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Date: 18 November 1998
To: Bechtel Hanford, Inc. (technical representative)
From: TechLaw, Inc.
Project: 100 BC Areas - Full Protocol (Waste Site 116-C-5)
Subject: Radiochemistry - Data Package No. W02534-QES (SDG No. W02534)



INTRODUCTION

This memo presents the results of data validation on Summary Data Package No. W02534-QES which was prepared by Quanterra Environmental Services (QES). A list of samples validated along with the analyses reported and the requested analytes is provided in the following table.

Sample ID	Sample Date	Media	Validation	Analysis
BOJD40	9/10/98	Soil	C	See note 1
BOJD41	9/10/98	Soil	C	See note 1
BOJD42	9/10/98	Soil	C	See note 1
BOJD43	9/10/98	Soil	C	See note 1
BOJD44	9/10/98	Soil	C	See note 1
BOJD45	9/10/98	Soil	C	See note 1
BOJD46	9/10/98	Soil	C	See note 1
BOJD47	9/10/98	Soil	C	See note 1
BOJD48	9/10/98	Soil	C	See note 1
BOJD50	9/10/98	Soil	C	See note 1

1 - Gamma spectroscopy; isotopic uranium, plutonium and americium; strontium-90; nickel-63.

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 (DOE/RL 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**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for radiochemical analysis 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 detection, radium-226 results in samples BOJD44, BOJD46, BOJD47, and BOJD48 were qualified as estimates and flagged "J".

Due to positive laboratory blank detection, the negative radium-226 result in sample BOJD44 was raised to the MDA and flagged "U".

Due to a positive laboratory blank detection, the uranium-238 (GEA) result in sample BOJD48 was qualified as an estimate 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 and matrix spike recovery range is 3 sigma. 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%.

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

Due to an LCS recovery of 157%, all detected uranium-238 (GEA) results were qualified as estimates and flagged "J".

All 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 or equal to 30 percent, 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. If either the original or replicate value is below the CRDL, the applicable control limits are 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 153%, all uranium-238 (GEA) results were qualified as estimates and flagged "J".

Due to the original sample (used for the laboratory duplicate) not being analyzed for radium-224, all radium-224 results were qualified as estimates and flagged "J".

All other duplicate results were acceptable.

Field Duplicate Samples

One pair of field duplicate samples (samples B0JD42/B0JD50) were submitted to QES for analysis. The duplicate sample results were compared using the validation guidelines for determining the RPD between a sample and its duplicate. The RPD for uranium-238 (GEA) was outside QC limits. Under the BHI statement of work, no qualification is required. All other field duplicate results were acceptable.

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- **Detection Levels**

Reported analytical detection levels are compared against the 100 Area Remedial Action Sampling and Analysis Plan target detection limits (TDLs) or the contract specific MDA if no TDL was specified, to ensure that laboratory detection levels meet the required criteria. Laboratory reported detection limits were above the TDL for europium-155 in samples BOJD40, BOJD43, BOJD44 and BOJD47. All other reported MDAs were at or below the TDL or contract specific MDA.

- **Completeness**

Data Package No. W02534-QES was submitted for validation and verified for completeness. The completion rate was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

Due to a positive laboratory blank detection, radium-226 results in samples BOJD44, BOJD46, BOJD47, and BOJD48 were qualified as estimates and flagged "J". Due to positive laboratory blank detection, the negative radium-226 result in sample BOJD44 was raised to the MDA and flagged "U". Due to a positive laboratory blank detection, the uranium-238 (GEA) result in sample BOJD48 was qualified as an estimate and flagged "J". Due to the lack of a LCS analysis, all plutonium-238 results were qualified as estimates and flagged "J". Due to an LCS recovery of 157%, all detected uranium-238 (GEA) results were qualified as estimates and flagged "J". Due to an RPD of 153%, all uranium-238 (GEA) results were qualified as estimates and flagged "J". Due to the original sample (used for the laboratory duplicate analysis) not being analyzed for radium-224, all radium-224 results 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.

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Appendix 1

Glossary of Data Reporting Qualifiers

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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

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DATA QUALIFICATION SUMMARY

SDG: W02534	REVIEWER: TLI	DATE: 11/18/98	PAGE <u>1</u> OF <u>1</u>
COMMENTS:			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Radium-226	J	BOJD44, BOJD46, BOJD47, BOJD48	Blank contamination
Radium-226	U	BOJD44	Blank contamination
Uranium-238(GEA)	J	BOJD48	Blank contamination
Plutonium-238	J	All	No LCS
Uranium-238(GEA)	J	BODJ43, BODJ47, BODJ48	LCS recovery
Uranium-238(GEA)	J	All	RPD
Radium-224	J	All reported	Analyte missing from duplicate original

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Appendix 3

Qualified Data Summary and Annotated Laboratory Reports

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SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02534 / 6212
 LAB SAMPLE ID: 80921501 MATRIX: SOIL
 CLIENT ID: B0JD40 DATE RECEIVED: 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	7.28E-01		N/A	N/A	3.00E-02	mg/L	N/A	EPA7496
AM-241	3.04E+00	J	2.6E-01	5.6E-01	3.05E-02	pCi/g	73.00%	RICHRC5080
U-234	1.20E+00		1.6E-01	2.5E-01	3.31E-02	pCi/g	82.00%	RICHRC5030
U-235	4.04E-02	J	2.9E-02	3.0E-02	2.35E-02	pCi/g	82.00%	RICHRC5030
U-238	9.57E-01	J	1.4E-01	2.1E-01	2.57E-02	pCi/g	82.00%	RICHRC5030
PU-238	2.58E-01		7.1E-02	8.1E-02	1.32E-02	pCi/g	84.30%	RICHRC5010
PU239/40	6.19E+00		3.5E-01	1.0E+00	1.32E-02	pCi/g	84.30%	RICHRC5010
AM-241	1.21E+00		4.3E-01	4.3E-01	N/A	pCi/g	N/A	RICHRC5017
CO-60	1.72E+01		1.7E+00	1.7E+00	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	4.04E+01		4.1E+00	4.1E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	1.27E+02		1.3E+01	1.3E+01	N/A	pCi/g	N/A	RICHRC5017
EU-154	2.03E+01		2.1E+00	2.1E+00	N/A	pCi/g	N/A	RICHRC5017
EU-155	1.23E+00		2.8E-01	2.8E-01	4.10E-01	pCi/g	N/A	RICHRC5017
K-40	1.10E+01		1.3E+00	1.3E+00	N/A	pCi/g	N/A	RICHRC5017
U-238	1.78E-01	UJ	2.7E+00	2.7E+00	4.05E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	2.82E+00		2.2E-01	9.1E-01	1.27E-01	pCi/g	80.40%	RICHRC5006
NI-63	5.83E+02		9.2E+00	7.1E+01	5.66E+00	pCi/g	87.60%	RICHRC5069

Number of Results: 17

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Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,
J = No U qualifier and result < RDL.

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SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: 80921502 **MATRIX:** SOIL
CLIENT ID: B0JD41 **DATE RECEIVED:** 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	1.09E+00		N/A	N/A	3.00E-02	mg/L	N/A	EPA7196
AM-241	1.82E+00	J	2.1E-01	3.7E-01	2.38E-02	pCi/g	69.40%	RICHRC5080
U-234	9.37E-01	J	1.3E-01	2.0E-01	2.81E-02	pCi/g	88.50%	RICHRC5030
U-235	2.29E-02	J	2.1E-02	2.2E-02	2.17E-02	pCi/g	88.50%	RICHRC5030
U-238	8.95E-01	J	1.3E-01	1.9E-01	2.53E-02	pCi/g	88.50%	RICHRC5030
PU-238	1.74E-01	J	5.9E-02	6.5E-02	1.35E-02	pCi/g	86.40%	RICHRC5010
PU239/40	4.23E+00		2.9E-01	7.2E-01	2.27E-02	pCi/g	86.40%	RICHRC5010
AM-241	6.46E-01		2.0E-01	2.0E-01	N/A	pCi/g	N/A	RICHRC5017
CO-60	1.08E+01		1.1E+00	1.1E+00	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	3.89E+01		3.9E+00	3.9E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	7.34E+01		7.4E+00	7.4E+00	N/A	pCi/g	N/A	RICHRC5017
EU-154	1.13E+01		1.2E+00	1.2E+00	N/A	pCi/g	N/A	RICHRC5017
EU-155	5.57E-01		2.1E-01	2.1E-01	N/A	pCi/g	N/A	RICHRC5017
K-40	1.12E+01		1.3E+00	1.3E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	8.05E-01	J	1.4E-01	1.4E-01	N/A	pCi/g	N/A	RICHRC5017
U-238	8.39E-01	UJ	1.4E+00	1.4E+00	2.14E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	4.22E+00		2.8E-01	1.5E+00	1.36E-01	pCi/g	77.10%	RICHRC5006
NI-63	4.79E+02		8.2E+00	5.9E+01	5.47E+00	pCi/g	90.70%	RICHRC5069

Number of Results: 18

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Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,
J = No U qualifier and result < RDL.

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SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: 80921503 **MATRIX:** SOIL
CLIENT ID: B0JD42 **DATE RECEIVED:** 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	2.00E-01		N/A	N/A	3.00E-02	mg/kg	N/A	RA27406
AM-241	1.66E+00	J	1.8E-01	3.1E-01	1.89E-02	pCi/g	89.40%	RICHRC5080
U-234	9.53E-01	J	1.4E-01	2.1E-01	2.33E-02	pCi/g	80.90%	RICHRC5030
U-235	2.47E-02	J	2.3E-02	2.3E-02	2.33E-02	pCi/g	80.90%	RICHRC5030
U-238	8.97E-01	J	1.4E-01	2.0E-01	1.38E-02	pCi/g	80.90%	RICHRC5030
PU-238	1.63E-01	J	6.2E-02	6.8E-02	2.93E-02	pCi/g	70.90%	RICHRC5010
PU239/40	3.93E+00		3.0E-01	7.2E-01	2.68E-02	pCi/g	70.90%	RICHRC5010
AM-241	7.09E-01		1.2E-01	1.2E-01	N/A	pCi/g	N/A	RICHRC5017
CO-60	9.13E+00		9.2E-01	9.2E-01	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	3.83E+01		3.8E+00	3.8E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	5.19E+01		5.2E+00	5.2E+00	N/A	pCi/g	N/A	RICHRC5017
EU-154	9.35E+00		9.7E-01	9.7E-01	N/A	pCi/g	N/A	RICHRC5017
EU-155	5.26E-01		1.7E-01	1.7E-01	N/A	pCi/g	N/A	RICHRC5017
K-40	1.23E+01		1.4E+00	1.4E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	6.75E-01	J	1.2E-01	1.2E-01	N/A	pCi/g	N/A	RICHRC5017
U-238	3.82E-01	UJ	7.0E-01	7.0E-01	1.08E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	2.53E+00		1.7E-01	8.3E-01	1.11E-01	pCi/g	68.80%	RICHRC5006
NI-63	3.88E+02		7.8E+00	4.9E+01	5.97E+00	pCi/g	83.60%	RICHRC5069

Number of Results: 18

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Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,
J = No U qualifier and result < RDL.

