

0072031

### VALIDATION SERVICES REQUEST

VSR No.: VSR06-012  
Rev.: 0

<b>Validator:</b> EQM	<b>Date Initiated:</b> 7/10/2006
<b>Project Coordinator(s):</b> TRENT, SJ	<b>QAPP Number:</b>
<b>Client(s):</b> ROHAY, VJ	<b>SAP Number:</b>
<b>Project(s):</b> CPP 200 Area	<b>Level of Validation (A, B, C, D, E):</b> C
<b>SAF Number(s):</b> F03-018	<b>Data Package(s):</b> 222S20030369, 222S20030383, H2459

**Validation Task Title:** 216-Z-9 Trench Characterization Borehole - Soil

<b>Validation Procedure/Revision Number to be utilized in validation:</b>	<b>Chem:</b>
	<b>Rad:</b>

**Comments:**

**RECEIVED**  
JAN 22 2007  
**EDMC**

<b>Requested Validation Start Date:</b> 7/10/2006	<b>Requested Validation Completion Date:</b> 7/31/2006
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**Project Hanford Management System  
COMMENT RESOLUTION SHEET**

Sheet 1 of 21

8/17/06

Document Number: SDG H245B-222S20030369 and Revision Number N/A Date: Aug 3, 2006

Document Title: 8/17/06 222S20030383

Data Validation for Strontium-90 Analysis 222S20030369 & 222S200300383

Reviewer:  
Bill Thackaberry  
Reviewers, if other than original:

Project/Organization:  
FH/GRP/OA  
Responsible Manager:  
Dana Farwick

**COMMENT(S)**

Initials (if other than listed reviewer)	Section/Step	Comments/Discrepancies	Basis	Recommendation	Resolution
	pg 1-8'	Package lacks the data summary that has been provided in the past showing analyte, detection limit, result and qualifiers.	Provided in all packages reviewed in the last 4 years	Provide the table	Rejected. Requested table is not required by data validation procedure* JPD 8/17/06
	pgs 24 Sec 11	This section should not be N/A	it applies to level C	complete the individual lines (no and N/A answers)	Accepted. JPD 8/17/06
			*All info in requested table is already in appendices 2 and 3 of the data validation report as written		JPD 8/17/06



Date: June 15, 2006  
 To: Fluor Hanford, Inc  
 From: Environmental Quality Management, Inc.  
 Project: 216-Z-9 Waste Site Vertical Borehole (Borehole C3426)  
 Subject: Data Validation for Strontium-90 Analysis

**INTRODUCTION**

This memo presents the results of data validation on Data Packages 222S20030369 and 222S20030383, prepared by the 222-S laboratory. A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analysis
B17N46	10/20/03	Soil	C	Strontium-90
B17TM6	10/29/03	Soil	C	Strontium-90

Data validation was conducted in accordance with HNF-20434, Rev. 0, *Data Validation Procedure for Radiochemical Analyses*, DOE/RL-2001-01, Rev. 0, Appendix B, *Plutonium/Organic-Rich Process Condensate/Process Waste Group Operable Unit Representative Sites Sampling and Analysis Plan*, and DOE/RL-2001-01, Rev. 0, Appendix E, *Sampling and Analysis Plan for Investigation of Dense, Nonaqueous-Phase Liquid Carbon Tetrachloride at the 216-Z-9 Trench*. Appendices 1 through 6 of this Data Validation Report provide additional information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Annotated Laboratory Reports
- Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
- Appendix 5. Data Validation Supporting Documentation
- Appendix 6. Additional Data Requested by Client

**DATA QUALITY PARAMETERS**

**Holding Times**

Holding times may be calculated from Chain-of-Custody forms to determine the validity of the results. Maximum holding time for strontium-90 analyses is specified as 6 months in DOE/RL-2001-01, App. B.

All holding times were met.

**Blanks**



- Laboratory Blanks

Blank samples are analyzed to determine if positive results are due to laboratory reagent, sample container, or detector contamination. If blank analysis results indicate the presence of an analyte above the minimum detectable activity (MDA), the following qualifiers are applied: All positive sample results less than five times the highest blank concentration are qualified as estimates and flagged "J"; sample results below the MDA are qualified as undetected and flagged "U"; samples results above the MDA and greater than five times the highest blank concentration are not qualified.

All blank criteria were met. Strontium-90 was not detected in the blank. The detection limit for the blank was less than the MDA and less than the required detection limit.

- Field Blank

No field blanks were submitted for analysis.

### **Accuracy**

Accuracy is evaluated from laboratory control sample (LCS) or blank spike sample (BSS) batch samples and spiked samples in the analytical batch. Measured activities are compared to the known added amounts. The acceptable LCS or BSS and matrix spike (MS) recovery range is 65-135%. In addition, a nonradiochemical carrier is used to determine the yield of the chemical separation procedure. The acceptable range for carrier recovery is 20% to 105%. Results outside the above ranges result in associated sample results being qualified as estimates. Results are rejected for LCS/BSS recoveries less than 30% or carrier or MS recoveries less than 10%.

LCS and MS recoveries satisfied the above criteria. A carrier was used for every sample, LCS, and blank (except for gamma spectroscopy) and acceptable results were obtained.

### **Precision**

- Laboratory Duplicates

Analytical precision is expressed by the relative percent differences (RPD) between results for one of the samples in the batch and a duplicate determination of that sample. If both results are nondetects, no RPD calculation is required. If both the activities measured for the sample and the duplicate are both greater than five times the required detection limit (RDL) and the RPD is less than 35%, no qualification is required. If either activity is less than five times the RDL, the control limit is two times the RDL. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

A duplicate was analyzed for each sample, and the requirements were met.

- Field Duplicate

No field duplicates were submitted for analysis.

### **Detection Levels**

Reported analytical detection levels are compared against the RDLs in DOE/RL-2001-01, Appendix B, to ensure that laboratory detection levels meet the required criteria.

All sample results were reported with MDAs equal to or less than the analyte-specific RDL.

### **Completeness**

Data Packages 222S20030369 and 222S20030383 were submitted for validation and verified for completeness. Completeness is based on the percentage of data requested by the client that were reported and determined to be valid (i.e., not rejected). The completion percentage was 100%.

### **MAJOR DEFICIENCIES**

None

### **MINOR DEFICIENCIES**

None

### **REFERENCES**

HNF-20434, Rev. 0, *Data Validation Procedure for Radiochemical Analyses*, Fluor Hanford, Inc., Richland, Washington (2004).

DOE/RL-2001-01, Rev. 0, Appendix B, *Plutonium/Organic-Rich Process Condensate/Process Waste Group Operable Unit Representative Sites Sampling and Analysis Plan*, U.S. Department of Energy, Richland, Washington (2004).

DOE/RL-2001-01, Rev. 0, Appendix E, *Sampling and Analysis Plan for Investigation of Dense, Nonaqueous-Phase Liquid Carbon Tetrachloride at the 216-Z-9 Trench*, U.S. Department of Energy, Richland, Washington (2004).

**Appendix 1**  
**Glossary of Data Reporting Qualifiers**

Qualifiers which may be applied by data validators in compliance with the data validation procedure are as follows:

- U - Indicates the compound or analyte was analyzed for and not detected above the minimum detectable activity (MDA) in the sample. The value reported is the sample result corrected for sample dilution and moisture content by the laboratory. The data is usable for decision making purposes.
- UJ - Indicates the compound or analyte was analyzed for and not detected at concentrations above the minimum detectable activity (MDA) in the sample. Due to a minor QC deficiency identified during the data validation, the associated quantitation limit is an estimate, but is usable for decision making purposes.
- J - Indicates the compound or analyte was analyzed for and detected. Due to a minor QC deficiency identified during the data validation, the associated concentration is an estimated, but the data are usable for decision-making purposes.
- R - Indicates the compound or analyte was analyzed for, detected, and due to an identified major QC deficiency, the data are unusable.
- UR - Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data is unusable due to an identified major QC deficiency.

**Appendix 2**  
**Summary of Data Qualification**

### DATA QUALIFICATION SUMMARY

<b>SDG:</b> 222S20030369 and 222S20030383	<b>REVIEWER:</b> JRJ	<b>DATE:</b> 6/15/06	<b>PAGE 1 OF 1</b>
<b>COMMENTS:</b> No data was qualified.			
<b>COMPOUND</b>	<b>QUALIFIER</b>	<b>SAMPLES AFFECTED</b>	<b>REASON</b>

**Appendix 3**  
**Annotated Laboratory Reports**

29 TRENCH  
Data Summary Report

CORE NUMBER: 222620030369  
SEGMENT #: 817N46

SEGMENT PORTION: Acid Digest

Sample	RAM	Analyte	Unit	Standard X	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count Err%
S03H000527	A	Silver - ICP-Acid Digest	ug/g	99.9	<5.48e-03	<1.11	<1.06	n/a	n/a	79.8	1.1	n/a
S03H000527	A	Magnic - ICP-Acid Digest	ug/g	117	<0.0514	11.0	<9.94	n/a	n/a	92.0	10	n/a
S03H000527	A	Barium - ICP-Acid Digest	ug/g	96.3	<0.0210	93.2	38.6	85.9	82.7	71.8	4.2	n/a
S03H000527	A	Beryllium - ICP-Acid Digest	ug/g	102	<1.33e-03	<0.270	<0.298	n/a	n/a	80.5	0.27	n/a
S03H000527	A	Bismuth - ICP-Acid Digest	ug/g	93.8	<0.0516	<10.4	<9.97	n/a	n/a	78.3	18	n/a
S03H000527	A	Cadmium - ICP-Acid Digest	ug/g	94.4	<2.12e-03	3.50	1.60	2.55	74.3	74.8	0.43	n/a
S03H000527	A	Chromium - ICP-Acid Digest	ug/g	97.2	<5.19e-03	16.0	13.7	14.8	15.7	76.9	1.0	n/a
S03H000527	A	Copper - ICP-Acid Digest	ug/g	97.4	<0.0122	16.6	15.0	15.8	10.4	77.3	2.5	n/a
S03H000527	A	Lithium - ICP-Acid Digest	ug/g	98.1	<1.79e-03	8.28	8.63	8.44	4.37	79.5	0.36	n/a
S03H000527	A	Manganese - ICP-Acid Digest	ug/g	94.2	<1.07e-03	157	164	160	4.57	79.4	0.22	n/a
S03H000527	A	Nickel - ICP-Acid Digest	ug/g	95.6	<0.0149	9.11	7.92	8.51	13.9	75.3	2.2	n/a
S03H000527	A	Phosphorus - ICP-Acid Digest	ug/g	94.8	<0.0196	464	594	529	24.6	82.1	4.0	n/a
S03H000527	A	Lead - ICP-Acid Digest	ug/g	94.2	<0.0235	8.21	5.75	6.98	35.2	76.2	4.7	n/a
S03H000527	A	Antimony - ICP-Acid Digest	ug/g	94.8	<0.0212	<4.29	<4.40	n/a	n/a	87.5	4.3	n/a
S03H000527	A	Selenium - ICP-Acid Digest	ug/g	97.1	<0.0518	<10.5	<10.0	n/a	n/a	78.6	10	n/a
S03H000527	A	Strontium - ICP-Acid Digest	ug/g	98.0	<1.07e-03	11.7	12.7	12.2	7.75	78.1	0.22	n/a
S03H000527	A	Zinc - ICP-Acid Digest	ug/g	93.1	<2.14e-03	48.8	35.2	42.0	32.3	73.3	0.53	n/a

SEGMENT PORTION: Environmental Acid

Sample	RAM	Analyte	Unit	Standard X	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count Err%
S03H000528	E	Strontium by Phosphorescence	ug/g	184	<1.14e-04	0.897	0.945	0.921	5.21	n/a	0.041	n/a
S03H000528	E	Strontium-89/90 High Level	uCi/g	98.8	<1.05e-05	<7.86e-06	<9.44e-06	n/a	n/a	n/a	1.4e-05	8.4e+02
S03H000528	E	Pu-239/240 by TRU-SPEC Resin	uCi/g	93.9	<4.74e-03	0.0446	0.0392	0.0419	42.9	n/a	6.4e-03	3.1
S03H000528	E	Pu-238 by TRU-SPEC Resin IonEx	uCi/g	n/a	<0.96e-03	<0.0106	<0.0103	n/a	n/a	n/a	0.011	14
S03H000528	E	Np237 by TIA Extraction	uCi/g	82.3	<2.93e-04	<5.04e-04	<3.96e-04	n/a	n/a	n/a	6.2e-06	1.8e+02
S03H000528	E	Thorium-232 by ICP/MS	ug/g	105	0.0241	2.94	3.41	3.18	14.6	99.0	3.7e-04	n/a
S03H000528	E	Uranium-233 by ICP/MS Acid Dig	ug/g	n/a	<1.80e-03	9.58e-05	1.10e-04	1.03e-04	13.8	n/a	2.8e-05	n/a
S03H000528	E	Uranium-234 by ICP/MS Acid Dig	ug/g	n/a	<6.00e-04	1.89e-04	1.56e-04	1.73e-04	19.5	n/a	9.3e-06	n/a
S03H000528	E	Uranium-235 by ICP/MS Acid Dig	ug/g	104	<2.20e-03	0.0104	8.91e-03	9.67e-03	15.6	112	3.4e-05	n/a
S03H000528	E	Uranium-238 by ICP/MS Acid Dig	ug/g	106	<0.110	0.742	0.647	0.695	13.6	101	1.7e-03	n/a
S03H000528	E	Cobalt-60 by GEA	uCi/g	184	<2.64e-04	<2.40e-04	<2.69e-04	n/a	n/a	n/a	2.6e-04	n/a
S03H000528	E	Antimony-125 by GEA	uCi/g	n/a	<5.00e-04	<5.91e-04	<6.19e-04	n/a	n/a	n/a	5.9e-04	n/a
S03H000528	E	Cesium-134 by GEA	uCi/g	n/a	<1.90e-04	<2.23e-04	<1.97e-04	n/a	n/a	n/a	2.2e-04	n/a
S03H000528	E	Cesium-137 by GEA	uCi/g	111	<3.84e-04	<3.94e-04	<4.03e-04	n/a	n/a	n/a	3.9e-04	n/a
S03H000528	E	Europium-152 by GEA	uCi/g	n/a	<3.24e-04	<3.27e-04	<3.28e-04	n/a	n/a	n/a	3.3e-04	n/a
S03H000528	E	Europium-154 by GEA	uCi/g	n/a	<7.08e-04	<7.84e-04	<7.67e-04	n/a	n/a	n/a	7.8e-04	n/a
S03H000528	E	Europium-155 by GEA	uCi/g	n/a	<2.84e-04	<2.80e-04	<2.68e-04	n/a	n/a	n/a	2.8e-04	n/a
S03H000528	E	Am-241 by TRU-SPEC Resin IonEx	uCi/g	105	<7.29e-03	0.114	0.0979	0.106	15.2	n/a	0.013	2.4
S03H000528	E	Alpha of Digestd Solid	uCi/g	95.4	<5.03e-04	0.148	0.125	0.136	16.8	95.0	1.2e-03	5.0
S03H000528	E	Beta of Solid Sample	uCi/g	105	<2.33e-03	0.0272	0.0191	0.0232	35.0	104	3.5e-03	12

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29 TRENCH  
Data Summary Report

