

Date: 27 May 1998  
 To: Bechtel Hanford Inc. (technical representative)  
 From: TechLaw, Inc.  
 Project: 100 D Areas - Full Protocol  
 Subject: Inorganics - Data Package No. W02308-QES (SDG No. W02308)

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## INTRODUCTION

This memo presents the results of data validation on Data Package No. W02308-QES prepared by Quanterra Environmental Services (QES). 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	Analysis
BON090	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON091	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON092	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON093	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON094	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON095	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON096	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)

Data validation was conducted in accordance with the BHI validation statement of work and the 100 Area Remedial Action Sampling and Analysis Plan (May 1998). Appendices 1 through 5 provide the following information as indicated below:

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

## **DATA QUALITY OBJECTIVES**

- **Holding Times**

Analytical holding times are assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: Soil samples must be analyzed within 24 hours for hexavalent chromium.

All holding times were acceptable.

- **Blanks**

### **Preparation Blanks**

At least one preparation blank, consisting of deionized distilled water processed through each sample preparation and analysis procedure, must be prepared and analyzed with every sample delivery group. In the case of positive blank results, samples with digestate concentrations (in ug/L) less than five times the preparation blank value have had their associated values qualified as non-detected and flagged "U". Samples with concentrations of greater than five times the highest blank concentration do not require qualification.

In the case of negative blank results, if the absolute value exceeds the Contract Required Detection Limit (CRDL), all nondetects are rejected and flagged "UR" and all detects that are less than ten times the absolute value of the associated preparation blank result are qualified as estimates and flagged "J". If the absolute value of the negative preparation blank is greater than the IDL and less than or equal to the CRDL, all nondetects are qualified as estimates and flagged "UJ" and all detects less than ten times the absolute value of the blank are qualified as estimates and flagged "J". If the sample results are greater than ten times the absolute value of the preparation blank, no qualification is necessary.

All preparation blank results were acceptable.

- **Accuracy**

### **Matrix Spike**

Matrix spike analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike recoveries must fall within the range of 70% to 130%. Samples with a spike recovery of less than 30% and a sample result

below the IDL are rejected and flagged "UR". Samples with a spike recovery of 30% to 69% and a sample result less than the IDL are qualified "UJ". Samples with a spike recovery of greater than 130% or less than 70% and a sample result greater than the IDL are qualified as estimates and flagged "J". Finally, for samples with a spike recovery greater than 130% and a sample result less than the IDL, no qualification is required.

Due to matrix spike recoveries below QC limits, all hexavalent chromium results were qualified as estimates and flagged "J/UJ".

- **Precision**

- Laboratory Duplicate Samples

- Laboratory duplicate sample analyses are used to measure laboratory precision and sample homogeneity. Results must be within RPD limits of plus or minus 30% for solid samples. If RPD values are out of specification and the sample concentration is greater than five times the CRDL, all associated sample results are qualified as estimated and flagged "J". If RPD values are plus or minus two times the CRDL and the sample concentration is less than five times the CRDL, all associated sample results are qualified as estimated and flagged "J/UJ". The performance criteria for aqueous laboratory duplicates are an RPD less than 30% for positive sample results greater than five times the CRDL or plus or minus the CRDL for positive sample results less than five times the CRDL. Sample results outside the criteria are qualified as estimates and flagged "J/UJ".

- Due to matrix spike duplicate RPDs outside QC limits, all ICP analytes in both samples were qualified as estimates and flagged "J/UJ".

- All laboratory duplicate recovery results were acceptable.

- **Analytical Detection Levels**

- Reported analytical detection levels are compared against CRDLs to ensure that laboratory detection levels meet the required criteria. All reported laboratory detection levels met the analyte specific CRDL.

- **Completeness**

- Data package No. W02308-QES (SDG No. W02308) was submitted for validation and verified for completeness. The completion percentage was 100%.

## **MAJOR DEFICIENCIES**

None found.

## **MINOR DEFICIENCIES**

Due to matrix spike recoveries below QC limits, all hexavalent chromium results were qualified as estimates and flagged "J/UJ". Data flagged 'J' is an estimate, but under the BHI validation SOW, the data may be usable for decision-making purposes. All other validated results are considered accurate within the standard error associated with the methods.

## **REFERENCES**

BHI, MRB-SBB-A23665, *Validation Statement of Work*, Bechtel Hanford Incorporated, September 5, 1997.

DOE/RL-96-22, Rev. 1, *100 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, May 1998.



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

- U - Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.
- UJ - Indicates the compound or analyte was analyzed for and not detected in the sample. Due to a QC deficiency identified during the data validation, the associated quantitation limit is an estimate.
- J - Indicates the compound or analyte was analyzed for and detected. Due to a QC deficiency identified during the data validation, the associated concentration is an estimate, but the data are usable for decision-making purposes.
- BJ - Applied to inorganic analyses only. Indicates the analyte concentration was greater than the IDL but less than the CRDL and is considered an estimated value.
- R - Indicates the compound or analyte was analyzed for, detected, and due to an identified 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 QC deficiency.
- NJ - Indicates presumptive evidence of a compound at an estimated value. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).
- N - Indicates presumptive evidence of a compound. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).

**Appendix 2**

**Summary of Data Qualification**

DATA QUALIFICATION SUMMARY

SDG: W02023	REVIEWER: TLI	DATE: 05/27/98	PAGE <u>1</u> OF <u>1</u>
COMMENTS:			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Hexavalent Chromium	J/UJ	All	Matrix spike recovery outside QC limits

**Appendix 3**

**Qualified Data Summary and Annotated Laboratory Reports**

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**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401604 MATRIX: SOIL  
 CLIENT ID: B0N090 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	6.00E-02		N/A	N/A	3.00E-02	mg/kg	N/A	EPA7196 J
AM-241	5.83E-03	U	1.2E-02	1.2E-02	1.58E-02	pCi/g	68.60%	RICHRC5057
U-234	2.39E+00		2.5E-01	4.8E-01	3.64E-02	pCi/g	65.50%	RICHRC5030
U-235	7.87E-02	J	4.7E-02	4.9E-02	4.43E-02	pCi/g	65.50%	RICHRC5030
U-238	2.51E+00		2.5E-01	5.0E-01	3.64E-02	pCi/g	65.50%	RICHRC5030
PU-238	1.12E-02	U	1.6E-02	1.6E-02	1.51E-02	pCi/g	54.20%	RICHRC5010
PU239/40	0.00E+00	U	0.0E+00	1.7E-02	1.51E-02	pCi/g	54.20%	RICHRC5010
AM-241	-6.18E-03	U	2.4E-02	2.4E-02	3.97E-02	pCi/g	N/A	RICHRC5017
CO-60	-1.95E-03	U	6.0E-03	6.0E-03	1.01E-02	pCi/g	N/A	RICHRC5017
CS-137DA	-4.41E-03	U	5.7E-03	5.8E-03	9.13E-03	pCi/g	N/A	RICHRC5017
EU-152	-4.34E-03	U	1.4E-02	1.4E-02	2.27E-02	pCi/g	N/A	RICHRC5017
EU-154	-1.28E-02	U	2.1E-02	2.1E-02	3.30E-02	pCi/g	N/A	RICHRC5017
EU-155	1.68E-02	U	1.6E-02	1.6E-02	2.62E-02	pCi/g	N/A	RICHRC5017
K-40	6.25E+00		2.9E-01	6.9E-01	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	1.84E-01		1.4E-02	2.3E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	1.42E-01		2.4E-02	2.8E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	1.82E-01	J	3.7E-02	4.1E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	3.15E-01		3.2E-01	3.2E-01	N/A	pCi/g	N/A	RICHRC5017
STRONTIUM	1.25E-02	U	3.8E-02	3.8E-02	1.01E-01	pCi/g	64.00%	RICHRC5006

Number of Results: 19

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3/26/98

**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401605 MATRIX: SOIL  
 CLIENT ID: B0N091 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	3.00E-02	<del>U</del>	N/A	N/A	3.00E-02	mg/kg	N/A	EPA7196(U)
<del>AM-241</del>	<del>4.13E-03</del>	<del>U</del>	<del>8.3E-03</del>	<del>8.3E-03</del>	<del>1.12E-02</del>	<del>pCi/g</del>	<del>94.90%</del>	<del>RICHRC5057</del>
<del>U-238</del>	<del>3.16E-01</del>	<del>J</del>	<del>8.2E-02</del>	<del>9.6E-02</del>	<del>1.43E-02</del>	<del>pCi/g</del>	<del>84.50%</del>	<del>RICHRC5030</del>
<del>U-238</del>	<del>3.69E-02</del>	<del>J</del>	<del>2.8E-02</del>	<del>2.8E-02</del>	<del>1.43E-02</del>	<del>pCi/g</del>	<del>84.50%</del>	<del>RICHRC5030</del>
<del>U-238</del>	<del>3.62E-01</del>	<del>J</del>	<del>8.8E-02</del>	<del>1.0E-01</del>	<del>2.63E-02</del>	<del>pCi/g</del>	<del>84.50%</del>	<del>RICHRC5030</del>
<del>PU-238</del>	<del>6.24E-03</del>	<del>U</del>	<del>1.2E-02</del>	<del>1.3E-02</del>	<del>1.69E-02</del>	<del>pCi/g</del>	<del>50.40%</del>	<del>RICHRC5030</del>
<del>PU239/40</del>	<del>0.00E+00</del>	<del>U</del>	<del>0.0E+00</del>	<del>1.9E-02</del>	<del>1.69E-02</del>	<del>pCi/g</del>	<del>50.40%</del>	<del>RICHRC5030</del>
<del>AM-241</del>	<del>-2.25E-02</del>	<del>U</del>	<del>1.9E-02</del>	<del>1.9E-02</del>	<del>2.81E-02</del>	<del>pCi/g</del>	<del>N/A</del>	<del>RICHRC5037</del>
<del>CO-60</del>	<del>9.83E-04</del>	<del>U</del>	<del>4.8E-03</del>	<del>4.8E-03</del>	<del>8.59E-03</del>	<del>pCi/g</del>	<del>N/A</del>	<del>RICHRC5037</del>
<del>CS-137DA</del>	<del>2.73E-03</del>	<del>U</del>	<del>4.4E-03</del>	<del>4.4E-03</del>	<del>7.73E-03</del>	<del>pCi/g</del>	<del>N/A</del>	<del>RICHRC5037</del>
<del>EU-152</del>	<del>-9.20E-04</del>	<del>U</del>	<del>1.2E-02</del>	<del>1.2E-02</del>	<del>2.05E-02</del>	<del>pCi/g</del>	<del>N/A</del>	<del>RICHRC5037</del>
<del>EU-154</del>	<del>-3.63E-03</del>	<del>U</del>	<del>1.7E-02</del>	<del>1.7E-02</del>	<del>2.76E-02</del>	<del>pCi/g</del>	<del>N/A</del>	<del>RICHRC5037</del>
<del>EU-155</del>	<del>1.03E-02</del>	<del>U</del>	<del>1.3E-02</del>	<del>1.3E-02</del>	<del>2.25E-02</del>	<del>pCi/g</del>	<del>N/A</del>	<del>RICHRC5037</del>
<del>K-40</del>	<del>5.23E+00</del>		<del>2.5E-01</del>	<del>5.8E-01</del>	<del>N/A</del>	<del>pCi/g</del>	<del>N/A</del>	<del>RICHRC5037</del>
<del>RA-224DA</del>	<del>1.59E-01</del>		<del>1.4E-02</del>	<del>2.1E-02</del>	<del>N/A</del>	<del>pCi/g</del>	<del>N/A</del>	<del>RICHRC5037</del>
<del>RA-226</del>	<del>1.43E-01</del>		<del>2.0E-02</del>	<del>2.4E-02</del>	<del>N/A</del>	<del>pCi/g</del>	<del>N/A</del>	<del>RICHRC5037</del>
<del>RA-228</del>	<del>1.87E-01</del>	<del>J</del>	<del>3.9E-02</del>	<del>4.3E-02</del>	<del>N/A</del>	<del>pCi/g</del>	<del>N/A</del>	<del>RICHRC5037</del>
<del>U-238</del>	<del>1.21E-01</del>	<del>U</del>	<del>1.6E-01</del>	<del>1.6E-01</del>	<del>2.56E-01</del>	<del>pCi/g</del>	<del>N/A</del>	<del>RICHRC5037</del>
STRONTIUM	1.76E-02	U	4.6E-02	4.6E-02	1.21E-01	pCi/g	51.60%	RICHRC5036

Number of Results: 19

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5/26/98

**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401601 MATRIX: SOIL  
 CLIENT ID: B0N092 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	3.00E-02	<del>U</del>	N/A	N/A	3.00E-02	mg/kg	N/A	EPA7196 <i>UJ</i>
AM-241	2.05E-01	J	6.3E-02	7.1E-02	1.32E-02	pCi/g	82.00%	RICHRC5057
U-234	7.62E-01	J	1.5E-01	2.0E-01	2.84E-02	pCi/g	60.50%	RICHRC5030
U-235	2.06E-02	U	2.4E-02	2.5E-02	2.84E-02	pCi/g	60.50%	RICHRC5030
U-238	7.47E-01	J	1.5E-01	2.0E-01	3.52E-02	pCi/g	60.50%	RICHRC5030
PU-238	-5.03E-04	U	1.0E-03	1.0E-03	2.53E-02	pCi/g	64.00%	RICHRC5010
PU239/40	1.16E-02	U	1.8E-02	1.8E-02	2.87E-02	pCi/g	64.00%	RICHRC5010
AM-241	-2.34E-02	U	3.4E-02	3.4E-02	5.56E-02	pCi/g	N/A	RICHRC5017
CO-60	5.59E-02		1.8E-02	1.9E-02	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	1.43E+00		3.6E-02	1.5E-01	N/A	pCi/g	N/A	RICHRC5017
EU-152	5.51E-01		4.6E-02	7.2E-02	N/A	pCi/g	N/A	RICHRC5017
EU-154	8.31E-02	U	2.6E-02	2.8E-02	5.12E-02	pCi/g	N/A	RICHRC5017
EU-155	4.46E-02	U	2.7E-02	2.7E-02	4.40E-02	pCi/g	N/A	RICHRC5017
K-40	8.61E+00		3.5E-01	9.3E-01	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	4.13E-01		2.4E-02	4.8E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	3.51E-01		3.4E-02	4.9E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	4.32E-01		5.9E-02	7.3E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	3.23E-01		3.1E-01	3.1E-01	N/A	pCi/g	N/A	RICHRC5017
STRONTIUM	7.99E-02	U	5.1E-02	5.7E-02	1.15E-01	pCi/g	83.20%	RICHRC5056

Number of Results: **19**

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5/26/98

**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401602 MATRIX: SOIL  
 CLIENT ID: B0N093 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	3.00E-02	<i>sk</i>	N/A	N/A	3.00E-02	mg/kg	N/A	EPA7196 vJ
AM-241	7.12E-02	J	3.6E-02	3.8E-02	2.42E-02	pCi/g	92.90%	RICHRC5057
U-234	7.48E-01	J	1.4E-01	1.9E-01	3.06E-02	pCi/g	66.10%	RICHRC5030
U-235	1.60E-02	U	2.1E-02	2.2E-02	3.47E-02	pCi/g	66.10%	RICHRC5030
U-238	5.77E-01	J	1.2E-01	1.5E-01	2.81E-02	pCi/g	66.10%	RICHRC5030
PU-238	6.35E-03	U	1.4E-02	1.4E-02	2.78E-02	pCi/g	61.80%	RICHRC5010
PU239/40	0.00E+00	U	0.0E+00	2.1E-02	1.87E-02	pCi/g	61.80%	RICHRC5010
AM-241	-2.75E-03	U	2.4E-02	2.4E-02	3.76E-02	pCi/g	N/A	RICHRC5017
CO-60	1.12E-02	U	8.0E-03	8.1E-03	1.47E-02	pCi/g	N/A	RICHRC5017
CS-137DA	1.94E-02	J	1.1E-02	1.1E-02	N/A	pCi/g	N/A	RICHRC5017
EU-152	2.04E-01		3.4E-02	4.0E-02	N/A	pCi/g	N/A	RICHRC5017
EU-154	2.72E-02	U	2.2E-02	2.2E-02	3.92E-02	pCi/g	N/A	RICHRC5017
EU-155	1.14E-02	U	1.9E-02	1.9E-02	3.15E-02	pCi/g	N/A	RICHRC5017
K-40	9.34E+00		3.1E-01	9.9E-01	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	4.40E-01		2.0E-02	4.9E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	3.47E-01		2.8E-02	4.4E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	4.70E-01		5.7E-02	7.4E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	3.34E-01	U	2.1E-01	2.2E-01	3.45E-01	pCi/g	N/A	RICHRC5017
STRONTIUM	2.16E-02	U	4.6E-02	4.6E-02	1.19E-01	pCi/g	61.50%	RICHRC5006

Number of Results: 19

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5/26/98

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**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401603 MATRIX: SOIL  
 CLIENT ID: B0N094 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	3.00E-02	U	N/A	N/A	3.00E-02	mg/kg	N/A	EPA71960J
AM-241	8.66E-02	J	4.4E-02	4.6E-02	2.50E-02	pCi/g	74.60%	RICHRC5057
U-234	6.40E-01	J	1.3E-01	1.7E-01	4.20E-02	pCi/g	71.90%	RICHRC5030
U-235	3.59E-02	J	3.1E-02	3.2E-02	3.37E-02	pCi/g	71.90%	RICHRC5030
U-238	5.67E-01	J	1.2E-01	1.5E-01	3.15E-02	pCi/g	71.90%	RICHRC5030
PU-238	3.80E-03	U	9.1E-03	9.1E-03	2.07E-02	pCi/g	73.20%	RICHRC5010
PU239/40	4.07E-02		2.7E-02	2.8E-02	1.22E-02	pCi/g	73.20%	RICHRC5010
AM-241	1.20E-02	U	5.3E-02	5.3E-02	8.50E-02	pCi/g	N/A	RICHRC5017
CO-60	7.22E-02		1.7E-02	1.9E-02	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	1.49E+00		3.8E-02	1.5E-01	N/A	pCi/g	N/A	RICHRC5017
EU-152	5.01E-01		4.4E-02	6.7E-02	N/A	pCi/g	N/A	RICHRC5017
EU-154	5.41E-02	U	3.1E-02	3.1E-02	5.50E-02	pCi/g	N/A	RICHRC5017
EU-155	3.64E-02	U	2.9E-02	2.9E-02	4.57E-02	pCi/g	N/A	RICHRC5017
K-40	9.34E+00		3.5E-01	1.0E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	4.87E-01		2.8E-02	5.6E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	3.86E-01		4.1E-02	5.6E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	4.39E-01		6.7E-02	8.1E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	4.05E-01	U	3.9E-01	4.0E-01	6.49E-01	pCi/g	N/A	RICHRC5017
STRONTIUM	6.35E-02	U	4.0E-02	4.5E-02	9.18E-02	pCi/g	75.40%	RICHRC5006

Number of Results: 19

*PKC*  
5/26/98  
*PKC*

**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401606 MATRIX: SOIL  
 CLIENT ID: B0N095 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	3.00E-02	U	N/A	N/A	3.00E-02	mg/kg	N/A	EPA7196U
AM-241	3.24E-02	J	2.5E-02	2.5E-02	1.25E-02	pCi/g	85.10%	RICHRC5057
U-234	7.69E-01	J	1.3E-01	1.8E-01	1.53E-02	pCi/g	71.20%	RICHRC5030
U-235	2.22E-02	U	2.3E-02	2.3E-02	2.27E-02	pCi/g	71.20%	RICHRC5030
U-238	7.40E-01	J	1.3E-01	1.8E-01	2.27E-02	pCi/g	71.20%	RICHRC5030
PU-238	1.18E-02		1.4E-02	1.4E-02	1.06E-02	pCi/g	81.30%	RICHRC5010
PU239/40	0.00E+00	U	0.0E+00	1.2E-02	1.06E-02	pCi/g	81.30%	RICHRC5010
AM-241	-5.08E-02	U	4.5E-02	4.5E-02	6.93E-02	pCi/g	N/A	RICHRC5017
CO-60	3.60E-04	U	8.0E-03	8.0E-03	1.33E-02	pCi/g	N/A	RICHRC5017
CS-137DA	2.08E-02	J	1.2E-02	1.2E-02	N/A	pCi/g	N/A	RICHRC5017
EU-152	1.59E-01	U	2.2E-02	2.7E-02	4.24E-02	pCi/g	N/A	RICHRC5017
EU-154	1.73E-02	U	2.6E-02	2.6E-02	4.48E-02	pCi/g	N/A	RICHRC5017
EU-155	1.66E-02	U	2.3E-02	2.3E-02	3.60E-02	pCi/g	N/A	RICHRC5017
K-40	9.93E+00		3.4E-01	1.0E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	5.25E-01		2.1E-02	5.7E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	4.03E-01		2.8E-02	4.9E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	5.62E-01		5.8E-02	8.1E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	5.60E-01	U	3.2E-01	3.3E-01	5.43E-01	pCi/g	N/A	RICHRC5017
STRONTIUM	8.68E-02	U	4.8E-02	5.6E-02	1.04E-01	pCi/g	96.10%	RICHRC5036