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SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: 80921504 **MATRIX:** SOIL
CLIENT ID: B0JD43 **DATE RECEIVED:** 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	2.42E-01		N/A	N/A	3.00E-02	mg/kg	N/A	EP 87-196
AM-241	8.41E-01	J	1.3E-01	1.8E-01	1.90E-02	pCi/g	86.10%	RICHRC5080
U-234	8.77E-01	J	1.5E-01	2.2E-01	4.36E-02	pCi/g	61.20%	RICHRC5030
U-235	4.69E-02	J	3.6E-02	3.7E-02	2.73E-02	pCi/g	61.20%	RICHRC5030
U-238	8.71E-01	J	1.5E-01	2.2E-01	4.02E-02	pCi/g	61.20%	RICHRC5030
PU-238	3.10E-02	U J	3.1E-02	3.1E-02	4.07E-02	pCi/g	59.10%	RICHRC5010
PU239/40	2.41E+00		2.6E-01	5.0E-01	3.66E-02	pCi/g	59.10%	RICHRC5010
AM-241	2.52E-01		1.1E-01	1.1E-01	N/A	pCi/g	N/A	RICHRC5017
CO-60	3.00E+00		3.1E-01	3.1E-01	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	2.90E+01		2.9E+00	2.9E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	3.23E+01		3.2E+00	3.2E+00	N/A	pCi/g	N/A	RICHRC5017
EU-154	4.52E+00		4.9E-01	4.9E-01	N/A	pCi/g	N/A	RICHRC5017
EU-155	3.12E-01		1.2E-01	1.2E-01	1.88E-01	pCi/g	N/A	RICHRC5017
K-40	1.10E+01		1.3E+00	1.3E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	6.93E-01		1.1E-01	1.1E-01	N/A	pCi/g	N/A	RICHRC5017
RA-228	7.08E-01		2.4E-01	2.4E-01	N/A	pCi/g	N/A	RICHRC5017
U-238	1.47E+00	J	8.1E-01	8.1E-01	1.29E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	1.60E+00		1.7E-01	5.9E-01	1.34E-01	pCi/g	79.70%	RICHRC5006
NI-63	9.17E+01		4.1E+00	1.6E+01	5.47E+00	pCi/g	89.30%	RICHRC5069

Number of Results: 19

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Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,
J = No U qualifier and result < RDL

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SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: 80921505 **MATRIX:** SOIL
CLIENT ID: B0JD44 **DATE RECEIVED:** 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	6.49E-01		N/A	N/A	3.80E-02	mg/kg	N/A	EPA7196
AM-241	3.16E-01	J	7.1E-02	8.4E-02	1.81E-02	pCi/g	98.30%	RICHRC5080
U-234	8.75E-01	J	1.2E-01	1.8E-01	2.20E-02	pCi/g	94.80%	RICHRC5030
U-235	8.46E-03	U	1.2E-02	1.3E-02	1.77E-02	pCi/g	94.80%	RICHRC5030
U-238	7.35E-01	J	1.1E-01	1.6E-01	1.77E-02	pCi/g	94.80%	RICHRC5030
PU-238	1.81E-02	U J	2.7E-02	2.7E-02	3.80E-02	pCi/g	44.50%	RICHRC5010
PU239/40	6.31E-01		1.5E-01	2.0E-01	4.31E-02	pCi/g	44.50%	RICHRC5010
AM-241	5.43E-02	U	1.3E-01	1.3E-01	2.13E-01	pCi/g	N/A	RICHRC5017
CO-60	2.02E+00		2.1E-01	2.1E-01	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	1.26E+01		1.3E+00	1.3E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	1.11E+01		1.1E+00	1.1E+00	N/A	pCi/g	N/A	RICHRC5017
EU-154	1.72E+00		2.2E-01	2.2E-01	N/A	pCi/g	N/A	RICHRC5017
EU-155	2.34E-01	J	9.6E-02	9.6E-02	1.47E-01	pCi/g	N/A	RICHRC5017
K-40	1.42E+01	J	1.5E+00	1.5E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	7.77E-01	J	1.1E-01	1.1E-01	N/A	pCi/g	N/A	RICHRC5017
RA-226	5.90E-01		1.1E-01	1.1E-01	N/A	pCi/g	N/A	RICHRC5017
RA-228	9.13E-01		2.0E-01	2.0E-01	N/A	pCi/g	N/A	RICHRC5017
U-238	1.63 6.01E-01	U J	1.0E+00	1.0E+00	1.63E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	2.28E+00		1.6E-01	7.3E-01	1.10E-01	pCi/g	62.00%	RICHRC5006
NI-63	1.05E+02		4.3E+00	1.7E+01	5.51E+00	pCi/g	89.50%	RICHRC5069

Number of Results: 20

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Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,
J = No U qualifier and result < RDL.

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SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02534 / 6212
 LAB SAMPLE ID: 80921506 MATRIX: SOIL
 CLIENT ID: B0JD45 DATE RECEIVED: 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	3.64E-01		N/A	N/A	3.00E-02	mg/kg	N/A	EPA7199
AM-241	4.34E+00	J	2.8E-01	7.0E-01	1.19E-02	pCi/g	90.00%	RICHRC5080
U-234	9.17E-01	J	1.4E-01	2.0E-01	2.69E-02	pCi/g	91.80%	RICHRC5030
U-235	4.38E-02	J	3.0E-02	3.1E-02	2.69E-02	pCi/g	91.80%	RICHRC5030
U-238	8.55E-01	J	1.3E-01	1.9E-01	3.12E-02	pCi/g	91.80%	RICHRC5030
PU-238	3.28E-01	J	1.1E-01	1.3E-01	3.89E-02	pCi/g	43.80%	RICHRC5010
PU239/40	7.26E+00		5.3E-01	1.6E+00	3.89E-02	pCi/g	43.80%	RICHRC5010
AM-241	1.25E+00		1.8E-01	1.8E-01	N/A	pCi/g	N/A	RICHRC5017
CO-60	1.04E+01		1.1E+00	1.1E+00	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	5.23E+01		5.2E+00	5.2E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	7.88E+01		7.9E+00	7.9E+00	N/A	pCi/g	N/A	RICHRC5017
EU-154	1.26E+01		1.3E+00	1.3E+00	N/A	pCi/g	N/A	RICHRC5017
EU-155	6.09E-01		2.1E-01	2.1E-01	N/A	pCi/g	N/A	RICHRC5017
K-40	1.12E+01		1.3E+00	1.3E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	6.99E-01	J	1.5E-01	1.5E-01	N/A	pCi/g	N/A	RICHRC5017
U-238	7.13E-01	UJ	7.9E-01	7.9E-01	1.26E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	2.20E+01		6.1E-01	6.8E+00	1.32E-01	pCi/g	78.30%	RICHRC5006
NI-63	5.43E+02		1.1E+01	6.9E+01	7.89E+00	pCi/g	61.70%	RICHRC5069

Number of Results: 18

R/R
11/18/98

Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,
J = No U qualifier and result < RDL.

000016

Quanterra Analytical Services, Inc
rptChemRadSample: v3.41

SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: 80921507 **MATRIX:** SOIL
CLIENT ID: B0JD46 **DATE RECEIVED:** 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	1.22E-01		N/A	N/A	3.00E-02	mg/kg	N/A	EPA7196
AM-241	5.36E-01	J	9.4E-02	1.2E-01	1.13E-02	pCi/g	93.60%	RICHRC5080
U-234	9.46E-01	J	1.5E-01	2.1E-01	3.03E-02	pCi/g	74.80%	RICHRC5030
U-235	2.66E-02	U	2.5E-02	2.6E-02	3.03E-02	pCi/g	74.80%	RICHRC5030
U-238	9.28E-01	J	1.5E-01	2.1E-01	3.21E-02	pCi/g	74.80%	RICHRC5030
PU-238	5.47E-02	J	3.2E-02	3.3E-02	1.23E-02	pCi/g	69.10%	RICHRC5010
PU239/40	1.12E+00		1.4E-01	2.2E-01	1.83E-02	pCi/g	69.10%	RICHRC5010
AM-241	3.39E-01		1.1E-01	1.1E-01	N/A	pCi/g	N/A	RICHRC5017
CO-60	3.19E+00		3.3E-01	3.3E-01	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	1.10E+01		1.1E+00	1.1E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	2.41E+01		2.4E+00	2.4E+00	N/A	pCi/g	N/A	RICHRC5017
EU-154	3.93E+00		4.3E-01	4.3E-01	N/A	pCi/g	N/A	RICHRC5017
EU-155	2.63E-01		1.2E-01	1.2E-01	N/A	pCi/g	N/A	RICHRC5017
K-40	1.21E+01		1.4E+00	1.4E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	7.47E-01	J	1.0E-01	1.0E-01	N/A	pCi/g	N/A	RICHRC5017
RA-226	6.37E-01	J	1.3E-01	1.3E-01	N/A	pCi/g	N/A	RICHRC5017
RA-228	7.75E-01		2.3E-01	2.3E-01	N/A	pCi/g	N/A	RICHRC5017
U-238	8.44E-01	UJ	6.9E-01	6.9E-01	1.14E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	9.83E-01	J	1.4E-01	3.6E-01	1.48E-01	pCi/g	75.90%	RICHRC5006
NI-63	1.26E+02		4.8E+00	2.0E+01	5.74E+00	pCi/g	86.10%	RICHRC5069

Number of Results: 20

RM
11/18/98

Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,
J = No U qualifier and result < RDL.

