

0050074

CERTIFICATE OF ANALYSIS

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

September 11, 1998

Attention: Joan Kessner



SAF Number	:	B98-022
Date First Sample Received	:	August 12, 1998
Number of Samples	:	One
Sample Type	:	Soil
SDG Number	:	W02494
Data Deliverable	:	15 Day / 45 Day Summary

I. Introduction

On August 12, 1998, one 15 day/45 day full protocol soil sample was received by the Quanterra Environmental Services Richland Laboratory (QESRL) for radiochemical and chemical analysis. Upon receipt, the sample was assigned the following laboratory ID number to correspond with the Bechtel Hanford, Inc. (BHI) specific ID:

<u>QESRL ID#</u>	<u>BHI ID#</u>	<u>MATRIX</u>	<u>DATE OF RECEIPT</u>
80819301	B0PK16	Soil	7/31/98

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.

The requested analyses were:

- Alpha Spectroscopy**
- Americium-241 by method RICH-RC-5062
- Plutonium-238, -239/40 by method RICH-RC-5062
- Gamma Spectroscopy**
- Gamma Scan by method RICH-RC-5017

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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 W02494 include a minimum of one Laboratory Control Sample (LCS), one method (reagent) blank, and one sample 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-5062

The LCS, batch blank, sample duplicate (BOPK16) and sample results are within contractual requirements. The LCS recovery did not meet the first level evaluation criteria of 70-130% recovery but was within the second level evaluation criteria of 40-160% at 57.1% recovery.

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

The LCS, batch blank, sample duplicate (BOPK16) and sample results are within contractual requirements. The isotopic tracer in the batch blank did not meet the first level evaluation criteria of 20-105% recovery but was within the second level evaluation criteria of 40-160% at 14% recovery.

Gamma Spectroscopy

Gamma Scan by method RICH-RC-5017

The LCS, batch blank, sample duplicate (BOPK16) and sample results are within contractual requirements.

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Gas Proportional Counting

Total Strontium by method RICH-RC-5006

The LCS, batch blank, sample duplicate (BOPK16) and sample results are within contractual requirements.

Liquid Scintillation Counting

Nickel-63 by method RICH-RC-5069

The LCS, batch blank, sample duplicate (BOPK16) and sample results are within contractual requirements. The TSIE for the batch blank sample is below the lowest point on our calibration curve. All other QC parameters are acceptable.

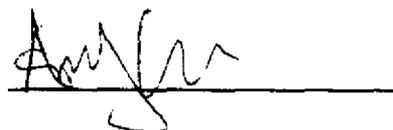
Chemical Analyses

Chromium Hex by EPA method 7196

The LCS, MS (BOPK16), batch blank, sample duplicate (BOPK16) and sample results are within contractual requirements.

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

SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland **SDG: /RPT GRP:** W02494 / 5947
LAB SAMPLE ID: 80819301 **MATRIX:** SOIL
CLIENT ID: B0PK16 **DATE RECEIVED:** 8/12/1998 4:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	5.89E+00		N/A	N/A	3.00E-02	mg/kg	N/A	EPA7196
AM-241	1.11E-01	J	7.4E-02	7.8E-02	3.33E-02	pCi/g	33.80%	RICHRC5062-
PU-238	8.66E-03	U	1.7E-02	1.7E-02	2.34E-02	pCi/g	47.00%	RICHRC5062-f
PU239/40	5.27E-01		1.4E-01	1.7E-01	3.48E-02	pCi/g	47.00%	RICHRC5062-f
AM-241	-9.01E-02	U	9.5E-02	9.6E-02	1.49E-01	pCi/g	N/A	RICHRC5017
CO-60	1.96E+00		5.8E-02	2.0E-01	N/A	pCi/g	N/A	RICHRC5017
CS-137DA	1.44E+01		1.2E-01	1.4E+00	N/A	pCi/g	N/A	RICHRC5017
EU-152	7.33E+00		1.8E-01	7.5E-01	N/A	pCi/g	N/A	RICHRC5017
EU-154	1.17E+00		1.0E-01	1.6E-01	N/A	pCi/g	N/A	RICHRC5017
EU-155	1.09E-01	U	8.3E-02	8.4E-02	1.38E-01	pCi/g	N/A	RICHRC5017
K-40	9.65E+00		4.3E-01	1.1E+00	N/A	pCi/g	N/A	RICHRC5017
RA-224DA	4.39E-01		5.6E-02	7.1E-02	N/A	pCi/g	N/A	RICHRC5017
RA-226	5.12E-01		8.4E-02	9.8E-02	N/A	pCi/g	N/A	RICHRC5017
RA-228	4.78E-01	U	9.9E-02	1.1E-01	1.77E-01	pCi/g	N/A	RICHRC5017
U-238	3.55E-01	U	7.9E-01	7.9E-01	1.25E+00	pCi/g	N/A	RICHRC5017
STRONTIUM	1.79E+00		1.3E-01	5.4E-01	9.24E-02	pCi/g	69.20%	RICHRC5006
NI-63	3.15E+02		7.6E+00	4.1E+01	6.50E+00	pCi/g	84.90%	RICHRC5069