Number of Results: 19

*ppm*  
5/26/98

**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401607 MATRIX: SOIL  
 CLIENT ID: B0N096 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	3.00E-02	U	N/A	N/A	3.00E-02	mg/kg	N/A	EPA7196 U
AM-241	1.73E-02	J	1.7E-02	1.8E-02	1.17E-02	pCi/g	96.50%	RICHRC5057
U-234	6.77E-01	J	1.4E-01	1.8E-01	2.75E-02	pCi/g	61.30%	RICHRC5030
U-235	1.37E-02	U	1.9E-02	2.0E-02	1.85E-02	pCi/g	61.30%	RICHRC5030
U-238	8.61E-01	J	1.5E-01	2.2E-01	3.13E-02	pCi/g	61.30%	RICHRC5030
PU-238	0.00E+00	U	0.0E+00	1.4E-02	1.26E-02	pCi/g	67.10%	RICHRC5010
PU239/40	1.39E-02		1.6E-02	1.6E-02	1.26E-02	pCi/g	67.10%	RICHRC5010
AM-241	6.74E-03	U	2.4E-02	2.4E-02	3.79E-02	pCi/g	N/A	RICHRC5017
CO-60	1.24E-02	U	6.3E-03	6.4E-03	1.23E-02	pCi/g	N/A	RICHRC5017
CS-137DA	-1.12E-03	U	6.5E-03	6.5E-03	1.05E-02	pCi/g	N/A	RICHRC5017
EU-152	4.85E-02	U	1.6E-02	1.7E-02	2.96E-02	pCi/g	N/A	RICHRC5017
EU-154	-4.53E-03	U	2.4E-02	2.4E-02	3.96E-02	pCi/g	N/A	RICHRC5017
EU-155	3.29E-02	U	1.8E-02	1.9E-02	3.16E-02	pCi/g	N/A	RICHRC5017
K-40	9.27E+00		3.2E-01	9.8E-01	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	4.56E-01		2.1E-02	5.0E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	3.59E-01		2.8E-02	4.5E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	4.59E-01		5.1E-02	6.8E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	4.80E-01		2.8E-01	2.9E-01	N/A	pCi/g	N/A	RICHRC5017
STRONTIUM	6.33E-02	U	4.7E-02	5.1E-02	1.11E-01	pCi/g	78.30%	RICHRC5036

Number of Results: 19

*Handwritten:*  
RPR  
5/26/98

**Appendix 4**

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

Quanterra Incorporated  
2800 George Washington Way  
Richland, Washington 99352

509 375-3131 Telephone  
509 375-5590 Fax

## CERTIFICATE OF ANALYSIS

Bechtel Hanford, Inc.  
3350 George Washington Way  
Richland, WA 99352

April 21, 1998

Attention: Joan Kessner




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SAF Number	:	B98-022
Date SDG Closed	:	April 1, 1998
Number of Samples	:	Seven (7)
Sample Type	:	Soil
SDG Number	:	W02308
Data Deliverable	:	Summary

---

### I. Introduction

On April 1, 1998, seven 15-day priority TAT soil samples were received by the Quanterra Environmental Services Richland Laboratory (QESRL) for radiochemical and chemical analysis. Upon receipt, the samples were assigned the following laboratory ID numbers to correspond with the Bechtel Hanford, Inc. (BHI) specific IDs:

<u>QESRL ID#</u>	<u>BHI ID#</u>	<u>MATRIX</u>	<u>DATE OF RECEIPT</u>
80401601	BON092	SOIL	4/1/98
80401602	BON093	SOIL	4/1/98
80401603	BON094	SOIL	4/1/98
80401604	BON090	SOIL	4/1/98
80401605	BON091	SOIL	4/1/98
80401606	BON095	SOIL	4/1/98
80401607	BON096	SOIL	4/1/98

### II. Analytical Results/Methodology

The analytical results for this report are presented by laboratory sample ID. Each set of data includes sample identification information, analytical results and the appropriate associated statistical errors.

Bechtel Hanford, Inc.  
April 21, 1998  
Page 2

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The requested analyses were:

**Alpha Spectroscopy**

Americium-241 by method RICH-RC-5062

Plutonium-238, -239/40 by method RICH-RC-5062

Uranium-234, -235, -238 by method RICH-RC-5062

**Gamma Spectroscopy**

Gamma Scan by method RICH-RC-5017

**Gas Proportional Counting**

Total Strontium by method RICH-RC-5006

**Chemical Analyses**

Chromium Hex by EPA method 7196

III. Quality Control

The analytical results for each analysis performed under SDG W02308 include a minimum of two Laboratory Control Samples (LCS) and one method (reagent) blank. Any exceptions have been noted in the "Comments" section.

Quality control sample results are reported in the same units as sample results.

IV. Comments

**Alpha Spectroscopy**

Americium-241 by method RICH-RC-5057

The LCS, batch blank, sample duplicate (B0N094) and sample results are within contractual requirements.

Plutonium-238, -239/40 by method RICH-RC-5010

The LCS, batch blank, sample duplicate (B0N094) and sample results are within contractual requirements.

Uranium-234, -235, -238 by method RICH-RC-5030

The LCS, batch blank, sample duplicate (B0N094) and sample results are within contractual requirements.

Bechtel Hanford, Inc.  
April 21, 1998  
Page 3

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### **Gamma Spectroscopy**

#### Gamma Scan by method RICH-RC-5017

The LCS, batch blank, sample duplicate (BON094) and sample results are within contractual requirements.

### **Gas Proportional Counting**

#### Total Strontium by method RICH-RC-5006

The LCS, batch blank, sample duplicate (BON092) and sample results are within contractual requirements.

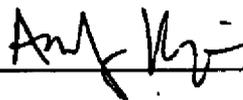
### **Chemical Analyses**

#### Chromium Hex by EPA method 7196

The LCS, batch blank, sample duplicate (BON093) and sample results are within contractual requirements. The MS/MSD recoveries were low at 42% and 55% respectively. The RPD of the MS/MSD was at 29% due to matrix interference.

I certify that this Certificate of Analysis is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature.

Reviewed and approved:

  
\_\_\_\_\_

Andy Kopriva  
Project Manager

Director: MT Stankovich  
 Project Designation: 100 D Areas - Full Protocol  
 Client No.: 96-045  
 Company Contact: OH Hamilton  
 Telephone No.: 531-0731  
 Project Coordinator: KOBERNER, CC  
 Date Turnaround: 15 Days

Shipping To: Quanta Incorporated  
 Sampling Location: 107-D3  
 Field Logbook No.: EL-135-1  
 Method of Shipment: Hand Delivered  
 Bill of Lading: Air Bill No. NA

POSSIBLE SAMPLE HAZARDS/REMARKS

Preservation	Name	Code	Name	Name	Code	Name
Type of Container	P	60	60	60	60	P
No. of Container(s)	1	1	1	1	2	2
Volume	20ml	60ml	60ml	60ml	60ml	1000ml

804015  
 1002308  
 SDX  
 804016  
 Loc Guard

SAMPLE ANALYSIS

Sample No.	Matrix *	Sample Date	Sample Time	Activity Date	Quantum Hex - 7196	Amersham 241: Sample Preparation: Sample Uranium	Shimadzu 9250 - Total Sr	PerkinElmer 8000 (TCL)	See Item (1) to Special Instructions
NO92 01	Soil	4-1-98	1010	X	X	X	X	X	A
NO93 02	Soil	4-1-98	0938	X	X	X	X	X	B
NO94 03	Soil	4-1-98	1010	X	X	X	X	X	AI
0000									
0000									
0000									
0000									

CHAIN OF POSSESSION

Signature/Print Name: \_\_\_\_\_

Requested By	Date/Time	Received By	Date/Time
Shirley	4-1-98 1300	David	4-1-98 1500
Shirley	4-1-98 1500	David	4-1-98 1500
Shirley	4-1-98 1500	David	4-1-98 1500

SPECIAL INSTRUCTIONS  
 \*\*COA R00D22 2F00\*\*\* The ERC contractor acknowledges the 24-hour holding time is not likely achievable for Hex Chrom by EPA 7196.  
 \*\* Use a separate Chain of Custody for each waste site.  
 (1) Quanta Spectrometry (Certim-137, Cobalt-60, Europium-152, Europium-154, Europium-155); Gamma Spec - Add-on (Amersham-241, Uranium-235)

LABORATORY SECTION: \_\_\_\_\_  
 Disposed By: \_\_\_\_\_  
 Date/Time: \_\_\_\_\_

# CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Collector MT Blankovich	Company/Contact GHI Hamilton	Telephone No. 531-0731	Project Coordinator KORNER, CC	Data Turnaround <b>15 Days</b>
Project Designation 100 D Areas - Full Protocol	Sampling Location 107-D3	SAF No. B98-022		
Case Chest No. 96-045	Field Logbook No. EL-1339-1	Method of Shipment Hand Delivered		
Shipped To Quanterra Incorporated	Offsite Property No. NA	Bill of Lading/Air Bill No. NA		

POSSIBLE SAMPLE HAZARDS/REMARKS	Preservation	None	Cool 4C	None	None	Cool 4C	None				
	Type of Container	P	uG	uG	uG	uG	P				
	No. of Container(s)	1	1	1	1	2	2				
	Special Handling and/or Storage	Volume	20ml	60ml	60ml	60ml	60ml	1000ml			

### SAMPLE ANALYSIS

804015

804016

804016

Loc. QUAD.

Sample No.	Matrix *	Sample Date	Sample Time	Activity Scan	Chromium Hex - 7196	Americium-241; Isotopic Plutonium; Isotopic Uranium	Strontium-89,90 - Total Sr	Pent/PCBs - 302*/(TCL)	See Item (1) in Special Instructions.		
IN090 04	Soil	4-1-98	0830	X	X	X	X	X	X		F
IN091 05	Soil	4-1-98	0840	X	X	X	X	X	X		E
IN095 06	Soil	4-1-98	0914	X	X	X	X	X	X		C
IN096 07	Soil	4-1-98	0850	X	X	X	X	X	X		D

0000

2X105

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS	Matrix *
		<p>**COA R00D22 2F00*** The ERC contractor acknowledges the 24-hour holding time is not likely achievable for Hex Chrome by EPA 7196.</p> <p>** Use a separate Chain of Custody for each waste site.</p> <p>(1) Gamma Spectroscopy (Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155); Gamma Spec - Add-on (Americium-241, Uranium-238)</p>	<ul style="list-style-type: none"> <li>S - Soil</li> <li>SB - Sediment</li> <li>SO - Solid</li> <li>SL - Sludge</li> <li>W - Water</li> <li>O - Oil</li> <li>A - Air</li> <li>DS - Drum Solids</li> <li>DL - Drum Liquids</li> <li>T - Tissue</li> <li>WI - Wipe</li> <li>L - Liquid</li> <li>V - Vegetation</li> <li>X - Other</li> </ul>
Equipped By	Date/Time	Received By	Date/Time
<i>[Signature]</i>	4-1-98 1300	<i>[Signature]</i>	4-1-98 1700
Equipped By	Date/Time	Received By	Date/Time
<i>[Signature]</i>	4-1-98 1500	<i>[Signature]</i>	4-1-98 1500
Equipped By	Date/Time	Received By	Date/Time
<i>[Signature]</i>	4-1-98	<i>[Signature]</i>	4-1-98

LABORATORY SECTION	Received By	Title	Date/Time
FINAL SAMPLE DISPOSITION	Disposed Method	Disposed By	Date/Time

**Appendix 5**

**Data Validation Supporting Documentation**

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	<b>C</b>	D	E
PROJECT: 100 D gress			DATA PACKAGE: W02308		
VALIDATOR: TLI		LAB: QFS		DATE: 5/18/98	
CASE:			SDG: W02308-QFS		
ANALYSES PERFORMED					
<input type="checkbox"/> CLP/CP	<input type="checkbox"/> CLP/GFAA	<input type="checkbox"/> CLP/Hg	<input type="checkbox"/> CLP/Cyanide	ACR-VI	<input type="checkbox"/>
<input type="checkbox"/> SW-846/CP	<input type="checkbox"/> SW-846/GFAA	<input type="checkbox"/> SW-846/Hg	<input type="checkbox"/> SW-846 Cyanide		<input type="checkbox"/>
SAMPLES/MATRIX					
B0N090, B0N091, B0N092, B0N093, B0N094,					
B0N095, B0N096					
501/					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Is technical verification documentation present? . . . . . Yes No **N/A**

Is a case narrative present? . . . . . **Yes** No N/A

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

\_\_\_\_\_

\_\_\_\_\_

2. HOLDING TIMES

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

Comments: ~~15 day hold~~ **STORE**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

3. INSTRUMENT PERFORMANCE AND CALIBRATIONS

- Were initial calibrations performed on all instruments? . . . . Yes No N/A
- Are initial calibrations acceptable? . . . . . Yes No N/A
- Are ICP interference checks acceptable? . . . . . Yes No N/A
- Were ICV and CCV checks performed on all instruments? . . . . . Yes No N/A
- Are ICV and CCV checks acceptable? . . . . . Yes No N/A

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

4. BLANKS

- Were ICB and CCB checks performed for all applicable analyses? Yes No N/A
- Are ICB and CCB results acceptable? . . . . . Yes No N/A
- Were preparation blanks analyzed? . . . . . Yes No N/A
- Are preparation blank results acceptable? . . . . . Yes No N/A
- Were field/trip blanks analyzed? . . . . . Yes No N/A
- Are field/trip blank results acceptable? . . . . . Yes No N/A

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

5. ACCURACY

- Were spike samples analyzed? . . . . . Yes No N/A
- Are spike sample recoveries acceptable? . . . . . Yes No N/A
- Were laboratory control samples (LCS) analyzed? . . . . . Yes No N/A
- Are LCS recoveries acceptable? . . . . . Yes No N/A

Comments: MS - 55 + 42 020  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

A-20/2

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

6. PRECISION

- Were laboratory duplicates analyzed? . . . . .  Yes No N/A
- Are laboratory duplicate samples RPD values acceptable? . . .  Yes No N/A
- Were ICP serial dilution samples analyzed? . . . . . Yes No  N/A
- Are ICP serial dilution %D values acceptable? . . . . . Yes No  N/A
- Are field duplicate RPD values acceptable? . . . . . Yes No  N/A
- Are field split RPD values acceptable? . . . . . Yes No  N/A

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

7. FURNACE AA QUALITY CONTROL

- Were duplicate injections performed as required? . . . . . Yes No  N/A
- Are duplicate injection %RSD values acceptable? . . . . . Yes No  N/A
- Were analytical spikes performed as required? . . . . . Yes No  N/A
- Are analytical spike recoveries acceptable? . . . . . Yes No  N/A
- Was MSA performed as required? . . . . . Yes No  N/A
- Are MSA results acceptable? . . . . . Yes No  N/A

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

8. REPORTED RESULTS AND DETECTION LIMITS

- Are results reported for all requested analyses? . . . . .  Yes No  N/A
- Are all results supported in the raw data? . . . . . Yes No  N/A
- Are results calculated properly? . . . . . Yes No  N/A
- Do results meet the CRDLs? . . . . .  Yes No  N/A

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



Date: 27 May 1998  
To: Bechtel Hanford Inc. (technical representative)  
From: TechLaw, Inc.  
Project: 100 D Areas - Full Protocol  
Subject: Pesticide/PCB - Data Package No. W02308-QES (SDG No. W02308)

## **INTRODUCTION**

This memo presents the results of data validation on Summary Data Package No. W02308-QES prepared by Quanterra Environmental Services (QES). A list of the samples validated along with the analyses reported and the method of analysis is provided in the following table.

Sample ID	Sample Date	Media	Validation	Analysis
BON090	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON091	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON092	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON093	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON094	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON095	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON096	04/01/98	Soil	C	Pest/PCBs by EPA 8080

Data validation was conducted in accordance with the BHI validation statement of work (BHI 1997) and the 100 Area Remedial Action Sampling and Analysis Plan (May 1998). Appendices 1 through 5 provide the following information as indicated below:

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

000001

## **DATA QUALITY OBJECTIVES**

- **Holding Times**

Analytical holding times were assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: Soil samples must be extracted within 14 days of the date of sample collection and analyzed within 40 days from the date of extraction.

If holding times are exceeded by less than two times the limit, all associated sample results are qualified as estimates and flagged "J" for detects and "UJ" for non-detects. If holding times are exceeded by greater than two times the limit, all associated detected sample results are qualified as estimates and flagged "J" and all non-detects are rejected and flagged "UR".

Holding times were met for all samples.

- **Blanks**

Method blank analyses are performed to determine the extent of laboratory contamination introduced through sampling, sample preparation or analysis. At least one method blank analysis must be conducted for every 20 samples. Method blanks should not contain target compounds at a concentration greater than the CRQL. If target compounds are present, sample results less than five times the blank concentration are qualified as nondetects and flagged "U". If the sample result is less than five times the blank concentration and less than CRQL, the result is qualified as a nondetect, elevated to the CRQL and flagged "U".

All method blank target compound results were acceptable.

- **Accuracy**

### **Matrix Spike/Matrix Spike Duplicate Recoveries**

Matrix spike/matrix spike duplicate analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike/matrix spike duplicate analyses are performed in duplicate using six compounds and must be within the established laboratory quality control limits of 70-130 percent. If spike recoveries are outside control limits, detected sample results less than 5 times the spike concentration are qualified as estimates and flagged "J". Undetected sample results with spike recoveries outside control limits are qualified as

estimates and flagged "UJ". Sample results greater than five times the spike concentration require no qualification.

All matrix spike/matrix spike duplicate recovery results were acceptable.

#### Surrogate Recovery

The analysis of surrogate compounds provide a measure of performance for individual samples. Matrix-specific surrogate compound recovery control windows have been established by the laboratory. When a surrogate compound recovery is outside the control window, all positively identified target compounds associated with the unacceptable surrogate recoveries are qualified as estimates and flagged "J". Nondetected compounds with surrogate recoveries less than the lower control limit are qualified as having an estimated detection limit and flagged "UJ". Undetected compounds with surrogate recoveries above the upper control limit require no qualification.

All surrogate recovery results were acceptable.

- **Precision**

#### Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike/matrix spike duplicate results provide matrix-specific information on the precision of the method for specific target compound classes. Precision is expressed as the RPD between the recoveries of duplicate matrix spike analyses performed on a sample. Results must be within RPD limits of +/- 30% for soil samples. If RPD values are out of specification and the sample concentration is less than five times the spike concentration, all associated detected sample results are qualified as estimates and flagged "J". If RPD values are out of specification and the sample concentration is greater than five times the spike concentration, no qualification is required.

All matrix spike/matrix spike duplicate RPD results were acceptable.

- **Detection Levels**

Reported laboratory detection levels are compared against CRQLs to ensure that laboratory detection levels meet the required criteria. The reported analytical detection level for toxaphene was above the CRQL in all samples. Under the BHI statement of work, no qualification is required. All other reported detection levels were at or below the CRQL. Under the BHI statement of work, no qualification is required.

- **Completeness**

Data Package No. W02308-QES (SDG No.W02308) was submitted for validation and verified for completeness. The completion rate was 100%.

**MAJOR DEFICIENCIES**

None found.

**MINOR DEFICIENCIES**

None found

**REFERENCES**

BHI, MRB-SBB-A23665, *Validation Statement of Work*, Bechtel Hanford Incorporated, September 5, 1997.

DOE/RL-96-22, Rev. 1, *100 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, May 1998.

**Appendix 1**

**Glossary of Data Reporting Qualifiers**

000005

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

- U - Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.
- UJ - Indicates the compound or analyte was analyzed for and not detected in the sample. Due to a QC deficiency identified during the data validation, the associated quantitation limit is an estimate.
- J - Indicates the compound or analyte was analyzed for and detected. The associated concentration is an estimate, but the data are usable for decision-making purposes.
- R - Indicates the compound or analyte was analyzed for, detected, and due to an identified 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 QC deficiency.
- NJ - Indicates presumptive evidence of a compound at an estimated value. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).
- N - Indicates presumptive evidence of a compound. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).

