence, these compounds are "B-flagged".

No target compounds were observed in the sample 92-01827.

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

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

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

Tentatively Identified Compounds: As shown in the attached 1E Forms, no non-EPA target compounds were observed in the blank or the samples.

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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

92-01827

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

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: 10 samples

Matrix: (soil/water) SOIL Lab Sample ID: B015M9

Sample wt/vol: 1.6035 (g/mL) G Lab File ID: >WC504

Level: (low/med) LOW Date Received: 11/18/91

% Moisture: not dec. 2.7 Date Analyzed: 11/25/91

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	31.	U
74-83-9	Bromomethane	31.	U
75-01-4	Vinyl Chloride	31.	U
75-00-3	Chloroethane	31.	U
75-09-2	Methylene Chloride	16.	U
67-64-1	Acetone	31.	U
75-15-0	Carbon Disulfide	16.	U
75-35-4	1,1-Dichloroethene	16.	U
75-34-3	1,1-Dichloroethane	16.	U
540-59-0	1,2-Dichloroethene (total)	16.	U
67-66-3	Chloroform	16.	U
107-02-2	1,2-Dichloroethane	16.	U
78-93-3	2-Butanone	31.	U
71-55-6	1,1,1-Trichloroethane	16.	U
56-23-5	Carbon Tetrachloride	16.	U
108-05-4	Vinyl Acetate	31.	U
75-27-4	Bromodichloromethane	16.	U
78-87-5	1,2-Dichloropropane	16.	U
10061-01-5	cis-1,3-Dichloropropene	16.	U
79-01-6	Trichloroethene	16.	U
124-48-1	Dibromochloromethane	16.	U
79-00-5	1,1,2-Trichloroethane	16.	U
71-43-2	Benzene	16.	U
10061-02-6	trans-1,3-Dichloropropene	16.	U
75-25-2	Bromoform	16.	U
108-10-1	4-Methyl-2-pentanone	31.	U
591-78-6	2-Hexanone	31.	U
127-18-4	Tetrachloroethene	16.	U
79-34-5	1,1,2,2-Tetrachloroethane	16.	U
108-88-3	Toluene	16.	U
108-90-7	Chlorobenzene	16.	U
100-41-4	Ethylbenzene	16.	U
100-42-5	Styrene	16.	U
133-02-7	Xylene (total)	16.	U

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1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

92-01827

L Name: BATTELLE-PNL Contract: ------

Lab Code: ------ Case No.: ----- SAS No.: ----- SDG No.: 10 [illegible]

Matrix: (soil/water) SOIL Lab Sample ID: B015M9

Sample wt/vol: 1.6035 (g/mL) g Lab File ID: >WC504

Level: (low/med) LOW Date Received: 11/18/91

% Moisture: not dec. 2.7 Date Analyzed: 11/25/91

Column: CAP Dilution Factor: 1.00

Number TICs found: 0

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

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
2.				
3.				
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SEMI-VOLATILE ORGANIC ANALYSIS

SAMPLE ANALYSIS REPORTED

Analysis of two soil samples, B015L5 and B015M9 from SDG 10, for semivolatile organic compounds by gas chromatography/mass spectrometry (GC/MS) is the subject of this report.

SAMPLE DESCRIPTION AND PREPARATION

Sample ID	ACL Lab Number
B015L5	92-01246
B015M9	92-01827

Sample B015L5 was received on 11/08/91 and sample B015M9 was received on 11/18/91. Extractions of both samples and spiked samples were performed.

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

ANALYSIS METHOD

- GC/MS procedure: PNL-ALO-345.
- GC/MS instrumentation: HP-5890/5970 GC/MS (WB38473)
- GC/MS location: Lab 325, 325 building.

QUALITY CONTROL

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

Form	Information	Comments
2D	Surrogate Recovery	Requirements were met for bothsamples.
3D	MS/MSD Recovery	Requirements were met for both samples (see comments below).

4B	Method Blank Summary	Requirements were met for both samples (see comments below).
5B	Tune/Mass Calibration	Requirements were met for both samples.
6B,C	Initial Calibration	Requirements were met.
7B,C	Continuing Calibration	Requirements were met for both samples.
8B,C	Internal Standards	Requirements were met for both samples (see comments below).

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

- Internal standards (ISTD). The abundance for one of the internal standards was too high on the second analysis after the continuing calibration. Investigation showed that abundances of all the internal standards in both samples, SBLKA1 and SBLKA2 were high, but within requirements except for the one in SBLKA2. The cause was determined to be a decrease in the electron multiplier (EM) voltage after the daily calibration. Returning the EM voltage to the proper value corrected the problem. This was verified by good surrogate and matrix recoveries in following analyses. The method blank SBLKA2 was re-analyzed. Retention times were slightly out for one ISTD on SBLK2 rerun and for two on B015M9 MSD rerun because of laboratory temperature fluctuations.

- MS/MSD recoveries. The matrix spike recoveries for both samples were very good. For some of the spike compounds, the measured concentrations were greater than the high concentration of the initial calibration. The spike concentrations are specified in the procedure in anticipation of a significant matrix effect for soil samples, and if the matrix effects are small, as for these samples, the calibration range can be exceeded. Re-analyses of these samples were not performed since none of the spike compounds were native to the samples. Furthermore, experience with matrix spiked samples such as these has been that concentrations measured

at x2 dilutions are within experimental error of the values measured at no dilution.

The first analysis of the MSD for sample B015M9 was not performed within the 12-hour time period, so it was re-analyzed.

Samples were extracted and analyzed within the required hold times.