CORE NUMBER: 222S20030383  
SEGMENT #: B17TM6

SEGMENT PORTION: Acid Digest

Sample#	R#	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count Err%
S03M00559	A	Silver -ICP-Acid Digest	ug/g	101	<5.48e-03	1.15	<1.10	n/a	n/a	98.5	1.1	n/a
S03M00559	A	Arsenic -ICP-Acid Digest	ug/g	115	<0.0514	<10.3	<10.3	n/a	n/a	113	10	n/a
S03M00559	A	Barium -ICP-Acid Digest	ug/g	95.6	<0.0210	53.4	53.2	53.3	0.377	94.5	4.2	n/a
S03M00559	A	Beryllium -ICP-Acid Digest	ug/g	103	<1.33e-03	0.293	<0.268	n/a	n/a	101	0.27	n/a
S03M00559	A	Bismuth -ICP-Acid Digest	ug/g	95.1	<0.0516	<10.4	10.8	n/a	n/a	93.2	10	n/a
S03M00559	A	Cadmium -ICP-Acid Digest	ug/g	93.8	<2.12e-03	1.79	1.45	1.62	20.6	90.8	0.42	n/a
S03M00559	A	Chromium -ICP-Acid Digest	ug/g	96.9	<5.19e-03	22.5	22.1	22.3	1.68	94.1	1.0	n/a
S03M00559	A	Copper -ICP-Acid Digest	ug/g	99.3	<0.0122	7.95	10.9	10.4	9.32	96.6	2.5	n/a
S03M00559	A	Lithium -ICP-Acid Digest	ug/g	98.8	<1.29e-03	10.6	9.80	10.2	7.94	97.2	0.36	n/a
S03M00559	A	Manganese -ICP-Acid Digest	ug/g	94.3	<1.07e-03	190	181	185	5.27	108	0.22	n/a
S03M00559	A	Nickel -ICP-Acid Digest	ug/g	95.2	<0.0110	20.2	18.2	19.2	10.5	92.8	2.2	n/a
S03M00559	A	Phosphorus -ICP-Acid Digest	ug/g	95.3	<0.0196	595	699	647	16.1	91.3	4.0	n/a
S03M00559	A	Lead -ICP-Acid Digest	ug/g	94.4	0.0257	6.58	<4.71	n/a	n/a	90.8	4.7	n/a
S03M00559	A	Antimony -ICP-Acid Digest	ug/g	94.7	0.0262	4.63	<4.27	n/a	n/a	82.3	4.3	n/a
S03M00559	A	Selenium -ICP-Acid Digest	ug/g	97.7	<0.0518	<10.4	<10.4	n/a	n/a	95.1	10	n/a
S03M00559	A	Strontium -ICP-Acid Digest	ug/g	97.5	<1.07e-03	13.7	23.3	18.5	52.0	96.4	0.22	n/a
S03M00559	A	Zinc -ICP-Acid Digest	ug/g	93.5	3.87e-03	37.8	33.2	35.5	12.9	91.2	0.43	n/a

SEGMENT PORTION: Environmental Acid

Sample#	R#	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count Err%
S03M00540	E	Uranium by Phosphorescence	ug/g	100	<4.14e-04	2.04	1.65	1.84	21.1	99.9	0.041	n/a
S03M00540	E	Strontium-89/90 High Level	uCi/g	100	<7.19e-06	1.34e-05	<1.25e-05	n/a	n/a	n/a	1.5e-05	88
S03M00540	E	Pu-239/240 by TRU-SPEC Resin	uCi/g	94.1	<7.26e-03	0.145	0.0897	0.102	24.9	n/a	0.044	2.7
S03M00540	E	Pu-238 by TRU-SPEC Resin IonEx	uCi/g	n/a	<0.0121	<0.0192	<0.0129	n/a	n/a	n/a	0.019	1.0e+02
S03M00540	E	Np-237 by ITA Extraction	uCi/g	75.5	<4.86e-04	<3.37e-04	<3.28e-04	n/a	n/a	n/a	7.1e-04	1.0e+02
S03M00540	E	Thorium-232 by ICP/MS	ug/g	105	0.0497	3.00	2.06	2.53	37.2	99.2	4.3e-04	n/a
S03M00540	E	Uranium-235 by ICP/MS Acid Dig	ug/g	n/a	<1.80e-03	9.13e-05	6.58e-05	7.86e-05	32.4	n/a	3.2e-05	n/a
S03M00540	E	Uranium-234 by ICP/MS Acid Dig	ug/g	n/a	<6.00e-04	3.34e-04	2.83e-04	3.08e-04	16.5	n/a	1.1e-05	n/a
S03M00540	E	Uranium-235 by ICP/MS Acid Dig	ug/g	104	<2.20e-03	0.0220	0.0190	0.0205	14.8	110	3.9e-05	n/a
S03M00540	E	Uranium-238 by ICP/MS Acid Dig	ug/g	106	<0.110	1.85	1.55	1.70	17.3	102	2.0e-03	n/a
S03M00540	E	Cobalt-60 by GEA	uCi/g	101	<2.99e-04	<3.05e-04	<3.45e-04	n/a	n/a	n/a	3.8e-04	n/a
S03M00540	E	Antimony-125 by GEA	uCi/g	n/a	<8.90e-04	<7.92e-04	<8.75e-04	n/a	n/a	n/a	7.9e-04	n/a
S03M00540	E	Cesium-134 by GEA	uCi/g	n/a	<2.92e-04	<2.90e-04	<2.89e-04	n/a	n/a	n/a	3.0e-04	n/a
S03M00540	E	Cesium-137 by GEA	uCi/g	103	<7.53e-04	<7.66e-04	<7.54e-04	n/a	n/a	n/a	7.7e-04	n/a
S03M00540	E	Europium-152 by GEA	uCi/g	n/a	<6.28e-04	<7.01e-04	<6.43e-04	n/a	n/a	n/a	7.0e-04	n/a
S03M00540	E	Europium-154 by GEA	uCi/g	n/a	<9.81e-04	<1.02e-03	<1.15e-03	n/a	n/a	n/a	1.0e-03	n/a
S03M00540	E	Europium-155 by GEA	uCi/g	n/a	<7.77e-04	<7.88e-04	<7.91e-04	n/a	n/a	n/a	7.9e-04	n/a
S03M00540	E	Am-241 by TRU-SPEC Resin IonEx	uCi/g	101	<9.60e-03	0.0532	0.0451	0.0492	16.5	n/a	0.013	3.4
S03M00540	E	Alpha of Digested Solid	uCi/g	87.0	<6.74e-04	0.145	0.127	0.136	13.2	85.5	1.6e-03	5.6
S03M00540	E	Beta of Solid Sample	uCi/g	104	<2.38e-03	0.0108	6.87e-03	8.84e-03	44.5	103	4.9e-03	93

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**Appendix 4**

**Laboratory Narrative and Chain-of-Custody Documentation**

## FINAL REPORT FOR THE SOIL SAMPLES FROM 216-Z-9 TRENCH – SAMPLE DELIVERY GROUPS 222S20030369 AND 222S20030383

### 1.0 INTRODUCTION

Two soil samples from the 216-Z-9 characterization borehole were received at the 222-S Laboratory; sample B17N46 on October 27, 2003 (sample delivery group [SDG] 222S20030369), and sample B17TM6 on October 31, 2003 (SDG 222S20030383). The samples were analyzed in accordance with the *216-Z-9 Trench Characterization Borehole Sampling and Analysis Concurrence for Analytical Requirements* (analytical instructions), the *222-S Laboratory Quality Assurance Plan* (reference 2), *Semi-Volatile Organic Compound Analysis* (reference 3), and *Volatile Organic Compound Analysis* (reference 4), referenced in the cover letter.

A Data Summary Report is included as Attachment 2. The correlation between the customer sample identification number and laboratory identification numbers is presented in the sample breakdown diagrams included as Attachment 3. Copies of the chain of custody, Request for Analysis, and Generator Knowledge Information forms are included as Attachment 4.

For sample B17N46, all detected compounds for the volatile organic analysis (VOA) were within the calibration range for the analysis of the low level sample (S03M000522), so the sample for high level VOA (S03M000523) did not require analysis.

For sample B17TM6, a very high concentration of carbon tetrachloride was detected during the analysis of the low level sample (S03M000533), and the results obtained for that analysis were unusable. The reported results were obtained from two different dilutions of the high level sample (S03M000534).

### 2.0 SAMPLE APPEARANCE AND HANDLING

Both samples (B17N46 and B17TM6) were described as moist soil. The samples were not homogenous, consisting of a mixture of coarse sand, "pea" gravel and pebbles.

The samples were stirred with a spatula prior to removing aliquots for analysis. However, with this type of sample, this method was not sufficient to achieve homogenization. The Laboratory does not have appropriate equipment to grind this type of sample to achieve better homogenization. This non-homogeneity is noted by the elevated results for the relative percent difference (RPD) between sample and duplicate results for some analytes.

For sample B17TM6, the aliquots for both the low level and high level VOA were each provided in a single amber glass bottle with no preservative. Because the bottles had to be opened in a

hood to obtain aliquots for analysis, the sample integrity was compromised and the results may be biased low.

For sample B17N46, pre-weighed vials containing preservative, water and a stir bar were provided to the project for collection of the aliquots for low level VOA. At the point of sample analysis, the chemical technologist noted that custody tape and additional labels had been added to the vials, which made it difficult to determine the weight of the samples. An attempt to determine the weight of the samples was made by weighing the vials as received, and then again after they were emptied and dried. The weight of the preservative added to the vials was already known. The stir bar weight was estimated based on the average weight of 5 stir bars. The weight of the water was estimated to be 5 g based on 5 mL of water. This allowed an estimate of the extra tape and labels to be made, which then allows the sample weight to be estimated.

### 3.0 HOLDING TIMES

The analytical instructions (reference 1) requested that the laboratory make every effort to meet the SW-846 holding times for VOA. The holding times were not met for either sample. For sample B17N46, the holding time was not met because of a combination of the 7-day delay between sampling and delivery of the samples to the laboratory and instrument operation problems. For sample B17TM6, the holding time was not met because of instrument operation problems.

### 4.0 ANALYTICAL RESULTS

The Data Summary Report, included as Attachment 2, presents the analytical results for the requested analytes. In this table, solid samples that were prepared by water digest are indicated with a "W" in the A# column. An "A" indicates an acid digest of a solid, and an "E" indicates that the stronger acid soil leach procedure was used to prepare the sample prior to analysis. Typically, if there is no letter identifier in this column, this indicates that the analysis was performed on a direct subsample with no separate preparation, or with sample preparation that was included as part of the analytical procedure steps.

Note that for the ion chromatography (IC) and inductively coupled plasma (ICP) spectroscopy analyses, the results reported for the blank are actually  $\mu\text{g/mL}$ , rather than  $\mu\text{g/g}$  as indicated in the Data Summary Report.

### 5.0 QUALITY CONTROL RESULTS (QC)

#### 5.1 LABORATORY CONTROL STANDARDS

Most laboratory control standard (LCS) recoveries were acceptable in accordance with the 222-S Laboratory Quality Assurance Plan (QAPP-016) (Clark 2003), referenced in the cover letter. For the semi-volatile organic analysis (SVOA) of sample B17N46 (S03M000525), one of the 11 compounds (n-Nitroso-di-n-propylamine) in the LCS had a recovery that was slightly below the requested range of 70% - 130% recovery. However, the reported recovery of 65% is typical of what is normally achieved for this compound so no reanalysis was requested based on the low recovery.

For the SVOA of sample B17TM6 (S03M000537), 5 of the 11 compounds in the LCS (the acid compounds) had recoveries above the requested range of 70% - 130% recovery. Following the analysis, the chemist noted that the standard might have been concentrated because of evaporation. Subsequent analysis of a new standard gave acceptable recoveries. The high recoveries could indicate a high bias in the reported results. However, because these compounds were not identified in the sample, no reanalysis was requested based on these high recoveries.

## 5.2 METHOD AND PREPARATION BLANKS

For most analyses, no analytes were detected in the method or preparation blank. However, for the IC analysis of sample B17N46 (S03M000553), chloride was detected in the water digest preparation blank. The sample was re-prepared two additional times and these results were determined to be the best, based on the results reported for nitrite. The level of nitrite detected in the other two blanks was greater than that detected in the sample. The concentration of chloride in the blank is about 22% of that reported for the sample. Comparison of results from the other two digests indicates that the reported sample results are biased high by about 22% - 29% because of this contamination.

Nitrite was reported in the blank prepared and analyzed with sample B17TM6 (S03M000561). The blank result was greater than that reported for the sample. This sample was also re-prepared two additional times. At the time of this analysis, the source of the contamination could not be determined. Because no nitrite was detected in the sample, no additional preparations were performed. The contamination issue is still under investigation.

For the ICP analysis of sample B17TM6 (S03M000559), lead (Pb), antimony (Sb), and zinc (Zn) contamination were detected in the acid digestion preparation blank. The concentration of Zn in the blank is less than 5% of that detected in the sample and was considered insignificant in accordance with QAPP-016 (Clark 2003). However, the concentration of Pb in the blank is 78% of that measured in the sample and the level of Sb in the blank is 113% of that detected in the sample. These results are reported from the third preparation of the sample. No further digestions were prepared because the duplicate results for Pb and Sb were both less than the reported detection limit, and previous results indicated that neither Pb nor Sb are present in the sample. Therefore, the results reported for Pb and Sb for the sample portion should be considered biased high due to contamination.

## 5.3 DUPLICATE ANALYSES

The requested precision for analysis was a relative percent difference (RPD)  $\pm$  20% for radionuclides and  $\pm$  30% for all other methods. Most analyte results met these criteria, except as noted below.

A duplicate sample was analyzed for both samples for most methods. However, after most analyses were completed, the project point of contact requested that the laboratory batch the two samples together for remaining analyses. Therefore, for the IC analysis, a duplicate was analyzed with sample B17N46 only.

For sample B17N46, an RPD greater than 20% was reported for total beta analysis for sample S03M000528. RPDs greater than 30% were reported for barium (Ba), cadmium (Cd), Pb, and Zn for sample S03M000527, and acetone for sample S03M000522. The RPD criterion was not

applicable for Cd and Pb, in accordance with QAPP-016 (reference 2), because the sample results were less than 10 times the method detection limit. The other high RPDs were attributed to sample inhomogeneity and no re-preparation and reanalysis was requested because the laboratory does not have equipment available to provide adequate homogenization of this type of sample matrix.

For sample B17TM6, RPDs greater than 20% were reported for plutonium-239/240 ( $^{239/240}\text{Pu}$ ), thorium-232 ( $^{232}\text{Th}$ ), uranium-233 ( $^{233}\text{U}$ ), and total beta analysis for sample S03M000540. However, the counting error for the beta analysis is greater than 15% and the  $^{233}\text{U}$  result is less than 10 times the method detection limit, so the RPD criterion is not applicable for those two analytes. An RPD greater than 30% was reported for strontium (Sr) for sample S03M000559, but the criterion was not applicable because the sample results were less than 10 times the method detection limit. The other high RPDs were attributed to sample inhomogeneity and no re-preparation and reanalysis was requested because the laboratory does not have equipment available to provide adequate homogenization of this type of sample matrix.

Duplicate analyses for the SVOA and polychlorinated biphenyl (PCB) analysis was performed by comparing a matrix spike (MS) with a matrix spike duplicate (MSD). The results of this comparison are discussed in the next section. For sample B17N46 VOA, both a duplicate and MSD were analyzed because some compounds were expected to be present in the sample.

For sample B17TM6 VOA, only an MS and MSD were analyzed. However, since chloroform, tetrachloroethene and carbon tetrachloride were detected in the sample, but were not compounds present in the spike solution, the results from the sample MS and MSD analyses can be compared as triplicates to provide precision information for the analysis. The results are presented in Table 1 and a percent relative standard deviation (%RSD) was calculated to give an indication of the precision. The %RSDs were less than 30%, which indicates that the analysis met the precision requirement.

**Table 1. Triplicate Analysis Results for Sample B17TM6 (S03M000534).**

Compound	Result ( $\mu\text{g}/\text{Kg}$ )	MS ( $\mu\text{g}/\text{Kg}$ )	MSD ( $\mu\text{g}/\text{Kg}$ )	%RSD
Chloroform	4.88e+3	5.46e+3	4.73e+3	7.7
Tetrachloroethane	1.70e+4	1.76e+4	1.66e+4	2.9
Carbon tetrachloride	3.76e+5	2.87e+5	3.13e+5	14.0

#### 5.4 MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

An MS sample was analyzed for both samples for most methods. However, after most analyses were completed, the project point of contact requested that the laboratory batch the two samples together for remaining analyses. Therefore, for the total uranium and IC analyses, an MS was analyzed with sample B17N46 only.

MS samples were analyzed with all methods except for pH,  $^{239/240}\text{Pu}$ ,  $^{236}\text{Pu}$ ,  $^{90}\text{Sr}$ , neptunium-237 ( $^{237}\text{Np}$ ), americium-241 ( $^{241}\text{Am}$ ) and the isotopes reported by gamma energy analysis (GEA). For VOA and SVOA, the analytical instructions (reference 1) requested that the laboratory report

spike recoveries only for the representative set of compounds indicated in the letters from H. L. Anastos (references 3 and 4). However, for VOA, some ketones were part of the standard mix used. Although the ketones were not required to be reported, for sample B17N46, acetone and 2-butanone recoveries and RPDs were discussed because those compounds were detected in the sample. For sample B17TM6, the ketones weren't reported because they were not requested by customer and no ketones were detected in the samples.

For PCB analysis, only aroclor-1254 is included in the matrix spike because it is the aroclor most commonly detected in samples on the Hanford site.