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

000007

DATA QUALIFICATION SUMMARY

SDG: W02308	REVIEWER: TLI	DATE: 05/27/98	PAGE <u>1</u> OF <u>1</u>
COMMENTS: No qualifiers assigned.			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON

**Appendix 3**

**Qualified Data Summary and Annotated Laboratory Reports**

000009

Project: BECHTEL-MANFORD																							
Laboratory: Quanterra																							
Case		SDG: W02308																					
Sample Number		B0N090		B0N091		B0N092		B0N093		B0N094		B0N095		B0N096									
Location		107-D3		107-D3		107-D3		107-D3		107-D3		107-D3		107-D3									
Remarks																							
Sample Date		04/01/98		04/01/98		04/01/98		04/01/98		04/01/98		04/01/98		04/01/98									
Pest/PCB	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
alpha-BHC	50	1.7	U	1.7	U	1.8	U																
beta-BHC	50	1.7	U	1.7	U	1.8	U																
delta-BHC	50	1.7	U	1.7	U	1.8	U																
gamma-BHC (Lindane)	50	1.7	U	1.7	U	1.8	U																
Heptachlor	50	1.7	U	1.7	U	1.8	U																
Aldrin	50	1.7	U	1.7	U	1.8	U																
Heptachlor epoxide	50	1.7	U	1.7	U	1.8	U																
Endosulfan I	50	1.7	U	1.7	U	1.8	U																
Dieldrin	50	1.7	U	1.7	U	1.8	U																
4,4'-DDE	50	1.7	U	1.7	U	1.8	U																
Endrin	50	1.7	U	1.7	U	1.8	U																
Endosulfan II	50	1.7	U	1.7	U	1.8	U																
4,4'-DDD	50	1.7	U	1.7	U	1.8	U																
Endosulfan sulfate	50	1.7	U	1.7	U	1.8	U																
4,4'-DDT	50	1.7	U	1.7	U	1.8	U																
Methoxychlor	50	3.3	U	3.3	U	3.4	U	3.5	U	3.3	U	3.4	U	3.5	U								
Endrin Aldehyde	50	1.7	U	1.7	U	1.8	U																
Tech. Chlordane	50	17	U	17	U	18	U																
Toxaphene	50	67	U	68	U	69	U	70	U	69	U	70	U	70	U								
Aroclor-1221	50	33	U	33	U	34	U	35	U	34	U	34	U	35	U								
Aroclor-1232	50	33	U	33	U	34	U	35	U	34	U	34	U	35	U								
Aroclor-1016/1242	50	33	U	33	U	34	U	35	U	34	U	34	U	35	U								
Aroclor-1248	50	33	U	33	U	34	U	35	U	34	U	34	U	35	U								
Aroclor-1254	50	33	U	33	U	34	U	35	U	34	U	34	U	35	U								
Aroclor-1260	50	33	U	33	U	34	U	35	U	34	U	34	U	35	U								

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1D  
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BON091

Lab Name: QUANTERRA, MO. Contract: 550.231

Lab Code: ITMO Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: W02308

Matrix: (soil/water) SOIL Lab Sample ID: 17398-005

Sample wt/vol: 30.1 (g/ml) G Lab File ID: \_\_\_\_\_

Level: (low/med) LOW Date Sampled: 04-01-98

% Moisture: not dec. 1 dec. \_\_\_\_\_ Date Extracted: 04-09-98

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 04-14-98

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

CAS NO. Compound CONCENTRATION UNITS:  
(ug/L or ug/Kg) UG/KG Q

319-84-6	alpha-BHC	1.7	U
319-85-7	beta-BHC	1.7	U
319-86-8	delta-BHC	1.7	U
58-89-9	gamma-BHC (Lindane)	1.7	U
76-44-8	Heptachlor	1.7	U
309-00-2	Aldrin	1.7	U
1024-57-3	Heptachlor epoxide	1.7	U
959-98-8	Endosulfan I	1.7	U
60-57-1	Dieldrin	1.7	U
72-55-9	4,4'-DDE	1.7	U
72-20-8	Endrin	1.7	U
33213-65-9	Endosulfan II	1.7	U
72-54-8	4,4'-DDD	1.7	U
1031-07-8	Endosulfan sulfate	1.7	U
50-29-3	4,4'-DDT	1.7	U
72-43-5	Methoxychlor	3.3	U
53494-70-5	Endrin Aldehyde	1.7	U
57-74-9	Tech. Chlordane	17	U
8001-35-2	Toxaphene	68	U
11104-28-2	Aroclor-1221	33	U
11141-28-2	Aroclor-1232	33	U
12674-11-2/53469-21-9	Aroclor-1016/1242	33	U
12672-29-6	Aroclor-1248	33	U
11097-57-4	Aroclor-1254	33	U
11096-82-5	Aroclor-1260	33	U

U: Concentration of analyte is less than the value given.

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5/27/98  
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1D  
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: QUANTERRA, MO. Contract: 550.231 BON092

Lab Code: ITMO Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: W02308

Matrix: (soil/water) SOIL Lab Sample ID: 17398-001

Sample wt/vol: 30.0 (g/ml) G Lab File ID: \_\_\_\_\_

Level: (low/med) LOW Date Sampled: 04-01-98

% Moisture: not dec. 3 dec. \_\_\_\_\_ Date Extracted: 04-15-98

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 04-16-98

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

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

CAS NO.	Compound	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/KG</u>	Q
319-84-6	alpha-BHC	1.8	U
319-85-7	beta-BHC	1.8	U
319-86-8	delta-BHC	1.8	U
58-89-9	gamma-BHC (Lindane)	1.8	U
76-44-8	Heptachlor	1.8	U
309-00-2	Aldrin	1.8	U
1024-57-3	Heptachlor epoxide	1.8	U
959-98-8	Endosulfan I	1.8	U
60-57-1	Dieldrin	1.8	U
72-55-9	4,4'-DDE	1.8	U
72-20-8	Endrin	1.8	U
33213-65-9	Endosulfan II	1.8	U
72-54-8	4,4'-DDD	1.8	U
1031-07-8	Endosulfan sulfate	1.8	U
50-29-3	4,4'-DDT	1.8	U
72-43-5	Methoxychlor	3.4	U
53494-70-5	Endrin Aldehyde	1.8	U
57-74-9	Tech. Chlordane	18	U
8001-35-2	Toxaphene	69	U
11104-28-2	Aroclor-1221	34	U
11141-28-2	Aroclor-1232	34	U
12674-11-2/53469-21-9	Aroclor-1016/1242	34	U
12672-29-6	Aroclor-1248	34	U
11097-57-4	Aroclor-1254	34	U
11096-82-5	Aroclor-1260	34	U

U: Concentration of analyte is less than the value given.

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PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BON093

Lab Name: QUANTERRA, MO Contract: 550.231

Lab Code: ITMO Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: W02308

Matrix: (soil/water) SOIL Lab Sample ID: 17398-002

Sample wt/vol: 30.1 (g/ml) G Lab File ID: \_\_\_\_\_

Level: (low/med) LOW Date Sampled: 04-01-98

% Moisture: not dec. 5 dec. \_\_\_\_\_ Date Extracted: 04-09-98

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 04-14-98

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

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

CAS NO. Compound U

CAS NO.	Compound	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/KG</u>	U
319-84-6	alpha-BHC	1.8	U
319-85-7	beta-BHC	1.8	U
319-86-8	delta-BHC	1.8	U
58-89-9	gamma-BHC (Lindane)	1.8	U
76-44-8	Heptachlor	1.8	U
309-00-2	Aldrin	1.8	U
1024-57-3	Heptachlor epoxide	1.8	U
959-98-8	Endosulfan I	1.8	U
60-57-1	Dieldrin	1.8	U
72-55-9	4,4'-DDE	1.8	U
72-20-8	Endrin	1.8	U
33213-65-9	Endosulfan II	1.8	U
72-54-8	4,4'-DDD	1.8	U
1031-07-8	Endosulfan sulfate	1.8	U
50-29-3	4,4'-DDT	1.8	U
72-43-5	Methoxychlor	3.5	U
53494-70-5	Endrin Aldehyde	1.8	U
57-74-9	Tech. Chlordane	18	U
8001-35-2	Toxaphene	70	U
11104-28-2	Aroclor-1221	35	U
11141-28-2	Aroclor-1232	35	U
12674-11-2/53469-21-9	Aroclor-1016/1242	35	U
12672-29-6	Aroclor-1248	35	U
11097-57-4	Aroclor-1254	35	U
11096-82-5	Aroclor-1260	35	U

U: Concentration of analyte is less than the value given.

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PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: QUANTERRA, MO. Contract: 550.231

BON094

Lab Code: ITMO Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: W02308

Matrix: (soil/water) SOIL Lab Sample ID: 17398-003

Sample wt/vol: 30.2 (g/ml) G Lab File ID: \_\_\_\_\_

Level: (low/med) LOW Date Sampled: 04-01-98

% Moisture: not dec. 4 dec. \_\_\_\_\_ Date Extracted: 04-15-98

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 04-16-98

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

CAS NO. Compound CONCENTRATION UNITS:  
(ug/L or ug/Kg) UG/KG Q

319-84-6	alpha-BHC	1.8	U
319-85-7	beta-BHC	1.8	U
319-86-8	delta-BHC	1.8	U
58-89-9	gamma-BHC (Lindane)	1.8	U
76-44-8	Heptachlor	1.8	U
309-00-2	Aldrin	1.8	U
1024-57-3	Heptachlor epoxide	1.8	U
959-98-8	Endosulfan I	1.8	U
60-57-1	Dieldrin	1.8	U
72-55-9	4,4'-DDE	1.8	U
72-20-8	Endrin	1.8	U
33213-65-9	Endosulfan II	1.8	U
72-54-8	4,4'-DDD	1.8	U
1031-07-8	Endosulfan sulfate	1.8	U
50-29-3	4,4'-DDT	1.8	U
72-43-5	Methoxychlor	3.3	U
53494-70-5	Endrin Aldehyde	1.8	U
57-74-9	Tech. Chlordane	18	U
8001-35-2	Toxaphene	69	U
11104-28-2	Aroclor-1221	34	U
11141-28-2	Aroclor-1232	34	U
12674-11-2/53469-21-9	Aroclor-1016/1242	34	U
12672-29-6	Aroclor-1248	34	U
11097-57-4	Aroclor-1254	34	U
11096-82-5	Aroclor-1260	34	U

U: Concentration of analyte is less than the value given.

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**Appendix 4**

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

000018

Quanterra Incorporated  
13715 Rider Trail North  
Earth City, Missouri 63045

314 298-8566 Telephone  
314 298-8757 Fax

## CASE NARRATIVE

Bechtel Hanford Incorporated  
3350 George Washington Way  
Richland, Washington 99352

May 5, 1998

Attention: Joan Kessner



---

Project number	:	550.231
Date Received by Lab	:	April 1, 1998
Number of Samples	:	Seven (7)
Sample Type	:	Soil
SDG Number	:	W02308
Data Deliverable	:	Summary

---

### I. Introduction

On April 1, 1998, seven (7) soil samples were received by Quanterra, St. Louis for chemical analysis. Upon receipt, the samples were given the following laboratory ID numbers to correspond with the specific client IDs:

<u>St. Louis ID</u>	<u>BHL ID</u>	<u>Richland ID</u>	<u>Matrix</u>	<u>Date of Receipt</u>
17398-001	B0N092	80401501	Soil	01-APR-98
17398-002	B0N093	80401502	Soil	01-APR-98
17398-003	B0N094	80401503	Soil	01-APR-98
17398-004	B0N090	80401504	Soil	01-APR-98
17398-005	B0N091	80401505	Soil	01-APR-98
17398-006	B0N095	80401506	Soil	01-APR-98
17398-007	B0N096	80401507	Soil	01-APR-98

### II. Analytical Results/ Methodology

The analytical results for this report are presented by analytical test. Each set of data includes sample identification information, analytical results and the appropriate detection limits.

Analyses requested: Pest/PCBs by EPA Method 8080.

Bechtel Hanford Incorporated  
May 5, 1998  
Project Number: 550.231  
SDG: W02308  
Page 2

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### III. Quality Control

A Laboratory Control Sample and Method Blank were analyzed with each preparation batch. A Matrix Spike and Matrix Spike Duplicate were performed per the protocol for each analyte in this SDG.

### IV. Definitions

The following codes are used to denote laboratory quality control samples and can be found in the data summary section of this report:

QCBLK- Quality Control Blank, Method Blank  
QCLCS- Quality Control Laboratory Control Sample, Blank Spike

### V. Comments

#### Shipping and Receiving

There were no variances noted during sample receipt..

#### Pesticides/PCBs

There are no comments or nonconformances associated with this analysis.

I certify that this data package is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature.

Reviewed and approved:



Robert E. White  
Project Manager

Collector: MT Shtankovich  
 Project Designation: 100 D Areas - Full Protocol  
 Ice Chest No.: 96-045  
 Company Contact: OH Hamilton  
 Telephone No.: 531-0731  
 Project Coordinator: KOERNER, CC  
 Date Turnaround: 15 Days  
 Sampling Location: 107-D2  
 Field Logbook No.: EL-1339-1  
 Method of Equipment Hand Delivered  
 Offsite Property No.: NA  
 Title of Lading: Air Bill No. NA

Shipped To: Quanta Incorporated

POSSIBLE SAMPLE HAZARDS/REMARKS

Special Handling and/or Storage

Sample No.	Matrix *	Sample Date	Sample Time	Name	Code	Notes	Code	Notes	Code	Notes	Code	Notes
BON092	Soil	4-1-98	1010	Activity Scan	60ml	Chromium Hex - 7196	60ml	Americium-241; Isotopic Phosphorus; Isotope Uranium	60ml	Strontium-90 - Total	60ml	See Item (1) in Special Instructions
BON093	Soil	4-1-98	0938									
BON094	Soil	4-1-98	1010									

SAMPLE ANALYSIS

804015

SDA

W02308

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4016

804016

LOC Quad

Sample No.	Matrix *	Sample Date	Sample Time	Name	Code	Notes	Code	Notes	Code	Notes	Code	Notes
BON092	Soil	4-1-98	1010									
BON093	Soil	4-1-98	0938									
BON094	Soil	4-1-98	1010									

CHAIN OF POSSESSION

Relinquished By: [Signature] Date/Time: 4-1-98 1800

Received By: [Signature] Date/Time: 4-1-98 1500

Relinquished By: [Signature] Date/Time: 4-1-98 1500

Received By: [Signature] Date/Time: 4-1-98 1500

Relinquished By: [Signature] Date/Time: 4-1-98 1500

Received By: [Signature] Date/Time: 4-1-98 1500

Relinquished By: [Signature] Date/Time: 4-1-98 1500

Received By: [Signature] Date/Time: 4-1-98 1500

LABORATORY SECTION: Received By: [Signature] Date/Time: [ ]

FINAL SAMPLE DISPOSITION: Disposed By: [Signature] Date/Time: [ ]

SPECIAL INSTRUCTIONS

\*\*COA R00D23 2F00\*\*\* The ERC contractor acknowledges the 24-hour holding time is not likely achievable for Hex Chroma by EPA 7196.

\*\* Use a separate Chain of Custody for each waste site.

(1) Gamma Spectroscopy (Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-153); Gamma Spec - Add-on (Americium-241, Uranium-238)

Matrix \*

- S - Soil
- SB - Sediment
- SO - Solid
- SL - Sludge
- W - Water
- O - Oil
- A - Air
- DS - Drum Solids
- DL - Drum Liquids
- T - Tissue
- WI - Wipe
- L - Liquid
- V - Vegetation
- X - Other

Collector MT Blankovich	Company/Contact OH Hamilton	Telephone No. 531-0731	Project Coordinator KOPRNER, CC	Date Turnaround 15 Days
Project Designation 100 D Area - Full Protocol	Sampling Location 107-D3	Field Logbook No. EL-1339-1	Method of Shipment Hand Delivered	
Ice Chest No. 96-043	Offsite Property No. NA	Bill of Lading/Air Bill No. NA		

Shipped To  
Quarters Incorporated

POSSIBLE SAMPLE HAZARDS/REMARKS

Preservation	Name	Code	Name	Name	Code	Name
Type of Container	P	40	40	40	40	P
No. of Container(s)	1	1	1	1	2	2
Volume	20ml	60ml	60ml	60ml	60ml	1000ml

Special Handling and/or Storage

SAMPLE ANALYSIS

804015

Sample No.	Matrix *	Sample Date	Sample Time	Activity Scan	Chromium Hex - 7196	American-241; Isotopic Uranium	Strontium-90/90 - Total %	FastPC - 807 (TCL)	See Item (1) in Special Instructions	Loc.
BON090 04	Sol	4-1-98	0830	X	X	X	X	X		Loc.
BON091 05	Sol	4-1-98	0840	X	X	X	X	X		804016
BON095 06	Sol	4-1-98	0914	X	X	X	X	X		804016
BON096 07	Sol	4-1-98	0850	X	X	X	X	X		804016

CHAIN OF POSSESSION

Sign/Print Names

Relinquished By	Date/Time	Received By	Date/Time
W. H. Blankovich	4-1-98 1300	Bob Pratt	4-1-98 1300
Relinquished By	Date/Time	Received By	Date/Time
Blankovich	4-1-98 1500	Blankovich	4-1-98 1500

LABORATORY SECTION

Received By

Disposal Method

Disposed By

Date/Time

Matrix \*

- S - Soil
- SE - Sediment
- SD - Solid
- SL - Sludge
- W - Water
- O - Oil
- A - Air
- DS - Dried Solids
- DL - Dried Liquids
- T - Tissue
- WT - Waste
- L - Liquid
- V - Vegetation
- X - Other

SPECIAL INSTRUCTIONS

\*\*COA R00D22 2F00\*\*\*\* The ERC contractor acknowledges the 24-hour holding time is not likely achievable for Hex Chrome by EPA 7196.

\*\* Use a separate Chain of Custody for each waste etc.