DATA

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

File Name	Sample Number	Sample Analyzed
>YB301		Mass calibration/tune check
>YB302		Continuing calibration
>YB303	92-01246-E-4	Method blank
>YB305	92-01246-E-1	B015L5
>YB306	92-01246-E-1D	B015L5 duplicate
>YB307	92-01246-E-2	B015L5 MS
>YB308	92-01246-E-3	B015L5 MSD
>YB309	92-01827-E-1	B015M9
>YB310	92-01827-E-1D	B015M9 duplicate
>YB311	92-01827-E-2	B015M9 MS
>YB604	92-01827-E-4	Method blank (re-analysis)
>YB605	92-01827-E-3	B015M9 MSD (re-analysis)

Laboratory data is maintained as follows:

Activity	LRB Number	Page Number
• GC/MS injection log	BNW-53728	20-22

- Extraction bench sheet: filed with data in the ACL records center
- GC screen data: filed with data in the ACL records center
- GC/MS data, sample report: filed with data in the ACL records center

RESULTS

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

	B015L5	Method Blank
Di-n-butylphthalate	31, 39 ug/Kg	90 ug/Kg
bis(2-Ethylhexyl)phthalate	34, 41	
Di-n-octylphthalate	23, 27	

	B015M9	Method Blank
Di-n-butylphthalate	540, <330	210
bis(2-Ethylhexyl)phthalate	39, 38	200
Di-n-octylphthalate	20, 20	

These are common contaminates from plastics, and except for the di-n-butylphthalate in one of the two B015M9 sample analyses, they are below the quantitation limits (CRQL).

Tentatively Identified Compounds (TIC): The attached 1F Forms show results for the TIC's. Concentration estimates for the TIC's are made assuming that the response factor for each TIC is one. The peak area for each TIC is then compared to the area of the nearest internal standard (for which concentrations are known) to estimate the TIC concentrations. Identification of the TIC is made by a computer search of the NIST mass spectral library to attempt a match with the spectrum of each of the TIC's. The TIC's reported as "Unknown" did not have satisfactory matches with library spectra. The TIC concentration estimate and identification are reported only if the TIC peak area is 10% or greater than the nearest internal standard peak area.

Sample B015L5 contains numerous TIC's, most of which are branched alkanes. The mass spectra of these alkanes are much alike, so identification of these compounds has a greater degree of uncertainty. The first three TIC's that have an "A" flag in the "Q" column are probably aldol condensation products formed in the sample preparation process.

Sample B015M9 has the aldol condensation products plus two other unknown TIC's at low concentration.

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

"Q" Flag	Definition
U	Indicates the compound was analyzed for but not detected, the U-flagged concentration is the Contract Required Quantitation Limit.

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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.

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1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015L5

La Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 10

Matrix: (soil/water) SOIL Lab Sample ID: 92-1246E1

Sample wt/vol: 30.245 (g/mL) G Lab File ID: >YB305

Level: (low/med) LOW Date Received: 11/08/91

% Moisture: not dec.4.2 dec. -- Date Extracted: 11/14/91

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 12/13/91

GPC Cleanup: (Y/N) N pH: 6.8 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

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015L5

La Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 10

Matrix: (soil/water) SOIL Lab Sample ID: 92-1246E1

Sample wt/vol: 30.245 (g/mL) G Lab File ID: >YB305

Level: (low/med) LOW Date Received: 11/08/91

% Moisture: not dec.4.2 dec. -- Date Extracted: 11/14/91

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 12/13/91

GPC Cleanup: (Y/N) N pH: 6.8 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	31.	JB
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	34.	J
117-84-0	Di-n-octylphthalate	23.	J
205-99-2	Benzo(b)fluoranthene	350.	U
207-08-9	Benzo(k)fluoranthene	350.	U
50-32-8	Benzo(a)pyrene	350.	U
193-39-5	Indeno(1,2,3-cd)pyrene	350.	U
53-70-3	Dibenz(a,h)anthracene	350.	U
191-24-2	Benzo(g,h,i)perylene	350.	U

(1) - Cannot be separated from Diphenylamine

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1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

B015L5

La. Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 10

Matrix: (soil/water) SOIL Lab Sample ID: 92-1246E1

Sample wt/vol: 30.245 (g/mL) G Lab File ID: >YB305

Level: (low/med) LOW Date Received: 11/08/91

% Moisture: not dec.4.2 dec. -- Date Extracted: 11/14/91

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 12/13/91

GPC Cleanup: (Y/N) N pH: 6.8 Dilution Factor: 1.00000

Number TICs found: 22

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

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	4.31	19000.	JAB
2.	110123	2-Hexanone, 5-methyl-	4.41	1700.	JAB
		Unknown alkane	5.00	590.	JAB
4.		Unknown	5.33	590.	J
5.	6044719	Dodecane, 6-methyl-	9.99	330.	J
6.		Unknown alkane	11.39	1900.	J
7.	629505	Tridecane	12.06	2100.	J
8.		Unknown alkane	12.52	570.	J
9.		Unknown	12.72	290.	J
10.	26730121	Tridecane, 4-methyl-	13.56	320.	J
11.	1560969	Tridecane, 2-methyl-	13.69	570.	J
12.	74645980	Dodecane, 2,7,10-trimethyl-	14.07	3300.	J
13.		Unknown	14.41	530.	J
14.	629629	Pentadecane	14.67	3100.	J
15.		Unknown alkane	14.76	490.	J
16.		Unknown	15.95	440.	J
17.	55045073	Dodecane, 2-methyl-8-propyl-	16.31	2900.	J
18.		Unknown alkane	16.51	340.	J
19.		Unknown alkane	17.30	1800.	J
20.		Unknown alkane	18.72	290.	J
21.		Unknown alkane	19.89	460.	J
22.	126738	Phosphoric acid tributyl est	21.14	930.	J
23.					
24.					
25.					
26.					
27.					
29.					
30.					

FORM I SV-TIC 1/87 Rev.