000017

Quanterra Analytical Services, Inc
rptChemRadSample: v3.41

SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: 80921508 **MATRIX:** SOIL
CLIENT ID: B0JD47 **DATE RECEIVED:** 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	6.03E-01		N/A	N/A	3.00E-02	mg/kg	N/A	EPA7196
AM-241	3.22E-01	J	7.5E-02	8.9E-02	1.19E-02	pCi/g	91.40%	RICHRC5080
U-234	1.01E+00		1.8E-01	2.6E-01	5.16E-02	pCi/g	52.40%	RICHRC5030
U-235	6.29E-02	J	4.5E-02	4.7E-02	3.66E-02	pCi/g	52.40%	RICHRC5030
U-238	9.37E-01		1.7E-01	2.5E-01	3.66E-02	pCi/g	52.40%	RICHRC5030
PU-238	5.11E-02		2.9E-02	3.0E-02	1.15E-02	pCi/g	74.50%	RICHRC5010
PU239/40	1.05E+00		1.3E-01	2.0E-01	1.15E-02	pCi/g	74.50%	RICHRC5010
AM-241	8.96E-02		1.0E-01	1.0E-01	N/A	pCi/g	N/A	RICHRC5017
CO-60	2.77E+00		2.9E-01	2.9E-01	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	1.51E+01		1.5E+00	1.5E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	2.01E+01		2.0E+00	2.0E+00	N/A	pCi/g	N/A	RICHRC5017
EU-154	2.83E+00		3.3E-01	3.3E-01	N/A	pCi/g	N/A	RICHRC5017
EU-155	2.05E-01		1.1E-01	1.1E-01	1.65E-01	pCi/g	N/A	RICHRC5017
K-40	1.24E+01		1.4E+00	1.4E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	7.77E-01	J	1.1E-01	1.1E-01	N/A	pCi/g	N/A	RICHRC5017
RA-226	6.53E-01	J	1.2E-01	1.2E-01	N/A	pCi/g	N/A	RICHRC5017
RA-228	8.64E-01		2.4E-01	2.4E-01	N/A	pCi/g	N/A	RICHRC5017
U-238	1.63E+00		8.1E-01	8.1E-01	1.29E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	1.80E+00		1.4E-01	6.1E-01	1.08E-01	pCi/g	64.20%	RICHRC5006
NI-63	1.21E+02		4.5E+00	1.9E+01	5.42E+00	pCi/g	91.80%	RICHRC5069

Number of Results: 20

DL
11/18/98

Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL.
J = No U qualifier and result < RDL.

000018

Quanterra Analytical Services, Inc
rptChemRadSample; v3.41

SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: 80921509 **MATRIX:** SOIL
CLIENT ID: B0JD48 **DATE RECEIVED:** 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	8.20E-02		N/A	N/A	3.00E-02	mg/kg	N/A	EPA7196
AM-241	5.87E-02	J	4.5E-02	4.6E-02	3.41E-02	pCi/g	49.60%	RICHRC5080
U-234	7.23E-01	J	1.2E-01	1.6E-01	2.75E-02	pCi/g	86.20%	RICHRC5030
U-235	2.84E-02	J	2.4E-02	2.4E-02	2.22E-02	pCi/g	86.20%	RICHRC5030
U-238	7.34E-01	J	1.2E-01	1.7E-01	2.60E-02	pCi/g	86.20%	RICHRC5030
PU-238	9.38E-03	U J	1.3E-02	1.3E-02	1.27E-02	pCi/g	63.70%	RICHRC5010
PU239/40	2.72E-01		7.1E-02	8.3E-02	1.89E-02	pCi/g	63.70%	RICHRC5010
AM-241	-4.25E-02	U	7.3E-02	7.3E-02	1.08E-01	pCi/g	N/A	RICHRC5017
CO-60	2.64E-01		3.8E-02	3.8E-02	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	8.14E-01		8.9E-02	8.9E-02	N/A	pCi/g	N/A	RICHRC5017
EU-152	2.71E+00		2.9E-01	2.9E-01	N/A	pCi/g	N/A	RICHRC5017
EU-154	4.70E-01		9.3E-02	9.3E-02	N/A	pCi/g	N/A	RICHRC5017
EU-155	4.38E-02	U	4.4E-02	4.4E-02	7.38E-02	pCi/g	N/A	RICHRC5017
K-40	1.28E+01		1.4E+00	1.4E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	6.39E-01	J	7.4E-02	7.4E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	5.55E-01	J	8.2E-02	8.2E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	6.40E-01		1.4E-01	1.4E-01	N/A	pCi/g	N/A	RICHRC5017
U-238	5.17E-01	J	6.7E-01	6.7E-01	N/A	pCi/g	N/A	RICHRC5017
STRONTIUM	2.61E-01	J	8.8E-02	1.2E-01	1.42E-01	pCi/g	71.50%	RICHRC5006
NI-63	1.46E+01	J	2.8E+00	8.2E+00	5.84E+00	pCi/g	85.10%	RICHRC5069

Number of Results: 20

Rme
11/18/98

Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,
J = No U qualifier and result < RDL.

000019

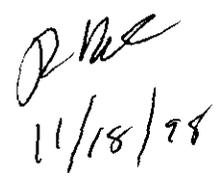
Quanterra Analytical Services, Inc
rptChemRadSample: v3.41

SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: 80921510 **MATRIX:** SOIL
CLIENT ID: B0JD50 **DATE RECEIVED:** 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	4.46E-01		N/A	N/A	3.00E-02	mg/kg	N/A	EPA7198
AM-241	1.63E+00	J	1.6E-01	2.8E-01	1.05E-02	pCi/g	105.00%	RICHRC5080
U-234	8.62E-01	J	1.5E-01	2.1E-01	3.05E-02	pCi/g	67.70%	RICHRC5030
U-235	2.96E-02	J	2.7E-02	2.8E-02	2.80E-02	pCi/g	67.70%	RICHRC5030
U-238	8.82E-01	J	1.5E-01	2.1E-01	1.66E-02	pCi/g	67.70%	RICHRC5030
PU-238	1.11E-01	J	4.8E-02	5.1E-02	1.43E-02	pCi/g	58.60%	RICHRC5010
PU239/40	4.57E+00		3.1E-01	7.9E-01	1.43E-02	pCi/g	58.60%	RICHRC5010
AM-241	5.40E-01		1.0E-01	1.0E-01	N/A	pCi/g	N/A	RICHRC5017
CO-60	8.82E+00		8.9E-01	8.9E-01	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	3.84E+01		3.8E+00	3.8E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	4.89E+01		4.9E+00	4.9E+00	N/A	pCi/g	N/A	RICHRC5017
EU-154	9.14E+00		9.5E-01	9.5E-01	N/A	pCi/g	N/A	RICHRC5017
EU-155	5.09E-01		1.8E-01	1.8E-01	N/A	pCi/g	N/A	RICHRC5017
K-40	1.17E+01		1.3E+00	1.3E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	6.71E-01	J	1.2E-01	1.2E-01	N/A	pCi/g	N/A	RICHRC5017
U-238	2.03E-01	UJ	6.7E-01	6.7E-01	1.05E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	2.41E+00		2.1E-01	8.6E-01	1.39E-01	pCi/g	76.10%	RICHRC5006
NI-63	4.19E+02		7.9E+00	5.2E+01	5.71E+00	pCi/g	86.50%	RICHRC5069

Number of Results: 18


 11/18/98

Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

CERTIFICATE OF ANALYSIS

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

October 20, 1998

Attention: Joan Kessner



SAF Number	:	B98-002
Number of Samples	:	Ten
SDG Closed	:	9/15/98
Sample Type	:	Soil
SDG Number	:	W02534
Data Deliverable	:	15 Day Priority / Full Protocol Summary

I. Introduction

On September 15, 1998, the Quanterra, Inc., Richland Laboratory (QRL) for a 15-day priority radiochemical analysis, received ten soil samples. Upon receipt, the samples were assigned the following laboratory ID numbers to correspond with the Bechtel Hanford (BHI) specific IDs:

<u>QTESRL ID#</u>	<u>BHI ID#</u>	<u>MATRIX</u>	<u>DATE OF RECEIPT</u>
80921501	BOJD40	SOIL	9/15/98
80921502	BOJD41	SOIL	9/15/98
80921503	BOJD42	SOIL	9/15/98
80921504	BOJD43	SOIL	9/15/98
80921505	BOJD44	SOIL	9/15/98
80921506	BOJD45	SOIL	9/15/98
80921507	BOJD46	SOIL	9/15/98
80921508	BOJD47	SOIL	9/15/98
80921509	BOJD48	SOIL	9/15/98
80921510	BOJD50	SOIL	9/15/98

II. Analytical Results/Methodology

Bechtel Hanford Inc.
October 20, 1998
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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.

The requested analyses were:

Alpha Spectroscopy

Americium-241 by method RICH-RC-5080

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

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

Gamma Spectroscopy

Gamma Scan by method RICH-RC-5017

Gas Proportional Counting

Total Strontium by method RICH-RC-5006

Liquid Scintillation Counting

Nickel-63 by method RICH-RC-5069

Chemical Analyses

Chromium Hex by EPA method 7196

III. Quality Control

The analytical results for each analysis performed under SDG W02534 include a minimum of one Laboratory Control Sample (LCS), one method (reagent) blank, and one duplicate. 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 tracer recovery for samples B0JD47 and B0JD50 was high: therefore, the entire sample batch was recounted are being recounted. The LCS, batch blank and sample duplicate (B0JD40 & B0JD45) recount results met the requirements of the contract.

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Bechtel Hanford Inc.
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Plutonium-238, -239/40 by method RICH-RC-5057

The LCS, batch blank, sample duplicate (B0JD45) and sample results met the requirements of the contract.

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

The LCS result from the original analysis failed to meet the requirement of the contract; therefore, the entire sample batch was reanalyzed. The LCS, batch blank, sample duplicate (B0JD45) and sample results from the reanalysis met the requirements of the contract.

Gamma Spectroscopy

Gamma Scan by method RICH-RC-5017

The LCS, batch blank, sample duplicate (B0JD40) and sample results met the requirements of the contract.

Gas Proportional Counting

Total Strontium by method RICH-RC-5006

The LCS, batch blank, sample duplicate (B0JD40) and sample results met the requirements of the contract.

Liquid Scintillation Counting

Nickel-63 by method RICH-RC-5069

The duplicate result from the original analysis did not meet the first level evaluation criteria of the contract at 29.5% RPD, therefore, the duplicate and target sample were reanalyzed. The LCS, MS (B0JD46), batch blank, sample duplicate reanalysis (B0JD45) and sample results met the requirements of the contract.

Chemical Analyses

Chromium Hex by EPA method 7196

The LCS, MS/MSD (B0JD48), batch blank, sample duplicate (B0JD48) and sample results met the requirements of the contract.

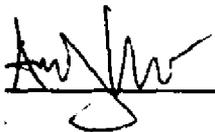
Bechtel Hanford Inc.

October 20, 1998

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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. The Laboratory Manager or a designee, as verified by the following signature has authorized release of the data contained in this hard copy data package.