(1) Gamma Spectroscopy (Caesium-137, Cobalt-60, Europium-152, Europium-154, Europium-159); Gamma Spcs - Add-on (Americium-241, Uranium-238)

**Appendix 5**

**Data Validation Supporting Documentation**



PESTICIDE/PCB DATA VALIDATION CHECKLIST

Are DBC retention times acceptable? . . . . . Yes No **N/A**  
 Is the GC/MS tuning/performance check acceptable? . . . . . Yes No **N/A**

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

3.2 CALIBRATIONS (METHOD 8080 AND 8081)

Are EVAL standard calibration factors and %RSD values acceptable? . . . . . Yes No **N/A**  
 Are quantitation column calibration factor %RSD values acceptable? . . . . . Yes No **N/A**  
 Were the analytical sequence requirements met? . . . . . Yes No **N/A**  
 Are continuing calibration %D values acceptable? . . . . . Yes No **N/A**

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

3.3 INSTRUMENT PERFORMANCE AND INITIAL CALIBRATION (3/90 SOW)

Was the initial calibration sequence performed? . . . . . Yes No **N/A**  
 Was the resolution acceptable in the resolution check mix? . . . . . Yes No **N/A**  
 Is resolution acceptable in the PEM, INDA and INDB? . . . . . Yes No **N/A**  
 Are DDT and Endrin breakdowns acceptable? . . . . . Yes No **N/A**  
 Are retention times in PEMs and calibration mixes acceptable? . . . . . Yes No **N/A**  
 Are RPD values in the PEMs acceptable? . . . . . Yes No **N/A**  
 Are %RSD values acceptable? . . . . . Yes No **N/A**

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

3.4 CALIBRATION VERIFICATION (3/90 SOW)

Were the analytical sequence requirements met? . . . . . Yes No **N/A**  
 Is resolution acceptable in the PEMs? . . . . . Yes No **N/A**  
 Are initial calibrations acceptable? . . . . . Yes No **N/A**

PESTICIDE/PCB DATA VALIDATION CHECKLIST

Are retention times acceptable in the PEMs, INDA and INDB mixes? . . . . .	Yes	No	N/A
Are RPD values in the PEMs acceptable? . . . . .	Yes	No	N/A
Are the DDT and endrin breakdowns acceptable? . . . . .	Yes	No	N/A
Was GPC cleanup performed? . . . . .	Yes	No	N/A
Is the GPC calibration check acceptable? . . . . .	Yes	No	N/A
Was Florisil cleanup performed? . . . . .	Yes	No	N/A
Is the Florisil performance check acceptable? . . . . .	Yes	No	N/A

N/A  
N/A  
N/A  
N/A  
N/A  
N/A  
N/A

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

4. BLANKS

Were laboratory blanks analyzed? . . . . .	Yes	No	N/A
Are laboratory blank results acceptable? . . . . .	Yes	No	N/A
Were field/trip blanks analyzed? . . . . .	Yes	No	N/A
Are field/trip blank results acceptable? . . . . .	Yes	No	N/A

Comments: 4,4- DDT in one blank - no qual req  
\_\_\_\_\_  
\_\_\_\_\_

5. ACCURACY

Were surrogates analyzed? . . . . .	Yes	No	N/A
Are surrogate recoveries acceptable? . . . . .	Yes	No	N/A
Were MS/MSD samples analyzed? . . . . .	Yes	No	N/A
Are MS/MSD results acceptable? . . . . .	Yes	No	N/A
Were LCS samples analyzed? . . . . .	Yes	No	N/A
Are LCS results acceptable? . . . . .	Yes	No	N/A

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

*AK*

PESTICIDE/PCB DATA VALIDATION CHECKLIST

6. PRECISION

- Are MS/MSD RPD values acceptable? . . . . .  Yes No N/A
- Are laboratory duplicate results acceptable? . . . . .  Yes No N/A
- Are field duplicate RPD values acceptable? . . . . . Yes  No N/A
- Are field split RPD values acceptable? . . . . . Yes No  N/A

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

7. SYSTEM PERFORMANCE

- Is chromatographic performance acceptable? . . . . . Yes No  N/A
- Are positive results resolved acceptably? . . . . . Yes No  N/A

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

8. COMPOUND IDENTIFICATION AND QUANTITATION

- Is compound identification acceptable? . . . . . Yes No  N/A
- Is compound quantitation acceptable? . . . . . Yes No  N/A

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

9. REPORTED RESULTS AND QUANTITATION LIMITS

- Are results reported for all requested analyses? . . . . .  Yes No N/A
- Are all results supported in the raw data? . . . . . Yes No  N/A
- Do results meet the CRQLs? . . . . . Yes  No N/A

Comments: Toxaphene - over in all samples  
\_\_\_\_\_  
\_\_\_\_\_

Date: 27 May 1998  
To: Bechtel Hanford, Inc. (technical representative)  
From: TechLaw, Inc.  
Project: 100 D Area - Full Protocol  
Subject: Radiochemistry - Data Package No. W02308-QES (SDG No. W02308)

## **INTRODUCTION**

This memo presents the results of data validation on Summary Data Package No. W02308-QES which was prepared by Quanterra Environmental Services (QES). A list of samples validated along with the analyses reported and the requested analyte is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation</b>	<b>Analysis</b>
BON090	04/01/98	Soil	C	See note 1
BON091	04/01/98	Soil	C	See note 1
BON092	04/01/98	Soil	C	See note 1
BON093	04/01/98	Soil	C	See note 1
BON094	04/01/98	Soil	C	See note 1
BON095	04/01/98	Soil	C	See note 1
BON096	04/01/98	Soil	C	See note 1

1 - Gamma spectroscopy (RICHR5017), alpha spectroscopy (RICHR5057/5030), and strontium-89/90 (RICHR5006).

Data validation was conducted in accordance with the BHI validation statement of work (BHI 1997) and the 100Area Sampling and Analysis Plan (May 1998). Appendices 1 through 5 provide the following information as indicated below:

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

## **DATA QUALITY OBJECTIVES**

- **Holding Times**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for all analytes is 6 months.

All holding times were acceptable.

- **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 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 elevated to the MDA and qualified as undetected and flagged "U"; sample results above the MDA and greater than five times the highest blank concentration are not qualified.

Due to positive laboratory blank results, all uranium-238 by GEA results were qualified as estimates and flagged "J/UJ".

Due to positive laboratory blank results, the radium-226 results in samples BON090 and BON091 were qualified as estimates and flagged "J".

All other blank results were acceptable.

- **Accuracy**

Accuracy is evaluated by analyzing distilled water or field samples spiked with known amounts of radionuclides. The sample activity as determined by analysis is compared to the known activity to assess accuracy. The acceptable laboratory control sample recovery range is 70% to 130%, while that for a matrix spike is 60% to 140%. In addition, samples may be spiked with a radiochemical tracer to assist in isolating the radioisotope of interest with the yield of the tracer being used in calculating sample activity. The acceptable range for tracer recovery is 20% to 105%. Spike sample results outside the above ranges result in associated sample results being qualified as estimates, rejected, or not qualified, depending on the activity of the individual sample.

Due to an LCS percent recovery below QC limits, all uranium-238 by GEA results were qualified as estimates and flagged "J/UJ".

Due to the lack of an LCS, all plutonium-238 results were qualified as estimates and flagged "J/UJ".

All results other accuracy results were acceptable.

- **Precision**

Analytical precision is expressed by the RPD between the recoveries of duplicate matrix spike analyses performed on a sample. Precision may also be assessed using unspiked duplicate sample analyses. If both sample and replicate activities are greater than five times the CRDL and the RPD is less than 30 percent for soil samples and 20 percent for water samples, the results are acceptable. If either activities are less than five times the CRDL, a control limit of less than or equal to two times the CRDL is used for soil samples and less than or equal to the CRDL for water samples. If either the original or replicate value is below the CRDL, the applicable control limits are less than or equal to the CRDL for water samples and less than or equal to two times the CRDL for soil samples. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

Due to an RPD of 188%, all GEA uranium-238 results were qualified as estimates and flagged "J/UJ".

All other duplicate results were acceptable.

- **Detection Levels**

Reported laboratory detection levels are reviewed to ensure that they are at or below the contract required MDA. The following MDAs were above the contract required MDA: Uranium-238 (GEA) results in samples BON091, BON093, BON094 and BON095. All other reported MDAs were at or below the analyte-specific CRDL.

- **Completeness**

Data Package No. W02308 (SDG No. W02308) was submitted for validation and verified for completeness. The completion rate was 100%.

## **MAJOR DEFICIENCIES**

None found.

## **MINOR DEFICIENCIES**

Due to an RPD of 188%, all GEA uranium-238 results were qualified as estimates and flagged "J/UJ". Due to an LCS percent recovery below QC limits, all uranium-238 by alpha spectroscopy results were qualified as estimates and flagged "J/UJ". Due to the lack of an LCS, all plutonium-238 results were qualified as estimates and flagged "J/UJ". Due to positive laboratory blank results, all uranium-238 by GEA results were qualified as estimates and flagged "J/UJ". Due to positive laboratory blank results, the radium-226 results in samples BON090 and BON091 were qualified as estimates and flagged "J". Data flagged 'J' is an estimate, but under the BHI validation SOW, the data may be usable for decision-making purposes. All other validated results are considered accurate within the standard error associated with the methods.

## **REFERENCES**

BHI, MRB-SBB-A23665, *Validation Statement of Work*, Bechtel Hanford Incorporated, September 5, 1997.

DOE/RL-96-22, Rev. 1, *100 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, May 1998

**Appendix 1**

**Glossary of Data Reporting Qualifiers**

Qualifiers which may be applied by data validators in compliance with the BHI statement of work 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 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 QC deficiency identified during the data validation, the associated concentration is an estimate, but the data are usable for decision-making purposes.
- R - Indicates the compound or analyte was analyzed for, detected, and due to an identified 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 QC deficiency.

**Appendix 2**

**Summary of Data Qualification**

000007

DATA QUALIFICATION SUMMARY

SDG: W02308	REVIEWER: TLI	DATE: 05/27/98	PAGE <u>1</u> OF <u>1</u>
COMMENTS:			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Uranium-238 (GEA)	J/UJ	All	LCS recovery below QC limits
Plutonium-238	J/UJ	All	No LCS
Uranium-238 (GEA)	J/UJ	All	RPD outside QC limits
Uranium-238 (GEA)	J/UJ	All	Blank contamination
Radium-226	J	BON090, BON091	Blank contamination

000008

**Appendix 3**

**Qualified Data Summary and Annotated Laboratory Reports**

Project: BECHTEL-HANFORD																																									
Laboratory: Quanterra																																									
Case		SDG: W02308																																							
Sample Number		B0N090		B0N091		B0N092		B0N093		B0N094		B0N095		B0N096																											
Location		107-D3		107-D3		107-D3		107-D3		107-D3		107-D3		107-D3																											
Remarks																																									
Sample Date		04/01/98		04/01/98		04/01/98		04/01/98		04/01/98		04/01/98		04/01/98																											
Radiochemistry	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q				
Americium-241	0.1	0.00583	U	0.00413	U	0.205	0.0712	0.0866	0.0324	0.0173																															
Uranium-234	0.1	2.39		0.316		0.762	0.748	0.64	0.769	0.677																															
Uranium-235	0.1	0.0787		0.0369		0.0206	U	0.016	U	0.0359	0.0222	U	0.0137	U																											
Uranium-238	0.1	2.51		0.362		0.747	0.577	0.567	0.74	0.861																															
Plutonium-238	0.1	0.0112	UJ	0.00824	UJ	-0.000503	UJ	0.00635	UJ	0.0038	UJ	0.0182	J	0	UJ																										
Plutonium-239/40	0.1	0	U	0	U	0.0116	U	0	U	0.0407	0	U	0.0139																												
Americium-241GEA	0.1	-0.00618	U	-0.0225	U	-0.0234	U	-0.00275	U	0.012	U	-0.0508	U	0.00674	U																										
Cobalt-60	0.05	-0.00185	U	0.00088	U	0.0559	0.0112	U	0.0722	0.00036	U	0.0124																													
Cesium-137DA	0.05	-0.00441	U	0.00273	U	1.43	0.0194	1.49	0.0208	-0.00112	U																														
Europium-152	0.1	-0.00434	U	-0.00092	U	0.551	0.204	0.501	0.159	0.0485																															
Europium-154	0.1	-0.0128	U	-0.00363	U	0.0631	0.0272	U	0.0541	U	0.0173	U	-0.00453	U																											
Europium-156	0.1	0.0166	U	0.0103	U	0.0448	0.0114	U	0.0384	U	0.0186	U	0.0329																												
Potassium-40	N/A	0.25		5.23		8.61	9.34	9.34	9.93	9.27																															
Radium-224DA	0.1	0.184		0.159		0.413	0.44	0.478	0.525	0.456																															
Radium-226	0.1	0.142	J	0.143	J	0.351	0.347	0.386	0.403	0.359																															
Radium-228	0.1	0.182		0.187		0.432	0.47	0.439	0.562	0.459																															
Uranium-238GEA	0.1	0.315	J	0.121	UJ	0.323	J	0.334	UJ	0.405	UJ	0.56	UJ	0.48	J																										
Strontium-90	1	0.0125	U	0.0176	U	0.0799	U	0.0216	U	0.0635	U	0.0668	U	0.0633	U																										

000010

N/A = Not Applicable

**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401604 MATRIX: SOIL  
 CLIENT ID: B0N090 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
✓ HEXCHROME	6.00E-02		N/A	N/A	3.00E-02	mg/kg	N/A	EPA7106
AM-241	5.83E-03	U	1.2E-02	1.2E-02	1.58E-02	pCi/g	68.60%	RICHRC5057
U-234	2.39E+00		2.5E-01	4.8E-01	3.64E-02	pCi/g	65.50%	RICHRC5030
U-235	7.87E-02	J	4.7E-02	4.9E-02	4.43E-02	pCi/g	65.50%	RICHRC5030
U-238	2.51E+00		2.5E-01	5.0E-01	3.64E-02	pCi/g	65.50%	RICHRC5030
PU-238	1.12E-02	<i>JK</i>	1.6E-02	1.6E-02	1.51E-02	pCi/g	54.20%	RICHRC5010 <b>UJ</b>
PU239/40	0.00E+00	U	0.0E+00	1.7E-02	1.51E-02	pCi/g	54.20%	RICHRC5010
AM-241	-6.18E-03	U	2.4E-02	2.4E-02	3.97E-02	pCi/g	N/A	RICHRC5017
CO-60	-1.95E-03	U	6.0E-03	6.0E-03	1.01E-02	pCi/g	N/A	RICHRC5017
CS-137DA	-4.41E-03	U	5.7E-03	5.8E-03	9.13E-03	pCi/g	N/A	RICHRC5017
EU-152	-4.34E-03	U	1.4E-02	1.4E-02	2.27E-02	pCi/g	N/A	RICHRC5017
EU-154	-1.28E-02	U	2.1E-02	2.1E-02	3.30E-02	pCi/g	N/A	RICHRC5017
EU-155	1.68E-02	U	1.6E-02	1.6E-02	2.62E-02	pCi/g	N/A	RICHRC5017
K-40	6.25E+00		2.9E-01	6.9E-01	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	1.84E-01		1.4E-02	2.3E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	1.42E-01		2.4E-02	2.8E-02	N/A	pCi/g	N/A	RICHRC5017 <b>J</b>
RA-228	1.82E-01	J	3.7E-02	4.1E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	3.15E-01		3.2E-01	3.2E-01	N/A	pCi/g	N/A	RICHRC5017 <b>J</b>
STRONTIUM	1.25E-02	U	3.8E-02	3.8E-02	1.01E-01	pCi/g	64.00%	RICHRC5006

Number of Results: **19**

*RM<sup>e</sup>*  
*5/27/98*

**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401605 MATRIX: SOIL  
 CLIENT ID: B0N091 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
<del>HEXCHROME</del>	<del>9.00E-02</del>	<del>U</del>	<del>N/A</del>	<del>N/A</del>	<del>3.00E-02</del>	<del>mg/kg</del>	<del>N/A</del>	<del>EPA719C</del>
AM-241	4.13E-03	U	8.3E-03	8.3E-03	1.12E-02	pCi/g	94.90%	RICHRC5057
U-234	3.16E-01	J	8.2E-02	9.6E-02	1.43E-02	pCi/g	84.50%	RICHRC5030
U-235	3.69E-02	J	2.8E-02	2.8E-02	1.43E-02	pCi/g	84.50%	RICHRC5030
U-238	3.62E-01	J	8.8E-02	1.0E-01	2.63E-02	pCi/g	84.50%	RICHRC5030
PU-238	6.24E-03	<i>sk</i>	1.2E-02	1.3E-02	1.69E-02	pCi/g	50.40%	RICHRC5030J
PU239/40	0.00E+00	U	0.0E+00	1.9E-02	1.69E-02	pCi/g	50.40%	RICHRC5030
AM-241	-2.25E-02	U	1.9E-02	1.9E-02	2.81E-02	pCi/g	N/A	RICHRC5037
CO-60	9.83E-04	U	4.8E-03	4.8E-03	8.59E-03	pCi/g	N/A	RICHRC5037
CS-137DA	2.73E-03	U	4.4E-03	4.4E-03	7.73E-03	pCi/g	N/A	RICHRC5037
EU-152	-9.20E-04	U	1.2E-02	1.2E-02	2.05E-02	pCi/g	N/A	RICHRC5037
EU-154	-3.63E-03	U	1.7E-02	1.7E-02	2.76E-02	pCi/g	N/A	RICHRC5037
EU-155	1.03E-02	U	1.3E-02	1.3E-02	2.25E-02	pCi/g	N/A	RICHRC5037
K-40	5.23E+00		2.5E-01	5.8E-01	N/A	pCi/g	N/A	RICHRC5037
RA-224DA	1.59E-01		1.4E-02	2.1E-02	N/A	pCi/g	N/A	RICHRC5037
RA-226	1.43E-01		2.0E-02	2.4E-02	N/A	pCi/g	N/A	RICHRC5037J
RA-228	1.87E-01	J	3.9E-02	4.3E-02	N/A	pCi/g	N/A	RICHRC5037
U-238	1.21E-01	<i>sk</i>	1.6E-01	1.6E-01	2.56E-01	pCi/g	N/A	RICHRC5037UJ
STRONTIUM	1.76E-02	U	4.6E-02	4.6E-02	1.21E-01	pCi/g	51.60%	RICHRC5006

Number of Results: 19

*mw*  
*5/27/98*

**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401601 MATRIX: SOIL  
 CLIENT ID: B0N092 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
<del>HEXCHROME</del>	<del>3.00E-02</del>	<del>U</del>	<del>N/A</del>	<del>N/A</del>	<del>3.00E-02</del>	<del>mg/kg</del>	<del>N/A</del>	<del>EPA7190</del>
AM-241	2.05E-01	J	6.3E-02	7.1E-02	1.32E-02	pCi/g	82.00%	RICHRC5057
U-234	7.62E-01	J	1.5E-01	2.0E-01	2.84E-02	pCi/g	60.50%	RICHRC5050
U-235	2.06E-02	U	2.4E-02	2.5E-02	2.84E-02	pCi/g	60.50%	RICHRC5050
U-238	7.47E-01	J	1.5E-01	2.0E-01	3.52E-02	pCi/g	60.50%	RICHRC5050
PU-238	-5.03E-04	<del>U</del>	1.0E-03	1.0E-03	2.53E-02	pCi/g	84.00%	RICHRC5010
PU239/40	1.16E-02	U	1.8E-02	1.8E-02	2.87E-02	pCi/g	64.00%	RICHRC5010
AM-241	-2.34E-02	U	3.4E-02	3.4E-02	5.56E-02	pCi/g	N/A	RICHRC5017
CO-60	5.59E-02		1.8E-02	1.9E-02	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	1.43E+00		3.6E-02	1.5E-01	N/A	pCi/g	N/A	RICHRC5017
EU-152	5.51E-01		4.6E-02	7.2E-02	N/A	pCi/g	N/A	RICHRC5017
EU-154	8.31E-02	<del>U</del>	2.6E-02	2.8E-02	5.12E-02	pCi/g	N/A	RICHRC5017
EU-155	4.46E-02	<del>U</del>	2.7E-02	2.7E-02	4.40E-02	pCi/g	N/A	RICHRC5017
K-40	8.61E+00		3.5E-01	9.3E-01	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	4.13E-01		2.4E-02	4.8E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	3.51E-01		3.4E-02	4.9E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	4.32E-01		5.9E-02	7.3E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	3.23E-01		3.1E-01	3.1E-01	N/A	pCi/g	N/A	RICHRC5017
STRONTIUM	7.99E-02	U	5.1E-02	5.7E-02	1.15E-01	pCi/g	83.20%	RICHRC5005

Number of Results: 19

*plus*  
5/27/98

**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401602 MATRIX: SOIL  
 CLIENT ID: B0N093 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
<del>HEXCHROME</del>	<del>3.00E-02</del>	<del>U</del>	<del>N/A</del>	<del>N/A</del>	<del>3.00E-02</del>	<del>mg/kg</del>	<del>N/A</del>	<del>EPA7196</del>
AM-241	7.12E-02	J	3.6E-02	3.8E-02	2.42E-02	pCi/g	92.90%	RICHRC5057
U-234	7.48E-01	J	1.4E-01	1.9E-01	3.06E-02	pCi/g	66.10%	RICHRC5030
U-235	1.60E-02	U	2.1E-02	2.2E-02	3.47E-02	pCi/g	66.10%	RICHRC5030
U-238	5.77E-01	J	1.2E-01	1.5E-01	2.81E-02	pCi/g	66.10%	RICHRC5030
PU-238	6.35E-03	<del>U</del>	1.4E-02	1.4E-02	2.78E-02	pCi/g	61.80%	RICHRC5010 <del>U</del>
PU239/40	0.00E+00	U	0.0E+00	2.1E-02	1.87E-02	pCi/g	61.80%	RICHRC5010
AM-241	-2.75E-03	U	2.4E-02	2.4E-02	3.76E-02	pCi/g	N/A	RICHRC5017
CO-60	1.12E-02	U	8.0E-03	8.1E-03	1.47E-02	pCi/g	N/A	RICHRC5017
CS-137DA	1.94E-02	J	1.1E-02	1.1E-02	N/A	pCi/g	N/A	RICHRC5017
EU-152	2.04E-01		3.4E-02	4.0E-02	N/A	pCi/g	N/A	RICHRC5017
EU-154	2.72E-02	U	2.2E-02	2.2E-02	3.92E-02	pCi/g	N/A	RICHRC5017
EU-155	1.14E-02	U	1.9E-02	1.9E-02	3.15E-02	pCi/g	N/A	RICHRC5017
K-40	9.34E+00		3.1E-01	9.9E-01	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	4.40E-01		2.0E-02	4.9E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	3.47E-01		2.8E-02	4.4E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	4.70E-01		5.7E-02	7.4E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	3.34E-01	<del>U</del>	2.1E-01	2.2E-01	3.45E-01	pCi/g	N/A	RICHRC5017 <del>U</del>
STRONTIUM	2.16E-02	U	4.6E-02	4.6E-02	1.19E-01	pCi/g	61.50%	RICHRC5006