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1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015M9

La. Name: BATTELLE-PNL Contract: -------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 10

Matrix: (soil/water) SOIL Lab Sample ID: 92-1827E1

Sample wt/vol: 30.08 (g/mL) G Lab File ID: >YB309

Level: (low/med) LOW Date Received: 11/18/91

% Moisture: not dec.2.1 dec. -- Date Extracted: 11/26/91

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 12/14/91

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

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

IC

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015M9

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

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 10

Matrix: (soil/water) SOIL Lab Sample ID: 92-1827E1

Sample wt/vol: 30.08 (g/mL) G Lab File ID: >YB309

Level: (low/med) LOW Date Received: 11/18/91

% Moisture: not dec.2.1 dec. -- Date Extracted: 11/26/91

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 12/14/91

GPC 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.	U
83-32-9	Acenaphthene	340.	U
51-28-5	2,4-Dinitrophenol	1700.	U
100-02-7	4-Nitrophenol	1700.	U
132-64-9	Dibenzofuran	340.	U
121-14-2	2,4-Dinitrotoluene	340.	U
84-66-2	Diethylphthalate	340.	U
7005-72-3	4-Chlorophenyl-phenylether	340.	U
86-73-7	Fluorene	340.	U
100-01-6	4-Nitroaniline	1700.	U
534-52-1	4,6-Dinitro-2-methylphenol	1700.	U
86-30-6	N-Nitrosodiphenylamine (1)	340.	U
101-55-3	4-Bromophenyl-phenylether	340.	U
118-74-1	Hexachlorobenzene	340.	U
87-86-5	Pentachlorophenol	1700.	U
85-01-8	Phenanthrene	340.	U
120-12-7	Anthracene	340.	U
84-74-2	Di-n-butylphthalate	540.	B
206-44-0	Fluoranthene	340.	U
129-00-0	Pyrene	340.	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	39.	JB
117-84-0	Di-n-octylphthalate	20.	J
205-99-2	Benzo(b)fluoranthene	340.	U
207-08-9	Benzo(k)fluoranthene	340.	U
50-32-8	Benzo(a)pyrene	340.	U
193-39-5	Indeno(1,2,3-cd)pyrene	340.	U
53-70-3	Dibenz(a,h)anthracene	340.	U
191-24-2	Benzo(g,h,i)perylene	340.	U

(1) - Cannot be separated from Diphenylamine

9713507.2877

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

B015M9

L Name:BATTELLE-PNL Contract:-------

Lab Code: ------- Case No.: ------ SAS No.: ------ SDG No.: 10

Matrix: (soil/water) SOIL Lab Sample ID: 92-1827E1

Sample wt/vol: 30.08 (g/mL) G Lab File ID: >YB309

Level: (low/med) LOW Date Received: 11/18/91

% Moisture: not dec.2.1 dec. -- Date Extracted:11/26/91

Extraction: (Sepf/Cont/Sonc) SONC Date Analyzed: 12/14/91

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

Number TICs found: 6

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

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	Unknown	4.31	18000.	JAB
2.	Unknown	4.40	1500.	JAB
3.	Unknown	4.98	620.	JAB
4.	Unknown	5.30	350.	JA
5.	Unknown	5.86	230.	J
6.	Unknown	6.72	200.	J
7.				
8.				
9.				
10.				
11.				
12.				
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30.				

FORM I SV-TIC 1/87 Rev.

PCB/PESTICIDE ANALYSIS RESULTS

SAMPLE ANALYSIS REPORTED

Analysis of two, soil samples for pesticides and PCBs (Aroclors) by gas chromatography/electron capture detection (GC/ECD) is the subject of this report.

SAMPLE DESCRIPTION AND PREPARATION

Sample ID	ACL Lab Number
B015L5	92-01246-P-1
B015L5 Duplicate	92-01246-P-1D
B015L5 MS	92-01246-P-2
B015L5 MSD	92-01246-P-3
Method Blank	92-01246-P-4
B015M9	92-01827-P-1
B015M9 Duplicate	92-01827-P-1D
B015M9 MS	92-01827-P-2
B015M9 MSD	92-01827-P-3
Method Blank	92-01827-P-4

The samples were received in good condition on 10/23/91 and 11/18/91 respectively. Extractions of both samples and spiked samples were performed.

- 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.

QUALITY CONTROL

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

Form	Information	Comments
2F	Surrogate Recovery	Meets all Requirements.
3F	MS/MSD Recovery	1 of 24 recoveries were outside control limits. RPD met all requirements.
4C	Method Blank Summary	Meets all method blank requirements.
8D	Evaluation Standards	Meets all requirements.
8E	Retention Time Summary	Meets all requirements.
9	Standards Summary	%D exceeded limits for one compound.
10	Identification Summary	Meets all requirements.

Samples were extracted and analyzed within the required hold times.

Note: (1) No action is required for recoveries or RPD's outside control limits reported on form 3F.

(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 "Rentention 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.

(3) Holding time: The extraction holding time for soil/sediment of 10 days was exceeded by 12 days for sample B015L5.

DATA

Laboratory data is maintained in as follows:

Activity	LRB Number	Page Number
• GC/ECD injection log	BNW-53202	67-68

- 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

RESULTS

As indicated on the attached 1D Forms the blanks and sample B015M9 contained no target compounds at levels above the contract required quantitation limit (CRQL) and are "Q" flagged accordingly. However, sample B015L5 was found to contain Aroclor-1254.

Peak height, rather than peak area, was used to determine breakdown on the Eval B standard analyzed 12/07/91. This was done due to improper integration of the peak area by the HP3396A integrator. The IND A/B standard analyzed on 12/07/91 had a %D greater than 15% (18%) for DDD. However DDD was not found in any samples or blanks.

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

"Q" Flag	Definition
U	Indicates the compound was analyzed for but not detected, the U-flagged concentration is the Contract Required Quantitation Limit.
B	Indicates compound was found in the blank.
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.

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015L5

Lab Name: Battelle PNL Contract:

Lab Code: PNL Case No.: SAS No.: SDG No.: 10

Matrix: (soil/water) SOIL Lab Sample ID: 92-01246-P-1

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

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

% Moisture: not dec. 4.0 dec. ---- Date Extracted:11/14/91

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 12/07/91

GPC Cleanup: (Y/N) N pH: 6.8 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	240.0	
11096-82-5	Arochlor-1260	160.0	U

9713507.2882

1D

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B015M9

Lab Name: Battelle PNL Contract:

Lab Code: PNL Case No.: SAS No.: SDG No.: 10

Matrix: (soil/water) SOIL Lab Sample ID: 92-01827-P-1

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

Level: (low/med) LOW Date Received: 11/18/91

% Moisture: not dec. 2.1 dec. ---- Date Extracted: 11/26/91

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 1/17/92

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

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

Westinghouse Hanford Company 071550/.2885

CHAIN OF CUSTODY

Custody Form Initiator M. C. Douglas

Project #: 91-019

Company Contact W.S. Thompson

Telephone (509) 376-2153

Project Designation/Sampling Locations 200-BP-1 Operable Unit

Collection Date 11-4-91

Boring: ~~216-B-57A~~ 216-B-49A and 216-B-50A (MCD 11/5/91)

Time 0920, 1043, 1330

Ice Chest No. SML-47

Field Logbook No. WHC-N-287-3

Bill of Lading/Airbill No. N/A

Offsite Property No. N/A

Method of Shipment Hand Carry

Shipped to 325 PNL Laboratory (300 Area)

Possible Sample Hazards/Remarks No radiological or chemical hazards detected by field instruments. All analyses CLP. Keep samples chilled.