Reviewed and approved:



Andy Kopriva
Project Manager

Collector Doug Bowers/Randy Coffman	Company Contact Jon Fancher	Telephone No. 373-5598	Project Coordinator KOERNER, CC	Data Turnaround 15 Days
Project Designation 100 BC Areas - Full Protocol	Sampling Location 116-C-5 basin	SAF No. B98-002		
Ice Chest No.	Field Logbook No. EL 1327-1	Method of Shipment hand deliver - govt. vehicle		
Shipped To Quanterra Incorporated	Offsite Property No.	Bill of Lading/Air Bill No.		

POSSIBLE SAMPLE HAZARDS/REMARKS	Preservation	None	Cool 4C	None	None	None	None	None	None		
	Type of Container	P	aG	aG	aG	aG	aG	aG	Mannelli		
	No. of Container(s)	1	1	1	1	1	1	1	1		
Special Handling and/or Storage Cool 4C	Volume	20g	60mL	60mL	60mL	60mL	60mL	60mL	500mL		

SAMPLE ANALYSIS 809214 SIDC W02534	Activity Scan	Chromium Hex - 7196	Americium-241; Isotopic Plutonium; Isotopic Uranium	ICP Metals - 6010A (SW-846) (Chromium, Lead)	Mercury - 7471 - (CV)	Nickel-63	Sr-90 - Total Sr	See item (1) in Special Instructions			
		809215				809215					

Sample No.	Matrix *	Sample Date	Sample Time	Chrom	Am-241	ICP	Hg	Ni	Sr	Other
B0JD40	1 ✓ Soil	9-10-98	0950	X	X	X	X	X	X	X
B0JD41	2 ✓ Soil	9-10-98	1030	X	X	X	X	X	X	X
B0JD42	3 ✓ Soil	9-10-98	0950	X	X	X	X	X	X	X
B0JD43	4 ✓ Soil	9-10-98	1315	X	X	X	X	X	X	X
B0JD44	5 ✓ Soil	9-10-98	1345	X	X	X	X	X	X	X
B0JD45	6 ✓ Soil	9-10-98	1000	X	X	X	X	X	X	X

CHAIN OF POSSESSION	Sign/Print Names		SPECIAL INSTRUCTIONS								Matrix * S - Soil SE - Sediment SO - Solid SL - Sludge W - Water O - Oil A - Air DS - Drum Solids DL - Drum Liquids T - Tissue WJ - Wipe L - Liquid V - Vegetation X - Other		
	Relinquished By <i>R. F. [Signature]</i>	Date/Time 1515	Received By <i>[Signature]</i>	Date/Time 1515	** The ERC contractor acknowledges the 24-hour holding time is not likely achievable for Hex Chrom by EPA 7196.								
	Relinquished By <i>[Signature]</i>	Date/Time 9-15-98	Received By <i>[Signature]</i>	Date/Time 9-15-98	** Use a separate Chain of Custody for each waste site.								
	Relinquished By <i>[Signature]</i>	Date/Time 1008	Received By <i>[Signature]</i>	Date/Time 1008	(1) Gamma Spectroscopy (Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155); Gamma Spec - Add-on (Americium-241, Uranium-238)								

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

Collector Doug Bowers/Randy Coffman	Company Contact Jon Fancher	Telephone No. 373-5598	Project Coordinator KOERNER, CC	Data Turnaround 15 Days
Project Designation 100 BC Areas - Full Protocol	Sampling Location 116-C-5 basin	SAF No. B98-002		

Ice Chest No.	Field Logbook No. EL 1327-1	Method of Shipment hand deliver - govt. vehicle
---------------	--------------------------------	--

Shipped To Quanterra Incorporated	Offsite Property No.	Bill of Lading/Air Bill No.
--------------------------------------	----------------------	-----------------------------

POSSIBLE SAMPLE HAZARDS/REMARKS	Preservation	None	Cool 4C	None	None	None	None	None	None	None	None	None	None
	Type of Container	P	aG	aG	aG	aG	aG	aG	Mannelli				
	No. of Container(s)	1	1	1	1	1	1	1	1				

Special Handling and/or Storage Cool/C	Volume	20g	60mL	500mL									
---	--------	-----	------	------	------	------	------	------	------	-------	--	--	--

SAMPLE ANALYSIS					Activity Scan	Chromium Hex - 7196	Americium-241; Isotopic Plutonium; Isotopic Uranium	ICP Metals - 6010A (SW-846) (Chromium, Lead)	Mercury - 7471 - (CV)	Nickel-63	Sr-90 - Total Sr	See item (1) in Special Instructions	
00027	809214					809215					809215		
Sample No.	Matrix *	Sample Date	Sample Time										
B0JD46	7 ✓ Soil	9-10-98	1245	X	X	X	X	X	X	X	X	X	X
B0JD47	8 ✓ Soil	9-10-98	1320	X	X	X	X	X	X	X	X	X	X
B0JD48	9 ✓ Soil	9-10-98	1030	X	X	X	X	X	X	X	X	X	X
B0JD49 - B0JD5010 RTC	Soil	9-10-98	0950	X	X	X	X	X	X	X	X	X	X

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS	Matrix *
Relinquished By <i>R. F. [Signature]</i>	Date/Time 9-15-98	Received By <i>Jon Fancher</i>	Date/Time 9-15-98
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

SPECIAL INSTRUCTIONS
 ** 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) 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

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

Appendix 5

Data Validation Supporting Documentation

RADIOCHEMICAL DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
PROJECT: 100-BC - Area		116-c-s B. area		DATA PACKAGE: W02534	
VALIDATOR: TLI		LAB: QES		DATE: 11/16/98	
CASE:			SDG: W02534		
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 checked="" type="checkbox"/> M-13		
SAMPLES/MATRIX soil					
BOJD40, BOJD41, BOJD42, BOJD43, BOJD44					
BOJD45, BOJD46, BOJD47, BOJD48, BOJD50					

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: _____

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: N. 63 → ok

140 12A 224/226 U-238 (48) J

ok ok → D44, D46, D47, D48 (J)

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: _____

AF2

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 - gamma 15720
No LCS for ~~15720~~ PU-238

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: U-238 15370
RA-224D4 - didn't run on orig sample - J

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: U-238 critical QC

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-155 → 40, 43, 44, 47 over

Radium → several missing

ASH

LABORATORY CONTROL SAMPLE

LAB NAME: **QUANTERRA, Richland** SDG: /RPT GRP: **W02534 / 6212**
 LAB SAMPLE ID: **J092151M** MATRIX: **SOIL**

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/ IDL	REPORT UNIT	YIELD	EXPECTED	RECOVER:
CS-137DA	3.46E-01		5.3E-02	5.3E-02	N/A	pCi/g	N/A	3.16E-01	109.30%
K-40	2.25E+01		2.4E+00	2.4E+00	N/A	pCi/g	N/A	1.95E+01	115.30%
RA-226	1.06E+00		1.5E-01	1.5E-01	N/A	pCi/g	N/A	1.15E+00	91.76%
RA-228	2.27E+00		2.9E-01	2.9E-01	N/A	pCi/g	N/A	1.87E+00	120.93%
U-238	1.65E+00		1.5E+00	1.5E+00	N/A	pCi/g	N/A	1.05E+00	157.31%

Number of Results:

BLANK RESULTS

LAB NAME: QUANTERRA, Richland SDG /RPT GRP: W02534 / 6212
 LAB SAMPLE ID: J092151X MATRIX: SOIL

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
AM-241	-1.19E-02	U	2.9E-02	2.9E-02	4.61E-02	pCi/g	N/A	RICHRC5017
CO-60	5.50E-03	U	9.7E-03	9.7E-03	1.81E-02	pCi/g	N/A	RICHRC5017
CS-137DA	-2.33E-03	U	9.0E-03	9.0E-03	1.49E-02	pCi/g	N/A	RICHRC5017
EU-152	-3.42E-03	U	2.4E-02	2.4E-02	4.00E-02	pCi/g	N/A	RICHRC5017
EU-154	-1.86E-03	U	3.1E-02	3.1E-02	5.20E-02	pCi/g	N/A	RICHRC5017
EU-155	2.51E-02	U	2.2E-02	2.2E-02	3.61E-02	pCi/g	N/A	RICHRC5017
K-40	2.85E-01		2.3E-01	2.3E-01	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	5.01E-02		2.8E-02	2.8E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	1.57E-01		5.1E-02	5.1E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	1.13E-01	U	4.6E-02	4.6E-02	8.57E-02	pCi/g	N/A	RICHRC5017
U-238	1.82E-01		4.0E-01	4.0E-01	N/A	pCi/g	N/A	RICHRC5017

Number of Results: 11

DUPLICATE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: D0921501 **MATRIX:** SOIL
CLIENT ID: B0JD40 **DATE RECEIVED** 9/15/98 3:15:00 PM
ORIG LAB SAMPLE ID: 80921501

ANALYTE	DUP RESULT	COUNTING Q ERROR (2 s)	TOTAL ERROR (2 s)	MDA/ IDL	REPORT UNIT	YIELD	METHOD NUMBER	ORIG RESULT	RPD
AM-241	1.43E+00	2.7E-01	2.7E-01	N/A	pCi/g	N/A	RICHRC5017	1.21E+00	16.70%
CO-60	1.72E+01	1.7E+00	1.7E+00	N/A	pCi/g	N/A	RICHRC5017	1.72E+01	0.29%
CS-137DA	4.06E+01	4.1E+00	4.1E+00	N/A	pCi/g	N/A	RICHRC5017	4.04E+01	0.40%
EU-152	1.25E+02	1.2E+01	1.2E+01	N/A	pCi/g	N/A	RICHRC5017	1.27E+02	1.59%
EU-154	1.96E+01	2.0E+00	2.0E+00	N/A	pCi/g	N/A	RICHRC5017	2.03E+01	3.50%
EU-155	1.13E+00	2.9E-01	2.9E-01	N/A	pCi/g	N/A	RICHRC5017	1.23E+00	8.31%
K-40	1.28E+01	1.4E+00	1.4E+00	N/A	pCi/g	N/A	RICHRC5017	1.10E+01	14.38%
RA-224DA	8.05E-01 U	1.3E-01	1.3E-01	1.75E-01	pCi/g	N/A	RICHRC5017	N/A	
U-238	1.34E+00 U	1.4E+00	1.4E+00	2.34E+00	pCi/g	N/A	RICHRC5017	1.78E-01	153.03%
STRONTIUM	3.08E+00	2.4E-01	1.1E+00	1.45E-01	pCi/g	79.00%	RICHRC5006	2.82E+00	8.82%

Number of Results: 10

Date: 18 November 1998
 To: Bechtel Hanford Inc. (technical representative)
 From: TechLaw, Inc.
 Project: 100 BC Areas - Full Protocol (Waste Site 116-C-5)
 Subject: Inorganics - Data Package No. W02534-QES (SDG No. W02534)

INTRODUCTION

This memo presents the results of data validation on Data Package No. W02534-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
B0JD40	9/10/98	Soil	C	See note 1
B0JD41	9/10/98	Soil	C	See note 1
B0JD42	9/10/98	Soil	C	See note 1
B0JD43	9/10/98	Soil	C	See note 1
B0JD44	9/10/98	Soil	C	See note 1
B0JD45	9/10/98	Soil	C	See note 1
B0JD46	9/10/98	Soil	C	See note 1
B0JD47	9/10/98	Soil	C	See note 1
B0JD48	9/10/98	Soil	C	See note 1
B0JD50	9/10/98	Soil	C	See note 1

1- ICP metals by 6010A (lead and chromium); mercury by 7471A; chromium VI by 3060B/7196A.