Most MS and/or MSD recoveries met the requirements in the analytical instructions (reference 1), except as noted below.

For sample B17N46 (S03M000525), most of the SVOA spike compounds (except pyrene) failed to meet the requirements. The low recoveries were attributed to a possible matrix effect because the recoveries for those compounds in the LCS were all acceptable (except for n-nitroso-di-n-propylamine, as noted previously). No reanalysis was requested because the sample matrix would still affect reanalysis results.

For sample B17TM6 (S03M000537) SVOA, most of the compounds failed to meet the requirements for MS and MSD recoveries because of the 50-fold dilution that was required to reduce the concentration of tri-n-butylphosphate so that it was within the calibration range. No reanalysis was requested because the same dilution would be required on the reanalysis and it is impractical to add sufficient spike solution for this sample where a substantial dilution is required.

For sample B17N46 (S03M000522) VOA, acetone and n-butanone have high recoveries. Because the LCS recoveries of these compounds were within the requested control limits, the high MS recoveries were attributed to a possible matrix effect that causes increased purging efficiencies for ketones. Again, no reanalysis was requested because of these MS recovery failures because a reanalysis was not expected to improve the results. The results reported for these two compounds should be considered biased high.

The RPDs between the MS and MSD for the PCB analyses met the requirements in the analytical instructions (reference 1). Some of the RPDs for the MS/MSDs analyzed with the VOA and SVOA failed to meet the requirements. The failures were attributed to the previously discussed matrix effects, so no reanalysis was requested.

The Data Summary Report included as Attachment 2 does not report the recoveries for the MSD analysis or the RPD for the MS/MSD analysis. This information is provided in Table 2 and Table 3 for VOA, Table 4 and Table 5 for SVOA and Table 6 and Table 7 for PCB analysis.

Table 2. MS/MSD Recoveries and RPDs for VOA for B17N46.

Compound	MS (%)	MSD (%)	RPD (%)
Benzene	98	101	3
Chlorobenzene	104	100	4
1,1-Dichloroethene	100	103	3
Toluene	95	92	3

**Table 2. MS/MSD Recoveries and RPDs for VOA for B17N46.**

Compound	MS (%)	MSD (%)	RPD (%)
Trichloroethene	115	119	3
Acetone	158 †	172 †	8
2-Butanone	140 †	190 †	30 †

† - spike recovery or RPD failed to meet customer requirements

**Table 3. MS/MSD Recoveries and RPDs for VOA for B17TM6.**

Compound	MS (%)	MSD (%)	RPD (%)
Benzene	110	115	4
Chlorobenzene	114	116	2
1,1-Dichloroethene	98	111	12
Toluene	110	113	3
Trichloroethene	102	103	1

**Table 4. MS/MSD Recoveries and RPDs for SVOA for B17N46.**

Compound	MS (%)	MSD (%)	RPD (%)
Phenol	67 †	65 †	3
2-Chlorophenol	61 †	61 †	0
1,4-Dichlorobenzene	8 †	13 †	48 †
N-Nitroso-di-n-propylamine	35 †	42 †	18
1,2,4-Trichlorobenzene	33 †	36 †	9
4-Chloro-3-methylphenol	55 †	62 †	12
Acenaphthene	64 †	66 †	3
4-Nitrophenol	53 †	65 †	20
2,4-Dinitrotoluene	54 †	63 †	15
Pentachlorophenol	51 †	63 †	21
Pyrene	88	92	4

† - spike recovery or RPD failed to meet customer requirements

**Table 5. MS/MSD Recoveries and RPDs for SVOA for B17TM6.**

Compound	MS (%)	MSD (%)	RPD (%)
Phenol	70	89	24
2-Chlorophenol	77	90	16
1,4-Dichlorobenzene	48 †	55 †	14
N-Nitroso-di-n-propylamine	23 †	47 †	68 †
1,2,4-Trichlorobenzene	47 †	67 †	35 †
4-Chloro-3-methylphenol	64 †	55 †	15 †
Acenaphthene	56 †	65 †	15 †
4-Nitrophenol	0 †	0 †	N/A

**Table 5. MS/MSD Recoveries and RPDs for SVOA for B17TM6.**

Compound	MS (%)	MSD (%)	RPD (%)
2,4-Dinitrotoluene	0 †	0 †	N/A
Pentachlorophenol	0 †	0 †	N/A
Pyrene	50 †	59 †	16

† - spike recovery or RPD failed to meet customer requirements

N/A - calculation not applicable

**Table 6. MS/MSD Recoveries and RPDs for PCB for B17N46.**

Compound	MS (%)	MSD (%)	RPD (%)
Aroclor 1254	76	72	5

**Table 7. MS/MSD Recoveries and RPDs for PCB for B17TM6.**

Compound	MS (%)	MSD (%)	RPD (%)
Aroclor 1254	120	106	12

## 5.5 SURROGATE RECOVERIES

Surrogate standards are added to all field and QC samples for VOA, SVOA and PCB analyses. The surrogate is added to monitor total method recovery through preparation, sample matrix cleanup and analysis.

Surrogates standard recoveries for VOA for sample B17N46 (S03M000522) met the requirements in QAPP-016 (reference 2). For the VOA for sample B17TM6 (S03M000534), dibromofluoromethane (DBFM) failed high by 4% on the sample aliquot. This failure was attributed to interference from the adjacent carbon tetrachloride peak, which exceeded the calibration curve and saturated the detector. This surrogate passed on the MS and MSD and on subsequent reanalysis of the diluted extract. Therefore, the reported sample results were considered acceptable.

Surrogates standard recoveries for PCB for sample B17N46 (S03M000522) met the requirements in QAPP-016 (reference 2). For the PCB analysis of sample B17TM6 (S03M000538), the recovery for decachlorobiphenyl in the LCS was slightly high. However, the reported results for the analysis were considered acceptable because the LCS, MS and MSD recoveries for the analysis all met the requirements.

For the SVOA for sample B17N46 (S03M000525), the recovery for nitrobenzene-d5 (one of 6 surrogates) failed to meet the requirements in QAPP-016 (reference 2). Administrative limits are set at 50% - 100% recovery. Recoveries for nitrobenzene-d5 ranged from 0% - 10% in the method blank, LCS, sample, MS, and MSD. The other 5 surrogates all had acceptable recoveries. The cause for the low recovery is unknown, however, the other base-neutral compounds that were spiked appear to be unaffected. Of the compounds of interest, only

n-tributylphosphate is in the base/neutral class. It is not chemically similar to nitrobenzene-d5, and is not likely to be affected by the poor recovery.

For the SVOA for sample B17TM6 (S03M000537), low surrogate recoveries were obtained because of the required 50-fold dilution. As discussed with the MS and MSD recovery failures, no reanalysis was requested based on these low recoveries. The sample results are considered usable.

## 5.6 OPPORTUNISTIC ANALYTES

The analytical instructions (reference 1) requested that the laboratory report opportunistic analyte results from the SVOA. These results are considered opportunistic because they are compounds that are calibrated for in the method, but are not requested.

For sample B17N46 (S03M000525), two opportunistic compounds were detected in the sample. Dimethylphthalate (chemical abstract system (CAS) number 131-11-3) was detected with a concentration of  $1.38 \times 10^3$   $\mu\text{g}/\text{Kg}$ . Diethylphthalate (CAS number 84-66-2) was detected with a concentration of  $4.31 \times 10^3$   $\mu\text{g}/\text{Kg}$ . Both of these results should be considered estimates because they were not greater than 10 times the detection limit of 960  $\mu\text{g}/\text{Kg}$ .

For sample B17TM6 (S03M000537), no opportunistic compounds were detected.

## 5.7 TENTATIVELY IDENTIFIED COMPOUNDS

The analytical instructions (reference 1) list five compounds for VOA that the laboratory does not routinely report, as indicated in the letter from H. L. Anastos (reference 4). The laboratory was requested to perform a tentatively identified compound (TIC) search for these compounds. These compounds were not detected in either of the two samples. However, several other TICs were identified, as discussed below. TICs are identified by the instrument library search based only on masses in the spectra and are not based on retention times or verified with independent check standards. These compounds could be misidentified because of matrix effects. The concentrations are estimated based only on the nearest internal standard and a presumed response factor of 1.

For sample B17N46 (S03M000525) SVOA, an unknown phthalate was reported as a TIC. However, this unknown phthalate was also detected in the LCS and the preparation blank and, therefore, was considered to be contamination from an unknown source of plastic and not related to the sample matrix. In addition, 2,2'-methylenebis[6-tert-butyl-4-ethylphenol] (CAS# 88-24-4) was detected with estimated concentrations of  $3.0 \times 10^3$   $\mu\text{g}/\text{Kg}$  in the MS and  $5.5 \times 10^3$   $\mu\text{g}/\text{Kg}$  in the MSD.

For sample B17TM6 (S03M000534) VOA, two compounds were detected as TICs in the sample portion as well as the MS and MSD. Bromobenzene (CAS# 108-86-1) was detected with an estimated concentration of  $4.0 \times 10^3$   $\mu\text{g}/\text{Kg}$  in the sample,  $4.2 \times 10^3$   $\mu\text{g}/\text{Kg}$  in the MS and  $4.1 \times 10^3$   $\mu\text{g}/\text{Kg}$  in the MSD. Estimated concentrations of hexachloroethane (CAS# 67-72-1) were  $8.5 \times 10^4$   $\mu\text{g}/\text{Kg}$  in the sample,  $9.0 \times 10^4$   $\mu\text{g}/\text{Kg}$  in the MS, and  $8.7 \times 10^4$   $\mu\text{g}/\text{Kg}$  in the MSD. In addition, nonanal (CAS# 124-19-6) was detected in the MS with an estimated concentration of  $3.9 \times 10^3$   $\mu\text{g}/\text{Kg}$  and in the MSD with an estimated concentration of  $2.2 \times 10^3$   $\mu\text{g}/\text{Kg}$ . Tridecane (CAS# 629-50-5) was only detected in the MS with an estimated concentration of  $1.0 \times 10^3$   $\mu\text{g}/\text{Kg}$ .

No other compounds were reported as TICs from either the VOA or SVOA for the two samples.

#### 5.8 TARGET QUANTITATION LIMITS

The laboratory was unable to meet all of the requested target quantitation limits due to necessary dilutions of the samples. These dilutions ensured analyte concentrations did not exceed calibration ranges and avoided contamination and carry-over problems. The laboratory used the largest feasible sample sizes.

## 6.0 ANALYTICAL PROCEDURES

Table 8 presents the 222-S Laboratory analytical procedures used to generate the reported results.

Table 8. Analytical Procedures.

Analysis	Preparation Procedure	Analysis Procedure
<b>Inorganic Analyses</b>		
pH	Direct	LA-212-105 Rev. D-0
Hg	Direct	LA-325-106 Rev. C-0
CN	Direct	LA-695-102 Rev. I-2
NH <sub>4</sub>	Water Digest	LA-533-101 Rev. K-0
IC	Water Digest	LA-533-107 Rev. C-2
Sulfide	Direct	LA-361-101 Rev. A-0
Total U	Acid Digest	LA-925-009 Rev. D-5
ICP	Acid Digest	LA-505-161 Rev. D-1
ICP-MS	Acid Digest	LA-506-101 Rev. C-0
<b>Radionuclide Analyses</b>		
AT/TB	Environmental Digest	LA-508-101 Rev. I-1
GEA	Environmental Digest	LA-548-121 Rev. F-5
<sup>90</sup> Sr	Environmental Digest	LA-220-101 Rev. F-0
<sup>237</sup> Np	Environmental Digest	LA-933-141 Rev. H-7
<sup>238</sup> Pu, <sup>239/240</sup> Pu	Environmental Digest	LA-953-104 Rev. D-0
<sup>241</sup> Am	Environmental Digest	LA-953-104 Rev. D-0
<b>Organic Analyses</b>		
VOA	Direct	LA-523-118 Rev. A-2
SVOA	Organic Extraction	LA-523-135 Rev. A-1
PCB	Organic Extraction	LA-523-140 Rev. B-0

**Abbreviations:**

Hg - mercury  
 CN - cyanide  
 NH<sub>4</sub> - ammonium  
 IC - ion chromatography  
 Total U - total uranium  
 ICP - inductively coupled plasma  
 ICP/MS - ICP/mass spectrometry  
 AT/TB - total alpha/total beta  
 GEA - gamma energy analysis

<sup>90</sup>Sr - strontium-90  
<sup>237</sup>Np - neptunium-237  
<sup>238</sup>Pu - plutonium-238  
<sup>239/240</sup>Pu - plutonium-239/240  
<sup>241</sup>Am - americium-241  
 VOA - volatile organic analysis  
 SVOA - semi-volatile organic analysis  
 PCB - polychlorinated biphenyls

**Notes:**

Acid digest procedure: LA-505-163 Rev. D-1  
 Water digest procedure: LA-504-101 Rev. I-0

Environmental acid digest procedure: LA-544-101 Rev. C-5  
 Organic extraction procedure: LA-523-138 Rev. C-2

FH-Central Plateau Project		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				F03-018-53	Page 1 of 1			
Collector Pope/Pfister/Hughes		Company Contact Steve Trent		Telephone No. 373-5869		Project Coordinator TRENT, SJ	Price Code 8N	Data Turnaround 60 Days		
Project Designation 216-Z-9 Trench Characterization Borehole - Soil		Sampling Location 216-Z-9/C3426 - Interval 25'25" - 43.5' - 46'		SAF No. F03-018		Air Quality <input type="checkbox"/>				
Ice Chest No. VIKING 4HZV		Field Logbook No. HNF-N-3361		COA 119152ES20		Method of Shipment Government Vehicle				
Shipped To 222-S Lab Operations		Office Property No. N/A		BIN of Lading/Air Bill No. N/A						
<b>POSSIBLE SAMPLE HAZARDS/REMARKS</b> RADIOACTIVE TAG TO: B17NMB <b>Hazard: Corrosive (Acidic)</b> Special Handling and/or Storage SAMPLES TO PUT 5 g soil into each vial with the encore sampler. Bottles are pre-labeled. Write the HHS number from the chain on each vial.				Preservation	Cool AC					
				Type of Container	P	4G5*				
				No. of Container(s)	1	1				
				Volume	500 mL	40 mL				
SAMPLE ANALYSIS				See item (1) in Special Instructions	SEE ITEM (2) IN SPECIAL INSTRUCTIONS					
Sample No.	Matrix *	Sample Date	Sample Time							
B17N46	SOIL	10/20/03	1029	X	X	X				
CHAIN OF POSSESSION				SPECIAL INSTRUCTIONS		Matrix *				
Relinquished By/Removed From TSP/PE/ASA		Date/Time 10/20/03 1430		Received By/Stored In AAA/CHANGE ROOM		Date/Time 10/20/03 1430				
Relinquished By/Removed From CHANGE ROOM		Date/Time 10/22/03 1300		Received By/Stored In SITE FRIDGE		Date/Time 10/22/03 1300				
Relinquished By/Removed From SITE FRIDGE		Date/Time 10/27/03 1300		Received By/Stored In GREG THOMAS/STEVIE THOMAS		Date/Time 10/27/03 1300				
Relinquished By/Removed From GREG THOMAS/STEVIE THOMAS		Date/Time 10/27/03 1330		Received By/Stored In JACQUELYN #4		Date/Time 10/27/03 1335				
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time				
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time				
LABORATORY SECTION				Received By		Title		Date/Time		
FINAL SAMPLE DISPOSITION				Disposal Method		Disposed By		Date/Time		

BIR-EE-011 (03/01/2002)