Sample Identification

(1) B015L0

1; 120 ml; Glass; Soil; CLP - Total Cn, Free Cn, Ferro Cn

(2) B015L2

1; 120 ml; Glass; Soil; CLP - Total Cn, Free Cn, Ferro Cn

(3) B015L4

1; 120 ml; Glass; Soil; CLP - Total Cn, Free Cn, Ferro Cn

☐ Field Transfer of Custody	CHAIN OF POSSESSION	(Sign and Print Names)
Relinquished by: M. C. Douglas Matthew C. Douglas	Received by: J. ROBBINS James Robbins	Date/Time: 11-5-91 11:15
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=002

9713507.2884

Westinghouse Hanford Company

SAMPLE ANALYSIS REQUEST

PART I: FIELD SECTION

Collector W.S Thompson, M.C. Douglas Date Sampled 11-4-91 Time 0920 1043 1330 hours

Company Contact W.S. Thompson Telephone (509) 376-2153

Sample Number	Number and Type of Sample Containers	Type of Sample*	Analysis Requested
B015L0	1; 120 ml; Glass	Soil	CLP - Total Cn, Free Cn, Ferro Cn
B015L2	1; 120 ml; Glass	Soil	CLP - Total Cn, Free Cn, Ferro Cn
B015L4	1; 120 ml; Glass	Soil	CLP - Total Cn, Free Cn, Ferro Cn

Field Information** Sample B015L0 collected from borehole 216-B-49A. Samples B015L2 & B015L4 collected from borehole 216-B-50A. Samples Support 200-BP-1, Task 2 & 4, RI/FS

Special Handling and/or Storage All sample analyses are CLP (See Laboratory Statement of Work). Please Keep samples Chilled.

Possible Sample Hazards No radiological or chemical hazards detected by hand-held field instruments.

PART II: LABORATORY SECTION

Received by J. Robbins J. ROBBINS Title Sr. RES. SCIENTIST Date 11-5-91

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)

B01-003

SAMPLE RECEIPT FORM

Delivered by: M.C. DOUGLAS Date/Time: 11-5-91. 11:15

Received by: J. ROBBINS

Customer Name or Project: 200BP-1

Customer Sample Number(s): B015L0, B015L2, B015L4

ALO Sample Number(s): 92-01202, 92-01203, 92-01204

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

2. Additional Shipping Forms (list):
   SAR

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

   Present ✓ Absent_____

   If Present, Condition: INTACT

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

   Notes: N/A

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

Westinghouse Hanford Company 9216507.2886

CHAIN OF CUSTODY

Custody Form Initiator W.S. THOMPSON

Project #: 91-019

Company Contact W. S. Thompson

Telephone (509) 376-2153

Project Designation/Sampling Locations 200-BP-1 Operable Unit

Collection Date 11/6/91

Boring: 216-B-50A

Time: 1144; 0732

Ice Chest No. # SML39

Field Logbook No. WHC-II-305-12

Bill of Lading/Airbill No. N/A

Offsite Property No. N/A

Method of Shipment Hand Carry

Shipped to 325 PNL Laboratory (300 Area) Attn: DIANE Bellofatto (6-2126)

Possible Sample Hazards/Remarks Sample #1 is radioactive soil; Sample #2 is nonradioactive water. No chemical hazards indicated with field instruments. Keep samples chilled. All analysis is CLP.

Sample Identification

(1) B015L5

1x125 ml; amber glass; soil; CLP-VOA 2mR/hr

1x950 ml; amber glass; soil (½ full) CLP-Semi-VOA, Pest/PCB, TOC 50mR/hr

(2) B015K4

3x40ml; amber glass; ~~soil~~ water; CLP-VOA

☐ Field Transfer of Custody	CHAIN OF POSSESSION	(Sign and Print Names)
Relinquished by: W.S. Thompson Wendy S Thompson	Received by: DIANA Bellofatto Diana Bellofatto	Date/Time: 11-8-91 12:00pm
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)

B01-005

9713507.2887

Westinghouse Hanford Company

SAMPLE ANALYSIS REQUEST

PART I: FIELD SECTION

Collector W.S. Thompson; J.G. Hoiger Date Sampled 11/6/91 Time 1144 hours 0732

Company Contact W.S Thompson Telephone (509) 376-2153

Sample Number	Number and Type of Sample Containers	Type of Sample*	Analysis Requested
(1) B015L5	1x125ml., amberglass; soil; CLP		VOA
	1x 950ml; amberglass; soil; CLP		Semi-VOA, Pest, PCB, TOC
(2) B015K4	3x 40ml, amber glass, water; CLP		VOA
			Attn: DIANE BELDEATTO. (6-2126)

Field Information** Samples support 200-BP-1 RI/FS (Task 2). Boring # 216-B-50A.

Special Handling and/or Storage Keep samples chilled. All analyses is CLP. 2ml/hr - 125ml; 5ml/hr - 950ml

Possible Sample Hazards #1 is radioactive soil; #2 is non radioactive water. No chemical hazards indicated by hand-held field instruments.