Data validation was conducted in accordance with the BHI validation statement of work and the 100 Area Remedial Action Sampling and Analysis Plan (DOE/RL 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 for mercury, chromium VI and ICP metals are assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: Solid samples must be analyzed within six (6) months for ICP metals, 30 days for chromium VI and 28 days for mercury.

All holding times were acceptable.

- **Blanks**

Preparation Blanks

At least one preparation blank, 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 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 a matrix spike recovery of 291.9% and a matrix spike duplicate recovery of 192.3%, mercury results in all samples were qualified as estimates and flagged "J".

All other accuracy spike recovery results were acceptable.

- **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".

Due to a laboratory duplicate RPD of 41.1%, mercury results in samples all were qualified as estimates and flagged "J".

All other laboratory duplicate recovery results were acceptable.

Field Duplicate Samples

One pair of field duplicate samples (samples B0JD42/B0JD50) were submitted to QES for analysis. The duplicate sample results were compared using the validation guidelines for determining the RPD between a sample and its duplicate. The RPD for chrome VI was outside QC limits. Under the BHI statement of work, no qualification is required. All other field duplicate results were acceptable.

- **Analytical Detection Levels**

Reported analytical detection levels are compared against the 100 Area Remedial Action Sampling and Analysis Plan target detection limits (TDLs) or the CRDL if no TDL was specified, to ensure that laboratory detection levels meet the required criteria. All reported laboratory detection levels met the analyte specific TDL or CRDL.

- **Completeness**

Data package No. W02534-QES (SDG No. W02534) was submitted for validation and verified for completeness. The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

Due to a matrix spike recovery of 291.9% and a matrix spike duplicate recovery of 192.3%, mercury results in all samples were qualified as estimates and flagged "J". Due to a laboratory duplicate RPD of 41.1%, mercury results in samples all 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.

Interoffice Memorandum 056910, Joan Kessner to Distribution, *Hexavalent Chromium Analytical Holding Time*, 4 March 1998.

Appendix 1

Glossary of Data Reporting Qualifiers

000005

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

000007

DATA QUALIFICATION SUMMARY

SDG: W02534	REVIEWER: TLI	DATE: 11/18/98	PAGE <u>1</u> OF <u>1</u>
COMMENTS:			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Mercury	J	All	MS/MSD percent recovery
Mercury	J	All	RPD

Appendix 3

Qualified Data Summary and Annotated Laboratory Reports

000009

SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: 80921501 **MATRIX:** SOIL
CLIENT ID: B0JD40 **DATE RECEIVED:** 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	7.28E-01		N/A	N/A	3.00E-02	mg/L	N/A	EPA7196
AM-241	3.04E+00	J	2.6E-01	5.6E-01	3.05E-02	pCi/g	73.00%	RICHRC5080
U-234	1.20E+00		1.6E-01	2.5E-01	3.31E-02	pCi/g	82.00%	RICHRC5030
U-235	4.04E-02	J	2.9E-02	3.0E-02	2.35E-02	pCi/g	82.00%	RICHRC5030
U-238	9.57E-01	J	1.4E-01	2.1E-01	2.57E-02	pCi/g	82.00%	RICHRC5030
PU-238	2.58E-01		7.1E-02	8.1E-02	1.32E-02	pCi/g	84.30%	RICHRC5010
PU239/40	6.19E+00		3.5E-01	1.0E+00	1.32E-02	pCi/g	84.30%	RICHRC5010
AM-241	1.21E+00		4.3E-01	4.3E-01	N/A	pCi/g	N/A	RICHRC5017
CO-60	1.72E+01		1.7E+00	1.7E+00	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	4.04E+01		4.1E+00	4.1E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	1.27E+02		1.3E+01	1.3E+01	N/A	pCi/g	N/A	RICHRC5017
EU-154	2.03E+01		2.1E+00	2.1E+00	N/A	pCi/g	N/A	RICHRC5017
EU-155	1.23E+00	U	2.8E-01	2.8E-01	4.10E-01	pCi/g	N/A	RICHRC5017
K-40	1.10E+01		1.3E+00	1.3E+00	N/A	pCi/g	N/A	RICHRC5017
U-238	1.78E-01	U	2.7E+00	2.7E+00	4.05E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	2.82E+00		2.2E-01	9.1E-01	1.27E-01	pCi/g	80.40%	RICHRC5006
NI-63	5.83E+02		9.2E+00	7.1E+01	5.66E+00	pCi/g	87.60%	RICHRC5069

Number of Results: 17

per
11/18/98

Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,
J = No U qualifier and result < RDL.

000021

Quanterra Analytical Services, Inc
rptChemRadSample; v3.41

ADD

SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: 80921502 **MATRIX:** SOIL
CLIENT ID: B0JD41 **DATE RECEIVED:** 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	1.09E+00		N/A	N/A	3.00E-02	mg/L	N/A	EPA7196
AM-241	1.82E+00	J	2.1E-01	3.7E-01	2.38E-02	pCi/g	69.40%	RICHRC5080
U-234	9.37E-01	J	1.3E-01	2.0E-01	2.81E-02	pCi/g	88.50%	RICHRC5030
U-235	2.29E-02	J	2.1E-02	2.2E-02	2.17E-02	pCi/g	88.50%	RICHRC5030
U-238	8.95E-01	J	1.3E-01	1.9E-01	2.53E-02	pCi/g	88.50%	RICHRC5030
PU-238	1.74E-01		5.9E-02	6.5E-02	1.35E-02	pCi/g	86.40%	RICHRC5010
PU239/40	4.23E+00		2.9E-01	7.2E-01	2.27E-02	pCi/g	86.40%	RICHRC5010
AM-241	6.46E-01		2.0E-01	2.0E-01	N/A	pCi/g	N/A	RICHRC5017
CO-60	1.08E+01		1.1E+00	1.1E+00	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	3.89E+01		3.9E+00	3.9E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	7.34E+01		7.4E+00	7.4E+00	N/A	pCi/g	N/A	RICHRC5017
EU-154	1.13E+01		1.2E+00	1.2E+00	N/A	pCi/g	N/A	RICHRC5017
EU-155	5.57E-01		2.1E-01	2.1E-01	N/A	pCi/g	N/A	RICHRC5017
K-40	1.12E+01		1.3E+00	1.3E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	8.05E-01		1.4E-01	1.4E-01	N/A	pCi/g	N/A	RICHRC5017
U-238	8.39E-01	U	1.4E+00	1.4E+00	2.14E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	4.22E+00		2.8E-01	1.5E+00	1.36E-01	pCi/g	77.10%	RICHRC5006
NI-63	4.79E+02		8.2E+00	5.9E+01	5.47E+00	pCi/g	90.70%	RICHRC5069

Number of Results: 18

Handwritten signature
11/18/98

Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,
J = No U qualifier and result < RDL.

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SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: 80921503 **MATRIX:** SOIL
CLIENT ID: B0JD42 **DATE RECEIVED:** 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	2.00E-01		N/A	N/A	3.00E-02	mg/kg	N/A	EPA7196
AM-241	1.66E+00	J	1.8E-01	3.1E-01	1.89E-02	pCi/g	89.40%	RICHRC5080
U-234	9.53E-01	J	1.4E-01	2.1E-01	2.33E-02	pCi/g	80.90%	RICHRC5030
U-235	2.47E-02	J	2.3E-02	2.3E-02	2.33E-02	pCi/g	80.90%	RICHRC5030
U-238	8.97E-01	J	1.4E-01	2.0E-01	1.38E-02	pCi/g	80.90%	RICHRC5030
PU-238	1.63E-01		6.2E-02	6.8E-02	2.93E-02	pCi/g	70.90%	RICHRC5010
PU239/40	3.93E+00		3.0E-01	7.2E-01	2.68E-02	pCi/g	70.90%	RICHRC5010
AM-241	7.09E-01		1.2E-01	1.2E-01	N/A	pCi/g	N/A	RICHRC5017
CO-60	9.13E+00		9.2E-01	9.2E-01	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	3.83E+01		3.8E+00	3.8E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	5.19E+01		5.2E+00	5.2E+00	N/A	pCi/g	N/A	RICHRC5017
EU-154	9.35E+00		9.7E-01	9.7E-01	N/A	pCi/g	N/A	RICHRC5017
EU-155	5.26E-01		1.7E-01	1.7E-01	N/A	pCi/g	N/A	RICHRC5017
K-40	1.23E+01		1.4E+00	1.4E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	6.75E-01		1.2E-01	1.2E-01	N/A	pCi/g	N/A	RICHRC5017
U-238	3.82E-01	U	7.0E-01	7.0E-01	1.08E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	2.53E+00		1.7E-01	8.3E-01	1.11E-01	pCi/g	68.80%	RICHRC5006
NI-63	3.88E+02		7.8E+00	4.9E+01	5.97E+00	pCi/g	83.60%	RICHRC5069

Number of Results: 18

[Handwritten Signature]
11/18/98

Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL.
J = No U qualifier and result < RDL.