FH-Central Plateau Project		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				F03-018-54	Page 1 of 1
Collector Popo/Triester/Hughes	Company Contact Steve Trent	Telephone No. 373-5869	Project Coordinator TRENT, SJ	Price Code 8N	Data Turnaround 60 Days		
Project Designation 216-Z-9 Trench Characterization Borehole - Soil	Sampling Location 216-Z-9/C3426 - Interval 29-25.7- <i>1-20-03</i> 43.5' - 18'	SAF No. F03-018	Air Quality <input type="checkbox"/>				
Ice Chest No. VIKING 4H2V	Field Logbook No. INF-N-3361	COA 119152ES10	Method of Shipment Government Vehicle				
Shipped To 222-S Lab Operations	Offsite Property No. N/A	Bill of Lading/Air Bill No. N/A					
POSSIBLE SAMPLE HAZARDS/REMARKS RADIOACTIVE TIE TO: B17KM8		Preservation	Temp (°C)				
Special Handling and/or Storage SAMPLERS: Collect 25 g with the encore sampler. If the TAD is 0.5 wires/hr this sample can be taken to WSCF. Sample analysis must occur in 48 hours or preserve with methanol.		Type of Container 2x bulk	0				
		No. of Container(s)	1				
		Volume	25g				
SAMPLE ANALYSIS		See here (1) in special instructions.					
Sample No.	Matrix *	Sample Date	Sample Time				
B17N61 B17N46 MC 10/27/03	SOIL	10-20-03	1029	X			
CHAIN OF POSSESSION		Sign/Print Names		SPECIAL INSTRUCTIONS			Matrix *
Relinquished By/Removed From SS Pate/ASB	Date/Time 10/20/03 1430	Received By/Stored In RAM/Chance Trailer	Date/Time 10/20/03 1421	(1) VOA - 8260A - Complete; VOA - 8260A (Add-On) (Acetonitrile, Hexane, n-Butylbenzene)			S-Soil SE-Sediment SO-Solid SL-Sludge W-Water O-Oil A-Air DS-Dryon Soils DL-Dryer Liquids T-Tissue W-Wipe L-Liquid V-Vegetation X-Other
Relinquished By/Removed From RAM/Chance Trailer	Date/Time 10/20/03 1300	Received By/Stored In Site Bridge	Date/Time 10/20/03 1300				
Relinquished By/Removed From Site Bridge	Date/Time 10/27/03	Received By/Stored In Greg Thomas/Chris Thomas	Date/Time 10/27/03 1330				
Relinquished By/Removed From Greg Thomas/Chris Thomas	Date/Time 10/27/03	Received By/Stored In Sealco/Dig H4	Date/Time 10/27/03 1335				
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time				
LABORATORY SECTION	Received By	Title		Date/Time			
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By		Date/Time			

BHI-EE-011 (03/01/2002)

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FLUOR Hanford Inc.		CENTRAL PLATEAU CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				F03-018-069		Page 1 of 1							
Collector Pope/Pfister/Hughes		Company Contact Steve Trent		Telephone No. 373-5869		Project Coordinator TRENT, SJ		Price Code <b>8N</b>							
Project Designation 216-Z-9 Trench Characterization Borehole - Soil		Sampling Location 216-Z-9/C3426 - Interval		SAF No. F03-018		Air Quality <input type="checkbox"/>		Data Turnaround <b>45 Days</b>							
Ice Chest No. <i>VIAING-4H2V</i>		Field Logbook No. HNF-N-3361		COA 119152ES10		Method of Shipment Government Vehicle									
Shipped To <i>MBS 10/2/03</i> Waste Sampling & Characterization <i>222-5</i>		Offsite Property No. <i>RSP 10E-973</i>		Bill of Lading/Air Bill No. N/A											
<b>POSSIBLE SAMPLE HAZARDS/REMARKS</b> RADIOACTIVE TIE TO: <i>B71W4</i>  <b>Special Handling and/or Storage</b> SAMPLERS: Fill VOA vials with Zero head space.				Preservation		Cool 4C	Cool 4C	Cool 4C	Cool 4C	None	None				
				Type of Container		aG	aG	aG	aG	aG	aG	P			
				No. of Container(s)		3	1	1	1	1	1	1			
				Volume		40mL	120mL 60mL	120mL 60mL	120mL 60mL	120mL 60mL	120mL 60mL	500mL			
<b>SAMPLE ANALYSIS</b>				See Item (1) in Special Instructions.		See Item (2) in Special Instructions.		PCBs - 8082		See Item (3) in Special Instructions.		See Item (4) in Special Instructions.		See Item (5) in Special Instructions.	
										<i>MBS 10/3/03</i>		<i>MBS 10/3/03</i>			
Sample No.		Matrix *		Sample Date		Sample Time									
B17TM6		SOIL		10/29/03		0856		X		X		X		X	
										<i>MBS 10/3/03</i>		<i>MBS 10/3/03</i>			
<b>CHAIN OF POSSESSION</b>				<b>Sign/Print Names</b>				<b>SPECIAL INSTRUCTIONS</b>				<b>Matrix *</b>			
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time		The lab is to achieve a detection limit of 5 pCi/g & 10 pCi/g for gross alpha and beta, respectively. (1) VOA - 8260A (TCL); VOA - 8260A (Add-On) (1-Butanol, Acetonitrile, cis-1,2-Dichloroethylene, Hexane, n-Butylbenzene, trans-1,2-Dichloroethylene) (2) Semi-VOA - 8270A (TCL); Semi-VOA - 8270A (Add-On) (1,2,4-Trimethylbenzene, Cyclohexanone, Tributyl phosphate); TPH-Diesel Range - WTPH-D (Total petroleum hydrocarbons - diesel range, Total petroleum hydrocarbons - kerastoc range) (3) ICP Metals - 6010A (TAL); ICP Metals - 6010A (Add-on) (Arsenic, Beryllium, Bismuth, Lead, Lithium, Phosphorus, Selenium, Strontium); ICP/MS - 200B (Add-on) (Mercury, Uranium) (4) IC Anions - 300.0 (Chloride, Fluoride, Nitrogen in Nitrate, Nitrogen in Nitrite, Phosphate, Sulfate); Cations (IC) - 300.7 (Nitrogen in ammonium); Total Cyanide - 9010; pH (Soil) - 9045 (5) Gross Alpha; Gross Beta; Gamma Spectroscopy [Cesium-137, Cobalt-60, Europium-152, Europium-154, Barium-137m]; Gamma Spec - Add-on [Antimony-125, Cesium-134]; Americium-241; Isotopic Plutonium; Isotopic Uranium; Neptunium-237				S-Soil SE-Sewer SO-Soil SW-Swag W-Water O-Oil A-Air DS-Dry Solid DL-Dry Liquid T-Tissue WT-Wipe L-Liquid V-Vegetation X-Other			
<i>J. S. Pope</i>		<i>10/29/03 1400</i>		<i>Site Fringe</i>		<i>10/29/03 1400</i>									
<i>Site Fringe</i>		<i>10/29/03 0940</i>		<i>M. G. Daucher</i>		<i>10/29/03</i>									
<i>M. G. Daucher</i>		<i>10/29/03</i>		<i>John W. Day</i>		<i>10/31/03</i>									
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time									
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time									
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time									
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time									
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time									
<b>LABORATORY SECTION</b>		Received By		Title				Date/Time							
<b>FINAL SAMPLE DISPOSITION</b>		Disposal Method		Disposed By				Date/Time							

A-6003-618(03/03)



## GENERATOR KNOWLEDGE INFORMATION

1. Chain of Custody Number \_\_\_\_\_ CAGN/COA 118478ES20 Customer Identification Number \_\_\_\_\_

2. List generator knowledge or description of process that produced sample. Or list description of sample source:

216-Z-9 Trench DNAPL Investigation

MSDS Available?  No  Yes Hanford MSDS No. \_\_\_\_\_

3. List all waste codes and constituents associated with the waste or media that was sampled, regardless of CERCLA status.

a) Does the sample contain any of the following listed waste codes?

By checking "unknown" the customer understands that no knowledge is available following a careful search.

List Federal Waste Code(s):

List Constituent(s):

P Codes: \_\_\_\_\_  Yes  No  Unknown

U Codes: \_\_\_\_\_  Yes  No  Unknown

K Codes: \_\_\_\_\_  Yes  No  Unknown

F Codes: F001 Carbon tetrachloride  Yes  No  Unknown

b) List applicable characteristic waste codes, flash point, pH, constituents, and concentrations as appropriate.

D001:  FP <100°F  FP ≥100 <140°F  DOT Oxidizer  Yes  No  Unknown

D002:  pH ≤2  pH ≥12.5  Solid Corrosive (WSC2)  Yes  No  Unknown

D003:  Cyanide  Sulfide  Water Reactive  Other \_\_\_\_\_  Yes  No  Unknown

D004-D045 (Identify applicable waste codes and concentrations): \_\_\_\_\_ (i.e., peroxide former, explosive, air reactive)  Yes  No  Unknown

c) If characteristic, list any known underlying hazardous constituents (UHCs) reasonably expected to be present, and their concentrations that may be present above the LDR treatment standard (40 CFR 268.48):

N/A

d) List any known Land Disposal Restrictions (LDR) subcategories, if applicable (40 CFR 268.40):

N/A

e) List any applicable Washington State dangerous waste codes: (not required if federally regulated)

(\*State mixture rule for ignitability)

WT01:  Yes  No  Unknown

WP01:  Yes  No  Unknown

WT02:  Yes  No  Unknown

WP02:  Yes  No  Unknown

W001:  Yes  No  Unknown

WP03:  Yes  No  Unknown

List constituents and concentrations:

F003:  Yes  No  Unknown

4. Is this material TSCA regulated for PCBs?  Yes  No  Unknown  Analysis Requested

List concentration if applicable: \_\_\_\_\_

If yes, what is the source of the PCBs? (see TSCA PCB Hanford Site User Guide, DOE/RL-2001-50)

- |  |   |   |                                  |
|--|---|---|----------------------------------|
| <input type="checkbox"/> PCB Liquid Waste      | <input type="checkbox"/> PCB Bulk Product Waste | <input type="checkbox"/> PCB Transformer ≥500 ppm   | <input type="checkbox"/> Unknown |
| <input type="checkbox"/> PCB Remediation Waste | <input type="checkbox"/> PCB R&D Waste          | <input type="checkbox"/> PCB contaminated electrical equipment (capacitor/ballast) <500 ppm |                                  |
| <input type="checkbox"/> PCB Spill Material    | <input type="checkbox"/> PCB Item               | <input type="checkbox"/> Other PCB Waste (list) _____                                       |                                  |

5. Is this material TRU?  Yes  No  Unknown

000000

### 6 ACCURACY OF INFORMATION

Based on my inquiry of those individuals immediately responsible for obtaining this information, that to the best of my knowledge, the information entered in this document is true, accurate, and complete.

Print & Sign \_\_\_\_\_

Date

10/6/03

**Appendix 5**

**Data Validation Supporting Documentation**

APPENDIX A

RADIOCHEMICAL DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	<u>C</u>	D	E
PROJECT:	216-3-9 Vertical Borehole		DATA PACKAGE: 222S20030383 and -0369		
VALIDATOR:	JR Jewett		LAB: 222-S	DATE: 6/15/06	
SDG:					
ANALYSES PERFORMED					
Gamma Spectrometry	Isotopes: 22	Technique: 22	Alpha Spectrometry	Gamma Spectrometry	
Total Uranium		Uranium			Standard Uranium - 90
SAMPLES/MATRIX					
B17N46 Soil					
B17T46 Soil					

1. Completeness .....  N/A

Technical verification forms present? .....  Yes No N/A

Comments:

Carrier recovery info was not in report, but was provided in e-mail from lab.  
See App. 6 of DVR.

2. Initial Calibration (Levels D, E) .....  N/A

Instruments/detectors calibrated? ..... Yes No N/A

Initial calibration acceptable? ..... Yes No N/A

Standards NIST traceable? ..... Yes No N/A

Standards Expired? ..... Yes No N/A

Calculation check acceptable? ..... Yes No N/A

Comments:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3. Continuing Calibration (Levels D, E) .....  N/A

Calibration checked within required frequency? ..... Yes No N/A

Calibration check acceptable? ..... Yes No N/A

Calibration check standards traceable? ..... Yes No N/A

Calibration check standards expired? ..... Yes No N/A

Calculation check acceptable? ..... Yes No N/A

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4. Background Counts (Levels D, E) .....  N/A

Background Counts checked within required frequency? ..... Yes No N/A

Background Counts acceptable? ..... Yes No N/A

Calculation check acceptable? ..... Yes No N/A

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

HNF-20434 REV 0

5. Blanks (Levels B, C, D, E) .....  N/A

Method blank analyzed within required frequency? ..... Yes No N/A

Method blank results acceptable? ..... Yes No N/A

Analytes detected in method blank? ..... Yes No N/A

Field blank(s) analyzed? ..... Yes No N/A

Field blank results acceptable? ..... Yes No N/A

Analytes detected in field blank(s)? ..... Yes No N/A

Transcription/Calculation Errors? (Levels D, E) ..... Yes No N/A

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

6. Laboratory Control Samples or Blank Spike Samples (Levels C, D, E) .....  N/A

LCS /BSS analyzed within required frequency? ..... Yes No N/A

LCS/BSS recoveries acceptable? ..... Yes No N/A

LCS/BSS traceable? (Levels D,E) ..... Yes No N/A

LCS/BSS expired? (Levels D,E) ..... Yes No N/A

LCS/BSS levels correct? (Levels D,E) ..... Yes No N/A

Transcription/Calculation Errors? (Levels D, E) ..... Yes No N/A

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

7. Chemical Carrier Recovery (Levels C, D, E) .....  N/A

Chemical carrier added? ..... Yes No N/A

Chemical recovery acceptable? ..... Yes No N/A

Chemical carrier traceable? (Levels D, E) ..... Yes No N/A

Chemical carrier expired? (Levels D, E) ..... Yes No N/A

Transcription/Calculation errors? (Levels D, E) ..... Yes No N/A

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

8. Tracer Recovery (Levels C, D, E) .....  N/A

Tracer added? ..... Yes No N/A

Tracer recovery acceptable? ..... Yes No N/A

Tracer traceable? (Levels D, E) ..... Yes No N/A

Tracer expired? (Levels D, E) ..... Yes No N/A

Transcription/Calculation errors? (Levels D, E) ..... Yes No N/A

Comments: ST Not used in Sr-90 method

PJG/406

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

9. Matrix Spikes (Levels C, D, E) .....  N/A

Matrix spike analyzed? ..... Yes No N/A

Spike recoveries acceptable? ..... Yes No N/A

Spike source traceable? (Levels D, E) ..... Yes No N/A

Spike source expired? Levels D, E) ..... Yes No N/A

Transcription/Calculation Errors? (Levels D, E) ..... Yes No N/A

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

10. Duplicates (Levels C, D, E) .....  N/A

Duplicates Analyzed at required frequency? .....  Yes  No  N/A

RPD Values Acceptable? .....  Yes  No  N/A

Transcription/Calculation Errors? (Levels D, E) .....  Yes  No  N/A

Comments:

~~RPD for BITTM6 was 52%.~~  
~~Results > ESA RDL Flagged "J"~~ JF 6/21/06

11. Field QC Samples (Levels C, D E) .....  N/A

Field duplicate sample(s) analyzed? .....  Yes  No  N/A

Field duplicate RPD values acceptable? .....  Yes  No  N/A

Field split sample(s) analyzed? .....  Yes  No  N/A

Field split RPD values acceptable? .....  Yes  No  N/A

Performance audit sample(s) analyzed? .....  Yes  No  N/A

Performance audit sample results acceptable? .....  Yes  No  N/A

Comments:

12. Holding Times (All levels)

Are sample holding times acceptable? .....  Yes  No  N/A

Comments:

13. Results and Detection Limits (All Levels) .....  N/A

Results reported for all required sample analyses? .....  Yes  No  N/A

Results supported in raw data?(Levels D, E) ..... Yes  No  N/A

Results Acceptable? (Levels D, E) ..... Yes  No  N/A

Transcription/Calculation errors? (Levels D, E) ..... Yes  No  N/A

MDA's meet required detection limits? .....  Yes  No  N/A

Transcription/calculation errors? (Levels D, E) ..... Yes  No  N/A

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



**Project Hanford Management System  
COMMENT RESOLUTION SHEET**

Sheet 1 of 21  
*JAG 8/13/06*

Document Number: SDG ~~2225~~ 222520030369 and Revision Number N/A Date: Aug 3, 2006

Document Title: 222520030383 *JAG 8/13/06*

Data Validation for Strontium-90 Analysis 222520030369 & 2225200300383

Reviewer: Bill Thackaberry Reviewers, if other than original:	Project/Organization: FH/GRP/QA  Responsible Manager: Dana Farwick
---	--

**COMMENT(S)**

Initials (if other than listed reviewer)	Section/Step	Comments/Discrepancies	Basis	Recommendation	Resolution
	pg 1-8	Package lacks the data summary that has been provided in the past showing analyte, detection limit, result and qualifiers.	Provided in all packages reviewed in the last 4 years	Provide the table	<i>Accepted, although table is not required by the data validation procedure. JAG 8/13/06</i>
<i>JAG 8/13/06</i>	pgs <del>X</del> 33 Sec II	This section should not be N/A	it applies to level C	complete the individual lines (no and N/A answers)	<i>Accepted. JAG 8/13/06</i>

Date: June 15, 2006  
 To: Fluor Hanford, Inc  
 From: Environmental Quality Management, Inc.  
 Project: 216-Z-9 Waste Site Vertical Borehole (Borehole C3426)  
 Subject: Data Validation for Strontium-90 Analysis

**INTRODUCTION**

This memo presents the results of data validation on Data Packages 222S20030369 and 222S20030383, prepared by the 222-S laboratory. A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analysis
B17N46	10/20/03	Soil	C	Strontium-90
B17TM6	10/29/03	Soil	C	Strontium-90

Data validation was conducted in accordance with HNF-20434, Rev. 0, *Data Validation Procedure for Radiochemical Analyses*, DOE/RL-2001-01, Rev. 0, Appendix B, *Plutonium/Organic-Rich Process Condensate/Process Waste Group Operable Unit Representative Sites Sampling and Analysis Plan*, and DOE/RL-2001-01, Rev. 0, Appendix E, *Sampling and Analysis Plan for Investigation of Dense, Nonaqueous-Phase Liquid Carbon Tetrachloride at the 216-Z-9 Trench*. Appendices 1 through 6 of this Data Validation Report provide additional information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Annotated Laboratory Reports
- Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
- Appendix 5. Data Validation Supporting Documentation
- Appendix 6. Additional Data Requested by Client

**DATA QUALITY PARAMETERS**

**Holding Times**

Holding times may be calculated from Chain-of-Custody forms to determine the validity of the results. Maximum holding time for strontium-90 analyses is specified as 6 months in DOE/RL-2001-01, App. B.