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)

B01-006

Westinghouse Hanford Company

9216507.2888

CHAIN OF CUSTODY

Custody Form Initiator: W.S. Thompson

Project #: 91-019

Company Contact: W. S. Thompson

Telephone: (509) 376-2153

Project Designation/Sampling Locations: 200-BP-1 Operable Unit

Collection Date: 11/6/91

Boring: 216-B-50A

Time: 1144; 1232

Ice Chest No.: #1 Ice chest # SNL39 #2 - ice chest # 21L 105

Field Logbook No.: WHC-N-305-12

Bill of Lading/Airbill No.: N/A

Offsite Property No.: N/A

Method of Shipment: Hand Carry

Shipped to: 325 PNL Laboratory (300 Area) Attn: Jim Robbins (6-4997)

Possible Sample Hazards/Remarks: Sample #1 is radioactive soil. Sample #2 is nonradioactive water. No chemical hazards indicated with hand-held field instruments. All analysis is CLP.

Sample Identification

① B015L5 20mR/hr

1x120ml; amber glass; soil; CLP- TOTAL CN free CN; ferro CN; Bi AA/ICP metals; NO_3; SO_4 PO_4; Tc99; TOTAL URANIUM

② B015J0

3x 1000ml; plastic; water; NaOH; CLP - total CN, free CN, ferro CN

☐ Field Transfer of Custody

CHAIN OF POSSESSION (Sign and Print Names)

Relinquished by:	Received by:	Date/Time:
W.S. Thompson / Sandy S Thompson	J. ROBBINS / J. Robbins	11-8-91 11:59
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)

B01-007

9713507.2889

Westinghouse Hanford Company

SAMPLE ANALYSIS REQUEST

PART I: FIELD SECTION

Collector WS Thompson, JG Hogan Date Sampled 11/6/91 Time 1144 (1232) hours

Company Contact W.S. Thompson Telephone (509) 376-2153

Sample Number	Number and Type of Sample Containers	Type of Sample*	Analysis Requested
(1) B015L5	1 x 120 ml, amber glass;	Soil, CLP-	TOTAL CN, FREE CN; FERROCN, Bi, AA/ICP, NO_3, SO_4, PO_4, Tc99, TOTAL URANIUM
(2) B015J0	3 x 1000 ml. plastic	water, CLP-	TOTAL CN; FREE CN, FERROCN

Attn: Jim Robbins
325 PNL

Field Information** Samples support 200-RP-1 RI/FS (TASK 2). Boring # 216-B-50A. Sample #1 is radioactive soil. Sample #2 is nonradioactive water. No chemical hazards indicated with field instruments.

Special Handling and/or Storage Keep samples chilled. All analyses is CLP.

Possible Sample Hazards No chemical hazards indicated with field instruments. Sample #1 is Radioactive Soil. Sample #2 is nonradioactive water. 20 mR/hr

PART II: LABORATORY SECTION

Received by J. Robbins Title Sr. RES. SCIENTIST Date 11-8-91

Analysis Required TOTAL CN

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

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

A-6000-406 (05/90)

B01-008

Westinghouse Hanford Company 9213507.2890

CHAIN OF CUSTODY

Custody Form Initiator W.S. Thompson

Project #: 91-019

Company Contact H. S. Thompson

Telephone (509) 376-2153

Project Designation/Sampling Locations 200-BP-1 Operable Unit

Collection Date 11/6/91

Boring: 216-B-50A

Time 1144

Ice Chest No. SMC 39

Field Logbook No. WHC-385-12

Bill of Lading/Airbill No. N/A

Offsite Property No. N/A

Method of Shipment Hand Carry

Shipped to 329 PNL Laboratory ; ATTN: NANCY WYNHOFF (6-8706)

Possible Sample Hazards/Remarks SAMPLE IS RADIOACTIVE. NO CHEMICAL HAZARDS INDICATED WITH FIELD INSTRUMENTS. KEEP SAMPLE CHILLED

Sample Identification

① B01SL5 (2 cm E/W)

1, 1000ml (half-full); glass; soil; CLP-TOTAL ALPHA, TOTAL Beta, GEA, Sr90 Cs137, Co60, Ru106, Pu(by AEA)

☐ Field Transfer of Custody

CHAIN OF POSSESSION (Sign and Print Names)

Relinquished by:	Received by:	Date/Time:
W.S. Thompson, Henry S Thompson	N. Wynhoff	11/8/91 11:25
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)

B01-009

9713507.2891

Westinghouse Hanford Company

SAMPLE ANALYSIS REQUEST

PART I: FIELD SECTION

Collector W.S. Thompson, J.G. Hogan Date Sampled 11/6/91 Time 1144 hours

Company Contact WS Thompson Telephone (509) 376-2153

Sample Number	Number and Type of Sample Containers	Type of Sample*	Analysis Requested
(1) B015L5	1x 1000ml; glass; soil; CLP-		TOTAL ALPHA, TOTAL BETA; GEA, Sr90, Cs137, Co60, Ru106, Pu (by AEA)
			Attn: Nancy Wynhoff (6-8706)

Field Information** Sample supports 200-BP-1 RI/FS. 216-B-50A boring.

Special Handling and/or Storage Keep sample chilled

Possible Sample Hazards Sample is radioactive. No chemical hazard indicated by hand-held field instrument. G.C. Mitchell

PART II: LABORATORY SECTION

Received by [illegible] Title Sr Tech Spec I Date 11/8/91

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)

B01=010

9713507.2892

Westinghouse Hanford Company	CHAIN OF CUSTODY

Custody Form Initiator W.S. Thompson

Project #: 91-019

Company Contact W. S. Thompson

Telephone (509) 376-2153

Project Designation/Sampling Locations 200-BP-1 Operable Unit

Collection Date 11/7/91

Boring: 216-B-43A

Time: 1405

Ice Chest No. SML105

Field Logbook No. WHC-N-385-12

Bill of Lading/Airbill No. N/A

Offsite Property No. N/A

Method of Shipment Hand Carry

Shipped to 325 PNL Laboratory (300 Area)

Possible Sample Hazards/Remarks None indicated by hand-held field instruments. Keep sample chilled. All analysis is CLP. See lab statement of work.