Number of Results: 17

**Quanterra Data Review Checklist
RADIOCHEMISTRY**

Work Order number (s): <u>908193</u>				
Client ID: <u>BHI</u>				
Due Date: <u>8-27-98</u>				
Lab Sample Number or SDG: <u>WQ 2494</u>				
Method Test Parameters: <u>Am241</u>				
Matrix: <u>Soil</u>				
Review Item	Yes (✓)	No (✓)	NA (✓)	2 nd Level Review (✓)
A. Calibration				
1. Is the calibration documentation included where applicable?			/	
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?	/			
2. Were all sample holding times met?	/			
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?	/			
C. QC Samples				
1. Is the blank yield within acceptance criteria?	/			
2. Is the Minimum Detectable Activity for the blank result ≤ the Contract Detection Limit?	/			
3. Is the blank result < 1/2 the Contract Detection Limit?	/			
4. Is the blank > 1/2 the Contract Detection Limit but < Contract Detection Limit?			/	
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?			/	
6. Is the LCS result within acceptance criteria?		/		
7. Is the LCS yield within acceptance criteria?	/			
8. Is the LCS Minimum Detectable Activity ≤ the Contract Detection Limit?	/			
9. MS/MSD results and yield meet acceptance criteria?			/	
10. Duplicate sample results and yield meet acceptance criteria?	/			
D. Other				
1. Are all Nonconformances included and noted?			/	
2. Are all required forms filed out?	/			
3. Correct methodology used?	/			
4. Transcription checked?				
5. Were all calculations checked at a minimum frequency?				
6. Units checked?	/			

Comments on any "No" response: BHQ data acceptable per PBM.

First Level Review: *John Thompson*
 Second Level Review: _____
 Form #: LS-038.2/96, Rev A

Date: 9-11-98
 Date: _____

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

PAGE 1 OF 2

LOG #: RD-98-_____

Project ID: <u>BHE</u>	NCM Initiated by: <u>[Signature]</u>
Sample Numbers: <u>20819315</u>	
Tests: <u>Amal</u>	
Matrix: <u>Soil</u>	<u>W02494</u>

Analytical Area (check appropriate area):

- | | | | |
|--|--------------------------------|--|--|
| <input type="checkbox"/> Sample control | <input type="checkbox"/> GC | <input type="checkbox"/> Wet chemistry | <input checked="" type="checkbox"/> Data review |
| <input type="checkbox"/> Organic preparation | <input type="checkbox"/> HPLC | <input type="checkbox"/> Metals | <input checked="" type="checkbox"/> Radiochemistry |
| <input type="checkbox"/> Inorganic preparation | <input type="checkbox"/> GC/MS | <input type="checkbox"/> Reporting | <input type="checkbox"/> Bioassay |

Nonconformance (check appropriate area):