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SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: 80921504 **MATRIX:** SOIL
CLIENT ID: B0JD43 **DATE RECEIVED:** 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	2.42E-01		N/A	N/A	3.00E-02	mg/kg	N/A	EPA7196
AM-241	8.41E-01	J	1.3E-01	1.8E-01	1.90E-02	pCi/g	66.10%	RICHRC5080
U-234	8.77E-01	J	1.5E-01	2.2E-01	4.36E-02	pCi/g	61.20%	RICHRC5030
U-235	4.69E-02	J	3.6E-02	3.7E-02	2.73E-02	pCi/g	61.20%	RICHRC5030
U-238	8.71E-01	J	1.5E-01	2.2E-01	4.02E-02	pCi/g	61.20%	RICHRC5030
PU-238	3.10E-02	U	3.1E-02	3.1E-02	4.07E-02	pCi/g	59.10%	RICHRC5010
PU239/40	2.41E+00		2.6E-01	5.0E-01	3.66E-02	pCi/g	59.10%	RICHRC5010
AM-241	2.52E-01		1.1E-01	1.1E-01	N/A	pCi/g	N/A	RICHRC5017
CO-60	3.00E+00		3.1E-01	3.1E-01	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	2.90E+01		2.9E+00	2.9E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	3.23E+01		3.2E+00	3.2E+00	N/A	pCi/g	N/A	RICHRC5017
EU-154	4.52E+00		4.9E-01	4.9E-01	N/A	pCi/g	N/A	RICHRC5017
EU-155	3.12E-01	U	1.2E-01	1.2E-01	1.88E-01	pCi/g	N/A	RICHRC5017
K-40	1.10E+01		1.3E+00	1.3E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	6.93E-01		1.1E-01	1.1E-01	N/A	pCi/g	N/A	RICHRC5017
RA-228	7.08E-01		2.4E-01	2.4E-01	N/A	pCi/g	N/A	RICHRC5017
U-238	1.47E+00	U	8.1E-01	8.1E-01	1.29E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	1.60E+00		1.7E-01	5.9E-01	1.34E-01	pCi/g	79.70%	RICHRC5006
NI-63	9.17E+01		4.1E+00	1.6E+01	5.47E+00	pCi/g	89.30%	RICHRC5069

Number of Results: 19

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10/18/98

Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,
J = No U qualifier and result < RDL

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ADDER

SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: 80921506 **MATRIX:** SOIL
CLIENT ID: B0JD45 **DATE RECEIVED:** 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	3.64E-01		N/A	N/A	3.00E-02	mg/kg	N/A	EPA7196
AM-241	4.34E+00	J	2.8E-01	7.0E-01	1.19E-02	pCi/g	90.00%	RICHRC5080
U-234	9.17E-01	J	1.4E-01	2.0E-01	2.69E-02	pCi/g	91.80%	RICHRC5030
U-235	4.38E-02	J	3.0E-02	3.1E-02	2.69E-02	pCi/g	91.80%	RICHRC5030
U-238	8.55E-01	J	1.3E-01	1.9E-01	3.12E-02	pCi/g	91.80%	RICHRC5030
PU-238	3.28E-01		1.1E-01	1.3E-01	3.89E-02	pCi/g	43.80%	RICHRC5010
PU239/40	7.26E+00		5.3E-01	1.6E+00	3.89E-02	pCi/g	43.80%	RICHRC5010
AM-241	1.25E+00		1.8E-01	1.8E-01	N/A	pCi/g	N/A	RICHRC5017
CO-60	1.04E+01		1.1E+00	1.1E+00	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	5.23E+01		5.2E+00	5.2E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	7.88E+01		7.9E+00	7.9E+00	N/A	pCi/g	N/A	RICHRC5017
EU-154	1.26E+01		1.3E+00	1.3E+00	N/A	pCi/g	N/A	RICHRC5017
EU-155	6.09E-01		2.1E-01	2.1E-01	N/A	pCi/g	N/A	RICHRC5017
K-40	1.12E+01		1.3E+00	1.3E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	6.99E-01		1.5E-01	1.5E-01	N/A	pCi/g	N/A	RICHRC5017
U-238	7.13E-01	U	7.9E-01	7.9E-01	1.26E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	2.20E+01		6.1E-01	6.8E+00	1.32E-01	pCi/g	78.30%	RICHRC5006
NI-63	5.43E+02		1.1E+01	6.9E+01	7.89E+00	pCi/g	61.70%	RICHRC5069

Number of Results: 18

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Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,
J = No U qualifier and result < RDL.

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SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: 80921507 **MATRIX:** SOIL
CLIENT ID: B0JD46 **DATE RECEIVED:** 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	1.22E-01		N/A	N/A	3.00E-02	mg/kg	N/A	EPA7196
AM-241	5.36E-01	J	9.4E-02	1.2E-01	1.13E-02	pCi/g	93.80%	RICHRC5080
U-234	9.46E-01	J	1.5E-01	2.1E-01	3.03E-02	pCi/g	74.80%	RICHRC5030
U-235	2.66E-02	U	2.5E-02	2.6E-02	3.03E-02	pCi/g	74.80%	RICHRC5030
U-238	9.28E-01	J	1.5E-01	2.1E-01	3.21E-02	pCi/g	74.80%	RICHRC5030
PU-238	5.47E-02		3.2E-02	3.3E-02	1.23E-02	pCi/g	69.10%	RICHRC5010
PU239/40	1.12E+00		1.4E-01	2.2E-01	1.83E-02	pCi/g	69.10%	RICHRC5010
AM-241	3.39E-01		1.1E-01	1.1E-01	N/A	pCi/g	N/A	RICHRC5017
CO-60	3.19E+00		3.3E-01	3.3E-01	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	1.10E+01		1.1E+00	1.1E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	2.41E+01		2.4E+00	2.4E+00	N/A	pCi/g	N/A	RICHRC5017
EU-154	3.93E+00		4.3E-01	4.3E-01	N/A	pCi/g	N/A	RICHRC5017
EU-155	2.63E-01		1.2E-01	1.2E-01	N/A	pCi/g	N/A	RICHRC5017
K-40	1.21E+01		1.4E+00	1.4E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	7.47E-01		1.0E-01	1.0E-01	N/A	pCi/g	N/A	RICHRC5017
RA-226	6.37E-01		1.3E-01	1.3E-01	N/A	pCi/g	N/A	RICHRC5017
RA-228	7.75E-01		2.3E-01	2.3E-01	N/A	pCi/g	N/A	RICHRC5017
U-238	6.44E-01	U	6.9E-01	6.9E-01	1.14E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	9.83E-01	J	1.4E-01	3.6E-01	1.48E-01	pCi/g	75.90%	RICHRC5006
NI-63	1.26E+02		4.8E+00	2.0E+01	5.74E+00	pCi/g	86.10%	RICHRC5069

Number of Results: 20

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11/18/98

SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: 80921508 **MATRIX:** SOIL
CLIENT ID: B0JD47 **DATE RECEIVED:** 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	6.03E-01		N/A	N/A	3.00E-02	mg/kg	N/A	EPA7196
AM-241	3.22E-01	J	7.5E-02	8.9E-02	1.19E-02	pCi/g	91.40%	RICHRC5080
U-234	1.01E+00		1.8E-01	2.6E-01	5.16E-02	pCi/g	52.40%	RICHRC5030
U-235	6.29E-02	J	4.5E-02	4.7E-02	3.66E-02	pCi/g	52.40%	RICHRC5030
U-238	9.37E-01	J	1.7E-01	2.5E-01	3.66E-02	pCi/g	52.40%	RICHRC5030
PU-238	5.11E-02		2.9E-02	3.0E-02	1.15E-02	pCi/g	74.50%	RICHRC5010
PU239/40	1.05E+00		1.3E-01	2.0E-01	1.15E-02	pCi/g	74.50%	RICHRC5010
AM-241	8.96E-02		1.0E-01	1.0E-01	N/A	pCi/g	N/A	RICHRC5017
CO-60	2.77E+00		2.9E-01	2.9E-01	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	1.51E+01		1.5E+00	1.5E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	2.01E+01		2.0E+00	2.0E+00	N/A	pCi/g	N/A	RICHRC5017
EU-154	2.83E+00		3.3E-01	3.3E-01	N/A	pCi/g	N/A	RICHRC5017
EU-155	2.05E-01	U	1.1E-01	1.1E-01	1.65E-01	pCi/g	N/A	RICHRC5017
K-40	1.24E+01		1.4E+00	1.4E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	7.77E-01		1.1E-01	1.1E-01	N/A	pCi/g	N/A	RICHRC5017
RA-226	6.53E-01		1.2E-01	1.2E-01	N/A	pCi/g	N/A	RICHRC5017
RA-228	8.64E-01		2.4E-01	2.4E-01	N/A	pCi/g	N/A	RICHRC5017
U-238	1.63E+00	U	8.1E-01	8.1E-01	1.29E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	1.80E+00		1.4E-01	6.1E-01	1.08E-01	pCi/g	64.20%	RICHRC5006
NI-63	1.21E+02		4.5E+00	1.9E+01	5.42E+00	pCi/g	91.80%	RICHRC5069

Number of Results: 20

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11/18/98

Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL
J = No U qualifier and result < RDL

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SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: 80921509 **MATRIX:** SOIL
CLIENT ID: B0JD48 **DATE RECEIVED:** 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	8.20E-02		N/A	N/A	3.00E-02	mg/kg	N/A	EPA7196
AM-241	5.87E-02	J	4.5E-02	4.6E-02	3.41E-02	pCi/g	49.68%	RICHRC5080
U-234	7.23E-01	J	1.2E-01	1.6E-01	2.75E-02	pCi/g	86.20%	RICHRC5030
U-235	2.84E-02	J	2.4E-02	2.4E-02	2.22E-02	pCi/g	86.20%	RICHRC5030
U-238	7.34E-01	J	1.2E-01	1.7E-01	2.60E-02	pCi/g	86.20%	RICHRC5030
PU-238	9.38E-03	U	1.3E-02	1.3E-02	1.27E-02	pCi/g	63.70%	RICHRC5010
PU239/40	2.72E-01		7.1E-02	8.3E-02	1.89E-02	pCi/g	63.70%	RICHRC5010
AM-241	-4.25E-02	U	7.3E-02	7.3E-02	1.08E-01	pCi/g	N/A	RICHRC5017
CO-60	2.64E-01		3.8E-02	3.8E-02	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	8.14E-01		8.9E-02	8.9E-02	N/A	pCi/g	N/A	RICHRC5017
EU-152	2.71E+00		2.9E-01	2.9E-01	N/A	pCi/g	N/A	RICHRC5017
EU-154	4.70E-01		9.3E-02	9.3E-02	N/A	pCi/g	N/A	RICHRC5017
EU-155	4.38E-02	U	4.4E-02	4.4E-02	7.38E-02	pCi/g	N/A	RICHRC5017
K-40	1.28E+01		1.4E+00	1.4E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	6.39E-01		7.4E-02	7.4E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	5.55E-01		8.2E-02	8.2E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	6.40E-01		1.4E-01	1.4E-01	N/A	pCi/g	N/A	RICHRC5017
U-238	5.17E-01		6.7E-01	6.7E-01	N/A	pCi/g	N/A	RICHRC5017
STRONTIUM	2.61E-01	J	8.8E-02	1.2E-01	1.42E-01	pCi/g	71.50%	RICHRC5006
NI-63	1.46E+01	J	2.8E+00	8.2E+00	5.84E+00	pCi/g	85.10%	RICHRC5069