Number of Results: 19

*pu*  
*5/27/98*

*0000*

**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401603 MATRIX: SOIL  
 CLIENT ID: B0N094 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
<del>HEXCHROME</del>	<del>3.00E-02</del>	<del>U</del>	<del>N/A</del>	<del>N/A</del>	<del>3.00E-02</del>	<del>mg/kg</del>	<del>N/A</del>	<del>EPA7196</del>
AM-241	8.66E-02	J	4.4E-02	4.6E-02	2.50E-02	pCi/g	74.60%	RICHRC5057
U-234	6.40E-01	J	1.3E-01	1.7E-01	4.20E-02	pCi/g	71.90%	RICHRC5030
U-235	3.59E-02	J	3.1E-02	3.2E-02	3.37E-02	pCi/g	71.90%	RICHRC5030
U-238	5.67E-01	J	1.2E-01	1.5E-01	3.15E-02	pCi/g	71.90%	RICHRC5030
PU-238	3.80E-03	<i>JK</i>	9.1E-03	9.1E-03	2.07E-02	pCi/g	73.20%	RICHRC5010UJ
PU239/40	4.07E-02		2.7E-02	2.8E-02	1.22E-02	pCi/g	73.20%	RICHRC5010
AM-241	1.20E-02	U	5.3E-02	5.3E-02	8.50E-02	pCi/g	N/A	RICHRC5017
CO-60	7.22E-02		1.7E-02	1.9E-02	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	1.49E+00		3.8E-02	1.5E-01	N/A	pCi/g	N/A	RICHRC5017
EU-152	5.01E-01		4.4E-02	6.7E-02	N/A	pCi/g	N/A	RICHRC5017
EU-154	5.41E-02	U	3.1E-02	3.1E-02	5.50E-02	pCi/g	N/A	RICHRC5017
EU-155	3.64E-02	U	2.9E-02	2.9E-02	4.57E-02	pCi/g	N/A	RICHRC5017
K-40	9.34E+00		3.5E-01	1.0E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	4.87E-01		2.8E-02	5.6E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	3.86E-01		4.1E-02	5.6E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	4.39E-01		6.7E-02	8.1E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	4.05E-01	<i>JK</i>	3.9E-01	4.0E-01	6.49E-01	pCi/g	N/A	RICHRC5017UJ
STRONTIUM	6.35E-02	U	4.0E-02	4.5E-02	9.18E-02	pCi/g	75.40%	RICHRC5006

Number of Results: 19

*0007*

### SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401606 MATRIX: SOIL  
 CLIENT ID: B0N095 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
<del>HEXCHROME</del>	<del>3.00E-02</del>	<del>U</del>	<del>N/A</del>	<del>N/A</del>	<del>3.00E-02</del>	<del>mg/kg</del>	<del>N/A</del>	<del>EPA7106</del>
AM-241	3.24E-02	J	2.5E-02	2.5E-02	1.25E-02	pCi/g	85.10%	RICHRC5057
U-234	7.69E-01	J	1.3E-01	1.8E-01	1.53E-02	pCi/g	71.20%	RICHRC5030
U-235	2.22E-02	U	2.3E-02	2.3E-02	2.27E-02	pCi/g	71.20%	RICHRC5030
U-238	7.40E-01	J	1.3E-01	1.8E-01	2.27E-02	pCi/g	71.20%	RICHRC5030
PU-238	1.18E-02		1.4E-02	1.4E-02	1.06E-02	pCi/g	81.30%	RICHRC5010
PU239/40	0.00E+00	U	0.0E+00	1.2E-02	1.06E-02	pCi/g	81.30%	RICHRC5010
AM-241	-5.08E-02	U	4.5E-02	4.5E-02	6.93E-02	pCi/g	N/A	RICHRC5017
CO-60	3.60E-04	U	8.0E-03	8.0E-03	1.33E-02	pCi/g	N/A	RICHRC5017
CS-137DA	2.08E-02	J	1.2E-02	1.2E-02	N/A	pCi/g	N/A	RICHRC5017
EU-152	1.59E-01	<i>JK</i>	2.2E-02	2.7E-02	4.24E-02	pCi/g	N/A	RICHRC5017
EU-154	1.73E-02	U	2.6E-02	2.6E-02	4.48E-02	pCi/g	N/A	RICHRC5017
EU-155	1.66E-02	U	2.3E-02	2.3E-02	3.60E-02	pCi/g	N/A	RICHRC5017
K-40	9.93E+00		3.4E-01	1.0E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	5.25E-01		2.1E-02	5.7E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	4.03E-01		2.8E-02	4.9E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	5.62E-01		5.8E-02	8.1E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	5.60E-01	<i>JK</i>	3.2E-01	3.3E-01	5.43E-01	pCi/g	N/A	RICHRC5017
STRONTIUM	8.68E-02	U	4.8E-02	5.6E-02	1.04E-01	pCi/g	96.10%	RICHRC5006

Number of Results: 19

*PKC*  
*5/27/99*

**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401607 MATRIX: SOIL  
 CLIENT ID: B0N096 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
<del>HEXCHROME</del>	<del>3.00E-02</del>	<del>U</del>	<del>N/A</del>	<del>N/A</del>	<del>3.00E-02</del>	<del>mg/kg</del>	<del>N/A</del>	<del>EPA7468</del>
AM-241	1.73E-02	J	1.7E-02	1.8E-02	1.17E-02	pCi/g	96.50%	RICHRC5057
U-234	6.77E-01	J	1.4E-01	1.8E-01	2.75E-02	pCi/g	61.30%	RICHRC5030
U-235	1.37E-02	U	1.9E-02	2.0E-02	1.85E-02	pCi/g	61.30%	RICHRC5030
U-238	8.61E-01	J	1.5E-01	2.2E-01	3.13E-02	pCi/g	61.30%	RICHRC5030
PU-238	0.00E+00	<i>JK</i>	0.0E+00	1.4E-02	1.26E-02	pCi/g	67.10%	RICHRC5010
PU239/40	1.39E-02		1.6E-02	1.6E-02	1.26E-02	pCi/g	67.10%	RICHRC5010
AM-241	6.74E-03	U	2.4E-02	2.4E-02	3.79E-02	pCi/g	N/A	RICHRC5017
CO-60	1.24E-02	<i>JK</i>	6.3E-03	6.4E-03	1.23E-02	pCi/g	N/A	RICHRC5017
CS-137DA	-1.12E-03	U	6.5E-03	6.5E-03	1.05E-02	pCi/g	N/A	RICHRC5017
EU-152	4.85E-02	<i>JK</i>	1.6E-02	1.7E-02	2.96E-02	pCi/g	N/A	RICHRC5017
EU-154	-4.53E-03	U	2.4E-02	2.4E-02	3.96E-02	pCi/g	N/A	RICHRC5017
EU-155	3.29E-02	<i>JK</i>	1.8E-02	1.9E-02	3.16E-02	pCi/g	N/A	RICHRC5017
K-40	9.27E+00		3.2E-01	9.8E-01	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	4.56E-01		2.1E-02	5.0E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	3.59E-01		2.8E-02	4.5E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	4.59E-01		5.1E-02	6.8E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	4.80E-01		2.8E-01	2.9E-01	N/A	pCi/g	N/A	RICHRC5017
STRONTIUM	6.33E-02	U	4.7E-02	5.1E-02	1.11E-01	pCi/g	78.30%	RICHRC5006

Number of Results: 19

*pmc*  
*5/27/98*

**Appendix 4**

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

Quanterra Incorporated  
2800 George Washington Way  
Richland, Washington 99352 ..

509 375-3131 Telephone  
509 375-5590 Fax

**CERTIFICATE OF ANALYSIS**

Bechtel Hanford, Inc.  
3350 George Washington Way  
Richland, WA 99352

April 21, 1998

Attention: Joan Kessner




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SAF Number	:	B98-022
Date SDG Closed	:	April 1, 1998
Number of Samples	:	Seven (7)
Sample Type	:	Soil
SDG Number	:	W02308
Data Deliverable	:	Summary

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**I. Introduction**

On April 1, 1998, seven 15-day priority TAT soil samples were received by the Quanterra Environmental Services Richland Laboratory (QESRL) for radiochemical and chemical analysis. Upon receipt, the samples were assigned the following laboratory ID numbers to correspond with the Bechtel Hanford, Inc. (BHI) specific IDs:

<u>QESRL ID#</u>	<u>BHI ID#</u>	<u>MATRIX</u>	<u>DATE OF RECEIPT</u>
80401601	B0N092	SOIL	4/1/98
80401602	B0N093	SOIL	4/1/98
80401603	B0N094	SOIL	4/1/98
80401604	B0N090	SOIL	4/1/98
80401605	B0N091	SOIL	4/1/98
80401606	B0N095	SOIL	4/1/98
80401607	B0N096	SOIL	4/1/98

**II. Analytical Results/Methodology**

The analytical results for this report are presented by laboratory sample ID. Each set of data includes sample identification information, analytical results and the appropriate associated statistical errors.

Bechtel Hanford, Inc.  
April 21, 1998  
Page 2

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The requested analyses were:

**Alpha Spectroscopy**

Americium-241 by method RICH-RC-5062

Plutonium-238, -239/40 by method RICH-RC-5062

Uranium-234, -235, -238 by method RICH-RC-5062

**Gamma Spectroscopy**

Gamma Scan by method RICH-RC-5017

**Gas Proportional Counting**

Total Strontium by method RICH-RC-5006

**Chemical Analyses**

Chromium Hex by EPA method 7196

III. Quality Control

The analytical results for each analysis performed under SDG W02308 include a minimum of two Laboratory Control Samples (LCS) and one method (reagent) blank. Any exceptions have been noted in the "Comments" section.

Quality control sample results are reported in the same units as sample results.

IV. Comments

**Alpha Spectroscopy**

Americium-241 by method RICH-RC-5057

The LCS, batch blank, sample duplicate (B0N094) and sample results are within contractual requirements.

Plutonium-238, -239/40 by method RICH-RC-5010

The LCS, batch blank, sample duplicate (B0N094) and sample results are within contractual requirements.

Uranium-234, -235, -238 by method RICH-RC-5030

The LCS, batch blank, sample duplicate (B0N094) and sample results are within contractual requirements.

Bechtel Hanford, Inc.  
April 21, 1998  
Page 3

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### **Gamma Spectroscopy**

#### Gamma Scan by method RICH-RC-5017

The LCS, batch blank, sample duplicate (BON094) and sample results are within contractual requirements.

### **Gas Proportional Counting**

#### Total Strontium by method RICH-RC-5006

The LCS, batch blank, sample duplicate (BON092) and sample results are within contractual requirements.

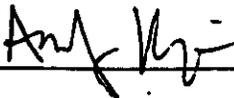
### **Chemical Analyses**

#### Chromium Hex by EPA method 7196

The LCS, batch blank, sample duplicate (BON093) and sample results are within contractual requirements. The MS/MSD recoveries were low at 42% and 55% respectively. The RPD of the MS/MSD was at 29% due to matrix interference.

I certify that this Certificate of Analysis is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature.

Reviewed and approved:



Andy Kopriva  
Project Manager

Collector MT Stankovich	Company Contact OH Hamilton	Telephone No. 531-0731	Project Coordinator KOERNER, CC	Data Turnaround <b>15 Days</b>
Project Designation 100 D Areas - Full Protocol	Sampling Location 107-D2	SAF No. B98-022		
Chest No. 96-045	Field Logbook No. EL-1339-1	Method of Shipment Hand Delivered		
Shipped To Quanterra Incorporated	Offsite Property No. NA	Bill of Lading / Air Bill No. NA		

Possible Sample Hazards/Remarks	Preservation	None	Cool 4C	None	None	Cool 4C	None				
	Type of Container	P	nG	nG	nG	nG	P				
	No. of Container(s)	1	1	1	1	2	2				
Special Handling and/or Storage	Volume	20ml	60ml	60ml	60ml	60ml	1000ml				

SAMPLE ANALYSIS 804015 SDG W02308	Activity Scan	Chromium Hex - 7196	Americium-241; Isotopic Phosonium; Isotopic Uranium	Strontium-89,90 - Total Sr	Fast/PCBs - 8000 (TCL)	See Item (1) in Special Instructions. 804016						Loc Quad
		80	4016									

Sample No.	Matrix *	Sample Date	Sample Time									
N092 01	Soil	4-1-98	1010	X	X	X	X	X	X			A
N093 02	Soil	4-1-98	0938	X	X	X	X	X	X			B
N094 03	Soil	4-1-98	1010	X	X	X	X	X	X			A1

CHAIN OF POSSESSION				Sign/Print Names				SPECIAL INSTRUCTIONS				Matrix *			
Inquired By: <i>[Signature]</i> Date/Time: 4-1-98 1300 Received By: <i>[Signature]</i> Date/Time: 4-1-98 1500				Inquired By: <i>[Signature]</i> Date/Time: 4-1-98 1500 Received By: <i>[Signature]</i> Date/Time: 4-1-98 1500				Inquired By: <i>[Signature]</i> Date/Time: 4-1-98 1500 Received By: <i>[Signature]</i> Date/Time: 4-1-98 1500				Inquired By: <i>[Signature]</i> Date/Time: 4-1-98 1500 Received By: <i>[Signature]</i> Date/Time: 4-1-98 1500			
								**COA R00D22 2F00*** The ERC contractor acknowledges the 24-hour holding time is not likely achievable for Hex Chrome by EPA 7196.  ** Use a separate Chain of Custody for each waste site.  (1) Gamma Spectroscopy (Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155); Gamma Spec - Add-on (Americium-241, Uranium-238)				S - Soil SB - Sediment SO - Solid SL - Sludge W - Water O - Oil A - Air DS - Drum Solids DL - Drum Liquids T - Tissue WI - Wipe L - Liquid V - Vegetation X - Other			

LABORATORY SECTION	Received By	Title	Date/Time
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

# CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

B98-022-3

Page 1 of 1

Collector MT Stankovich	Company Contact Oil Hamilton	Telephone No. 531-0731	Project Coordinator KORNER, CC	Data Turnaround  <b>15 Days</b>
Project Designation 100 D Areas - Full Protocol	Sampling Location 107-D3	SAF No. B98-022		

Case Chest No. 96-045	Field Logbook No. EL-1339-1	Method of Shipment Hand Delivered
Shipped To Quanterra Incorporated	Offsite Property No. NA	Bill of Lading/Air Bill No. NA

Possible Sample Hazards/Remarks	Preservation	None	Cool 4C	None	None	Cool 4C	None					
	Type of Container	P	aG	aG	aG	aG	P					
	No. of Container(s)	1	1	1	1	2	2					
Special Handling and/or Storage	Volume	20ml	60ml	60ml	60ml	60ml	1000ml					

**SAMPLE ANALYSIS**

804015

804016

804016

Loc.  
Q4AD.

Sample No.	Matrix *	Sample Date	Sample Time	Activity Scan	Chromium Hex - 7196	Americium-241; Isotopic Plutonium; Isotopic Uranium	Strontium-89,90 - Total Sr	Pest/PCBs - 80% (TCL)	See item (1) in Special Instructions.				
01090 04	Soil	4-1-98	0830	X	X	X	X	X	X				F
01091 05	Soil	4-1-98	0840	X	X	X	X	X	X				E
01095 06	Soil	4-1-98	0914	X	X	X	X	X	X				C
01098 07	Soil	4-1-98	0850	X	X	X	X	X	X				D
01099													
01100													
01101													

2X138

CHAIN OF POSSESSION	Sign/Print Names
Received By	Date/Time
<i>[Signature]</i>	4-1-98 1300
Received By	Date/Time
<i>[Signature]</i>	4-1-98 1500
Received By	Date/Time
<i>[Signature]</i>	4-1-98 2100cpm
Received By	Date/Time

**SPECIAL INSTRUCTIONS**

\*\*COA R00D22 2F00\*\*\* The ERC contractor acknowledges the 24-hour holding time is not likely achievable for Hex Chrome by EPA 7196.

\*\* Use a separate Chain of Custody for each waste site.

(1) Gamma Spectroscopy (Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155); Gamma Spec - Add-on (Americium-241, Uranium-238)

- Matrix \***
- S - Soil
  - SE - Sediment
  - SO - Solid
  - SL - Sludge
  - W - Water
  - O - Oil
  - A - Air
  - DS - Drum Solids
  - DL - Drum Liquids
  - T - Tissue
  - WI - Wipe
  - L - Liquid
  - V - Vegetation
  - X - Other

<b>LABORATORY SECTION</b>	Received By	Title	Date/Time
<b>FINAL SAMPLE DISPOSITION</b>	Disposal Method	Disposed By	Date/Time

**Appendix 5**

**Data Validation Supporting Documentation**

RADIOCHEMICAL DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	<b>C</b>	D	E
PROJECT: 100-D-areas			DATA PACKAGE: W02308-QB5		
VALIDATOR: Ted Law		LAB: QBR		DATE: 5/8/98	
CASE:			SDG: W02308-QB5		
ANALYSES PERFORMED					
<input type="checkbox"/> Gross Alpha/Beta	<input checked="" type="checkbox"/> Strontium-90	<input type="checkbox"/> Technetium-99	<input checked="" type="checkbox"/> Alpha Spectroscopy	<input checked="" type="checkbox"/> Gamma Spectroscopy	
<input type="checkbox"/> Total Uranium	<input type="checkbox"/> Radium-22	<input type="checkbox"/> Tritium	<input type="checkbox"/>		
SAMPLES/MATRIX B0N090, B0N091, B0N092, B0N093, B0N094, B0N095, B0N096					
Soil					

1. Completeness . . . . . ~~N/A~~

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

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

2. Initial Calibration . . . . . ~~N/A~~

Instruments/detectors calibrated within one year of sample analysis? . . . . . Yes No ~~N/A~~  
 Initial calibration acceptable? . . . . . Yes No ~~N/A~~  
 Standards NIST traceable? . . . . . Yes No ~~N/A~~  
 Standards Expired? . . . . . Yes No ~~N/A~~

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

*APZ*

3. Continuing Calibration . . . . .  N/A

Calibration checked within one week of sample analysis? . . . Yes No N/A

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

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

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

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

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4. Blanks . . . . .  N/A

Method blank analyzed? . . . . .  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? . . . . . Yes No  N/A

Comments: detect balance MDA → 224 - J 90+9/

U-238 - J/VJ all 224 - ok

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

5. Matrix Spikes . . . . .  N/A

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

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

Spike source traceable? . . . . . Yes No N/A

Spike source expired? . . . . . Yes No N/A

Transcription/Calculation Errors? . . . . . Yes No N/A

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

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

*Handwritten signature*

6. Laboratory Control Samples . . . . .  N/A

LCS analyzed? . . . . .  Yes No N/A

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

LCS traceable? . . . . . Yes No  N/A

Transcription/Calculation Errors? . . . . . Yes No  N/A

Comments: U-238 64.4 J/ST

PU-238 NO LCS J/ST

7. Chemical Recovery . . . . .  N/A

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

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

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

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

Transcription/Calculation errors? . . . . . Yes No  N/A

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

8. Duplicates . . . . .  N/A

Duplicates Analyzed? . . . . .  Yes No N/A

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

Transcription/Calculation Errors? . . . . . Yes No N/A

Comments: AM 241 U 238 U 238 PU 239/40 AM 241 GBT

EU 154 EU-155 U-238 GBT J/ST all

0.1

- 9. Field QC Samples . . . . .  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: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

- 10. Holding Times
- Are sample holding times acceptable? . . . . .  Yes  No  N/A

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

- 11. Results and Detection Limits (Levels D & E) . . . . .  N/A
- Results reported for all required sample analyses? . . . . .  Yes  No  N/A
- Results supported in raw data? . . . . . Yes  No  N/A
- Results Acceptable? . . . . .  Yes  No  N/A
- Transcription/Calculation errors? . . . . . Yes  No  N/A
- MDA's meet required detection limits? . . . . . Yes  No  N/A
- Transcription/calculation errors? . . . . . Yes  No  N/A

Comments: ~~EU-152 BONORS M2~~  
~~U-238 set - 91, 93, 94, 95~~  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Review Comment Record (RCR)