All holding times were met.

**Blanks**

- Laboratory Blanks

Blank samples are analyzed to determine if positive results are due to laboratory reagent, sample container, or detector contamination. If blank analysis results indicate the presence of an analyte above the minimum detectable activity (MDA), the following qualifiers are applied: All positive sample results less than five times the highest blank concentration are qualified as estimates and flagged "J"; sample results below the MDA are qualified as undetected and flagged "U"; samples results above the MDA and greater than five times the highest blank concentration are not qualified.

All blank criteria were met. Strontium-90 was not detected in the blank. The detection limit for the blank was less than the MDA and less than the required detection limit.

- Field Blank

No field blanks were submitted for analysis.

### **Accuracy**

Accuracy is evaluated from laboratory control sample (LCS) or blank spike sample (BSS) batch samples and spiked samples in the analytical batch. Measured activities are compared to the known added amounts. The acceptable LCS or BSS and matrix spike (MS) recovery range is 65-135%. In addition, a nonradiochemical carrier is used to determine the yield of the chemical separation procedure. The acceptable range for carrier recovery is 20% to 105%. Results outside the above ranges result in associated sample results being qualified as estimates. Results are rejected for LCS/BSS recoveries less than 30% or carrier or MS recoveries less than 10%.

LCS and MS recoveries satisfied the above criteria. A carrier was used for every sample, LCS, and blank (except for gamma spectroscopy) and acceptable results were obtained.

### **Precision**

- Laboratory Duplicates

Analytical precision is expressed by the relative percent differences (RPD) between results for one of the samples in the batch and a duplicate determination of that sample. If both results are nondetects, no RPD calculation is required. If both the activities measured for the sample and the duplicate are both greater than five times the required detection limit (RDL) and the RPD is less than 35%, no qualification is required. If either activity is less than five times the RDL, the control limit is two times the RDL. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

A duplicate was analyzed for each sample, and the requirements were met.

- Field Duplicate

No field duplicates were submitted for analysis.

### **Detection Levels**

Reported analytical detection levels are compared against the RDLs in DOE/RL-2001-01, Appendix B, to ensure that laboratory detection levels meet the required criteria.

All sample results were reported with MDAs equal to or less than the analyte-specific RDL.

### **Completeness**

Data Packages 222S20030369 and 222S20030383 were submitted for validation and verified for completeness. Completeness is based on the percentage of data requested by the client that were reported and determined to be valid (i.e., not rejected). The completion percentage was 100%.

## **MAJOR DEFICIENCIES**

None

## **MINOR DEFICIENCIES**

None

## **REFERENCES**

HNF-20434, Rev. 0, *Data Validation Procedure for Radiochemical Analyses*, Fluor Hanford, Inc., Richland, Washington (2004).

DOE/RL-2001-01, Rev. 0, Appendix B, *Plutonium/Organic-Rich Process Condensate/Process Waste Group Operable Unit Representative Sites Sampling and Analysis Plan*, U.S. Department of Energy, Richland, Washington (2004).

DOE/RL-2001-01, Rev. 0, Appendix E, *Sampling and Analysis Plan for Investigation of Dense, Nonaqueous-Phase Liquid Carbon Tetrachloride at the 216-Z-9 Trench*, U.S. Department of Energy, Richland, Washington (2004).

**Appendix 1**  
**Glossary of Data Reporting Qualifiers**

Qualifiers which may be applied by data validators in compliance with the data validation procedure are as follows:

- U - Indicates the compound or analyte was analyzed for and not detected above the minimum detectable activity (MDA) in the sample. The value reported is the sample result corrected for sample dilution and moisture content by the laboratory. The data is usable for decision making purposes.
- UJ - Indicates the compound or analyte was analyzed for and not detected at concentrations above the minimum detectable activity (MDA) in the sample. Due to a minor QC deficiency identified during the data validation, the associated quantitation limit is an estimate, but is usable for decision making purposes.
- J - Indicates the compound or analyte was analyzed for and detected. Due to a minor QC deficiency identified during the data validation, the associated concentration is an estimated, but the data are usable for decision-making purposes.
- R - Indicates the compound or analyte was analyzed for, detected, and due to an identified major QC deficiency, the data are unusable.
- UR - Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data is unusable due to an identified major QC deficiency.

**Appendix 2**  
**Summary of Data Qualification**

### DATA QUALIFICATION SUMMARY

<b>SDG:</b> 222S20030369 and 222S20030383	<b>REVIEWER:</b> JRJ	<b>DATE:</b> 6/15/06	<b>PAGE 1 OF 1</b>
<b>COMMENTS:</b> No data was qualified.			
<b>COMPOUND</b>	<b>QUALIFIER</b>	<b>SAMPLES AFFECTED</b>	<b>REASON</b>

**Appendix 3**  
**Annotated Laboratory Reports**

**STRONTIUM-90 ANALYSIS, SOIL (PCI/G)**

<b>Project: FLUOR HANFORD</b>							
<b>Laboratory: 222-S</b>							
<b>Case:</b>		<b>SDG: 222S20030369 and 222S20030383</b>					
<b>Sample Number</b>		<b>B17N46</b>			<b>B17TM6</b>		
<b>Remarks</b>							
<b>Sample Date</b>		<b>10/20/03</b>			<b>10/29/03</b>		
<b>Analysis Date</b>		<b>01/12/04</b>			<b>01/12/04</b>		
<b>Radionuclides</b>	<b>RTQL</b>	<b>Result</b>	<b>Q</b>	<b>MDA</b>	<b>Result</b>	<b>Q</b>	<b>MDA</b>
Strontium-90	1	7.86	U	14	13.4		15

RTQL = required target quantitation limit

Q = validation qualifier; laboratory-applied non-detect qualifiers "U" have been included for clarity.

MDA = minimum detectable activity

GEA = gamma energy analysis

AEA = alpha energy analysis

29 TRENCH  
Data Summary Report

CORE NUMBER: 22262030369  
SEGMENT #: B17W46

SEGMENT PORTION: Acid Digest

Sample#	R#	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count	Err%
S03M000527	A	Silver - ICP-Acid Digest	ug/g	99.9	<5.48e-03	<1.11	<1.06	n/a	n/a	79.8	1.1	n/a	n/a
S03M000527	A	Arsenic - ICP-Acid Digest	ug/g	117	<0.0514	11.0	<9.94	n/a	n/a	92.0	10	n/a	n/a
S03M000527	A	Barium - ICP-Acid Digest	ug/g	96.3	<0.0210	93.2	38.6	85.9	82.7	71.8	4.2	n/a	n/a
S03M000527	A	Beryllium - ICP-Acid Digest	ug/g	102	<1.33e-03	<0.270	<0.258	n/a	n/a	80.5	0.27	n/a	n/a
S03M000527	A	Bismuth - ICP-Acid Digest	ug/g	93.8	<0.0516	<10.4	<9.97	n/a	n/a	76.3	10	n/a	n/a
S03M000527	A	Cadmium - ICP-Acid Digest	ug/g	94.4	<2.12e-03	3.50	1.60	2.55	74.3	74.8	0.43	n/a	n/a
S03M000527	A	Chromium - ICP-Acid Digest	ug/g	97.2	<5.19e-03	16.0	13.7	14.8	15.7	76.9	1.0	n/a	n/a
S03M000527	A	Copper - ICP-Acid Digest	ug/g	97.4	<0.0122	16.6	15.0	15.8	10.4	77.3	2.5	n/a	n/a
S03M000527	A	Lithium - ICP-Acid Digest	ug/g	99.1	<1.79e-03	0.26	8.63	8.44	4.37	79.5	0.36	n/a	n/a
S03M000527	A	Manganese - ICP-Acid Digest	ug/g	94.2	<1.07e-03	157	164	160	4.57	79.4	0.22	n/a	n/a
S03M000527	A	Nickel - ICP-Acid Digest	ug/g	95.6	<0.0140	9.11	7.92	8.51	13.9	75.3	2.2	n/a	n/a
S03M000527	A	Phosphorus - ICP-Acid Digest	ug/g	98.6	<0.0196	464	594	529	24.6	82.1	4.0	n/a	n/a
S03M000527	A	Lead - ICP-Acid Digest	ug/g	94.2	<0.0235	8.21	5.75	6.98	35.2	76.2	4.7	n/a	n/a
S03M000527	A	Antimony - ICP-Acid Digest	ug/g	94.8	<0.0212	<4.29	<4.10	n/a	n/a	67.5	4.3	n/a	n/a
S03M000527	A	Selenium - ICP-Acid Digest	ug/g	97.1	<0.0518	<10.5	<10.0	n/a	n/a	78.6	10	n/a	n/a
S03M000527	A	Strontium - ICP-Acid Digest	ug/g	98.0	<1.07e-03	11.7	12.7	12.2	7.75	78.1	0.22	n/a	n/a
S03M000527	A	Zinc - ICP-Acid Digest	ug/g	93.1	<2.14e-03	48.8	35.2	42.0	32.3	73.3	0.43	n/a	n/a

SEGMENT PORTION: Environmental Acid

Sample#	R#	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count	Err%
S03M000528	E	Uranium by Phosphorescence	ug/g	104	<4.14e-04	0.077	0.945	0.921	5.21	n/a	0.041	n/a	n/a
S03M000528	E	Strontium-89/90 High Level	uCi/g	98.8	<1.05e-05	<7.86e-06	<9.44e-06	n/a	n/a	n/a	1.4e-05	8.4e+02	n/a
S03M000528	E	Pu-239/240 by TRU-SPEC Resin	uCi/g	93.3	<4.74e-03	0.0446	0.0392	0.0419	42.9	n/a	6.4e-03	3.1	n/a
S03M000528	E	Pu-238 by TRU-SPEC Resin IonEx	uCi/g	n/a	<8.96e-03	<0.0106	<0.0103	n/a	n/a	n/a	0.011	14	n/a
S03M000528	E	Np237 by TTA Extraction	uCi/g	82.5	<2.93e-04	<5.04e-04	<3.96e-04	n/a	n/a	n/a	6.2e-04	1.8e+02	n/a
S03M000528	E	Thorium-232 by ICP/MS	ug/g	105	0.0241	2.94	3.41	3.18	14.6	99.0	3.7e-04	n/a	n/a
S03M000528	E	Uranium-233 by ICP/MS Acid Dig	ug/g	n/a	<1.80e-03	9.58e-05	1.10e-04	1.03e-04	13.8	n/a	2.8e-05	n/a	n/a
S03M000528	E	Uranium-234 by ICP/MS Acid Dig	ug/g	n/a	<6.00e-04	1.89e-04	1.56e-04	1.73e-04	19.5	n/a	9.3e-06	n/a	n/a
S03M000528	E	Uranium-235 by ICP/MS Acid Dig	ug/g	104	<2.20e-03	0.0104	8.91e-03	9.67e-03	15.6	112	3.4e-05	n/a	n/a
S03M000528	E	Uranium-238 by ICP/MS Acid Dig	ug/g	106	<0.110	0.742	0.647	0.695	13.6	101	1.7e-03	n/a	n/a
S03M000528	E	Cobalt-60 by GEA	uCi/g	104	<2.64e-04	<2.60e-04	<2.69e-04	n/a	n/a	n/a	2.6e-04	n/a	n/a
S03M000528	E	Antimony-125 by GEA	uCi/g	n/a	<5.02e-04	<5.91e-04	<6.19e-04	n/a	n/a	n/a	5.9e-04	n/a	n/a
S03M000528	E	Cesium-134 by GEA	uCi/g	n/a	<1.90e-04	<2.23e-04	<1.97e-04	n/a	n/a	n/a	2.2e-04	n/a	n/a
S03M000528	E	cesium-137 by GEA	uCi/g	111	<3.84e-04	<3.94e-04	<4.03e-04	n/a	n/a	n/a	3.9e-04	n/a	n/a
S03M000528	E	Europlum-152 by GEA	uCi/g	n/a	<3.24e-04	<3.27e-04	<3.28e-04	n/a	n/a	n/a	3.3e-04	n/a	n/a
S03M000528	E	Europlum-154 by GEA	uCi/g	n/a	<7.08e-04	<7.84e-04	<7.67e-04	n/a	n/a	n/a	7.8e-04	n/a	n/a
S03M000528	E	Europlum-155 by GEA	uCi/g	n/a	<2.84e-04	<2.80e-04	<2.68e-04	n/a	n/a	n/a	2.8e-04	n/a	n/a
S03M000528	E	Am-241 by TRU-SPEC Resin IonEx	uCi/g	105	<7.29e-03	0.114	0.0979	0.106	15.2	n/a	0.013	2.4	n/a
S03M000528	E	Alpha of Digested Solid	uCi/g	95.4	<5.03e-04	0.148	0.125	0.136	16.8	95.0	1.2e-03	5.0	n/a
S03M000528	E	Beta of Solid Sample	uCi/g	105	<2.33e-03	0.0272	0.0191	0.0232	35.0	104	3.5e-03	13	n/a

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Data Summary Report

CORE NUMBER: 222620030383  
SEGMENT #: 8171M6

SEGMENT PORTION: Acid Digest

Sample#	R	AW	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count Err%
S03M000559	A		Silver -ICP-Acid Digest	ug/g	101	<5.48e-03	1.15	<1.10	n/a	n/a	98.5	1.1	n/a
S03M000559	A		Arsenic -ICP-Acid Digest	ug/g	115	<0.0514	<10.3	<10.3	n/a	n/a	113	10	n/a
S03M000559	A		Barium -ICP-Acid Digest	ug/g	95.6	<0.0210	53.4	53.2	53.3	0.377	94.5	4.2	n/a
S03M000559	A		Beryllium -ICP-Acid Digest	ug/g	103	<1.33e-03	0.293	<0.268	n/a	n/a	101	0.27	n/a
S03M000559	A		Bismuth -ICP-Acid Digest	ug/g	95.1	<0.0516	<10.4	10.8	n/a	n/a	93.2	10	n/a
S03M000559	A		Cadmium -ICP-Acid Digest	ug/g	93.8	<2.12e-03	1.79	1.45	1.62	20.6	90.8	0.42	n/a
S03M000559	A		Chromium -ICP-Acid Digest	ug/g	96.9	<5.19e-03	22.5	22.1	22.3	1.68	94.1	1.0	n/a
S03M000559	A		Copper -ICP-Acid Digest	ug/g	97.3	<0.0122	9.95	10.9	10.4	9.32	96.6	2.5	n/a
S03M000559	A		Lithium -ICP-Acid Digest	ug/g	98.8	<1.20e-03	10.6	9.80	10.2	7.94	97.2	0.36	n/a
S03M000559	A		Manganese -ICP-Acid Digest	ug/g	94.5	<1.07e-03	190	181	185	5.27	108	0.22	n/a
S03M000559	A		Nickel -ICP-Acid Digest	ug/g	95.2	<0.0110	20.2	18.2	19.2	10.5	92.8	2.2	n/a
S03M000559	A		Phosphorus -ICP-Acid Digest	ug/g	95.3	<0.0196	595	699	647	16.1	91.3	4.0	n/a
S03M000559	A		Lead -ICP-Acid Digest	ug/g	94.4	0.0257	6.58	<4.71	n/a	n/a	90.8	4.7	n/a
S03M000559	A		Antimony -ICP-Acid Digest	ug/g	94.7	0.0262	4.63	<4.27	n/a	n/a	82.3	4.3	n/a
S03M000559	A		Selenium -ICP-Acid Digest	ug/g	97.7	<0.0518	<10.4	<10.4	n/a	n/a	95.1	10	n/a
S03M000559	A		Strontium -ICP-Acid Digest	ug/g	97.5	<1.07e-03	13.7	23.3	18.5	52.0	96.4	0.22	n/a
S03M000559	A		Zinc -ICP-Acid Digest	ug/g	93.5	3.87e-03	37.8	33.2	35.5	12.9	91.2	0.43	n/a