Number of Results: 20

11/18/98

SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02534 / 6212
LAB SAMPLE ID: 80921510 **MATRIX:** SOIL
CLIENT ID: B0JD50 **DATE RECEIVED:** 9/15/98 3:15:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	4.46E-01		N/A	N/A	3.00E-02	mg/kg	N/A	EPA7196
AM-241	1.63E+00	J	1.6E-01	2.8E-01	1.05E-02	pCi/g	105.00%	RICHRC5080
U-234	8.62E-01	J	1.5E-01	2.1E-01	3.05E-02	pCi/g	67.70%	RICHRC5030
U-235	2.96E-02	J	2.7E-02	2.8E-02	2.80E-02	pCi/g	67.70%	RICHRC5030
U-238	8.82E-01	J	1.5E-01	2.1E-01	1.66E-02	pCi/g	67.70%	RICHRC5030
PU-238	1.11E-01		4.8E-02	5.1E-02	1.43E-02	pCi/g	58.60%	RICHRC5010
PU239/40	4.57E+00		3.1E-01	7.9E-01	1.43E-02	pCi/g	58.60%	RICHRC5010
AM-241	5.40E-01		1.0E-01	1.0E-01	N/A	pCi/g	N/A	RICHRC5017
CO-60	8.82E+00		8.9E-01	8.9E-01	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	3.84E+01		3.8E+00	3.8E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	4.89E+01		4.9E+00	4.9E+00	N/A	pCi/g	N/A	RICHRC5017
EU-154	9.14E+00		9.5E-01	9.5E-01	N/A	pCi/g	N/A	RICHRC5017
EU-155	5.09E-01		1.8E-01	1.8E-01	N/A	pCi/g	N/A	RICHRC5017
K-40	1.17E+01		1.3E+00	1.3E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	6.71E-01		1.2E-01	1.2E-01	N/A	pCi/g	N/A	RICHRC5017
U-238	2.83E-01	U	6.7E-01	6.7E-01	1.05E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	2.41E+00		2.1E-01	8.6E-01	1.39E-01	pCi/g	76.10%	RICHRC5006
NI-63	4.19E+02		7.9E+00	5.2E+01	5.71E+00	pCi/g	86.50%	RICHRC5069

Number of Results: 18

[Handwritten Signature]
9/15/98

Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,
J = No U qualifier and result < RDL.

000030

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rptChemRadSample: v3.41

Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

Quanterra Incorporated
13715 Rider Trail North
Earth City, Missouri 63045

314 298-8566 Telephone
314 298-8757 Fax

CASE NARRATIVE

Bechtel Hanford Incorporated
3190 George Washington Way
Richland, Washington 99352



October 09, 1998

Attention: Joan Kessner

Project Number	:	550.186
SDG	:	W02534
Number of Samples	:	Ten (10)
Sample Matrix	:	Soil
Data Deliverable	:	Summary
Date SDG Closed	:	September 15, 1998

II. Introduction

On September 15, 1998 ten "soil" samples were received by Quanterra, Richland and transferred to Quanterra, St. Louis for chemical analysis. There are no comments or nonconformances associated with the shipping and receiving of these samples. Upon receipt, the samples were given the following laboratory ID numbers to correspond with the specific client ID's:

<u>St. Louis ID</u>	<u>BHI ID</u>	<u>SAF ID</u>	<u>Matrix</u>	<u>Date of Receipt</u>
18890-001	B0JD40	B98-002	Soil	15-SEP-98
18890-002	B0JD41	B98-002	Soil	15-SEP-98
18890-004	B0JD43	B98-002	Soil	15-SEP-98
18890-005	B0JD44	B98-002	Soil	15-SEP-98
18890-006	B0JD45	B98-002	Soil	15-SEP-98
18890-007	B0JD46	B98-002	Soil	15-SEP-98
18890-008	B0JD47	B98-002	Soil	15-SEP-98
18890-009	B0JD48	B98-002	Soil	15-SEP-98
18890-010	B0JD50	B98-002	Soil	15-SEP-98
18890-011	B0JD42	B98-002	Soil	15-SEP-98

Bechtel Hanford Incorporated

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III. 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.

III. Analytical Results/ Methodology (continued)

Analyses requested: ICP Metals (Chromium and Lead) by EPA method 6010A.
 Mercury by EPA method 7471

Deviation from Request: No Deviation from requested methods.

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

MS- Matrix Spike.

MSD- Matrix Spike Duplicate.

V. Comments

General: Richland ID: 809214

Inorganics: A Laboratory Control Sample, Method Blank, Matrix Spike and Matrix Spike Duplicate were analyzed with each preparation batch per the protocol for this analysis.

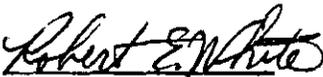
Sample 18890-002 required dilution for the ICP analysis due to interelement interferences. The instrument software flagged the original run with an error code indicating that an interferant; in this case Iron was interfering with the accurate quantitation of Lead and Chromium. The sample was diluted by a factor of 5 and reanalyzed without interference errors.

Bechtel Hanford Incorporated
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Page 3

Inorganics: (cont.) The recoveries of the Mercury matrix spike and matrix spike duplicate were greater than 120% but the data did not require flagging because the Mercury concentration in the sample was greater than 4 x the spiking level.

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

CERTIFICATE OF ANALYSIS

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

October 20, 1998

Attention: Joan Kessner



SAF Number	:	B98-002
Number of Samples	:	Ten
SDG Closed	:	9/15/98
Sample Type	:	Soil
SDG Number	:	W02534
Data Deliverable	:	15 Day Priority / Full Protocol Summary

I. Introduction

On September 15, 1998, the Quanterra, Inc., Richland Laboratory (QRL) for a 15-day priority radiochemical analysis, received ten soil samples. Upon receipt, the samples were assigned the following laboratory ID numbers to correspond with the Bechtel Hanford (BHI) specific IDs:

<u>QTESRL ID#</u>	<u>BHI ID#</u>	<u>MATRIX</u>	<u>DATE OF RECEIPT</u>
80921501	B0JD40	SOIL	9/15/98
80921502	B0JD41	SOIL	9/15/98
80921503	B0JD42	SOIL	9/15/98
80921504	B0JD43	SOIL	9/15/98
80921505	B0JD44	SOIL	9/15/98
80921506	B0JD45	SOIL	9/15/98
80921507	B0JD46	SOIL	9/15/98
80921508	B0JD47	SOIL	9/15/98
80921509	B0JD48	SOIL	9/15/98
80921510	B0JD50	SOIL	9/15/98

II. Analytical Results/Methodology

Bechtel Hanford Inc.
October 20, 1998
Page 2

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.

The requested analyses were:

Alpha Spectroscopy

Americium-241 by method RICH-RC-5080

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

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

Gamma Spectroscopy

Gamma Scan by method RICH-RC-5017

Gas Proportional Counting

Total Strontium by method RICH-RC-5006

Liquid Scintillation Counting

Nickel-63 by method RICH-RC-5069

Chemical Analyses

Chromium Hex by EPA method 7196

III. Quality Control

The analytical results for each analysis performed under SDG W02534 include a minimum of one Laboratory Control Sample (LCS), one method (reagent) blank, and one duplicate. 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 tracer recovery for samples B0JD47 and B0JD50 was high: therefore, the entire sample batch was recounted are being recounted. The LCS, batch blank and sample duplicate (B0JD40 & B0JD45) recount results met the requirements of the contract.

Bechtel Hanford Inc.
October 20, 1998
Page 3

Plutonium-238, -239/40 by method RICH-RC-5057

The LCS, batch blank, sample duplicate (B0JD45) and sample results met the requirements of the contract.

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

The LCS result from the original analysis failed to meet the requirement of the contract; therefore, the entire sample batch was reanalyzed. The LCS, batch blank, sample duplicate (B0JD45) and sample results from the reanalysis met the requirements of the contract.

Gamma Spectroscopy

Gamma Scan by method RICH-RC-5017

The LCS, batch blank, sample duplicate (B0JD40) and sample results met the requirements of the contract.

Gas Proportional Counting

Total Strontium by method RICH-RC-5006

The LCS, batch blank, sample duplicate (B0JD40) and sample results met the requirements of the contract.

Liquid Scintillation Counting

Nickel-63 by method RICH-RC-5069

The duplicate result from the original analysis did not meet the first level evaluation criteria of the contract at 29.5% RPD, therefore, the duplicate and target sample were reanalyzed. The LCS, MS (B0JD46), batch blank, sample duplicate reanalysis (B0JD45) and sample results met the requirements of the contract.

Chemical Analyses

Chromium Hex by EPA method 7196

The LCS, MS/MSD (B0JD48), batch blank, sample duplicate (B0JD48) and sample results met the requirements of the contract.

Bechtel Hanford Inc.
October 20, 1998
Page 4

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. The Laboratory Manager or a designee, as verified by the following signature has authorized release of the data contained in this hard copy data package.

Reviewed and approved:

A handwritten signature in black ink, appearing to read "Andy Kopriva", written over a horizontal line.