<p>Holding Time Violations (exceeded by _____ days)*</p> <p><i>Category I: Laboratory Independent</i></p> <p><input type="checkbox"/> 1. Holding time expired in transit</p> <p><input type="checkbox"/> 2. Sample received > 48 hrs. or 1/2 holding time has expired</p> <p><input type="checkbox"/> 3. Test added by client after expiration</p> <p><i>Category II: Laboratory Dependent</i></p> <p><input type="checkbox"/> 4. Instrument failure</p> <p><input type="checkbox"/> 5. Analyst error</p> <p><input type="checkbox"/> 6. Login error</p> <p><input type="checkbox"/> 7. Miscommunication</p> <p><input type="checkbox"/> 8. Other (complete description required)</p> <p><i>Category III: Analysis Reruns (QA/QC)</i></p> <p><input type="checkbox"/> 9. Surrogates</p> <p><input type="checkbox"/> 10. Internal Standards</p> <p><input type="checkbox"/> 11. Spike Recoveries</p> <p><input type="checkbox"/> 12. Blank Contamination</p> <p><i>Category IV: Analysis Reruns (Confirmation)</i></p> <p><input type="checkbox"/> 13. Second column</p> <p><input type="checkbox"/> 14. Contamination check</p> <p><input type="checkbox"/> 15. Confirmation of matrix effects</p> <p><input type="checkbox"/> 16. Other (complete description required)</p>	<p>Quality Assurance/Quality Control</p> <p><input type="checkbox"/> 17. QC data reported outside of controls</p> <p><input type="checkbox"/> 18. Incorrect procedure used</p> <p><input type="checkbox"/> 19. SOP intentionally modified with QA and Tech. approval</p> <p><input type="checkbox"/> 20. Invalid instrument calibration</p> <p><input type="checkbox"/> 21. Insufficient sample received for proper analysis</p> <p>Incorrect or Incomplete Client Deliverable</p> <p><input type="checkbox"/> 22. Hardcopy deliverable error</p> <p><input type="checkbox"/> 23. Electronic deliverable error</p> <p>Reported detection limits elevated due to:</p> <p><input type="checkbox"/> 24. Sample matrix</p> <p><input type="checkbox"/> 25. Insufficient sample volume</p> <p><input type="checkbox"/> 26. Other (complete description required)</p> <p><input checked="" type="checkbox"/> 27. Other (specify): <u>LC Recovery 57%</u></p> <p>Comments/Explanation: _____</p> <p>_____</p> <p>_____</p> <p>_____</p>
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Notification (check appropriate area):

Client notified by (name and date): _____ <input checked="" type="checkbox"/> in writing <u>CN</u> <input type="checkbox"/> by facsimile <input type="checkbox"/> by telephone <input type="checkbox"/> other (explain)	Client's name and response: _____ <input type="checkbox"/> process "as is" <input type="checkbox"/> re-sample <input type="checkbox"/> on hold until _____ <input type="checkbox"/> other (explain)
---	---

Project Manager (signature and date): [Signature] 9/2/98

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

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LOG#: RD-98

Corrective Action

Root Cause

poor spectral quality

Initial and date:

JK 8-27-98

Corrective Action

NA

Initial and Date:

Responsibility for performing CA assigned to:

Actions to prevent recurrence

NA

Initial and Date:

First Level Supervisor:

[Signature]

Date:

8-27-98

Responsible Manager:

[Signature]

Date:

9/10/98

Quality Assurance Review

Anomaly

Deficiency

Rerun

Further action required:

Assigned to:

QA signature:

[Signature]

Date:

9/10/98

Corrective Action Verification

Verified

Cannot Verify (specify reason):

NA

Nonconformance Memo Closure

QA signature/date:

[Signature]

9-10-98

**Quanterra Data Review Checklist
RADIOCHEMISTRY**

Work Order number (s): 808193
 Client ID: BHI
 Due Date: 8-27-98
 Lab Sample Number or SDG: W92494
 Method Test Parameters: Plutonium
 Matrix: Soil