SEGMENT PORTION: Environmental Acid

Sample#	R	AW	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count Err%
S03M000540	E		Uranium by Phosphorescence	ug/g	104	<4.14e-04	2.04	1.65	1.84	21.1	99.9	0.041	n/a
S03M000540	E		Strontium-89/90 High Level	uCi/g	100	<7.19e-06	1.34e-05	<1.25e-05	n/a	n/a	n/a	1.5e-05	88
S03M000540	E		Pu-239/240 by TRU-SPEC Resin	uCi/g	94.1	<7.26e-03	0.115	0.0097	0.102	24.7	n/a	0.014	2.7
S03M000540	E		Pu-238 by TRU-SPEC Resin IonEx	uCi/g	n/a	<0.0121	<0.0192	<0.0129	n/a	n/a	n/a	0.019	1.0e+02
S03M000540	E		Np-237 by ITA Extraction	uCi/g	75.5	<4.86e-04	<3.37e-04	<3.28e-04	n/a	n/a	n/a	7.1e-04	1.0e+02
S03M000540	E		Thorium-232 by ICP/MS	ug/g	105	0.0497	3.00	2.06	2.53	37.2	99.2	4.3e-04	n/a
S03M000540	E		Uranium-233 by ICP/MS Acid Dig	ug/g	n/a	<1.80e-03	9.13e-05	6.58e-05	7.86e-05	32.4	n/a	3.2e-05	n/a
S03M000540	E		Uranium-234 by ICP/MS Acid Dig	ug/g	n/a	<6.00e-04	3.34e-04	2.83e-04	3.08e-04	16.5	n/a	1.1e-05	n/a
S03M000540	E		Uranium-235 by ICP/MS Acid Dig	ug/g	104	<2.20e-03	0.0220	0.0190	0.0205	14.8	110	3.9e-05	n/a
S03M000540	E		Uranium-238 by ICP/MS Acid Dig	ug/g	106	<0.110	1.85	1.55	1.70	17.3	102	2.0e-03	n/a
S03M000540	E		Cobalt-60 by GEA	uCi/g	101	<2.99e-04	<3.85e-04	<3.45e-04	n/a	n/a	n/a	3.8e-04	n/a
S03M000540	E		Antimony-125 by GEA	uCi/g	n/a	<9.08e-04	<7.92e-04	<8.75e-04	n/a	n/a	n/a	7.9e-04	n/a
S03M000540	E		Cesium-134 by GEA	uCi/g	n/a	<2.92e-04	<2.98e-04	<2.89e-04	n/a	n/a	n/a	3.0e-04	n/a
S03M000540	E		Cesium-137 by GEA	uCi/g	103	<7.53e-04	<7.66e-04	<7.44e-04	n/a	n/a	n/a	7.7e-04	n/a
S03M000540	E		Europium-152 by GEA	uCi/g	n/a	<6.28e-04	<7.01e-04	<6.43e-04	n/a	n/a	n/a	7.0e-04	n/a
S03M000540	E		Europium-154 by GEA	uCi/g	n/a	<9.81e-04	<1.02e-03	<1.15e-03	n/a	n/a	n/a	1.0e-03	n/a
S03M000540	E		Europium-155 by GEA	uCi/g	n/a	<7.77e-04	<7.88e-04	<7.91e-04	n/a	n/a	n/a	7.9e-04	n/a
S03M000540	E		Am-241 by TRU-SPEC Resin IonEx	uCi/g	101	<9.60e-03	0.0532	0.0451	0.0492	16.5	n/a	0.013	3.4
S03M000540	E		Alpha of Digested Solid	uCi/g	87.0	<6.74e-04	0.145	0.127	0.136	13.2	85.5	1.6e-03	5.6
S03M000540	E		Beta of Solid Sample	uCi/g	104	<2.38e-03	0.0108	6.87e-03	8.84e-03	44.5	103	4.9e-03	33

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**Appendix 4**

**Laboratory Narrative and Chain-of-Custody Documentation**

## FINAL REPORT FOR THE SOIL SAMPLES FROM 216-Z-9 TRENCH - SAMPLE DELIVERY GROUPS 222S20030369 AND 222S20030383

### 1.0 INTRODUCTION

Two soil samples from the 216-Z-9 characterization borehole were received at the 222-S Laboratory; sample B17N46 on October 27, 2003 (sample delivery group [SDG] 222S20030369), and sample B17TM6 on October 31, 2003 (SDG 222S20030383). The samples were analyzed in accordance with the *216-Z-9 Trench Characterization Borehole Sampling and Analysis Concurrence for Analytical Requirements* (analytical instructions), the *222-S Laboratory Quality Assurance Plan* (reference 2), *Semi-Volatile Organic Compound Analysis* (reference 3), and *Volatile Organic Compound Analysis* (reference 4), referenced in the cover letter.

A Data Summary Report is included as Attachment 2. The correlation between the customer sample identification number and laboratory identification numbers is presented in the sample breakdown diagrams included as Attachment 3. Copies of the chain of custody, Request for Analysis, and Generator Knowledge Information forms are included as Attachment 4.

For sample B17N46, all detected compounds for the volatile organic analysis (VOA) were within the calibration range for the analysis of the low level sample (S03M000522), so the sample for high level VOA (S03M000523) did not require analysis.

For sample B17TM6, a very high concentration of carbon tetrachloride was detected during the analysis of the low level sample (S03M000533), and the results obtained for that analysis were unusable. The reported results were obtained from two different dilutions of the high level sample (S03M000534).

### 2.0 SAMPLE APPEARANCE AND HANDLING

Both samples (B17N46 and B17TM6) were described as moist soil. The samples were not homogenous, consisting of a mixture of coarse sand, "pea" gravel and pebbles.

The samples were stirred with a spatula prior to removing aliquots for analysis. However, with this type of sample, this method was not sufficient to achieve homogenization. The Laboratory does not have appropriate equipment to grind this type of sample to achieve better homogenization. This non-homogeneity is noted by the elevated results for the relative percent difference (RPD) between sample and duplicate results for some analytes.

For sample B17TM6, the aliquots for both the low level and high level VOA were each provided in a single amber glass bottle with no preservative. Because the bottles had to be opened in a

hood to obtain aliquots for analysis, the sample integrity was compromised and the results may be biased low.

For sample B17N46, pre-weighed vials containing preservative, water and a stir bar were provided to the project for collection of the aliquots for low level VOA. At the point of sample analysis, the chemical technologist noted that custody tape and additional labels had been added to the vials, which made it difficult to determine the weight of the samples. An attempt to determine the weight of the samples was made by weighing the vials as received, and then again after they were emptied and dried. The weight of the preservative added to the vials was already known. The stir bar weight was estimated based on the average weight of 5 stir bars. The weight of the water was estimated to be 5 g based on 5 mL of water. This allowed an estimate of the extra tape and labels to be made, which then allows the sample weight to be estimated.

### 3.0 HOLDING TIMES

The analytical instructions (reference 1) requested that the laboratory make every effort to meet the SW-846 holding times for VOA. The holding times were not met for either sample. For sample B17N46, the holding time was not met because of a combination of the 7-day delay between sampling and delivery of the samples to the laboratory and instrument operation problems. For sample B17TM6, the holding time was not met because of instrument operation problems.

### 4.0 ANALYTICAL RESULTS

The Data Summary Report, included as Attachment 2, presents the analytical results for the requested analytes. In this table, solid samples that were prepared by water digest are indicated with a "W" in the A# column. An "A" indicates an acid digest of a solid, and an "E" indicates that the stronger acid soil leach procedure was used to prepare the sample prior to analysis. Typically, if there is no letter identifier in this column, this indicates that the analysis was performed on a direct subsample with no separate preparation, or with sample preparation that was included as part of the analytical procedure steps.

Note that for the ion chromatography (IC) and inductively coupled plasma (ICP) spectroscopy analyses, the results reported for the blank are actually  $\mu\text{g/mL}$ , rather than  $\mu\text{g/g}$  as indicated in the Data Summary Report.

### 5.0 QUALITY CONTROL RESULTS (QC)

#### 5.1 LABORATORY CONTROL STANDARDS

Most laboratory control standard (LCS) recoveries were acceptable in accordance with the 222-S Laboratory Quality Assurance Plan (QAPP-016) (Clark 2003), referenced in the cover letter. For the semi-volatile organic analysis (SVOA) of sample B17N46 (S03M000525), one of the 11 compounds (n-Nitroso-di-n-propylamine) in the LCS had a recovery that was slightly below the requested range of 70% - 130% recovery. However, the reported recovery of 65% is typical of what is normally achieved for this compound so no reanalysis was requested based on the low recovery.

For the SVOA of sample B17TM6 (S03M000537), 5 of the 11 compounds in the LCS (the acid compounds) had recoveries above the requested range of 70% - 130% recovery. Following the analysis, the chemist noted that the standard might have been concentrated because of evaporation. Subsequent analysis of a new standard gave acceptable recoveries. The high recoveries could indicate a high bias in the reported results. However, because these compounds were not identified in the sample, no reanalysis was requested based on these high recoveries.

## 5.2 METHOD AND PREPARATION BLANKS

For most analyses, no analytes were detected in the method or preparation blank. However, for the IC analysis of sample B17N46 (S03M000553), chloride was detected in the water digest preparation blank. The sample was re-prepared two additional times and these results were determined to be the best, based on the results reported for nitrite. The level of nitrite detected in the other two blanks was greater than that detected in the sample. The concentration of chloride in the blank is about 22% of that reported for the sample. Comparison of results from the other two digests indicates that the reported sample results are biased high by about 22% - 29% because of this contamination.

Nitrite was reported in the blank prepared and analyzed with sample B17TM6 (S03M000561). The blank result was greater than that reported for the sample. This sample was also re-prepared two additional times. At the time of this analysis, the source of the contamination could not be determined. Because no nitrite was detected in the sample, no additional preparations were performed. The contamination issue is still under investigation.

For the ICP analysis of sample B17TM6 (S03M000559), lead (Pb), antimony (Sb), and zinc (Zn) contamination were detected in the acid digestion preparation blank. The concentration of Zn in the blank is less than 5% of that detected in the sample and was considered insignificant in accordance with QAPP-016 (Clark 2003). However, the concentration of Pb in the blank is 78% of that measured in the sample and the level of Sb in the blank is 113% of that detected in the sample. These results are reported from the third preparation of the sample. No further digestions were prepared because the duplicate results for Pb and Sb were both less than the reported detection limit, and previous results indicated that neither Pb nor Sb are present in the sample. Therefore, the results reported for Pb and Sb for the sample portion should be considered biased high due to contamination.

## 5.3 DUPLICATE ANALYSES

The requested precision for analysis was a relative percent difference (RPD)  $\pm$  20% for radionuclides and  $\pm$  30% for all other methods. Most analyte results met these criteria, except as noted below.

A duplicate sample was analyzed for both samples for most methods. However, after most analyses were completed, the project point of contact requested that the laboratory batch the two samples together for remaining analyses. Therefore, for the IC analysis, a duplicate was analyzed with sample B17N46 only.

For sample B17N46, an RPD greater than 20% was reported for total beta analysis for sample S03M000528. RPDs greater than 30% were reported for barium (Ba), cadmium (Cd), Pb, and Zn for sample S03M000527, and acetone for sample S03M000522. The RPD criterion was not

applicable for Cd and Pb, in accordance with QAPP-016 (reference 2), because the sample results were less than 10 times the method detection limit. The other high RPDs were attributed to sample inhomogeneity and no re-preparation and reanalysis was requested because the laboratory does not have equipment available to provide adequate homogenization of this type of sample matrix.

For sample B17TM6, RPDs greater than 20% were reported for plutonium-239/240 ( $^{239/240}\text{Pu}$ ), thorium-232 ( $^{232}\text{Th}$ ), uranium-233 ( $^{233}\text{U}$ ), and total beta analysis for sample S03M000540. However, the counting error for the beta analysis is greater than 15% and the  $^{233}\text{U}$  result is less than 10 times the method detection limit, so the RPD criterion is not applicable for those two analytes. An RPD greater than 30% was reported for strontium (Sr) for sample S03M000559, but the criterion was not applicable because the sample results were less than 10 times the method detection limit. The other high RPDs were attributed to sample inhomogeneity and no re-preparation and reanalysis was requested because the laboratory does not have equipment available to provide adequate homogenization of this type of sample matrix.

Duplicate analyses for the SVOA and polychlorinated biphenyl (PCB) analysis was performed by comparing a matrix spike (MS) with a matrix spike duplicate (MSD). The results of this comparison are discussed in the next section. For sample B17N46 VOA, both a duplicate and MSD were analyzed because some compounds were expected to be present in the sample.

For sample B17TM6 VOA, only an MS and MSD were analyzed. However, since chloroform, tetrachloroethene and carbon tetrachloride were detected in the sample, but were not compounds present in the spike solution, the results from the sample MS and MSD analyses can be compared as triplicates to provide precision information for the analysis. The results are presented in Table 1 and a percent relative standard deviation (%RSD) was calculated to give an indication of the precision. The %RSDs were less than 30%, which indicates that the analysis met the precision requirement.

Table 1. Triplicate Analysis Results for Sample B17TM6 (S03M000534).

Compound	Result ( $\mu\text{g}/\text{Kg}$ )	MS ( $\mu\text{g}/\text{Kg}$ )	MSD ( $\mu\text{g}/\text{Kg}$ )	%RSD
Chloroform	4.88e+3	5.46e+3	4.73e+3	7.7
Tetrachloroethane	1.70e+4	1.76e+4	1.66e+4	2.9
Carbon tetrachloride	3.76e+5	2.87e+5	3.13e+5	14.0

#### 5.4 MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

An MS sample was analyzed for both samples for most methods. However, after most analyses were completed, the project point of contact requested that the laboratory batch the two samples together for remaining analyses. Therefore, for the total uranium and IC analyses, an MS was analyzed with sample B17N46 only.

MS samples were analyzed with all methods except for pH,  $^{239/240}\text{Pu}$ ,  $^{238}\text{Pu}$ ,  $^{90}\text{Sr}$ , neptunium-237 ( $^{237}\text{Np}$ ), americium-241 ( $^{241}\text{Am}$ ) and the isotopes reported by gamma energy analysis (GEA). For VOA and SVOA, the analytical instructions (reference 1) requested that the laboratory report

spike recoveries only for the representative set of compounds indicated in the letters from H. L. Anastos (references 3 and 4). However, for VOA, some ketones were part of the standard mix used. Although the ketones were not required to be reported, for sample B17N46, acetone and 2-butanone recoveries and RPDs were discussed because those compounds were detected in the sample. For sample B17TM6, the ketones weren't reported because they were not requested by customer and no ketones were detected in the samples.

For PCB analysis, only aroclor-1254 is included in the matrix spike because it is the aroclor most commonly detected in samples on the Hanford site.

Most MS and/or MSD recoveries met the requirements in the analytical instructions (reference 1), except as noted below.

For sample B17N46 (S03M000525), most of the SVOA spike compounds (except pyrene) failed to meet the requirements. The low recoveries were attributed to a possible matrix effect because the recoveries for those compounds in the LCS were all acceptable (except for n-nitroso-di-n-propylamine, as noted previously). No reanalysis was requested because the sample matrix would still affect reanalysis results.

For sample B17TM6 (S03M000537) SVOA, most of the compounds failed to meet the requirements for MS and MSD recoveries because of the 50-fold dilution that was required to reduce the concentration of tri-n-butylphosphate so that it was within the calibration range. No reanalysis was requested because the same dilution would be required on the reanalysis and it is impractical to add sufficient spike solution for this sample where a substantial dilution is required.