Andy Kopriva
Project Manager

Collector Doug Bowers/Randy Coffman	Company Contact Jon Fancher	Telephone No. 373-5598	Project Coordinator KOERNER, CC	Data Turnaround 15 Days						
Project Designation 100 BC Areas - Full Protocol	Sampling Location 116-C-5 basin	SAF No. B98-002								
Ice Chest No.	Field Logbook No. EL 1327-1	Method of Shipment hand deliver - govt. vehicle								
Shipped To Quanterra Incorporated	Offsite Property No.	Bill of Lading/Air Bill No.								
POSSIBLE SAMPLE HAZARDS/REMARKS	Preservation	None	Cool 4C	None	None	None	None	None	None	None
	Type of Container	P	aG	aG	aG	aG	aG	aG	Marinelli	
	No. of Container(s)	1	1	1	1	1	1	1	1	
Special Handling and/or Storage Cool 4C	Volume	20g	60mL	60mL	60mL	60mL	60mL	60mL	300mL	

SAMPLE ANALYSIS	Activity Beta	Chromium Hex - 7196	Americium-241; Isotopic Plutonium; Isotopic Uranium	ICP Metals - 6010A (BW-246) (Chromium, Lead)	Mercury - 7471 - (CV)	Nickel-63	Strontium-89,90 - Total Sr	See Item (1) in Special Instructions
		809214	W02534	809215			809215	

Sample No	Matrix *	Sample Date	Sample Time	Activity Beta	Chromium Hex - 7196	Americium-241; Isotopic Plutonium; Isotopic Uranium	ICP Metals - 6010A (BW-246) (Chromium, Lead)	Mercury - 7471 - (CV)	Nickel-63	Strontium-89,90 - Total Sr	See Item (1) in Special Instructions	
B0JD40	1 ✓ Soil	9-10-98	0950	X	X	X	-X	-X	X	X	X	BoPK
B0JD41	2 ✓ Soil	9-10-98	1030	X	X	X	-X	-X	X	X	X	BoPK
B0JD42	3 ✓ Soil	9-10-98	0950	X	X	X	X	X	X	X	X	BoPK
B0JD43	4 ✓ Soil	9-10-98	1315	X	X	X	-X	-X	X	X	X	BoPK
B0JD44	5 ✓ Soil	9-10-98	1345	X	X	X	-X	-X	X	X	X	BoPK
B0JD45	6 ✓ Soil	9-10-98	1000	X	X	X	-X	-X	X	X	X	BoPK

CHAIN OF POSSESSION		Sign/Print Names	
Relinquished By <i>R. F. [Signature]</i>	Date/Time 1515	Received By <i>[Signature]</i>	Date/Time 1515
Relinquished By <i>[Signature]</i>	Date/Time 9/15/98	Received By <i>[Signature]</i>	Date/Time 9/15/98
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

SPECIAL INSTRUCTIONS

** The ERC contractor acknowledges the 24-hour holding time is not likely achievable for Hex Chrom by BPA 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)

B0JD42 soil rec'd. 07-22-98.

SW 09/24-98 1x60mL - Hg

1x60mL - ICP

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

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

0000039

Collector Doug Bowers/Randy Coffman	Company Contact Jon Fancher	Telephone No. 373-5598	Project Coordinator KOERNER, CC	Data Turnaround 15 Days					
Project Designation 100 BC Areas - Full Protocol	Sampling Location 116-C-3 basin	Field Logbook No. EL 1327-1	SAF No. B98-002						
Ice Chest No.	Offsite Property No.	Method of Shipment hand deliver - govt. vehicle		Bill of Lading/Air Bill No.					
Shipped To Quanterra Incorporated	Preservation								
POSSIBLE SAMPLE HAZARDS/REMARKS	Type of Container	P	60	60	60	60	60	60	Marine/11
	No. of Container(s)	1	1	1	1	1	1	1	1
	Volume	20g	60mL	60mL	60mL	60mL	60mL	60mL	500mL

Special Handling and/or Storage	Activity Scan	Chromium Hex - 7196	Americium-241; Isotopic Plutonium; Isotopic Uranium	ICP Metals - 6010A (SW-846) (Chromium, Lead)	Mercury - 7471 - (CV)	Nickel-63	Strontium-89,90 -- Total Sr	See Item (1) in Special Instructions.
Cool 4C								

809214

809215

809215

000040

Sample no.	Matrix	Sample Date	Count	Hex	Chrom	Am	ICP	Hg	Ni	Sr	Other	Remarks	
10JD46	7 ✓	Soil	9-10-98	1245	X	X	X	X	X	X	X	X	BOPK
10JD47	8 ✓	Soil	9-10-98	1320	X	X	X	X	X	X	X	X	BOPK
10JD48	9 ✓	Soil	9-10-98	1030	X	X	X	X	X	X	X	X	BOPK
10JD49 - B03D50	10 ✓	Soil	9-10-98	0950	X	X	X	X	X	X	X	X	BOPK
							10340	1068					

CHAIN OF POSSESSION	Relinquished By	Date/Time	Received By	Date/Time	SPECIAL INSTRUCTIONS ** 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) 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 Solid DL - Drum Liquid T - Tissue WI - Wipe L - Liquid V - Vegetation X - Other
	Relinquished By	Date/Time	Received By	Date/Time		
	Relinquished By	Date/Time	Received By	Date/Time		
	Relinquished By	Date/Time	Received By	Date/Time		

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

Appendix 5

Data Validation Supporting Documentation

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
PROJECT: 100-BC-4/993 ^{116-C-3 Decision} - Full Protocol			DATA PACKAGE: W02534		
VALIDATOR: TLI		LAB: GES		DATE: 11/14/98	
CASE:			SDG: W02534		
ANALYSES PERFORMED					
<input type="checkbox"/> CLP/PCP	<input type="checkbox"/> CLP/GFAA	<input type="checkbox"/> CLP/Hg	<input type="checkbox"/> CLP/Cyanide	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> SW-846/PCP	<input type="checkbox"/> SW-846/GFAA	<input checked="" type="checkbox"/> SW-846/Hg	<input type="checkbox"/> SW-846 Cyanide	<input checked="" type="checkbox"/> CR VI	<input type="checkbox"/>
SAMPLES/MATRIX Soil					
BOJD40, BOJD41, BOJD42, BOJD43, BOJD44					
BOJD45, BOJD46, BOJD47, BOJD48, BOJPS0					

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: _____

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: Hg - 291.9
Hg SD - 192.3

A-26

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: Hg - 41.17% RPD

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: _____

Review Comment Record (RCR)

1. Date
11/23/98

2. Review No.
BHI/QA98014

3. Project
100 BC Areas

4. Page
Page 1 of 1

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

WO2534-QES (SDG No. WO2534)

6. Program/Project/
Building Number

100BC Areas – Full
Protocol
(Waste Site 116-C-5)

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

22 Dec 98
Date

Claude Stacey
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	Inorganics: Page 003, 004, and 008 indicate the Mercury results are to be qualified as "J" due to MSD and laboratory spike RPD being above the specified acceptance limits. However, page 010 or the laboratory data sheets do not reflect this qualification.		Corrected <i>PS</i>	
2	Inorganics: Page 001, Page headings, under Project has (Waste Site 16-C-5) this should be (Waste Site 116-C-5).		Corrected <i>PS</i>	
3				

Duncan, Jeanette M

From: Blumenkranz, David B
 Sent: Tuesday, November 24, 1998 3:04 PM
 To: Duncan, Jeanette M; Weiss, Richard L
 Cc: Sturges, Mark H; Fancher, Jonathan D (Jon)
 Subject: Data Validation for 107-D1 PCB data, 116-C-5 inorganics and radiochemistry data

Jeanette,

General/Global (W02130-QES & W02534-QES): The validator needs to be aware the CRDLs and the 100 Area Remedial Action Sampling and Analysis Plan (SAP) target detection limits (TDLs) are not necessarily the same. We need to have CRDLs evaluated per BHI Validation Statement of Work and we need to have the SAP TDLs evaluated per the SAP. The validator needs to clarify this in the appropriate portion of the text (see example below)...

"Reported laboratory detection levels (or MDAs, if applicable) are reviewed to ensure that they are at or below the 100 Area Remedial Action Sampling and Analysis Plan (SAP) target detection limits (TDLs) and at or below the CRDLs. Laboratory reported detection limits (or MDAs, if applicable) were above the SAP TDLs for samples X, Y, and Z, and above the CRDLs for samples W, X, and Y. All other reported detection limits (or MDAs, if applicable) were at or below the SAP TDLs and CRDLs."

Concerning the Data Validation for 107-D1 PCB data (W02130-QES):

- 1. The column heading of column #2 of Attachment 3 (p. 10) needs to be changed from "CRDL" to "TDL".

Concerning the Data Validation for 116-C-5 inorganics data (W02534-QES):

- 1. Under the project title, please change "(Waste Site 16-C-5)" to read "(Waste Site 116-C-5)."
- 2. I'm assuming the column heading of column #2 of Attachment 3 (p. 10) needs to be changed from "CRDL" to "TDL". In the text (p. 3-4), change/clarify that both SAP TDLs and CRDLs were examined to ensure the detection limits were less than the SAP TDLs and the CRDLs (see above).

Concerning the Data Validation for 116-C-5 radiochemistry data (W02534-QES):

- 1. The column heading of column #2 of Attachment 3 is labeled "CRDL" yet the text on p. 4 discusses SAP analyte-specific detection limits. Please clarify (see above).

Thanks,
Dave

Comments should be applied to

- W02534 (116-C-5) (vs R 003)
- 107-D1 vs R 004 + 005 + 003 + 001

D7
CS
D1

Not to Ho 161 Ref

Post-It™ brand fax transmittal memo 7671 # of pages > 3

To	Jeanette Duncan	From	R. Ch
Co.		Co.	
Dept.		Phone #	
Fax #		Fax #	

Review Comment Record (RCR)

1. Date
11/23/98

2. Review No.
BHI/QA98014

3. Project
100 BC Areas

4. Page
Page 1 of 1

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

WO2534-QES (SDG No. WO2534)

6. Program/Project/
Building Number
100BC Areas - Full
Protocol
(Waste Site 116-C-5)

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	Inorganics: Page 003, 004, and 008 indicate the Mercury results are to be qualified as "J" due to MSD and laboratory spike RPD being above the specified acceptance limits. However, page 010 or the laboratory data sheets do not reflect this qualification.			
2	Inorganics: Page 001, Page headings, under Project has (Waste Site 16-C-5) this should be (Waste Site 116-C-5).			
3				

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: 16 November 1998

Information Request

SDG No. W02534 - Rad

Radium-224/226/228 - these analytes are not consistently reported for each sample. Were they required to be.

Analyses were not specifically
request to be reported by
the lab. Any ?'s - contact
J.H. Kessner on 375-4688

[Handwritten signature]

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: 18 November 1998

Information Request

W02534 - Radiochemistry analysis

Sample B0JD50 is a split of B0JD42. My experience has been that a split is sent to a different lab and a duplicate to the same lab as the original. The opposite appears to have happened in this case. Do you want a comparison? If so, do I call it a split or a duplicate?

the splits + dups were mislabeled.
B0JD50 is a duplicate + B0JD27
is the split
EBJ

THE FOLLOWING FILE(S) ERASED

FILE	FILE TYPE	OPTION	TEL NO.	PAGE	RESULT
016	MEMORY TX		3755151	02/02	OK

ERRORS

- 1) HANG UP OR LINE FAIL
- 2) BUSY
- 3) NO ANSWER
- 4) NO FACSIMILE CONNECTION

Nov-17-98 02:16P R. Bruce Christian

509-375-5151

P.01

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: 16 November 1998

Information Request