Sample Identification

① B015L8

1, 120ml; glass; soil; CLP-TOTAL cyanide, free cyanide; ferrocyanide

☐ Field Transfer of Custody

CHAIN OF POSSESSION (Sign and Print Names)		
Relinquished by: W.S. Thompson Wendy S Thompson	Received by: J. ROBBINS J. Robbins	Date/Time: 11-8-91 11:59
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=011

9713507.2893

Westinghouse Hanford Company

SAMPLE ANALYSIS REQUEST

PART I: FIELD SECTION

Collector W.S. Thompson, J G Hogan Date Sampled 11/7/91 Time 1405 hours

Company Contact W.S. Thompson Telephone (509) 376-2153

Sample Number	Number and Type of Sample Containers	Type of Sample*	Analysis Requested
(1) B01SL8	1, 120ml.; glass; soil	; CLP - total	cyanide; free cyanide; ferrocyanide

Field Information** Sample supports 200-BP-1 (TASK 2) RI/FS 216-B-43A Boring.

Special Handling and/or Storage keep sample chilled

Possible Sample Hazards No hazards indicated with hand-held field instruments

PART II: LABORATORY SECTION

Received by [signature] Title Sr. RES SCIENTIST Date 11-8-91

Analysis Required TOTAL CN

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

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

A-6000-406 (05/90)

B01=012

9713507.2894

SAMPLE RECEIPT FORM

Delivered by: WENDY THOMPSON Date/Time: 11-8-91 11:59

Received by: DIANA Bellafatto, Jim Robbins

Customer Name or Project: 200BP-1 TASK 2&4

Customer Sample Number(s): B01545, B01544, B01550, B01548

ALO Sample Number(s): 92-01246, 92-01247, 92-01248, 92-01249

1. Customer Chain-of-Custody Form: Present X Absent ____

2. Additional Shipping Forms (list): RSR, SAR

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

   Present X Absent ____

   If Present, Condition: in tact

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

   Notes: OKAY

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.) 2°C ±1°

6. Condition of Sample Vials. good

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

8. Resolution of Problems or Discrepancies. good

RETURN COMPLETED FORM TO PROJECT MANAGER

9713507.2895

200-BP-1 QA PLAN: ALO-001
PROGRAM: 16772
FILE CAT.:
PNL-ALO-051, Rev. 0
Exhibit 1
Page 1 of 1

SAMPLE RECEIPT FORM

Delivered by: Wendy Thompson Date/Time: 11:25 11/8/91

Received by: Nancy Wynhoff

Customer Sample Number(s): B01515

ALO Sample Number(s): 92-01246

1. Customer Chain-of-Custody Form: Present X Absent

2. Additional Shipping Forms (list):
SAR, RSR

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

Present X 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: NA

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

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

9213507.2896

Westinghouse Hanford Company	CHAIN OF CUSTODY

Custody Form Initiator M.C. Douglas — Project #: 91-019

Company Contact W. S. Thompson — Telephone (509) 376-2153

Project Designation/Sampling Locations 200-BP-1 Operable Unit — Collection Date 11-8-91; 11-11-91

Boring: 216-B-49B — Time: 1013 ; 0915

Ice Chest No. PACE / KS #22 — Field Logbook No. WHC-N-385-12

Bill of Lading/Airbill No. N/A — Offsite Property No. N/A

Method of Shipment Hand Carry

Shipped to 325 PNL Laboratory (300 Area)

Possible Sample Hazards/Remarks No chemical or radiological hazards detected.
All analyses CLP- See Statement of Work. Please keep sample chilled.

Sample Identification

① B015M0
1; 120 ml; Glass; Soil; CLP - Total Cn, Free Cn, Ferro Cn

② B015M2
1; 120 ml; Glass; Soil; CLP - Total Cn, Free Cn, Ferro Cn

☐ Field Transfer of Custody — CHAIN OF POSSESSION — (Sign and Print Names)

Relinquished by:	Received by:	Date/Time:
M.C. Douglas Matthew C. Douglas	J. ROBBINS James Robbins	10:55 11-12-91
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=015

9713507.2897

Westinghouse Hanford Company

SAMPLE ANALYSIS REQUEST

PART I: FIELD SECTION 11-11-91 0915

Collector J. Hagen, J. Darling, M. Douglas. Date Sampled 11-8-91 Time 1013 hours

Company Contact W.S. Thompson Telephone (509) 376-2153

Sample Number	Number and Type of Sample Containers	Type of Sample*	Analysis Requested
B015M0	1; 120 ml; Glass	Soil	CLP - Total CN, Free CN, Ferro CN
B015M2	1; 120 ml; Glass	Soil	CLP - Total CN, Free CN, Ferro CN

Field Information** Sample collected from borehole 216-B-49B in support of 200-BP-1 Task 2 RI/FS.

Special Handling and/or Storage All analyses CLP Keep sample chilled

Possible Sample Hazards No chemical or radiological hazards detected with hand held field instruments.

PART II: LABORATORY SECTION

Received by [signature] Title Sr. RES SCIENTIST Date 11-12-91

Analysis Required TOTAL CN

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

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

A-6000-406 (05/90)

B01=016

9713507.2898

200-BP-1 QA PLAN: ALO-001
PROGRAM: 16772
FILE CAT.:

PNL-ALO-051, Rev. 0
Exhibit 1
Page 1 of 1

SAMPLE RECEIPT FORM

Delivered by: MATT DOUGLAS Date/Time: 11-12-91 10:55

Received by: J. ROBBINS

Customer Name or Project: 200 BP-1 TASK 284

Customer Sample Number(s): B015M0 B015M2

ALO Sample Number(s): 92-01466 92-01467

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

2. Additional Shipping Forms (list):
   SAR

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

   Present ✓ Absent_____

   If Present, Condition: INTACT

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

   Notes: N/A.