Review Item	Yes (✓)	No (✓)	NA (✓)	2 nd Level Review (✓)
A. Calibration				
1. Is the calibration documentation included where applicable?			/	
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?	/			/
2. Were all sample holding times met?	/			/
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?	/			/
C. QC Samples				
1. Is the blank yield within acceptance criteria?	NA	/		
2. Is the Minimum Detectable Activity for the blank result ≤ the Contract Detection Limit?	/			/
3. Is the blank result < 1/2 the Contract Detection Limit?	/			/
4. Is the blank > 1/2 the Contract Detection Limit but < Contract Detection Limit?			/	
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?			/	
6. Is the LCS result within acceptance criteria?	/			/
7. Is the LCS yield within acceptance criteria?	/			/
8. Is the LCS Minimum Detectable Activity ≤ the Contract Detection Limit?	/			/
9. MS/MSD results and yield meet acceptance criteria?			/	
10. Duplicate sample results and yield meet acceptance criteria?	/			/
D. Other				
1. Are all Nonconformances included and noted?	NA			
2. Are all required forms filed out?	/			/
3. Correct methodology used?	/			/
4. Transcription checked?	/			/
5. Were all calculations checked at a minimum frequency?	/			/
6. Units checked?	/			/

Comments on any "No" response: _____

First Level Review: _____

Date: 8-27-98

Second Level Review: _____

Date: 8/2 A

Form #: LS-038.2 / 96, Rev 4

9/2/98

0015

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

PAGE 1 OF 2

LOG #: RD-98-

Project ID: BHE NCM Initiated by: JR 8-27-98
 Sample Numbers: 2081931B
 Tests: PUSO
 Matrix: Soil W02494

Analytical Area (check appropriate area):

- | | | | |
|--|--------------------------------|--|--|
| <input type="checkbox"/> Sample control | <input type="checkbox"/> GC | <input type="checkbox"/> Wet chemistry | <input checked="" type="checkbox"/> Data review |
| <input type="checkbox"/> Organic preparation | <input type="checkbox"/> HPLC | <input type="checkbox"/> Metals | <input checked="" type="checkbox"/> Radiochemistry |
| <input type="checkbox"/> Inorganic preparation | <input type="checkbox"/> GC/MS | <input type="checkbox"/> Reporting | <input type="checkbox"/> Bioassay |

Nonconformance (check appropriate area):

Holding Time Violations (exceeded by _____ days)

Category I: Laboratory Independent

- 1. Holding time expired in transit
- 2. Sample received > 48 hrs. or 1/2 holding time has expired
- 3. Test added by client after expiration

Category II: Laboratory Dependent

- 4. Instrument failure
- 5. Analyst error
- 6. Login error
- 7. Miscommunication
- 8. Other (complete description required)

Category III: Analysis Reruns (QA/QC)

- 9. Surrogates
- 10. Internal Standards
- 11. Spike Recoveries
- 12. Blank Contamination

Category IV: Analysis Reruns (Confirmation)

- 13. Second column
- 14. Contamination check
- 15. Confirmation of matrix effects
- 16. Other (complete description required)

Quality Assurance/Quality Control

- 17. QC data reported outside of controls
- 18. Incorrect procedure used
- 19. SOP intentionally modified with QA and Tech. approval
- 20. Invalid instrument calibration
- 21. Insufficient sample received for proper analysis

Incorrect or Incomplete Client Deliverable

- 22. Hardcopy deliverable error
- 23. Electronic deliverable error

Reported detection limits elevated due to:

- 24. Sample matrix
- 25. Insufficient sample volume
- 26. Other (complete description required)

27. Other (specify): tracer recovery
14%

Comments/Explanation:

Notification (check appropriate area):

Client notified by (name and date): _____	Client's name and response: _____
<input checked="" type="checkbox"/> in writing <u>CN</u>	<input type="checkbox"/> process "as is"
<input type="checkbox"/> by telephone	<input type="checkbox"/> re-sample
<input type="checkbox"/> by facsimile	<input type="checkbox"/> on hold until _____
<input type="checkbox"/> other (explain)	<input type="checkbox"/> other (explain)

Project Manager (signature and date): [Signature] 9/2/98

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

PAGE 2 OF 2

LOG# RD-92

Corrective Action

Root Cause

unknown

Initial and date:

MC 8-27-98

Corrective Action

contacted pm. sample + LCS results yields OK, Dup
OK, blank result < ROL, blank mba < ROL.