For sample B17N46 (S03M000522) VOA, acetone and n-butanone have high recoveries. Because the LCS recoveries of these compounds were within the requested control limits, the high MS recoveries were attributed to a possible matrix effect that causes increased purging efficiencies for ketones. Again, no reanalysis was requested because of these MS recovery failures because a reanalysis was not expected to improve the results. The results reported for these two compounds should be considered biased high.

The RPDs between the MS and MSD for the PCB analyses met the requirements in the analytical instructions (reference 1). Some of the RPDs for the MS/MSDs analyzed with the VOA and SVOA failed to meet the requirements. The failures were attributed to the previously discussed matrix effects, so no reanalysis was requested.

The Data Summary Report included as Attachment 2 does not report the recoveries for the MSD analysis or the RPD for the MS/MSD analysis. This information is provided in Table 2 and Table 3 for VOA, Table 4 and Table 5 for SVOA and Table 6 and Table 7 for PCB analysis.

Table 2. MS/MSD Recoveries and RPDs for VOA for B17N46.

Compound	MS (%)	MSD (%)	RPD (%)
Benzene	98	101	3
Chlorobenzene	104	100	4
1,1-Dichloroethene	100	103	3
Toluene	95	92	3

**Table 2. MS/MSD Recoveries and RPDs for VOA for B17N46.**

Compound	MS (%)	MSD (%)	RPD (%)
Trichloroethene	115	119	3
Acetone	158 †	172 †	8
2-Butanone	140 †	190 †	30 †

† - spike recovery or RPD failed to meet customer requirements

**Table 3. MS/MSD Recoveries and RPDs for VOA for B17TM6.**

Compound	MS (%)	MSD (%)	RPD (%)
Benzene	110	115	4
Chlorobenzene	114	116	2
1,1-Dichloroethene	98	111	12
Toluene	110	113	3
Trichloroethene	102	103	1

**Table 4. MS/MSD Recoveries and RPDs for SVOA for B17N46.**

Compound	MS (%)	MSD (%)	RPD (%)
Phenol	67 †	65 †	3
2-Chlorophenol	61 †	61 †	0
1,4-Dichlorobenzene	8 †	73 †	48 †
N-Nitroso-di-n-propylamine	35 †	42 †	18
1,2,4-Trichlorobenzene	33 †	36 †	9
4-Chloro-3-methylphenol	55 †	62 †	12
Acenaphthene	64 †	66 †	3
4-Nitrophenol	53 †	65 †	20
2,4-Dinitrotoluene	54 †	63 †	15
Pentachlorophenol	51 †	63 †	21
Pyrene	89	92	4

† - spike recovery or RPD failed to meet customer requirements

**Table 5. MS/MSD Recoveries and RPDs for SVOA for B17TM6.**

Compound	MS (%)	MSD (%)	RPD (%)
Phenol	78	89	24
2-Chlorophenol	77	90	16
1,4-Dichlorobenzene	48 †	55 †	14
N-Nitroso-di-n-propylamine	23 †	47 †	68 †
1,2,4-Trichlorobenzene	47 †	67 †	35 †
4-Chloro-3-methylphenol	64 †	55 †	15 †
Acenaphthene	56 †	65 †	15 †
4-Nitrophenol	0 †	0 †	N/A

**Table 5. MS/MSD Recoveries and RPDs for SVOA for B17TM6.**

Compound	MS (%)	MSD (%)	RPD (%)
2,4-Dinitrotoluene	0 †	0 †	N/A
Pentachlorophenol	0 †	0 †	N/A
Pyrene	50 †	59 †	16

† - spike recovery or RPD failed to meet customer requirements

N/A - calculation not applicable

**Table 6. MS/MSD Recoveries and RPDs for PCB for B17N46.**

Compound	MS (%)	MSD (%)	RPD (%)
Aroclor 1254	76	72	5

**Table 7. MS/MSD Recoveries and RPDs for PCB for B17TM6.**

Compound	MS (%)	MSD (%)	RPD (%)
Aroclor 1254	120	106	12

## 5.5 SURROGATE RECOVERIES

Surrogate standards are added to all field and QC samples for VOA, SVOA and PCB analyses. The surrogate is added to monitor total method recovery through preparation, sample matrix cleanup and analysis.

Surrogates standard recoveries for VOA for sample B17N46 (S03M000522) met the requirements in QAPP-016 (reference 2). For the VOA for sample B17TM6 (S03M000534), dibromofluoromethane (DBFM) failed high by 4% on the sample aliquot. This failure was attributed to interference from the adjacent carbon tetrachloride peak, which exceeded the calibration curve and saturated the detector. This surrogate passed on the MS and MSD and on subsequent reanalysis of the diluted extract. Therefore, the reported sample results were considered acceptable.

Surrogates standard recoveries for PCB for sample B17N46 (S03M000522) met the requirements in QAPP-016 (reference 2). For the PCB analysis of sample B17TM6 (S03M000538), the recovery for decachlorobiphenyl in the LCS was slightly high. However, the reported results for the analysis were considered acceptable because the LCS, MS and MSD recoveries for the analysis all met the requirements.

For the SVOA for sample B17N46 (S03M000525), the recovery for nitrobenzene-d5 (one of 6 surrogates) failed to meet the requirements in QAPP-016 (reference 2). Administrative limits are set at 50% - 100% recovery. Recoveries for nitrobenzene-d5 ranged from 0% - 10% in the method blank, LCS, sample, MS, and MSD. The other 5 surrogates all had acceptable recoveries. The cause for the low recovery is unknown, however, the other base-neutral compounds that were spiked appear to be unaffected. Of the compounds of interest, only

n-tributylphosphate is in the base/neutral class. It is not chemically similar to nitrobenzene-d5, and is not likely to be affected by the poor recovery.

For the SVOA for sample B17TM6 (S03M000537), low surrogate recoveries were obtained because of the required 50-fold dilution. As discussed with the MS and MSD recovery failures, no reanalysis was requested based on these low recoveries. The sample results are considered usable.

## 5.6 OPPORTUNISTIC ANALYTES

The analytical instructions (reference 1) requested that the laboratory report opportunistic analyte results from the SVOA. These results are considered opportunistic because they are compounds that are calibrated for in the method, but are not requested.

For sample B17N46 (S03M000525), two opportunistic compounds were detected in the sample. Dimethylphthalate (chemical abstract system (CAS) number 131-11-3) was detected with a concentration of  $1.38 \times 10^3$   $\mu\text{g}/\text{Kg}$ . Diethylphthalate (CAS number 84-66-2) was detected with a concentration of  $4.31 \times 10^3$   $\mu\text{g}/\text{Kg}$ . Both of these results should be considered estimates because they were not greater than 10 times the detection limit of 960  $\mu\text{g}/\text{Kg}$ .

For sample B17TM6 (S03M000537), no opportunistic compounds were detected.

## 5.7 TENTATIVELY IDENTIFIED COMPOUNDS

The analytical instructions (reference 1) list five compounds for VOA that the laboratory does not routinely report, as indicated in the letter from H. L. Anastos (reference 4). The laboratory was requested to perform a tentatively identified compound (TIC) search for these compounds. These compounds were not detected in either of the two samples. However, several other TICs were identified, as discussed below. TICs are identified by the instrument library search based only on masses in the spectra and are not based on retention times or verified with independent check standards. These compounds could be misidentified because of matrix effects. The concentrations are estimated based only on the nearest internal standard and a presumed response factor of 1.

For sample B17N46 (S03M000525) SVOA, an unknown phthalate was reported as a TIC. However, this unknown phthalate was also detected in the LCS and the preparation blank and, therefore, was considered to be contamination from an unknown source of plastic and not related to the sample matrix. In addition, 2,2'-methylenebis[6-tert-butyl-4-ethylphenol] (CAS# 88-24-4) was detected with estimated concentrations of  $3.0 \times 10^3$   $\mu\text{g}/\text{Kg}$  in the MS and  $5.5 \times 10^3$   $\mu\text{g}/\text{Kg}$  in the MSD.

For sample B17TM6 (S03M000534) VOA, two compounds were detected as TICs in the sample portion as well as the MS and MSD. Bromobenzene (CAS# 108-86-1) was detected with an estimated concentration of  $4.0 \times 10^3$   $\mu\text{g}/\text{Kg}$  in the sample,  $4.2 \times 10^3$   $\mu\text{g}/\text{Kg}$  in the MS and  $4.1 \times 10^3$   $\mu\text{g}/\text{Kg}$  in the MSD. Estimated concentrations of hexachloroethane (CAS# 67-72-1) were  $8.5 \times 10^4$   $\mu\text{g}/\text{Kg}$  in the sample,  $9.0 \times 10^4$   $\mu\text{g}/\text{Kg}$  in the MS, and  $8.7 \times 10^4$   $\mu\text{g}/\text{Kg}$  in the MSD. In addition, nonanal (CAS# 124-19-6) was detected in the MS with an estimated concentration of  $3.9 \times 10^3$   $\mu\text{g}/\text{Kg}$  and in the MSD with an estimated concentration of  $2.2 \times 10^3$   $\mu\text{g}/\text{Kg}$ . Tridecane (CAS# 629-50-5) was only detected in the MS with an estimated concentration of  $1.0 \times 10^3$   $\mu\text{g}/\text{Kg}$ .

No other compounds were reported as TICs from either the VOA or SVOA for the two samples.

#### 5.8 TARGET QUANTITATION LIMITS

The laboratory was unable to meet all of the requested target quantitation limits due to necessary dilutions of the samples. These dilutions ensured analyte concentrations did not exceed calibration ranges and avoided contamination and carry-over problems. The laboratory used the largest feasible sample sizes.

## 6.0 ANALYTICAL PROCEDURES

Table 8 presents the 222-S Laboratory analytical procedures used to generate the reported results.

Table 8. Analytical Procedures.

Analysis	Preparation Procedure	Analysis Procedure
<b>Inorganic Analyses</b>		
pH	Direct	LA-212-105 Rev. D-0
Hg	Direct	LA-325-106 Rev. C-0
CN	Direct	LA-695-102 Rev. I-2
NH <sub>4</sub>	Water Digest	LA-533-101 Rev. K-0
IC	Water Digest	LA-533-107 Rev. C-2
Sulfide	Direct	LA-361-101 Rev. A-0
Total U	Acid Digest	LA-925-009 Rev. D-5
ICP	Acid Digest	LA-505-161 Rev. D-1
ICP-MS	Acid Digest	LA-506-101 Rev. C-0
<b>Radionuclide Analyses</b>		
AT/TB	Environmental Digest	LA-508-101 Rev. I-1
GEA	Environmental Digest	LA-548-121 Rev. F-5
<sup>90</sup> Sr	Environmental Digest	LA-220-101 Rev. F-0
<sup>237</sup> Np	Environmental Digest	LA-933-141 Rev. H-7
<sup>238</sup> Pu, <sup>239/240</sup> Pu	Environmental Digest	LA-953-104 Rev. D-0
<sup>241</sup> Am	Environmental Digest	LA-953-104 Rev. D-0
<b>Organic Analyses</b>		
VOA	Direct	LA-523-118 Rev. A-2
SVOA	Organic Extraction	LA-523-135 Rev. A-1
PCB	Organic Extraction	LA-523-140 Rev. B-0

**Abbreviations:**

Hg - mercury  
 CN - cyanide  
 NH<sub>4</sub> - ammonium  
 IC - ion chromatography  
 Total U - total uranium  
 ICP - inductively coupled plasma  
 ICP/MS - ICP/mass spectrometry  
 AT/TB - total alpha/total beta  
 GEA - gamma energy analysis

<sup>90</sup>Sr - strontium-90  
<sup>237</sup>Np - neptunium-237  
<sup>238</sup>Pu - plutonium-238  
<sup>239/240</sup>Pu - plutonium-239/240  
<sup>241</sup>Am - americium-241  
 VOA - volatile organic analysis  
 SVOA - semi-volatile organic analysis  
 PCB - polychlorinated biphenyls

**Notes:**

Acid digest procedure: LA-505-163 Rev. D-1  
 Water digest procedure: LA-504-101 Rev. I-0

Environmental acid digest procedure: LA-544-101 Rev. C-5  
 Organic extraction procedure: LA-523-138 Rev. C-2

FH-Central Platenn Project		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				F03-018-53	Page 1 of 1
Collector Pope/Pfister/Hughes	Company Contact Steve Trent	Telephone No. 373-5869	Project Coordinator TRENT, SJ		Price Code 8N	Data Turnaround 60 Days	
Project Designation 216-2-9 Trench Characterization Borehole - Soil	Sampling Location 216-2-9/C3426 - Interval 23'-25' 7"	43.5' - 44'	SAP No. F03-018		Air Quality <input type="checkbox"/>		
Ice Chest No. VIKING 4HZV	Field Logbook No. HNF-N-3361	COA 119152ES20	Method of Shipment Government Vehicle				
Shipped To 222-S Lab Operations	Offsite Property No. N/A	Bill of Lading/Air Bill No. N/A					
<b>POSSIBLE SAMPLE HAZARDS/REMARKS</b> RADIOACTIVE TAG TO: B17N46 Hazard: Corrosive (Acidic) Special Handling and/or Storage SAMPLERS TO PUT 5 g soil into each vial with the encore sampler. Bottles are pre-labeled. Write the file number from the chain on each vial.				Preservation Cool 4C NONE COOL 4C	Type of Container aCa P a65 *	No. of Container(s) 5 1 1	Volume 50mL 500 mL 40 mL
<b>SAMPLE ANALYSIS</b>				See item (1) in special instructions SEE ITEM (2) IN SPECIAL INSTRUCTIONS SEE ITEM (U)			
Sample No.	Matrix *	Sample Date	Sample Time				
B17N46	SOIL	10/20/03	1029	X	X	X	
<b>CHAIN OF POSSESSION</b>				<b>SPECIAL INSTRUCTIONS</b> ** 222-S Laboratory will provide 40 mL VOA vials that have been pre-preserved with sodium bisulfite. (1) VOA - 8260A - Complete; VOA - 8260A (Add-On) (Acetonitrile, Hexane, n-Butylbenzene)		Matrix * S=Soil SE=Soil/soot SO=Soil/s SI=Sludge W=Water O=Oil A=Air DS=Dross Solids DL=Dross Liquid T=Trace W=Wipe L=Liquid V=Vegetation S=Other	
Relinquished By/Removed From JSA/PE/ASR	Date/Time 10/20/03 1430	Received By/Stored In AAA/CHANGE ROOM	Date/Time 10/20/03 1450	Contact: Mark Duenstherer 373-7116			
Relinquished By/Removed From CHANGE TRUCK	Date/Time 10/22/03 1300	Received By/Stored In SITE FRIDGE	Date/Time 10/22/03 1300				
Relinquished By/Removed From SITE FRIDGE	Date/Time 10/27/03 1300	Received By/Stored In GREG THOMAS/ALYSSA THOMAS	Date/Time 10/27/03 1300				
Relinquished By/Removed From GREG THOMAS/ALYSSA THOMAS	Date/Time 10/27/03 1330	Received By/Stored In SALIE DIER	Date/Time 10/27/03 1335				
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time				
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time				
LABORATORY SECTION	Received By	Title		Date/Time			
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By		Date/Time			

BH-EE-011 (03/01/2002)