5. Condition of Shipping Container (i,e., broken container, dented, breached plastic bag, temperature of sample container as defined in Section 3.0 in PNL-ALO-051, etc.)
   OK [WATER IN CONTACT WITH ICE IS 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

9213507.2899

Westinghouse Hanford Company

CHAIN OF CUSTODY

Custody Form Initiator: M. C. Douglas

Project #: 91-019

Company Contact: W. S. Thompson

Telephone: (509) 376-2153

Project Designation/Sampling Locations: 200-BP-1 Operable Unit

Collection Date: 11-12-91

Boring: 216-B-50A & 216-B-43A

Time: 1037, 1317

Ice Chest No.: PACE/KS #22

Field Logbook No.: WHC-N-385-12

Bill of Lading/Airbill No.: N/A

Offsite Property No.: N/A

Method of Shipment: Hand Carry

Shipped to: 325 PNL Laboratory (300 Area)

Possible Sample Hazards/Remarks: No chemical or radiological hazards detected. All analyses CLP (See Statement of Work) "Keep Samples Chilled"

Sample Identification

(1) B015M6 216-B-50A

1; 120 ml; Glass; Soil; CLP - Total CN, Free CN, Ferro CN

(2) B015M4 216-B-43A

1; 120 ml; Glass; Soil; CLP - Total CN, Free CN, Ferro CN

☒ Field Transfer of Custody

CHAIN OF POSSESSION (Sign and Print Names)		
Relinquished by: M. C. Douglas Matthew C. Douglas	Received by: W S Thompson Henry S Thompson	Date/Time: 11/13/91 0901
Relinquished by: W.S. Thompson Henry S Thompson	Received by: J. ROBBINS J. Robbins	Date/Time: 11-13-91 0945
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

9713507.2900

Westinghouse Hanford Company

SAMPLE ANALYSIS REQUEST

PART I: FIELD SECTION

Collector W. Thompson, M. Douglas, J. Hogan, J. Sterling Date Sampled 11-12-91 Time 1037 / 1312 hours

Company Contact W. S. Thompson Telephone (509) 376-2153

Sample Number	Number and Type of Sample Containers	Type of Sample*	Analysis Requested
B015M6	1; 120 ml; Glass	Soil	CLP - Total CN, Free CN, Ferro CN
B015M4	1; 120 ml; Glass	Soil	CLP - Total CN, Free CN, Ferro CN

Field Information** Sample B015M6 collected at 216-B-50A and sample B015M4 collected at 216-B-43A. Samples support 200-BP-1 (Task 2,4) RI/FS

Special Handling and/or Storage "Keep samples chilled" All analyses CLP (See Statement of Work)

Possible Sample Hazards No chemical or radiological hazards detected.

PART II: LABORATORY SECTION

Received by [illegible] Title Sr. RES SCIENTIST Date 11-13-91

Analysis Required TOTAL CN

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

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

A-6000-406 (05/90)

B01-019.

9713507.2901

200-BP-1 QA PLAN: ALO-001
PROGRAM: 16772
FILE CAT.:

PNL-ALO-051, Rev. 0
Exhibit 1
Page 1 of 1

SAMPLE RECEIPT FORM

Delivered by: W. THOMPSON Date/Time: 11-13-91 0945

Received by: J. ROBBINS

Customer Name or Project: 200BP-1

Customer Sample Number(s): B015M6 B015M4

ALO Sample Number(s): 92-01510 92-01511

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

2. Additional Shipping Forms (list):

   SAK

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: OK

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.) WATER IN CONTACT WITH ICE AT 0°C

   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

9713507.2902

Westinghouse Hanford Company	CHAIN OF CUSTODY

Custody Form Initiator: W. S. Thompson — Project #: 91-019

Company Contact: W. S. Thompson — Telephone: (509) 376-2153

Project Designation/Sampling Locations: 200-BP-1 Operable Unit — Collection Date: 11-14-91

Boring: 216-B-49B — Time: 1406

Ice Chest No.: SML105 — Field Logbook No.: WHC-N-385-12

Bill of Lading/Airbill No.: N/A — Offsite Property No.: N/A

Method of Shipment: Hand Carry

Shipped to: 325 PNL Laboratory (300 Area)

Possible Sample Hazards/Remarks: Sample is radioactive. No chemical hazards detected. "Keep sample chilled." "All analyses CLP." Attn: Diane Bellofatto

Sample Identification

① B015M9

1; 120 ml; Amber glass; Soil; CLP - VOA .25mR/hr, contact

1; 950 ml; Amber glass; Soil; CLP - Semi-VOA, Pest/PCB, TOC 50mR/hr, contact

☐ Field Transfer of Custody

CHAIN OF POSSESSION (Sign and Print Names)		
Relinquished by: W.S. Thompson, Gladys J Thompson	Received by: DIANA Bellofatto, Diana Bellofatto	Date/Time: 11-18-91 1:49 pm
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:

B01-021

9213507.2903

Westinghouse Hanford Company	CHAIN OF CUSTODY

Custody Form Initiator: W. S. Thompson — Project #: 91-019

Company Contact: W. S. Thompson — Telephone: (509) 376-2153

Project Designation/Sampling Locations: 200-BP-1 Operable Unit — Collection Date: 11-14-91

Boring: 216-B-49B — Time: 1406

Ice Chest No.: SMC105 — Field Logbook No.: WHC-N-305-12

Bill of Lading/Airbill No.: N/A — Offsite Property No.: N/A

Method of Shipment: Hand Carry

Shipped to: 325 PNL Laboratory (300 Area)

Possible Sample Hazards/Remarks: Sample is radioactive. No Chemical hazards detected. "Keep Sample chilled." "All analyses CLP." Attn: Jim Robbins

Sample Identification

① B015M9 10mR/hr, contact

1; 125 ml; Glass; Soil; CLP - Total CN, Free CN, Ferro CN, Bi, AA/ICP metals, Anions, Tc99, Total Uranium

☐ Field Transfer of Custody	CHAIN OF POSSESSION	(Sign and Print Names)
Relinquished by: W.S. Thompson, Wendy S. Thompson	Received by: J. ROBBINS, J. Robbins	Date/Time: 11-18-91 1:50
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=022

9213507.2904

Westinghouse Hanford Company	CHAIN OF CUSTODY

Cl dy Form Initiator W. S. Thompson — Project #: 91-019

Company Contact W. S. Thompson — Telephone (509) 376-2153

Project Designation/Sampling Locations 200-BP-1 Operable Unit — Collection Date 11-14-91

Boring: 216-B-49B — Time 1406

Ice Chest No. SM(*)05 — Field Logbook No. WHC-385-12

Bill of Lading/Airbill No. N/A — Offsite Property No. N/A

Method of Shipment Hand Carry

Shipped to 329 PHL Laboratory

Possible Sample Hazards/Remarks Sample is radioactive. 46 mR/hr, contact. No chemical hazards detected.
"Keep Sample Chilled." All analyses CLP. Attn: Nancy Wynhoff

Sample Identification

① B015m9

1; 1000 ml; Glass; Soil; CLP - Total alpha/beta, GEA, Pu (AEA), Sr90, Co60, Cs137, Ru106.