1. Date 6/01/98	2. Review No. BHI/QA98005
3. Project 107-D3	4. Page Page 1 of 1

5. Document Number(s)/Title(s) W02308-QBS (SDG No. W02308)	6. Program/Project/ Building Number 107-D3 - Soil	7. Reviewer Claude Stacey	8. Organization/Group BHI/QA	9. Location/Phone HO-16/372-9208
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17. Comment Submittal Approval: \_\_\_\_\_  
 10. Agreement with indicated comment disposition(s): \_\_\_\_\_  
 11. CLOSED

Organization Manager (Optional) \_\_\_\_\_ Date \_\_\_\_\_  
 Reviewer/Point of Contact \_\_\_\_\_ Date 6/29/98  
 Reviewer/Point of Contact C. Stacey

Author/Originator \_\_\_\_\_ Author/Originator \_\_\_\_\_

12. Item	13. Comment(s)/Discrepancy(s) (Provide technical justification for the comment and detailed recommendation of the action required to correct/resolve the discrepancy/problem indicated.)	14. Hold Point	15. Disposition (Provide justification if NOT accepted.)	16. Status
1	RadChem: Page 10 and 13, sample B0N092 indicates EU-154 and 155 are below the MDA; however, data does not support this.		change work	
2	RadChem: Page 10 and 16, sample B0N095 indicates EU-152 is below the MDA; however, data does not support this. In addition, page 03 and 028 states Bu-152's MDA was above the contract MDA; however, the MDA for Bu-152 is actually below the required 0.1.		changes work	
3	RadChem: Page 10 and 017, sample B0N096 indicates Co-60, Bu-152, and Bu-155 results are below the MDA; however, the reported data does not support this conclusion.		changes work	

Post-it® Fax Note	7671	Date	<u>6/29/98</u>	# of pages	<u>1</u>
To	<u>Jeannette</u>	From	<u>C. Stacey</u>		
Co./Dept.		Co.			
Phone #		Phone #	<u>372-9208</u>		
Fax #	<u>372-6725</u>	Fax #			

JUN '29 '98 08:24AM BHI 509 372 9654  
 BBI SAMPLE XGT  
 P. 1/1 002

# Review Comment Record (RCR)

1. Date  
6/01/98

2. Review No.  
BHI/QA98005

3. Project  
107-D3

4. Page  
Page 1 of 1

5. Document Number(s)/Title(s)

W02308-QBS (SDG No. W02308)

6. Program/Project/  
Building Number

107-D3 - Soil

7. Reviewer

Claude Stacey

8. Organization/Group

BHI/QA

9. Location/Phone

H0-16/372-9208

17. Comment Submittal Approval:

10. Agreement with indicated comment disposition(s)

11. CLOSED

Organization Manager (Optional)

Date

Reviewer/Point of Contact

Date

Reviewer/Point of Contact

Author/Originator

Author/Originator

12. Item	13. Comment(s)/Discrepancy(s) (Provide technical justification for the comment and detailed recommendation of the action required to correct/resolve the discrepancy/problem indicated.)	14. Hold Point	15. Disposition (Provide justification if NOT accepted.)	16. Status
1	RadChem: Page 10 and 13, sample B0N092 indicates EU-154 and 155 are below the MDA; however, data does not support this.		change made	
2	RadChem: Page 10 and 16, sample B0N095 indicates EU-152 is below the MDA; however, data does not support this. In addition, page 03 and 028 states Bu-152's MDA was above the contract MDA; however, the MDA for Bu-152 is actually below the required 0.1.		changes made	
3	RadChem: Page 10 and 017, sample B0N096 indicates Co-60, Eu-152, and Bu-155 results are below the MDA; however, the reported data does not support this conclusion.		changes made	

00000/00120

BHI SAMPLE MGT

0002

Date: 27 May 1998  
 To: Bechtel Hanford, Inc. (technical representative)  
 From: TechLaw, Inc.  
 Project: 100 D Area - Full Protocol  
 Subject: Radiochemistry - Data Package No. W02308-QES (SDG No. W02308)

**INTRODUCTION**

This memo presents the results of data validation on Summary Data Package No. W02308-QES which was prepared by Quanterra Environmental Services (QES). A list of samples validated along with the analyses reported and the requested analyte is provided in the following table.

Sample ID	Sample Date	Media	Validation	Analysis
BON090	04/01/98	Soil	C	See note 1
BON091	04/01/98	Soil	C	See note 1
BON092	04/01/98	Soil	C	See note 1
BON093	04/01/98	Soil	C	See note 1
BON094	04/01/98	Soil	C	See note 1
BON095	04/01/98	Soil	C	See note 1
BON096	04/01/98	Soil	C	See note 1

1 - Gamma spectroscopy (RICHR5017), alpha spectroscopy (RICHR5057/5030), and strontium-89/90 (RICHR5006).

Data validation was conducted in accordance with the BHI validation statement of work (BHI 1997) and the 100Area Sampling and Analysis Plan (May 1998). Appendices 1 through 5 provide the following information as indicated below:

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

## **DATA QUALITY OBJECTIVES**

- **Holding Times**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for all analytes is 6 months.

All holding times were acceptable.

- **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 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 elevated to the MDA and qualified as undetected and flagged "U"; sample results above the MDA and greater than five times the highest blank concentration are not qualified.

Due to positive laboratory blank results, all uranium-238 by GEA results were qualified as estimates and flagged "J/UJ".

Due to positive laboratory blank results, the radium-226 results in samples BON090 and BON091 were qualified as estimates and flagged "J".

All other blank results were acceptable.

- **Accuracy**

Accuracy is evaluated by analyzing distilled water or field samples spiked with known amounts of radionuclides. The sample activity as determined by analysis is compared to the known activity to assess accuracy. The acceptable laboratory control sample recovery range is 70% to 130%, while that for a matrix spike is 60% to 140%. In addition, samples may be spiked with a radiochemical tracer to assist in isolating the radioisotope of interest with the yield of the tracer being used in calculating sample activity. The acceptable range for tracer recovery is 20% to 105%. Spike sample results outside the above ranges result in associated sample results being qualified as estimates, rejected, or not qualified, depending on the activity of the individual sample.

Due to an LCS percent recovery below QC limits, all uranium-238 by GEA results were qualified as estimates and flagged "J/UJ".

Due to the lack of an LCS, all plutonium-238 results were qualified as estimates and flagged "J/UJ".

All results other accuracy results were acceptable.

- **Precision**

Analytical precision is expressed by the RPD between the recoveries of duplicate matrix spike analyses performed on a sample. Precision may also be assessed using unspiked duplicate sample analyses. If both sample and replicate activities are greater than five times the CRDL and the RPD is less than 30 percent for soil samples and 20 percent for water samples, the results are acceptable. If either activities are less than five times the CRDL, a control limit of less than or equal to two times the CRDL is used for soil samples and less than or equal to the CRDL for water samples. If either the original or replicate value is below the CRDL, the applicable control limits are less than or equal to the CRDL for water samples and less than or equal to two times the CRDL for soil samples. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

Due to an RPD of 188%, all GEA uranium-238 results were qualified as estimates and flagged "J/UJ".

All other duplicate results were acceptable.

- **Detection Levels**

Reported laboratory detection levels are reviewed to ensure that they are at or below the contract required MDA. The following MDAs were above the contract required MDA: Uranium-238 (GEA) results in samples B0N091, B0N093, B0N094 and B0N095. All other reported MDAs were at or below the analyte-specific CRDL.

- **Completeness**

Data Package No. W02308 (SDG No. W02308) was submitted for validation and verified for completeness. The completion rate was 100%.

## **MAJOR DEFICIENCIES**

None found.

## **MINOR DEFICIENCIES**

Due to an RPD of 188%, all GEA uranium-238 results were qualified as estimates and flagged "J/UJ". Due to an LCS percent recovery below QC limits, all uranium-238 by alpha spectroscopy results were qualified as estimates and flagged "J/UJ". Due to the lack of an LCS, all plutonium-238 results were qualified as estimates and flagged "J/UJ". Due to positive laboratory blank results, all uranium-238 by GEA results were qualified as estimates and flagged "J/UJ". Due to positive laboratory blank results, the radium-226 results in samples BON090 and BON091 were qualified as estimates and flagged "J". Data flagged 'J' is an estimate, but under the BHI validation SOW, the data may be usable for decision-making purposes. All other validated results are considered accurate within the standard error associated with the methods.

## **REFERENCES**

BHI, MRB-SBB-A23665, *Validation Statement of Work*, Bechtel Hanford Incorporated, September 5, 1997.

DOE/RL-96-22, Rev. 1, *100 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, May 1998

Project: BECHTEL-HANFORD																										
Laboratory: Quanterra																										
Case		SDG: W02308																								
Sample Number	B0N090		B0N091		B0N092		B0N093		B0N094		B0N095		B0N096													
Location	107-D3		107-D3		107-D3		107-D3		107-D3		107-D3		107-D3													
Remarks																										
Sample Date	04/01/98		04/01/98		04/01/98		04/01/98		04/01/98		04/01/98		04/01/98													
Radiochemistry	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	
Americium-241	0.1	0.00583	U	0.00413	U	0.205	0.0712	0.0866	0.0324	0.0173																
Uranium-234	0.1	2.39		0.316		0.762	0.748	0.64	0.769	0.677																
Uranium-235	0.1	0.0787		0.0389		0.0206	U	0.016	U	0.0359	0.0222	U	0.0137	U												
Uranium-238	0.1	2.51		0.362		0.747	0.577	0.567	0.74	0.861																
Plutonium-238	0.1	0.0112	UJ	0.00624	UJ	-0.000503	UJ	0.00635	UJ	0.0038	UJ	0.0182	J	0	UJ											
Plutonium-239/240	0.1	0	U	0	U	0.0116	U	0	U	0.0407	0	U	0.0139													
Americium-241GEA	0.1	-0.00618	U	-0.0225	U	-0.0234	U	-0.00275	U	0.012	U	-0.0508	U	0.00674	U											
Cobalt-60	0.05	-0.00195	U	0.00098	U	0.0559	0.0112	U	0.0722	0.00036	U	0.0124														
Cesium-137DA	0.05	-0.00441	U	0.00273	U	1.43	0.0194	1.49	0.0208	-0.00112	U															
Europium-152	0.1	-0.00434	U	-0.00082	U	0.551	0.204	0.501	0.159	0.0485																
Europium-154	0.1	-0.0128	U	-0.00363	U	0.0831	0.0272	U	0.0541	U	0.0173	U	-0.00453	U												
Europium-155	0.1	0.0168	U	0.0103	U	0.0446	0.0114	U	0.0364	U	0.0166	U	0.0328													
Potassium-40	N/A	6.25		5.23		8.61	9.34	9.34	9.93	9.27																
Radium-224DA	0.1	0.184		0.159		0.413	0.44	0.478	0.525	0.456																
Radium-226	0.1	0.142	J	0.143	J	0.351	0.347	0.388	0.403	0.359																
Radium-228	0.1	0.182		0.187		0.432	0.47	0.439	0.562	0.459																
Uranium-238GEA	0.1	0.315	J	0.121	UJ	0.323	J	0.334	UJ	0.405	UJ	0.56	UJ	0.48	J											
Strontium-90	1	0.0125	U	0.0176	U	0.0799	U	0.0216	U	0.0835	U	0.0868	U	0.0633	U											

000010

N/A = Not Applicable

**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401601 MATRIX: SOIL  
 CLIENT ID: B0N092 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
<del>HEXCHROME</del>	<del>3.00E-02</del>	<del>U</del>	<del>N/A</del>	<del>N/A</del>	<del>3.00E-02</del>	<del>mg/kg</del>	<del>N/A</del>	<del>EPA7190</del>
AM-241	2.05E-01	J	6.3E-02	7.1E-02	1.32E-02	pCi/g	82.00%	RICHRC5057
U-234	7.62E-01	J	1.5E-01	2.0E-01	2.84E-02	pCi/g	60.50%	RICHRC5030
U-235	2.06E-02	U	2.4E-02	2.5E-02	2.84E-02	pCi/g	60.50%	RICHRC5030
U-238	7.47E-01	J	1.5E-01	2.0E-01	3.52E-02	pCi/g	60.50%	RICHRC5030
PU-238	-5.03E-04	<del>U</del>	1.0E-03	1.0E-03	2.53E-02	pCi/g	64.00%	RICHRC5010
PU239/40	1.16E-02	U	1.8E-02	1.8E-02	2.87E-02	pCi/g	64.00%	RICHRC5010
AM-241	-2.34E-02	U	3.4E-02	3.4E-02	5.56E-02	pCi/g	N/A	RICHRC5017
CO-60	5.59E-02		1.8E-02	1.9E-02	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	1.43E+00		3.6E-02	1.5E-01	N/A	pCi/g	N/A	RICHRC5017
EU-152	5.51E-01		4.6E-02	7.2E-02	N/A	pCi/g	N/A	RICHRC5017
EU-154	8.31E-02	<del>U</del>	2.6E-02	2.8E-02	5.12E-02	pCi/g	N/A	RICHRC5017
EU-155	4.46E-02	<del>U</del>	2.7E-02	2.7E-02	4.40E-02	pCi/g	N/A	RICHRC5017
K-40	8.61E+00		3.5E-01	9.3E-01	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	4.13E-01		2.4E-02	4.8E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	3.51E-01		3.4E-02	4.9E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	4.32E-01		5.9E-02	7.3E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	3.23E-01		3.1E-01	3.1E-01	N/A	pCi/g	N/A	RICHRC5017
STRONTIUM	7.99E-02	U	5.1E-02	5.7E-02	1.15E-01	pCi/g	83.20%	RICHRC5006

Number of Results: 19

*Plus  
5/27/98*

**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401606 MATRIX: SOIL  
 CLIENT ID: B0N095 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
<del>HEXCHROME</del>	<del>3.00E-02</del>	<del>U</del>	<del>N/A</del>	<del>N/A</del>	<del>3.00E-02</del>	<del>mg/kg</del>	<del>N/A</del>	<del>EPA7486</del>
AM-241	3.24E-02	J	2.5E-02	2.5E-02	1.25E-02	pCi/g	85.10%	RICHRC5057
U-234	7.69E-01	J	1.3E-01	1.8E-01	1.53E-02	pCi/g	71.20%	RICHRC5030
U-235	2.22E-02	U	2.3E-02	2.3E-02	2.27E-02	pCi/g	71.20%	RICHRC5030
U-238	7.40E-01	J	1.3E-01	1.8E-01	2.27E-02	pCi/g	71.20%	RICHRC5030
PU-238	1.18E-02		1.4E-02	1.4E-02	1.06E-02	pCi/g	81.30%	RICHRC5010
PU239/40	0.00E+00	U	0.0E+00	1.2E-02	1.06E-02	pCi/g	81.30%	RICHRC5010
AM-241	-5.08E-02	U	4.5E-02	4.5E-02	6.93E-02	pCi/g	N/A	RICHRC5017
CO-60	3.60E-04	U	8.0E-03	8.0E-03	1.33E-02	pCi/g	N/A	RICHRC5017
CS-137DA	2.08E-02	J	1.2E-02	1.2E-02	N/A	pCi/g	N/A	RICHRC5017
EU-152	1.59E-01	<i>JK</i>	2.2E-02	2.7E-02	4.24E-02	pCi/g	N/A	RICHRC5017
EU-154	1.73E-02	U	2.6E-02	2.6E-02	4.48E-02	pCi/g	N/A	RICHRC5017
EU-155	1.66E-02	U	2.3E-02	2.3E-02	3.60E-02	pCi/g	N/A	RICHRC5017
K-40	9.93E+00		3.4E-01	1.0E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	5.25E-01		2.1E-02	5.7E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	4.03E-01		2.8E-02	4.9E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	5.62E-01		5.8E-02	8.1E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	5.60E-01	<i>JK</i>	3.2E-01	3.3E-01	5.43E-01	pCi/g	N/A	RICHRC5017
STRONTIUM	8.68E-02	U	4.8E-02	5.6E-02	1.04E-01	pCi/g	98.10%	RICHRC5006

Number of Results: 19

*PKC*  
*5/27/99*

**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401607 MATRIX: SOIL  
 CLIENT ID: B0N096 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
<del>HEXCHROME</del>	<del>3.00E-02</del>	<del>U</del>	<del>N/A</del>	<del>N/A</del>	<del>3.00E-02</del>	<del>mg/kg</del>	<del>N/A</del>	<del>EPA7168</del>
AM-241	1.73E-02	J	1.7E-02	1.8E-02	1.17E-02	pCi/g	96.50%	RICHRC5017
U-234	6.77E-01	J	1.4E-01	1.8E-01	2.75E-02	pCi/g	61.30%	RICHRC5030
U-235	1.37E-02	U	1.9E-02	2.0E-02	1.85E-02	pCi/g	61.30%	RICHRC5030
U-238	8.61E-01	J	1.5E-01	2.2E-01	3.13E-02	pCi/g	61.30%	RICHRC5030
PU-238	0.00E+00	<i>U</i>	0.0E+00	1.4E-02	1.26E-02	pCi/g	67.10%	RICHRC5010
PU239/40	1.39E-02		1.6E-02	1.6E-02	1.26E-02	pCi/g	67.10%	RICHRC5010
AM-241	6.74E-03	U	2.4E-02	2.4E-02	3.79E-02	pCi/g	N/A	RICHRC5017
CO-60	1.24E-02	<i>U</i>	6.3E-03	6.4E-03	1.23E-02	pCi/g	N/A	RICHRC5017
CS-137DA	-1.12E-03	U	6.5E-03	6.5E-03	1.05E-02	pCi/g	N/A	RICHRC5017
EU-152	4.85E-02	<i>U</i>	1.6E-02	1.7E-02	2.96E-02	pCi/g	N/A	RICHRC5017
EU-154	-4.53E-03	U	2.4E-02	2.4E-02	3.96E-02	pCi/g	N/A	RICHRC5017
EU-155	3.29E-02	<i>U</i>	1.8E-02	1.9E-02	3.16E-02	pCi/g	N/A	RICHRC5017
K-40	9.27E+00		3.2E-01	9.8E-01	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	4.56E-01		2.1E-02	5.0E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	3.59E-01		2.8E-02	4.5E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	4.59E-01		5.1E-02	6.8E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	4.80E-01		2.8E-01	2.9E-01	N/A	pCi/g	N/A	RICHRC5017
STRONTIUM	6.33E-02	U	4.7E-02	5.1E-02	1.11E-01	pCi/g	78.30%	RICHRC5006

Number of Results: 19

*pmc*  
5/27/98

- 9. Field QC Samples . . . . .  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: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

10. Holding Times

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

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

11. Results and Detection Limits (Levels D & E) . . . . .  N/A

- Results reported for all required sample analyses? . . . . .  Yes  No  N/A
- Results supported in raw data? . . . . . Yes  No  N/A
- Results Acceptable? . . . . .  Yes  No  N/A
- Transcription/Calculation errors? . . . . . Yes  No  N/A
- MDA's meet required detection limits? . . . . . Yes  No  N/A
- Transcription/calculation errors? . . . . . Yes  No  N/A

Comments: EU 152 BONORS M2  
GA U-238 set - 91, 93, 94, 95  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

*AAK*

Date: 27 May 1998  
To: Bechtel Hanford Inc. (technical representative)  
From: TechLaw, Inc.  
Project: 100 D Areas - Full Protocol  
Subject: Pesticide/PCB - Data Package No. W02308-QES (SDG No. W02308)

## **INTRODUCTION**

This memo presents the results of data validation on Summary Data Package No. W02308-QES prepared by Quanterra Environmental Services (QES). A list of the samples validated along with the analyses reported and the method of analysis is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation</b>	<b>Analysis</b>
BON090	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON091	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON092	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON093	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON094	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON095	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON096	04/01/98	Soil	C	Pest/PCBs by EPA 8080

Data validation was conducted in accordance with the BHI validation statement of work (BHI 1997) and the 100 Area Remedial Action Sampling and Analysis Plan (May 1998). Appendices 1 through 5 provide the following information as indicated below:

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

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## **DATA QUALITY OBJECTIVES**

- **Holding Times**

Analytical holding times were assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: Soil samples must be extracted within 14 days of the date of sample collection and analyzed within 40 days from the date of extraction.

If holding times are exceeded by less than two times the limit, all associated sample results are qualified as estimates and flagged "J" for detects and "UJ" for non-detects. If holding times are exceeded by greater than two times the limit, all associated detected sample results are qualified as estimates and flagged "J" and all non-detects are rejected and flagged "UR".

Holding times were met for all samples.