FH-Central Plateau Project		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST			F03-018-54		Page 1 of 1	
Collector Pope/Pfister/Hughes	Company Contact Steve Trent	Telephone No. 373-3809	Project Coordinator TRENT, SJ		Price Code 8N	Data Turnaround 60 Days		
Project Designation 216-Z-9 Trench Characterization Borehole - Soil	Sampling Location 216-Z-9/C3426 - Interval 25-25.7	43.5' - 46'		SAF No. F03-018	Air Quality <input type="checkbox"/>			
Ice Chest No. VIKING 4H2V	Field Logbook No. HNF-N-3361	COA 119152ES10	Method of Shipment Government Vehicle					
Shipped To 222-S Lab Operations	Office Property No. N/A	Bill of Lading/Air Bill No. N/A						
POSSIBLE SAMPLE HAZARDS/REMARKS RADIOACTIVE TIE TO: B17NM8				Preservation Cool				
Special Handling and/or Storage SAMPLERS: Collect 25 g with the encore sampler. If the rate is 0.5 m/min/hr this sample can be taken to WSCF. Sample analysis must occur in 48 hours or preserve with methanol.				Type of Container 2X DUCK	0			
				No. of Container(s)	1			
				Volume	25g			
SAMPLE ANALYSIS				See item (1) in special instructions.				
Sample No.	Matrix *	Sample Date	Sample Time					
B17NM8 B17N46 PMG 10/27/03	SOIL	10-20-03	1029	X				
CHAIN OF POSSESSION				Sign/Print Names	SPECIAL INSTRUCTIONS			Matrix *
Relinquished By/Removed From SS Pope/Hughes	Date/Time 10/20/03 1430	Received By/Stored In RMA/Chance Trailer	Date/Time 10/20/03 1430	(1) VOA - 8260A - Complete; VOA - 8260A (Add-On) [Acetonitrile, Hexane, n-Butylbenzene]			S-Soil SS-Sediment SO-Solid SL-Sludge W-Water O-Oil A-Air D-Drum Solids DL-Drum Liquids T-Tissue W-Wipe L-Liquid V-Vegetation X-Other	
Relinquished By/Removed From RMA/Chance Trailer	Date/Time 10/20/03 1300	Received By/Stored In Site fridge	Date/Time 10/20/03 1300					
Relinquished By/Removed From Site fridge	Date/Time 10/27/03 1300	Received By/Stored In Greg Thomas/Drug Thomas	Date/Time 10/27/03 1300					
Relinquished By/Removed From Greg Thomas/Drug Thomas	Date/Time 10/27/03 1330	Received By/Stored In Sealed bag #4	Date/Time 10/27/03 1335					
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time					
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time					
LABORATORY SECTION	Received By	Title		Date/Time				
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By		Date/Time				

BH-EE-011 (03/01/2002)

011196



FLUOR Hanford Inc.		CENTRAL PLATEAU CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				F03-018-069		Page 1 of 1			
Collector Pope/Pfister/Hughes		Company Contact Steve Trent		Telephone No. 373-5869		Project Coordinator TRENT, SJ		Price Code 8N Data Turnaround 45 Days			
Project Designation 216-Z-9 Trench Characterization (Borehole - Soil)		Sampling Location 216-Z-9/C3426 - Interval		SAF No. F03-018		Air Quality <input type="checkbox"/>					
Ice Chest No. V11116-442V		Field Logbook No. HNF-N-3361		COA 119152ES10		Method of Shipment Government Vehicle					
Shipped To <i>MMS 10/31/03</i> Waste Sampling & Characterization 222-5		Offsite Property No. -N/A- <i>RSR 106973</i>		Bill of Lading/Air Bill No. N/A							
POSSIBLE SAMPLE HAZARDS/REMARKS RADIOACTIVE TIE TO: <i>B77M04</i>				Preservation		Cool 4C	Cool 4C	Cool 4C	Cool 4C	None	None
Special Handling and/or Storage SAMPLERS: Fill VOA vials with zero head space.				Type of Container		30a*	aG	aG	64P 26A	aG	P
				No. of Container(s)		3	1	1	1	1	1
				Volume		40mL	120mL 60mL	120mL 60mL	120mL 60mL	500mL	
SAMPLE ANALYSIS				See Item (1) in Special Instructions.		See Item (2) in Special Instructions.	FCB-1002	See Item (3) in Special Instructions.	See Item (4) in Special Instructions.	See Item (5) in Special Instructions.	
				<i>MMS 10/31/03</i>				<i>MMS 10/31/03</i>			
				<i>MMS 10/31/03</i>				<i>MMS 10/31/03</i>			
Sample No.	Matrix *	Sample Date	Sample Time								
B77M8	SOIL	10/29/03	0856	X	X	X	X	X	X		
							<i>MMS 10/31/03</i>		<i>MMS 10/31/03</i>		
CHAIN OF POSSESSION				Sign/Print Names				SPECIAL INSTRUCTIONS			
Relinquished By/Removed From <i>JS Pate 10/28/03 14:00</i>		Date/Time		Received By/Stored In <i>Steve Trent 10/28/03 14:00</i>		Date/Time		<p>The lab is to achieve a detection limit of 5 pCi/g &amp; 10 pCi/g for gross alpha and beta, respectively.</p> <p>(1) VOA - 8260A (TCL); VOA - 8260A (Add-On) (1-Butanol, Acetonitrile, cis-1,2-Dichloroethylene, Hexane, n-Butylbenzene, trans-1,2-Dichloroethylene)</p> <p>(2) Semi-VOA - 8270A (TCL); Semi-VOA - 8270A (Add-On) (1,2,4-Trimethylbenzene, Cyclohexanone, Tributyl phosphate); TPH-Diesel Range - WTPH-D (Total petroleum hydrocarbons - diesel range, Total petroleum hydrocarbons - kerostene range)</p> <p>(3) ICP Metals - 6010A (TAL); ICP Metals - 6010A (Add-on) (Arsenic, Beryllium, Bismuth, Lead, Lithium, Phosphorus, Selenium, Strontium); ICP/MS - 200.8 (Add-on) (Mercury, Uranium)</p> <p>(4) IC Anions - 300.0 (Chloride, Fluoride, Nitrogen in Nitrate, Nitrogen in Nitrite, Phosphate, Sulfate); Cations (IC) - 300.7 (Nitrogen in ammonium); Total Cyanide - 9010; pH (Soil) - 9045</p> <p>(5) Gross Alpha; Gross Beta; Gamma Spectroscopy (Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155); Gamma Spec - Add-on (Antimony-125, Cesium-134); Americium-241; Isotopic Plutonium; Isotopic Uranium; Neptunium-237</p>			
Relinquished By/Removed From <i>Steve Trent 10/29/03 09:00</i>		Date/Time		Received By/Stored In <i>M.A. Bucher 10/29/03</i>		Date/Time					
Relinquished By/Removed From <i>M.A. Bucher 10/31/03 10:00</i>		Date/Time		Received By/Stored In <i>Steve Trent 10/31/03</i>		Date/Time					
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time					
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time					
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time		Matrix *			
LABORATORY SECTION		Received By <i>DO</i>		Title		Date/Time				S-Sol SD-Solid S-Solids W-Water O-Oil A-Air DS-Dross Solids DL-Dross Liquid T-Tissue WI-Wipe L-Liquid V-Vegetation X-Other	
FINAL SAMPLE DISPOSITION		Disposal Method <i>X</i>		Disposed By				Date/Time			

A-6003-618(03/03)



### GENERATOR KNOWLEDGE INFORMATION

1. Chain of Custody Number \_\_\_\_\_ CACN/COA 118478BS20 Customer Identification Number \_\_\_\_\_

2. List generator knowledge or description of process that produced sample. Or list description of sample source:  
216-2-9 Trench DNAPL Investigation

MSDS Available?  No  Yes Hanford MSDS No. \_\_\_\_\_

3. List all waste codes and constituents associated with the waste or media that was sampled, regardless of CERCLA status.

a) Does the sample contain any of the following listed waste codes?

*By checking "unknown" the customer understands that no knowledge is available following a careful search.*

List Federal Waste Code(s):

List Constituent(s):

P Codes: \_\_\_\_\_  Yes  No  Unknown

U Codes: \_\_\_\_\_  Yes  No  Unknown

R Codes: \_\_\_\_\_  Yes  No  Unknown

F Codes: F001 Carbon tetrachloride  Yes  No  Unknown

b) List applicable characteristic waste codes, flash point, pH, constituents, and concentrations as appropriate.

D001:  FP <100°F  FP ≥100 <140°F  DOT Oxidizer  Yes  No  Unknown

D002:  pH ≤2  pH ≥12.5  Solid Corrosive (WSC2)  Yes  No  Unknown

D003:  Cyanide  Sulfide  Water Reactive  Other \_\_\_\_\_  Yes  No  Unknown

D004-D043 (Identify applicable waste codes and concentrations): \_\_\_\_\_  Yes  No  Unknown  
(i.e., peroxide former, explosive, air reactive)

c) If characteristic, list any known underlying hazardous constituents (UHCs) reasonably expected to be present, and their concentrations that may be present above the LDR treatment standard (40 CFR 268.48):

N/A

d) List any known Land Disposal Restrictions (LDR) subcategories, if applicable (40 CFR 268.40):

N/A

e) List any applicable Washington State dangerous waste codes: (not required if federally regulated) (\*State mixture rule for ignitability)

WT01:  Yes  No  Unknown

WP01:  Yes  No  Unknown

WT02:  Yes  No  Unknown

WP02:  Yes  No  Unknown

WT03:  Yes  No  Unknown

WP03:  Yes  No  Unknown

List constituents and concentrations:

F003:  Yes  No  Unknown

4. Is this material TSCA regulated for PCBs?  Yes  No  Unknown  Analysis Requested

List concentration if applicable: \_\_\_\_\_

If yes, what is the source of the PCBs? (see TSCA PCB Hanford Site User Guide, DOE/RL-2001-50)

- |  |   |   |                                  |
|--|---|---|----------------------------------|
| <input type="checkbox"/> PCB Liquid Waste      | <input type="checkbox"/> PCB Bulk Product Waste | <input type="checkbox"/> PCB Transformer ≥500 ppm   | <input type="checkbox"/> Unknown |
| <input type="checkbox"/> PCB Remediation Waste | <input type="checkbox"/> PCB R&D Waste          | <input type="checkbox"/> PCB-contaminated electrical equipment (capacitor/ballast) <500 ppm |                                  |
| <input type="checkbox"/> PCB Spill Material    | <input type="checkbox"/> PCB Item               | <input type="checkbox"/> Other PCB Waste (list) _____                                       |                                  |

5. Is this material TRU?  Yes  No  Unknown

000030

**6. ACCURACY OF INFORMATION**

Based on my inquiry of those individuals immediately responsible for obtaining this information, that to the best of my knowledge, the information entered in this document is true, accurate, and complete.

Print & Sign \_\_\_\_\_

Date 10/6/03

**Appendix 5**

**Data Validation Supporting Documentation**

APPENDIX A

RADIOCHEMICAL DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
PROJECT:	216-Z-9 Vertical	Borehole	DATA PACKAGE: 222S20030383 and -0369		
VALIDATOR:	JR Jewett	LAB:	222-S	DATE:	6/15/06
SDG:					
ANALYSES PERFORMED					
Gamma Alpha Beta	Scintillation	Thin-layer	Alpha Spectrometry	Gamma Spectrometry	
Total Uranium	Radium-22	Tritium		Strontium-90	
SAMPLES/MATRIX					
	B17 N46	Soil			
	B17 TM6	Soil			

1. Completeness .....  N/A

Technical verification forms present? .....  Yes  No  N/A

Comments:

Carrier recovery info was not in report, but was provided in e-mail from lab.  
See App. 6 of DVR.

2. Initial Calibration (Levels D, E) .....  N/A

Instruments/detectors calibrated? ..... Yes No N/A

Initial calibration acceptable? ..... Yes No N/A

Standards NIST traceable? ..... Yes No N/A

Standards Expired? ..... Yes No N/A

Calculation check acceptable? ..... Yes No N/A

Comments:

3. Continuing Calibration (Levels D, E) .....  N/A

Calibration checked within required frequency? ..... Yes No N/A

Calibration check acceptable? ..... Yes No N/A

Calibration check standards traceable? ..... Yes No N/A

Calibration check standards expired? ..... Yes No N/A

Calculation check acceptable? ..... Yes No N/A

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. Background Counts (Levels D, E) .....  N/A

Background Counts checked within required frequency? ..... Yes No N/A

Background Counts acceptable? ..... Yes No N/A

Calculation check acceptable? ..... Yes No N/A

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5. Blanks (Levels B, C, D, E) .....  N/A

Method blank analyzed within required frequency? .....  Yes  No  N/A

Method blank results acceptable? .....  Yes  No  N/A

Analytes detected in method blank? .....  Yes  No  N/A

Field blank(s) analyzed? .....  Yes  No  N/A

Field blank results acceptable? .....  Yes  No  N/A

Analytes detected in field blank(s)? .....  Yes  No  N/A

Transcription/Calculation Errors? (Levels D, E) .....  Yes  No  N/A

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

6. Laboratory Control Samples or Blank Spike Samples (Levels C, D, E) .....  N/A

LCS /BSS analyzed within required frequency? .....  Yes  No  N/A

LCS/BSS recoveries acceptable? .....  Yes  No  N/A

LCS/BSS traceable? (Levels D,E) .....  Yes  No  N/A

LCS/BSS expired? (Levels D,E) .....  Yes  No  N/A

LCS/BSS levels correct? (Levels D,E) .....  Yes  No  N/A

Transcription/Calculation Errors? (Levels D, E) .....  Yes  No  N/A

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

7. Chemical Carrier Recovery (Levels C, D, E) .....  N/A

Chemical carrier added? .....  Yes  No  N/A

Chemical recovery acceptable? .....  Yes  No  N/A

Chemical carrier traceable? (Levels D, E) .....  Yes  No  N/A

Chemical carrier expired? (Levels D, E) ..... Yes No N/A

Transcription/Calculation errors? (Levels D, E) ..... Yes No N/A

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

8. Tracer Recovery (Levels C, D, E) .....  N/A

Tracer added? ..... Yes No N/A

Tracer recovery acceptable? ..... Yes No N/A

Tracer traceable? (Levels D, E) ..... Yes No N/A

Tracer expired? (Levels D, E) ..... Yes No N/A

Transcription/Calculation errors? (Levels D, E) ..... Yes No N/A

Comments: Not used in Sr-90 method

06/06

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

9. Matrix Spikes (Levels C, D, E) .....  N/A

Matrix spike analyzed? ..... Yes No N/A

Spike recoveries acceptable? ..... Yes No N/A

Spike source traceable? (Levels D, E) ..... Yes No N/A

Spike source expired? Levels D, E) ..... Yes No N/A

Transcription/Calculation Errors? (Levels D, E) ..... Yes No N/A

Comments: \_\_\_\_\_

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\_\_\_\_\_

10. Duplicates (Levels C, D, E) .....  N/A

Duplicates Analyzed at required frequency? .....  Yes  No  N/A

RPD Values Acceptable? .....  Yes  No  N/A

Transcription/Calculation Errors? (Levels D, E) .....  Yes  No  N/A

Comments:

~~RPD for BITTM6 was 52%.~~  
~~Results > ESA RDL Flagged "J"~~

11. Field QC Samples (Levels C, D E) .....  N/A

Field duplicate sample(s) analyzed? .....  Yes  No  N/A

Field duplicate RPD values acceptable? .....  Yes  No  N/A

Field split sample(s) analyzed? .....  Yes  No  N/A

Field split RPD values acceptable? .....  Yes  No  N/A

Performance audit sample(s) analyzed? .....  Yes  No  N/A

Performance audit sample results acceptable? .....  Yes  No  N/A

Comments:

12. Holding Times (All levels)

Are sample holding times acceptable? .....  Yes  No  N/A

Comments:

13. Results and Detection Limits (All Levels) .....  N/A

Results reported for all required sample analyses?.....  Yes  No  N/A

Results supported in raw data? (Levels D, E)..... Yes  No  N/A

Results Acceptable? (Levels D, E)..... Yes  No  N/A

Transcription/Calculation errors? (Levels D, E)..... Yes  No  N/A

MDA's meet required detection limits?.....  Yes  No  N/A

Transcription/calculation errors? (Levels D, E)..... Yes  No  N/A

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



**Appendix 6**

**Additional Documentation Requested  
(e-mail from lab re carrier recoveries)**

**From:** Bushaw, Ruth A  
**Sent:** Monday, June 19, 2006 6:50 AM  
**To:** Trent, Stephen J  
**Subject:** RE: Tracer Recoveries.  
**Importance:** High

Steve,

The Sr-90 analysis uses a carrier, not a tracer. The carrier recoveries for the Sr-90 analysis for these samples are listed below.

SDG 222S20030369  
B17N46  
S03M000528  
Sr-90 tracer recovery = 81.6%

SDG 222S20030383  
B17TM6  
S03M000540  
Sr-90 tracer recovery = 84.2%

Please let me know if there is any other information that you need.

Thanks,

**Ruth A. Bushaw**

Project Coordinator  
222-S Laboratory  
373-4314

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**From:** Trent, Stephen J  
**Sent:** Thursday, June 15, 2006 2:31 PM  
**To:** Bushaw, Ruth A  
**Subject:** Tracer Recoveries.

Ruth,

Need tracer recoveries for Sr-90 in SDG 222S20030369... samples B17TM6 and B17N46....  
Email response is fine.

Steve Trent  
Sample Management Project Coordinator  
Fluor Hanford - Groundwater Remediation Project  
Ph: (509) 373-5869  
Cell: (509) 947-9354  
EFax: (866) 252-5816  
Site Pager: 85-7344