☐ Field Transfer of Custody

CHAIN OF POSSESSION		(Sign and Print Names)
Relinquished by: W.S. Thompson, Kendy S Thompson	Received by: Sandra L Fadeff	Date/Time: 11/18/91 1:05 p.m.
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)

B01-023

9713507.2905

Westinghouse Hanford Company

SAMPLE ANALYSIS REQUEST

PART I: FIELD SECTION

Collector M. Douglas, J. Hugen Date Sampled 11-14-91 Time 1406 hours

Company Contact W.S. Thompson Telephone (509) 376-2153

Sample Number	Number and Type of Sample Containers	Type of Sample*	Analysis Requested
B015M9	1; 120ml; Amberglass	Soil	CLP-VOA 25ml/hr
	1; 950ml; Amberglass	Soil	CLP-Semi-VOA, Pest/PCB, TOC 50ml/hr
			M Cantu

Field Information** Sample collected from borehole 216-B-49B in support of 200-BP-1, Task 2 & 4 RI/FS. Attn: Diane Bellofatto.

Special Handling and/or Storage "All analyses CLP (See statement of work)". "Keep samples Chilled".

Possible Sample Hazards Sample is radioactive. No chemical hazards detected.

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)

B01=024

9713507.2906

Westinghouse Hanford Company

SAMPLE ANALYSIS REQUEST

PART I: FIELD SECTION

Collector M. Douglas, J. Hagen — Date Sampled 11-14-91 Time 1406 hours

Company Contact W.S. Thompson — Telephone (509) 376-2153

Sample Number	Number and Type of Sample Containers	Type of Sample*	Analysis Requested
B015m9	1; 125 ml; Glass	Soil	CLP - Total CN, Free CN, Ferro CN, Bi, AA/ICP Metals, Anions, Tc99, Total Uranium.

Field Information** Sample collected from borehole 216-B-49B in support of 200-BP-1, Task 2 & 4 RI/FS. 10mR/hr contact. Attn: Jim Robbins

Special Handling and/or Storage "All analyses CLP (see Statement of Work)". "Keep samples Chilled"

Possible Sample Hazards Sample is radioactive. No chemical hazards detected.

PART II: LABORATORY SECTION

Received by J. Robbins — Title Sr. RES. SCIENTIST — Date 11-18-91

Analysis Required TOTAL CN + INORGANICS PARAMETERS OF INTEREST

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

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

A-6000-406 (05/90)

B01-025

9713507.2907

Westinghouse Hanford Company

SAMPLE ANALYSIS REQUEST

PART I: FIELD SECTION

Collector M. Douglas, J. Hogan Date Sampled 11-14-91 Time 1406 hours

Company Contact W.S. Thompson Telephone (509) 376-2153

Sample Number	Number and Type of Sample Containers	Type of Sample*	Analysis Requested
B015M9	1; 1000 ml; Glass	Soil	CLP - Total alpha/beta, GEA, Pu (AEA), Sr90, Co60, Cs137, Ru106.

Field Information** Sample collected from borehole 216-B-49B in support of 200-BP-1, Task 2.4 RI/FS. Attn: Nancy Wynhoff

46mR/hr, contact

Special Handling and/or Storage "All analysis CLP (See Statement of Work)."

"Keep sample chilled."

Possible Sample Hazards Sample is radioactive.

No chemical hazards detected.

PART II: LABORATORY SECTION

Received by S. K. Fadyll Title Sr. Research Scientist Date 11/13/91

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)

B01-026.

9713507.2908

SAMPLE RECEIPT FORM

Delivered by: Wendy Thompson Date/Time: 11-18-91

Received by: Jim Robbins + Diana Bellofatto

Customer Name or Project: 200-BP-1

Customer Sample Number(s): B015m9

ALO Sample Number(s): 92-01827

1. Customer Chain-of-Custody Form: Present X Absent ____

2. Additional Shipping Forms (list): RSR, SAR

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

   Present yes Absent ____

   If Present, Condition: good

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

   Notes: good

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 condition 5.9°C

6. Condition of Sample Vials. good

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

8. Resolution of Problems or Discrepancies. OKAY

RETURN COMPLETED FORM TO PROJECT MANAGER

9713507.2909

SAMPLE RECEIPT FORM

Delivered by: W. S. Thompson Date/Time: 11/18/91 ; 1:00

Received by: S. K. Fackeff

Customer Sample Number(s): B015M9

ALO Sample Number(s): 92-01827

1. Customer Chain-of-Custody Form: Present ✓ Absent ____

2. Additional Shipping Forms (list):
   Sample Analysis Request
   Sample Status Report (total activity)

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

   Present ✓ Absent ____

   If Present, Condition: unbroken

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

   Notes:

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 ; temperature N/A.

6. Condition of Sample Vials.
   good

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

8. Resolution of Problems or Discrepancies.
   none

RETURN COMPLETED FORM TO PROJECT MANAGER

Page 1 of 1 9713507.2910 Chain of Custody Number 200BP1-99

ALO CHAIN OF CUSTODY

200-BP-1 QA PLAN: ALO-001
PROGRAM: 16772
FILE CAT.: 14.2

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
92-01246	Tc-99/U	SOIL

SENDER Aimee Brown 12/12/91 10:35AM DATE

RECEIVER Eric Thyne 12/12/91 10:35 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-1-111

B02-002

 9713507.2911

Chain of Custody Number 200BP1-100

ALO CHAIN OF CUSTODY

200-BP-1 QA PLAN: ALO-001
PROGRAM: 16772
FILE CAT.: 142

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
92-01827	Tc-99/U	SOIL

SENDER [signature] 12/19/91 10:35AM DATE

RECEIVER [signature] 12/19/91 10 35 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-1-119

B02-003