- **Blanks**

Method blank analyses are performed to determine the extent of laboratory contamination introduced through sampling, sample preparation or analysis. At least one method blank analysis must be conducted for every 20 samples. Method blanks should not contain target compounds at a concentration greater than the CRQL. If target compounds are present, sample results less than five times the blank concentration are qualified as nondetects and flagged "U". If the sample result is less than five times the blank concentration and less than CRQL, the result is qualified as a nondetect, elevated to the CRQL and flagged "U".

All method blank target compound results were acceptable.

- **Accuracy**

### **Matrix Spike/Matrix Spike Duplicate Recoveries**

Matrix spike/matrix spike duplicate analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike/matrix spike duplicate analyses are performed in duplicate using six compounds and must be within the established laboratory quality control limits of 70-130 percent. If spike recoveries are outside control limits, detected sample results less than 5 times the spike concentration are qualified as estimates and flagged "J". Undetected sample results with spike recoveries outside control limits are qualified as

estimates and flagged "UJ". Sample results greater than five times the spike concentration require no qualification.

All matrix spike/matrix spike duplicate recovery results were acceptable.

#### Surrogate Recovery

The analysis of surrogate compounds provide a measure of performance for individual samples. Matrix-specific surrogate compound recovery control windows have been established by the laboratory. When a surrogate compound recovery is outside the control window, all positively identified target compounds associated with the unacceptable surrogate recoveries are qualified as estimates and flagged "J". Nondetected compounds with surrogate recoveries less than the lower control limit are qualified as having an estimated detection limit and flagged "UJ". Undetected compounds with surrogate recoveries above the upper control limit require no qualification.

All surrogate recovery results were acceptable.

- **Precision**

#### Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike/matrix spike duplicate results provide matrix-specific information on the precision of the method for specific target compound classes. Precision is expressed as the RPD between the recoveries of duplicate matrix spike analyses performed on a sample. Results must be within RPD limits of +/- 30% for soil samples. If RPD values are out of specification and the sample concentration is less than five times the spike concentration, all associated detected sample results are qualified as estimates and flagged "J". If RPD values are out of specification and the sample concentration is greater than five times the spike concentration, no qualification is required.

All matrix spike/matrix spike duplicate RPD results were acceptable.

- **Detection Levels**

Reported laboratory detection levels are compared against CRQLs to ensure that laboratory detection levels meet the required criteria. The reported analytical detection level for toxaphene was above the CRQL in all samples. Under the BHI statement of work, no qualification is required. All other reported detection levels were at or below the CRQL. Under the BHI statement of work, no qualification is required.

- **Completeness**

Data Package No. W02308-QES (SDG No.W02308) was submitted for validation and verified for completeness. The completion rate was 100%.

**MAJOR DEFICIENCIES**

None found.

**MINOR DEFICIENCIES**

None found

**REFERENCES**

BHI, MRB-SBB-A23665, *Validation Statement of Work*, Bechtel Hanford Incorporated, September 5, 1997.

DOE/RL-96-22, Rev. 1, *100 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, May 1998.

Date: 27 May 1998  
To: Bechtel Hanford Inc. (technical representative)  
From: TechLaw, Inc.  
Project: 100 D Areas - Full Protocol  
Subject: Inorganics - Data Package No. W02308-QES (SDG No. W02308)

## **INTRODUCTION**

This memo presents the results of data validation on Data Package No. W02308-QES prepared by Quanterra Environmental Services (QES). A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation</b>	<b>Analysis</b>
BON090	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON091	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON092	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON093	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON094	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON095	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON096	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)

Data validation was conducted in accordance with the BHI validation statement of work and the 100 Area Remedial Action Sampling and Analysis Plan (May 1998). Appendices 1 through 5 provide the following information as indicated below:

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

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## **DATA QUALITY OBJECTIVES**

- **Holding Times**

Analytical holding times are assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: Soil samples must be analyzed within 24 hours for hexavalent chromium.

All holding times were acceptable.

- **Blanks**

### **Preparation Blanks**

At least one preparation blank, consisting of deionized distilled water processed through each sample preparation and analysis procedure, must be prepared and analyzed with every sample delivery group. In the case of positive blank results, samples with digestate concentrations (in ug/L) less than five times the preparation blank value have had their associated values qualified as non-detected and flagged "U". Samples with concentrations of greater than five times the highest blank concentration do not require qualification.

In the case of negative blank results, if the absolute value exceeds the Contract Required Detection Limit (CRDL), all nondetects are rejected and flagged "UR" and all detects that are less than ten times the absolute value of the associated preparation blank result are qualified as estimates and flagged "J". If the absolute value of the negative preparation blank is greater than the IDL and less than or equal to the CRDL, all nondetects are qualified as estimates and flagged "UJ" and all detects less than ten times the absolute value of the blank are qualified as estimates and flagged "J". If the sample results are greater than ten times the absolute value of the preparation blank, no qualification is necessary.

All preparation blank results were acceptable.

- **Accuracy**

### **Matrix Spike**

Matrix spike analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike recoveries must fall within the range of 70% to 130%. Samples with a spike recovery of less than 30% and a sample result

below the IDL are rejected and flagged "UR". Samples with a spike recovery of 30% to 69% and a sample result less than the IDL are qualified "UJ". Samples with a spike recovery of greater than 130% or less than 70% and a sample result greater than the IDL are qualified as estimates and flagged "J". Finally, for samples with a spike recovery greater than 130% and a sample result less than the IDL, no qualification is required.

Due to matrix spike recoveries below QC limits, all hexavalent chromium results were qualified as estimates and flagged "J/UJ".

- **Precision**

- Laboratory Duplicate Samples

Laboratory duplicate sample analyses are used to measure laboratory precision and sample homogeneity. Results must be within RPD limits of plus or minus 30% for solid samples. If RPD values are out of specification and the sample concentration is greater than five times the CRDL, all associated sample results are qualified as estimated and flagged "J". If RPD values are plus or minus two times the CRDL and the sample concentration is less than five times the CRDL, all associated sample results are qualified as estimated and flagged "J/UJ". The performance criteria for aqueous laboratory duplicates are an RPD less than 30% for positive sample results greater than five times the CRDL or plus or minus the CRDL for positive sample results less than five times the CRDL. Sample results outside the criteria are qualified as estimates and flagged "J/UJ".

Due to matrix spike duplicate RPDs outside QC limits, all ICP analytes in both samples were qualified as estimates and flagged "J/UJ".

All laboratory duplicate recovery results were acceptable.

- **Analytical Detection Levels**

Reported analytical detection levels are compared against CRDLs to ensure that laboratory detection levels meet the required criteria. All reported laboratory detection levels met the analyte specific CRDL.

- **Completeness**

Data package No. W02308-QES (SDG No. W02308) was submitted for validation and verified for completeness. The completion percentage was 100%.

## **MAJOR DEFICIENCIES**

None found.

## **MINOR DEFICIENCIES**

Due to matrix spike recoveries below QC limits, all hexavalent chromium results were qualified as estimates and flagged "J/UJ". Data flagged 'J' is an estimate, but under the BHI validation SOW, the data may be usable for decision-making purposes. All other validated results are considered accurate within the standard error associated with the methods.

## **REFERENCES**

BHI, MRB-SBB-A23665, *Validation Statement of Work*, Bechtel Hanford Incorporated, September 5, 1997.

DOE/RL-96-22, Rev. 1, *100 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, May 1998.



Date: 27 May 1998  
To: Bechtel Hanford, Inc. (technical representative)  
From: TechLaw, Inc.  
Project: 100 D Area - Full Protocol  
Subject: Radiochemistry - Data Package No. W02308-QES (SDG No. W02308)

## **INTRODUCTION**

This memo presents the results of data validation on Summary Data Package No. W02308-QES which was prepared by Quanterra Environmental Services (QES). A list of samples validated along with the analyses reported and the requested analyte is provided in the following table.

Sample ID	Sample Date	Media	Validation	Analysis
BON090	04/01/98	Soil	C	See note 1
BON091	04/01/98	Soil	C	See note 1
BON092	04/01/98	Soil	C	See note 1
BON093	04/01/98	Soil	C	See note 1
BON094	04/01/98	Soil	C	See note 1
BON095	04/01/98	Soil	C	See note 1
BON096	04/01/98	Soil	C	See note 1

1 - Gamma spectroscopy (RICHR5017), alpha spectroscopy (RICHR5057/5030), and strontium-89/90 (RICHR5006).

Data validation was conducted in accordance with the BHI validation statement of work (BHI 1997) and the 100Area Sampling and Analysis Plan (May 1998). Appendices 1 through 5 provide the following information as indicated below:

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

## **DATA QUALITY OBJECTIVES**

- **Holding Times**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for all analytes is 6 months.

All holding times were acceptable.

- **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 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 elevated to the MDA and qualified as undetected and flagged "U"; sample results above the MDA and greater than five times the highest blank concentration are not qualified.

Due to positive laboratory blank results, all uranium-238 by GEA results were qualified as estimates and flagged "J/UJ".

Due to positive laboratory blank results, the radium-226 results in samples BON090 and BON091 were qualified as estimates and flagged "J".

All other blank results were acceptable.

- **Accuracy**

Accuracy is evaluated by analyzing distilled water or field samples spiked with known amounts of radionuclides. The sample activity as determined by analysis is compared to the known activity to assess accuracy. The acceptable laboratory control sample recovery range is 70% to 130%, while that for a matrix spike is 60% to 140%. In addition, samples may be spiked with a radiochemical tracer to assist in isolating the radioisotope of interest with the yield of the tracer being used in calculating sample activity. The acceptable range for tracer recovery is 20% to 105%. Spike sample results outside the above ranges result in associated sample results being qualified as estimates, rejected, or not qualified, depending on the activity of the individual sample.

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Due to an LCS percent recovery below QC limits, all uranium-238 by GEA results were qualified as estimates and flagged "J/UJ".

Due to the lack of an LCS, all plutonium-238 results were qualified as estimates and flagged "J/UJ".

All results other accuracy results were acceptable.

- **Precision**

Analytical precision is expressed by the RPD between the recoveries of duplicate matrix spike analyses performed on a sample. Precision may also be assessed using unspiked duplicate sample analyses. If both sample and replicate activities are greater than five times the CRDL and the RPD is less than 30 percent for soil samples and 20 percent for water samples, the results are acceptable. If either activities are less than five times the CRDL, a control limit of less than or equal to two times the CRDL is used for soil samples and less than or equal to the CRDL for water samples. If either the original or replicate value is below the CRDL, the applicable control limits are less than or equal to the CRDL for water samples and less than or equal to two times the CRDL for soil samples. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

Due to an RPD of 188%, all GEA uranium-238 results were qualified as estimates and flagged "J/UJ".

All other duplicate results were acceptable.

- **Detection Levels**

Reported laboratory detection levels are reviewed to ensure that they are at or below the contract required MDA. The following MDAs were above the contract required MDA: Uranium-238 (GEA) results in samples BON091, BON093, BON094 and BON095. All other reported MDAs were at or below the analyte-specific CRDL.

- **Completeness**

Data Package No. W02308 (SDG No. W02308) was submitted for validation and verified for completeness. The completion rate was 100%.

## **MAJOR DEFICIENCIES**

None found.

## **MINOR DEFICIENCIES**

Due to an RPD of 188%, all GEA uranium-238 results were qualified as estimates and flagged "J/UJ". Due to an LCS percent recovery below QC limits, all uranium-238 by alpha spectroscopy results were qualified as estimates and flagged "J/UJ". Due to the lack of an LCS, all plutonium-238 results were qualified as estimates and flagged "J/UJ". Due to positive laboratory blank results, all uranium-238 by GEA results were qualified as estimates and flagged "J/UJ". Due to positive laboratory blank results, the radium-226 results in samples BON090 and BON091 were qualified as estimates and flagged "J". Data flagged 'J' is an estimate, but under the BHI validation SOW, the data may be usable for decision-making purposes. All other validated results are considered accurate within the standard error associated with the methods.

## **REFERENCES**

BHI, MRB-SBB-A23665, *Validation Statement of Work*, Bechtel Hanford Incorporated, September 5, 1997.

DOE/RL-96-22, Rev. 1, *100 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, May 1998

Project: BECHTEL-HANFORD																														
Laboratory: Quanterra																														
Case		SDG: W02308																												
Sample Number	B0N090		B0N091		B0N092		B0N093		B0N094		B0N095		B0N096																	
Location	107-D3		107-D3		107-D3		107-D3		107-D3		107-D3		107-D3																	
Remarks																														
Sample Date	04/01/98		04/01/98		04/01/98		04/01/98		04/01/98		04/01/98		04/01/98																	
Radiochemistry	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	
Americium-241	0.1	0.00583	U	0.00413	U	0.205		0.0712		0.0866		0.0324		0.0173																
Uranium-234	0.1	2.39		0.318		0.762		0.748		0.64		0.769		0.677																
Uranium-235	0.1	0.0787		0.0369		0.0206	U	0.016	U	0.0359		0.0222	U	0.0137	U															
Uranium-238	0.1	2.51		0.362		0.747		0.577		0.567		0.74		0.861																
Plutonium-238	0.1	0.0112	UJ	0.00624	UJ	-0.000503	UJ	0.00635	UJ	0.0038	UJ	0.0182	J	0	UJ															
Plutonium-239/40	0.1	0	U	0	U	0.0118	U	0	U	0.0407		0	U	0.0139																
Americium-241GEA	0.1	-0.00818	U	-0.0225	U	-0.0234	U	-0.00275	U	0.012	U	-0.0508	U	0.00674	U															
Cobalt-60	0.06	-0.00195	U	0.00098	U	0.0559		0.0112	U	0.0722		0.00038	U	0.0124																
Cesium-137DA	0.06	-0.00441	U	0.00273	U	1.43		0.0194		1.49		0.0208		-0.00112	U															
Europium-152	0.1	-0.00434	U	-0.00092	U	0.551		0.204		0.501		0.159		0.0485																
Europium-154	0.1	-0.0128	U	-0.00363	U	0.0831		0.0272	U	0.0541	U	0.0173	U	-0.00453	U															
Europium-155	0.1	0.0168	U	0.0103	U	0.0448		0.0114	U	0.0384	U	0.0168	U	0.0329																
Potassium-40	N/A	6.25		5.23		8.61		9.34		9.34		9.93		9.27																
Radium-224DA	0.1	0.184		0.159		0.413		0.44		0.478		0.525		0.456																
Radium-226	0.1	0.142	J	0.143	J	0.351		0.347		0.386		0.403		0.359																
Radium-228	0.1	0.182		0.187		0.432		0.47		0.439		0.562		0.458																
Uranium-238GEA	0.1	0.315	J	0.121	UJ	0.323	J	0.334	UJ	0.405	UJ	0.56	UJ	0.48	J															
Strontium-90	1	0.0125	U	0.0176	U	0.0799	U	0.0216	U	0.0635	U	0.0688	U	0.0633	U															

000010

N/A = Not Applicable

**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401601 MATRIX: SOIL  
 CLIENT ID: B0N092 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
<i>W</i> HEXCHROME	3.00E-02	U	N/A	N/A	3.00E-02	mg/kg	N/A	EPA7190
AM-241	2.05E-01	J	6.3E-02	7.1E-02	1.32E-02	pCi/g	82.00%	RICHRC5057
U-234	7.62E-01	J	1.5E-01	2.0E-01	2.84E-02	pCi/g	60.50%	RICHRC5030
U-235	2.06E-02	U	2.4E-02	2.5E-02	2.84E-02	pCi/g	60.50%	RICHRC5030
U-238	7.47E-01	J	1.5E-01	2.0E-01	3.52E-02	pCi/g	60.50%	RICHRC5030
PU-238	-5.03E-04	<i>U</i>	1.0E-03	1.0E-03	2.53E-02	pCi/g	64.00%	RICHRC50100J
PU239/40	1.16E-02	U	1.8E-02	1.8E-02	2.87E-02	pCi/g	64.00%	RICHRC5010
AM-241	-2.34E-02	U	3.4E-02	3.4E-02	5.56E-02	pCi/g	N/A	RICHRC5017
CO-60	5.59E-02		1.8E-02	1.9E-02	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	1.43E+00		3.6E-02	1.5E-01	N/A	pCi/g	N/A	RICHRC5017
EU-152	5.51E-01		4.6E-02	7.2E-02	N/A	pCi/g	N/A	RICHRC5017
EU-154	8.31E-02	<i>U</i>	2.6E-02	2.8E-02	5.12E-02	pCi/g	N/A	RICHRC5017
EU-155	4.46E-02	<i>U</i>	2.7E-02	2.7E-02	4.40E-02	pCi/g	N/A	RICHRC5017
K-40	8.61E+00		3.5E-01	9.3E-01	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	4.13E-01		2.4E-02	4.8E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	3.51E-01		3.4E-02	4.9E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	4.32E-01		5.9E-02	7.3E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	3.23E-01		3.1E-01	3.1E-01	N/A	pCi/g	N/A	RICHRC5017J
STRONTIUM	7.99E-02	U	5.1E-02	5.7E-02	1.15E-01	pCi/g	83.20%	RICHRC5036

Number of Results: 19

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5/27/98

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**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland      SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401606      MATRIX: SOIL  
 CLIENT ID: B0N095      DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
<del>HEXCHROME</del>	<del>3.00E-02</del>	<del>U</del>	<del>N/A</del>	<del>N/A</del>	<del>3.00E-02</del>	<del>mg/kg</del>	<del>N/A</del>	<del>EPA7196-</del>
AM-241	3.24E-02	J	2.5E-02	2.5E-02	1.25E-02	pCi/g	85.10%	RICHRC5057
U-234	7.69E-01	J	1.3E-01	1.8E-01	1.53E-02	pCi/g	71.20%	RICHRC5030
U-235	2.22E-02	U	2.3E-02	2.3E-02	2.27E-02	pCi/g	71.20%	RICHRC5030
U-238	7.40E-01	J	1.3E-01	1.8E-01	2.27E-02	pCi/g	71.20%	RICHRC5030
PU-238	1.18E-02		1.4E-02	1.4E-02	1.06E-02	pCi/g	81.30%	RICHRC5010 J
PU239/40	0.00E+00	U	0.0E+00	1.2E-02	1.06E-02	pCi/g	81.30%	RICHRC5010
AM-241	-5.08E-02	U	4.5E-02	4.5E-02	6.93E-02	pCi/g	N/A	RICHRC5017
CO-60	3.60E-04	U	8.0E-03	8.0E-03	1.33E-02	pCi/g	N/A	RICHRC5017
CS-137DA	2.08E-02	J	1.2E-02	1.2E-02	N/A	pCi/g	N/A	RICHRC5017
EU-152	1.59E-01	<i>JK</i>	2.2E-02	2.7E-02	4.24E-02	pCi/g	N/A	RICHRC5017
EU-154	1.73E-02	U	2.6E-02	2.6E-02	4.48E-02	pCi/g	N/A	RICHRC5017
EU-155	1.66E-02	U	2.3E-02	2.3E-02	3.60E-02	pCi/g	N/A	RICHRC5017
K-40	9.93E+00		3.4E-01	1.0E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	5.25E-01		2.1E-02	5.7E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	4.03E-01		2.8E-02	4.9E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	5.62E-01		5.8E-02	8.1E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	5.60E-01	<i>JK</i>	3.2E-01	3.3E-01	5.43E-01	pCi/g	N/A	RICHRC5017 U
STRONTIUM	8.68E-02	U	4.8E-02	5.6E-02	1.04E-01	pCi/g	96.10%	RICHRC5006

Number of Results: 19

*RBE*  
*5/27/98*

**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02308 / 4919  
 LAB SAMPLE ID: 80401607 MATRIX: SOIL  
 CLIENT ID: B0N096 DATE RECEIVED: 4/1/1998 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
<del>HEXCHROME</del>	<del>3.00E-02</del>	<del>U</del>	<del>N/A</del>	<del>N/A</del>	<del>3.00E-02</del>	<del>mg/kg</del>	<del>N/A</del>	<del>EPA7168</del>
AM-241	1.73E-02	J	1.7E-02	1.8E-02	1.17E-02	pCi/g	96.50%	RICHRC5057
U-234	6.77E-01	J	1.4E-01	1.8E-01	2.75E-02	pCi/g	61.30%	RICHRC5030
U-235	1.37E-02	U	1.9E-02	2.0E-02	1.85E-02	pCi/g	61.30%	RICHRC5030
U-238	8.61E-01	J	1.5E-01	2.2E-01	3.13E-02	pCi/g	61.30%	RICHRC5030
PU-238	0.00E+00	<i>U</i>	0.0E+00	1.4E-02	1.26E-02	pCi/g	67.10%	RICHRC5010 <i>U</i>
PU239/40	1.39E-02		1.6E-02	1.6E-02	1.26E-02	pCi/g	67.10%	RICHRC5010
AM-241	6.74E-03	U	2.4E-02	2.4E-02	3.79E-02	pCi/g	N/A	RICHRC5017
CO-60	1.24E-02	<i>U</i>	6.3E-03	6.4E-03	1.23E-02	pCi/g	N/A	RICHRC5017
CS-137DA	-1.12E-03	U	6.5E-03	6.5E-03	1.05E-02	pCi/g	N/A	RICHRC5017
EU-152	4.85E-02	<i>U</i>	1.6E-02	1.7E-02	2.96E-02	pCi/g	N/A	RICHRC5017
EU-154	-4.53E-03	U	2.4E-02	2.4E-02	3.96E-02	pCi/g	N/A	RICHRC5017
EU-155	3.29E-02	<i>U</i>	1.8E-02	1.9E-02	3.16E-02	pCi/g	N/A	RICHRC5017
K-40	9.27E+00		3.2E-01	9.8E-01	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	4.56E-01		2.1E-02	5.0E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	3.59E-01		2.8E-02	4.5E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	4.59E-01		5.1E-02	6.8E-02	N/A	pCi/g	N/A	RICHRC5017
U-238	4.80E-01		2.8E-01	2.9E-01	N/A	pCi/g	N/A	RICHRC5017 <i>J</i>
STRONTIUM	6.33E-02	U	4.7E-02	5.1E-02	1.11E-01	pCi/g	78.30%	RICHRC5036

Number of Results: 19

*RM*  
*5/27/98*

*0014*

- 9. Field QC Samples . . . . .  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: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

10. Holding Times

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

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

11. Results and Detection Limits (Levels D & E) . . . . .  N/A

- Results reported for all required sample analyses? . . . . .  Yes No  N/A
- Results supported in raw data? . . . . . Yes No  N/A
- Results Acceptable? . . . . .  Yes No  N/A
- Transcription/Calculation errors? . . . . . Yes No  N/A
- MDA's meet required detection limits? . . . . . Yes  No  N/A
- Transcription/calculation errors? . . . . . Yes No  N/A

Comments: ~~EU 152 BONORS N2~~  
~~U-238 set - 91, 93, 94, 95~~  
 \_\_\_\_\_  
 \_\_\_\_\_

*AAK*

Date: 27 May 1998  
To: Bechtel Hanford Inc. (technical representative)  
From: TechLaw, Inc.  
Project: 100 D Areas - Full Protocol  
Subject: Pesticide/PCB - Data Package No. W02308-QES (SDG No. W02308)

## **INTRODUCTION**

This memo presents the results of data validation on Summary Data Package No. W02308-QES prepared by Quanterra Environmental Services (QES). A list of the samples validated along with the analyses reported and the method of analysis is provided in the following table.