Initial and Date:

MC 8-27-98

Responsibility for performing CA assigned to:

Actions to prevent recurrence

NA

Initial and Date:

First Level Supervisor:

Phil Thompson

Date:

8-27-98

Responsible Manager:

R. X. X

Date:

9/10/98

Quality Assurance Review

Anomaly

Deficiency

Rerun

Further action required:

Assigned to:

QA signature:

C. Black

Date:

9/10/98

8/9/10/98

Corrective Action Verification

Verified

Cannot Verify (specify reason):

NA

Nonconformance Memo Closure

QA signature/date:

C. Black

9/10/98

0017

**Quanterra Data Review Checklist
RADIOCHEMISTRY**

Work Order number (st): <u>808123</u>				
Client ID: <u>BKI</u>				
Due Date: <u>8-27-98</u>				
Lab Sample Number or SDG: <u>WQ2494</u>				
Method Test Parameters: <u>Gamma</u>				
Matrix: <u>SOIL</u>				
Review Item	Yes (✓)	No (✗)	NA (✓)	2 nd Level Review (✓)
A. Calibration				
1. Is the calibration documentation included where applicable?			/	
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?			/	
2. Were all sample holding times met?	/			/
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?	/			/
C. QC Samples				
1. Is the blank yield within acceptance criteria?			/	
2. Is the Minimum Detectable Activity for the blank result ≤ the Contract Detection Limit?	/			/
3. Is the blank result < 1/2 the Contract Detection Limit?	/			/
4. Is the blank > 1/2 the Contract Detection Limit but < Contract Detection Limit?			/	
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?			/	
6. Is the LCS result within acceptance criteria?	/			/
7. Is the LCS yield within acceptance criteria?			/	
8. Is the LCS Minimum Detectable Activity ≤ the Contract Detection Limit?			/	
9. MS/MSD results and yield meet acceptance criteria?			/	
10. Duplicate sample results and yield meet acceptance criteria?	/			/
D. Other				
1. Are all Nonconformances included and noted?			/	
2. Are all required forms filed out?	/			/
3. Correct methodology used?	/			/
4. Transcription checked?	/			/
5. Were all calculations checked at a minimum frequency?	/			/
6. Units checked?	/			/

Comments on any "No" response: _____

First Level Review: [Signature]

Date: 8-27-98

Second Level Review: [Signature]

Date: 9/2/98

Form #: LS-038/2/96, Rev 4

Report 30 pages on last page of summary report
LR teal

0018

**Quanterra Data Review Checklist
RADIOCHEMISTRY**

Work Order number(s): <u>808193</u>				
Client ID: <u>BHI</u>				
Due Date: <u>8-27-98</u>				
Lab Sample Number or SDG: <u>WQ2494</u>				
Method Test Parameters: <u>TOTAL SR</u>				
Matrix: <u>Soil</u>				
Review Item	Yes (✓)	No (✓)	NA (✓)	2 nd Level Review (✓)
A. Calibration			/	
1. Is the calibration documentation included where applicable?				
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?	/			/
2. Were all sample holding times met?	/			/
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?	/			/
C. QC Samples				
1. Is the blank yield within acceptance criteria?	/			/
2. Is the Minimum Detectable Activity for the blank result ≤ the Contract Detection Limit?	/			/
3. Is the blank result < 1/2 the Contract Detection Limit?	/			/
4. Is the blank > 1/2 the Contract Detection Limit but < Contract Detection Limit?			/	
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?			/	
6. Is the LCS result within acceptance criteria?	/			/
7. Is the LCS yield within acceptance criteria?	/			/
8. Is the LCS Minimum Detectable Activity ≤ the Contract Detection Limit?	/			/
9. MS/MSD results and yield meet acceptance criteria?				
10. Duplicate sample results and yield meet acceptance criteria?	/		ATC	
D. Other				
1. Are all Nonconformances included and noted?				
2. Are all required forms filed out?	/			/
3. Correct methodology used?	/			/
4. Transcription checked?	/			/
5. Were all calculations checked at a minimum frequency?	/			/
6. Units checked?	/			/