Sample ID	Sample Date	Media	Validation	Analysis
BON090	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON091	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON092	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON093	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON094	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON095	04/01/98	Soil	C	Pest/PCBs by EPA 8080
BON096	04/01/98	Soil	C	Pest/PCBs by EPA 8080

Data validation was conducted in accordance with the BHI validation statement of work (BHI 1997) and the 100 Area Remedial Action Sampling and Analysis Plan (May 1998). Appendices 1 through 5 provide the following information as indicated below:

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

000001

## **DATA QUALITY OBJECTIVES**

- **Holding Times**

Analytical holding times were assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: Soil samples must be extracted within 14 days of the date of sample collection and analyzed within 40 days from the date of extraction.

If holding times are exceeded by less than two times the limit, all associated sample results are qualified as estimates and flagged "J" for detects and "UJ" for non-detects. If holding times are exceeded by greater than two times the limit, all associated detected sample results are qualified as estimates and flagged "J" and all non-detects are rejected and flagged "UR".

Holding times were met for all samples.

- **Blanks**

Method blank analyses are performed to determine the extent of laboratory contamination introduced through sampling, sample preparation or analysis. At least one method blank analysis must be conducted for every 20 samples. Method blanks should not contain target compounds at a concentration greater than the CRQL. If target compounds are present, sample results less than five times the blank concentration are qualified as nondetects and flagged "U". If the sample result is less than five times the blank concentration and less than CRQL, the result is qualified as a nondetect, elevated to the CRQL and flagged "U".

All method blank target compound results were acceptable.

- **Accuracy**

### **Matrix Spike/Matrix Spike Duplicate Recoveries**

Matrix spike/matrix spike duplicate analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike/matrix spike duplicate analyses are performed in duplicate using six compounds and must be within the established laboratory quality control limits of 70-130 percent. If spike recoveries are outside control limits, detected sample results less than 5 times the spike concentration are qualified as estimates and flagged "J". Undetected sample results with spike recoveries outside control limits are qualified as

estimates and flagged "UJ". Sample results greater than five times the spike concentration require no qualification.

All matrix spike/matrix spike duplicate recovery results were acceptable.

#### Surrogate Recovery

The analysis of surrogate compounds provide a measure of performance for individual samples. Matrix-specific surrogate compound recovery control windows have been established by the laboratory. When a surrogate compound recovery is outside the control window, all positively identified target compounds associated with the unacceptable surrogate recoveries are qualified as estimates and flagged "J". Nondetected compounds with surrogate recoveries less than the lower control limit are qualified as having an estimated detection limit and flagged "UJ". Undetected compounds with surrogate recoveries above the upper control limit require no qualification.

All surrogate recovery results were acceptable.

- **Precision**

#### Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike/matrix spike duplicate results provide matrix-specific information on the precision of the method for specific target compound classes. Precision is expressed as the RPD between the recoveries of duplicate matrix spike analyses performed on a sample. Results must be within RPD limits of +/- 30% for soil samples. If RPD values are out of specification and the sample concentration is less than five times the spike concentration, all associated detected sample results are qualified as estimates and flagged "J". If RPD values are out of specification and the sample concentration is greater than five times the spike concentration, no qualification is required.

All matrix spike/matrix spike duplicate RPD results were acceptable.

- **Detection Levels**

Reported laboratory detection levels are compared against CRQLs to ensure that laboratory detection levels meet the required criteria. The reported analytical detection level for toxaphene was above the CRQL in all samples. Under the BHI statement of work, no qualification is required. All other reported detection levels were at or below the CRQL. Under the BHI statement of work, no qualification is required.

- **Completeness**

Data Package No. W02308-QES (SDG No.W02308) was submitted for validation and verified for completeness. The completion rate was 100%.

**MAJOR DEFICIENCIES**

None found.

**MINOR DEFICIENCIES**

None found

**REFERENCES**

BHI, MRB-SBB-A23665, *Validation Statement of Work*, Bechtel Hanford Incorporated, September 5, 1997.

DOE/RL-96-22, Rev. 1, *100 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, May 1998.

Date: 27 May 1998  
To: Bechtel Hanford Inc. (technical representative)  
From: TechLaw, Inc.  
Project: 100 D Areas - Full Protocol  
Subject: Inorganics - Data Package No. W02308-QES (SDG No. W02308)

## **INTRODUCTION**

This memo presents the results of data validation on Data Package No. W02308-QES prepared by Quanterra Environmental Services (QES). A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation</b>	<b>Analysis</b>
BON090	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON091	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON092	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON093	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON094	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON095	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)
BON096	04/01/98	Soil	C	Hexavalent Chromium (EPA 7196)

Data validation was conducted in accordance with the BHI validation statement of work and the 100 Area Remedial Action Sampling and Analysis Plan (May 1998). Appendices 1 through 5 provide the following information as indicated below:

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

000001

## **DATA QUALITY OBJECTIVES**

- **Holding Times**

Analytical holding times are assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: Soil samples must be analyzed within 24 hours for hexavalent chromium.

All holding times were acceptable.

- **Blanks**

### **Preparation Blanks**

At least one preparation blank, consisting of deionized distilled water processed through each sample preparation and analysis procedure, must be prepared and analyzed with every sample delivery group. In the case of positive blank results, samples with digestate concentrations (in ug/L) less than five times the preparation blank value have had their associated values qualified as non-detected and flagged "U". Samples with concentrations of greater than five times the highest blank concentration do not require qualification.

In the case of negative blank results, if the absolute value exceeds the Contract Required Detection Limit (CRDL), all nondetects are rejected and flagged "UR" and all detects that are less than ten times the absolute value of the associated preparation blank result are qualified as estimates and flagged "J". If the absolute value of the negative preparation blank is greater than the IDL and less than or equal to the CRDL, all nondetects are qualified as estimates and flagged "UJ" and all detects less than ten times the absolute value of the blank are qualified as estimates and flagged "J". If the sample results are greater than ten times the absolute value of the preparation blank, no qualification is necessary.

All preparation blank results were acceptable.

- **Accuracy**

### **Matrix Spike**

Matrix spike analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike recoveries must fall within the range of 70% to 130%. Samples with a spike recovery of less than 30% and a sample result

below the IDL are rejected and flagged "UR". Samples with a spike recovery of 30% to 69% and a sample result less than the IDL are qualified "UJ". Samples with a spike recovery of greater than 130% or less than 70% and a sample result greater than the IDL are qualified as estimates and flagged "J". Finally, for samples with a spike recovery greater than 130% and a sample result less than the IDL, no qualification is required.

Due to matrix spike recoveries below QC limits, all hexavalent chromium results were qualified as estimates and flagged "J/UJ".

- **Precision**

- Laboratory Duplicate Samples

Laboratory duplicate sample analyses are used to measure laboratory precision and sample homogeneity. Results must be within RPD limits of plus or minus 30% for solid samples. If RPD values are out of specification and the sample concentration is greater than five times the CRDL, all associated sample results are qualified as estimated and flagged "J". If RPD values are plus or minus two times the CRDL and the sample concentration is less than five times the CRDL, all associated sample results are qualified as estimated and flagged "J/UJ". The performance criteria for aqueous laboratory duplicates are an RPD less than 30% for positive sample results greater than five times the CRDL or plus or minus the CRDL for positive sample results less than five times the CRDL. Sample results outside the criteria are qualified as estimates and flagged "J/UJ".

Due to matrix spike duplicate RPDs outside QC limits, all ICP analytes in both samples were qualified as estimates and flagged "J/UJ".

All laboratory duplicate recovery results were acceptable.

- **Analytical Detection Levels**

Reported analytical detection levels are compared against CRDLs to ensure that laboratory detection levels meet the required criteria. All reported laboratory detection levels met the analyte specific CRDL.

- **Completeness**

Data package No. W02308-QES (SDG No. W02308) was submitted for validation and verified for completeness. The completion percentage was 100%.

## **MAJOR DEFICIENCIES**

None found.

## **MINOR DEFICIENCIES**

Due to matrix spike recoveries below QC limits, all hexavalent chromium results were qualified as estimates and flagged "J/UJ". Data flagged 'J' is an estimate, but under the BHI validation SOW, the data may be usable for decision-making purposes. All other validated results are considered accurate within the standard error associated with the methods.

## **REFERENCES**

BHI, MRB-SBB-A23665, *Validation Statement of Work*, Bechtel Hanford Incorporated, September 5, 1997.

DOE/RL-96-22, Rev. 1, *100 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, May 1998.

Bechtel Hanford, Inc.  
3350 George Washington Way  
Richland, WA 99352

Attn: BHI Sample Management  
MO-105/300 Area  
MSIN: LO-20  
Phone: 373-5665  
FAX: 373-6725

## BHI Sample Management

# Fax

To: Bruce Christian      From: Jeanette Duncan  
Fax: 375-5151      Pages: 2  
Phone:      Date: 6/4  
Re:      CC:

Urgent     For Review     Please Comment     Please Reply     Please Recycle

● Comments:

Bruce - Here's Claude's comments -  
sent an E mail to the client asking  
if he has any comments - Jeanette

<b>Review Comment Record (RCR)</b>	1. Date 6/01/98	2. Review No. BHI/QA98005
	3. Project 107-D3	4. Page Page 1 of 1

5. Document Number(s)/Title(s)  W02308-QES (SDG No. W02308)	6. Program/Project/ Building Number 107-D3 – Soil	7. Reviewer  Claude Stacey	8. Organization/Group  BHI/QA	9. Location/Phone  HO-16/372-9208
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17. Comment Submittal Approval: 10. Agreement with indicated comment disposition(s) 11. CLOSED

Organization Manager (Optional)

Date

Reviewer/Point of Contact

Date

Reviewer/Point of Contact

Author/Originator

Author/Originator

12. Item	13. Comment(s)/Discrepancy(s) (Provide technical justification for the comment and detailed recommendation of the action required to correct/resolve the discrepancy/problem indicated.)	14. Hold Point	15. Disposition (Provide justification if NOT accepted.)	16. Status
1	RadChem: Page 10 and 13, sample B0N092 indicates EU-154 and 155 are below the MDA; however, data does not support this.			
2	RadChem: Page 10 and 16, sample B0N095 indicates EU-152 is below the MDA; however, data does not support this. In addition, page 03 and 028 states Eu-152's MDA was above the contract MDA; however, the MDA for Eu-152 is actually below the required 0.1.			
3	RadChem: Page 10 and 017, sample B0N096 indicates Co-60, Eu-152, and Eu-155 results are below the MDA; however, the reported data does not support this conclusion.			

Bechtel Hanford, Inc.  
3350 George Washington Way  
Richland, WA 99352

## BHI Sample Management

Attn: BHI Sample Management  
MO-105/300 Area  
MSIN: LO-20  
Phone: 373-5665  
FAX: 373-6725

# Fax

To: R. B. Christian From: R. L. Weiss  
Fax: ~~509-373-6725~~ Pages: 1  
Phone: 281-530-2191 Date: 5-19-78  
Re: \_\_\_\_\_ CC: \_\_\_\_\_

Urgent  For Review  Please Comment  Please Reply  Please Recycle

● Comments:

Bruce

#1 Package is for SFL analysis from Geantec

#2 Use SAP Table II-2 SFL values where available. Use 0.1  $\mu\text{Ci/g}$  for all

Ra isotopes. No CRDL for K-40 (not requested by client) Please let me know what this will do to U-238 (GFA) results.

#3 Analysis for G<sup>#</sup> began at 8:00 am  
4-2-78

Rich

to: Jeanette Duncan

19 May 98

From RB Christian

Fax # 509-373-6725

IR - W02308 - QES

#1<sup>rd</sup> is the 15-day turnaround referred to in the package the QTL or SFL referred to in the SAP pg II-5.

#2-<sup>nd</sup> gamma Spec - Due to the duplicate RPD being out of spec, I need an ~~RPD~~/CRDL to determine if qualifiers need to be assigned

#3 CR<sup>4</sup> → I need the time (of day) of analysis to determine if the 24-hr holding time was met

\*\*\*\*\*  
\*\*\* ACTIVITY REPORT \*\*\*  
\*\*\*\*\*

TRANSMISSION OK

TX/RX NO.	9060
CONNECTION TEL	12815302191
CONNECTION ID	
START TIME	05/19 07:38
USAGE TIME	00'28
PAGES	1
RESULT	OK

\*\*\*\*\*  
\*\*\* ACTIVITY REPORT \*\*\*  
\*\*\*\*\*

RECEPTION OK

TX/RX NO. 9097

CONNECTION TEL 509 375 5151

CONNECTION ID

START TIME 05/26 13:59

USAGE TIME 00'22

PAGES 1

RESULT OK

\*\*\*\*\*  
\*\*\* ACTIVITY REPORT \*\*\*  
\*\*\*\*\*

TRANSMISSION OK

TX/RX NO.	9102	
CONNECTION TEL		3755151
CONNECTION ID		
START TIME	05/26 15:21	
USAGE TIME	00'46	
PAGES	2	
RESULT	OK	



**FAX** *W02308***TECHLAW, INC.**

451 Hills, Suite 23  
Richland, WA 99352  
509-375-5667  
509-375-5151 (fax)

To: Jeanette Duncan

From: Bruce Christian

Pages: 1

Date: 26 May 1998

Information Request: Radiochemistry, page 0015

Radium-228 - the result is reported as 0.0598 (undetected), but the MDA is reported as 0.0412. I need verification of which is correct, the U qualifier or the MDA.

*Value is non-detected. -U. This is an artifact of Quentron's older Gamma Spec. Software. The subroutine which produces a "result" when the system says non-detect occasionally yields a value just above the MDA.*

*Rich*

# **FAX**

## **TECHLAW, INC.**

**451 Hills, Suite 23  
Richland, WA 99352  
509-375-5667  
509-375-5151 (fax)**

To: Jeanette Duncan

From: Bruce Christian

Pages: 1

Date: 26 May 1998

Information Request: Radiochemistry, page 0015

Radium-228 - the result is reported as 0.0598 (undetected), but the MDA is reported as 0.0412. I need verification of which is correct, the U qualifier or the MDA.

---

Author: David B Blumenkranz at ~BHI001  
Date: 7/14/98 4:39 PM  
Priority: Normal  
TO: Richard L Weiss at ~BHI012  
CC: Jeanette M Duncan at ~BHI012  
CC: Mark H Sturges  
Subject: 107-D3 Validation package.

----- Message Contents -----

Rich,

It looks like the validator was still using an accuracy (percent recovery) for matrix spikes (radiological analysis) of 60-140%. The way we interpret the SAP, the requirement for recovery is 70-130% or +/- 3 std. dev. To be truly beneficial, the validator should check that MS & MSD recovery is 70-130%, per the Table II-2 of the SAP.

Also, the validator is still checking the CRDLs, but is not checking the DLs against the SAP. To clarify, it's my understanding that someone in Sample Mgt. will do this right? If they could check both the CRDLs and the SAP DLs, it might save us some work and add the legitimacy that comes from a third party.

Side Issue:

Somehow we need to document that the lab continuing calibration sample analyses (ICV, CCV, ICB, and CCB) are within control limits. That is, we need to make sure that where applicable, the +/- 3 std. dev. requirement of the SAP is adhered to. Thermo Analytical is pretty good about stating this right up front in the narrative for their data package. I can't find like statements in the Quanterra packages. It doesn't seem to be part of the validation either. I know it's a contractual requirement, but how do we enforce it? Any suggestions?

Thanks,  
Dave

---

Author: David B Blumenkranz at ~BHI001  
Date: 6/10/98 7:48 AM  
Priority: Normal  
TO: Mark H Sturges  
CC: Jeanette M Duncan at ~BHI012  
Subject: Data Validation Package No. W02308-QES

----- Message Contents -----

The attached file has my comments on the Data Validation Package No. W02308-QES.

Thanks,  
Dav<<File: validcom.doc>>e

Comments on Data Validation Package W02308-QES (D.B.Blumenkranz, 6/9/98):

1. To aid us in verifying compliance with the PARCC parameters of the SAP, the following information should be presented in a convenient table format:

Detection limits or MDAs for each analyte and sample (as applicable),

Surrogate/Matrix Spike/Matrix Spike Duplicate recovery for each applicable analyte,

Matrix Spike/Matrix Spike Duplicate RPDs for each applicable analyte.

2. Compare the data to the PARCC parameters of the SAP and indicate the following:

Report all analytes/analyses that have associated detection limits that are not as low as those specified in Table II-2 of the SAP.

Report analytes (from the MS & MSD) that do not have a percent recovery within 100 $\pm$ 30% (or  $\pm$ 3 standard deviations for GeLi/HPGe analytical detection methods).

Report analytes (from the MS & MSD) that do not have a RPD within  $\pm$ 30%

3. Appendix 3, p.1, Summary Table:

In the "Remarks" row, please indicate the following for clarity:

Sample Number	B0N090	B0N091	B0N092	B0N093	B0N094	B0N095	B0N096
Location	107-D3						
Remarks	FB	EB	A	B	FD-A	C	D

4. Include the lab QCBLK, QCLCS, lab Matrix Spike, and Matrix Spike Duplicate analyses in Appendix 3 (or other supporting Appendix) for information.
5. Where is the DCB for the Aroclor analytical results in Appendix 3 of W02308-QES, Pesticide/PCB analytical results (probably a lab issue, not a validation issue)? Maybe the "other" results pages should be presented in Appendix 3, not the "FORM I" data sheets which are somewhat incomplete.
6. Where is the validation of SDG H0143 (the field split sample)? Was it not provided to the validator? More importantly, how do the results of field split, duplicate and main sample compare?

This is the kind of information we need to assess the data for usability for site closeout.