Comments on any "No" response: _____

First Level Review: *Paul R. King*

Second Level Review: *AM*

Form #: LS-038.2 / 06, Rev 4

Date: 8-27-98

Date: 8 9/2/98

**Quanterra Data Review Checklist
RADIOCHEMISTRY**

Work Order number (st): 808193

Client ID: BHI

Due Date: 8.27.98

Lab Sample Number or SDG: WQ2494

Method Test Parameters: Ni-63

Matrix: Soil

Review Item	Yes (✓)	No (✓)	N/A (✓)	2 nd Level Review (✓)
A. Calibration				
1. Is the calibration documentation included where applicable?			—	
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?	—			—
2. Were all sample holding times met?	—			—
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?	—			—
C. QC Samples				
1. Is the blank yield within acceptance criteria?	—			—
2. Is the Minimum Detectable Activity for the blank result ≤ the Contract Detection Limit?	—			—
3. Is the blank result < 1/2 the Contract Detection Limit?	—			—
4. Is the blank > 1/2 the Contract Detection Limit but < Contract Detection Limit?			—	
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?			—	
6. Is the LCS result within acceptance criteria?	—			—
7. Is the LCS yield within acceptance criteria?	—			—
8. Is the LCS Minimum Detectable Activity ≤ the Contract Detection Limit?	—			—
9. MS/MSD results and yield meet acceptance criteria?			—	
10. Duplicate sample results and yield meet acceptance criteria?	—			—
D. Other				
1. Are all Nonconformances included and noted?	INCM			—
2. Are all required forms filed out?	—			—
3. Correct methodology used?	—			—
4. Transcription checked?	—			—
5. Were all calculations checked at a minimum frequency?	—			—
6. Units checked?	—			—

Comments on any "No" response:

First Level Review:

Paul Klugman
AKM

Date:

8-27-98

Second Level Review:

Date:

9/2/98

Form #: LS-038.2/96, Rev 4

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

PAGE 1 OF 2

LOG #: RD-98-_____

Project ID: <u>BHI</u>	NCM Initiated by: <u>MKS-12-88</u>
Sample Numbers: <u>J081931B</u>	
Tests: <u>N163</u>	
Matrix: <u>Soil</u>	<u>W02494</u>

Analytical Area (check appropriate area):

- | | | | |
|--|--------------------------------|--|--|
| <input type="checkbox"/> Sample control | <input type="checkbox"/> GC | <input type="checkbox"/> Wet chemistry | <input checked="" type="checkbox"/> Data review |
| <input type="checkbox"/> Organic preparation | <input type="checkbox"/> HPLC | <input type="checkbox"/> Metals | <input checked="" type="checkbox"/> Radiochemistry |
| <input type="checkbox"/> Inorganic preparation | <input type="checkbox"/> GC/MS | <input type="checkbox"/> Reporting | <input type="checkbox"/> Bioassay |

Nonconformance (check appropriate area):

Holding Time Violations (exceeded by _____ days)

Category I: Laboratory Independent

- 1. Holding time expired in transit
- 2. Sample received > 48 hrs. or 1/2 holding time has expired
- 3. Test added by client after expiration

Category II: Laboratory Dependent

- 4. Instrument failure
- 5. Analyst error
- 6. Login error
- 7. Miscommunication
- 8. Other (complete description required)

Category III: Analysis Reruns (QA/QC)

- 9. Surrogates
- 10. Internal Standards
- 11. Spike Recoveries
- 12. Blank Contamination

Category IV: Analysis Reruns (Confirmation)

- 13. Second column
- 14. Contamination check
- 15. Confirmation of matrix effects
- 16. Other (complete description required)

Quality Assurance/Quality Control

- 17. QC data reported outside of controls
- 18. Incorrect procedure used
- 19. SOP intentionally modified with QA and Tech. approval
- 20. Invalid instrument calibration
- 21. Insufficient sample received for proper analysis

Incorrect or Incomplete Client Deliverable

- 22. Hardcopy deliverable error
- 23. Electronic deliverable error

Reported detection limits elevated due to:

- 24. Sample matrix
- 25. Insufficient sample volume
- 26. Other (complete description required)

27. Other (specify): Blank BSE is below lower point on calibration

Comments/Explanation: curide

Notification (check appropriate area):

Client notified by (name and date): _____	Client's name and response: _____
<input checked="" type="checkbox"/> in writing <u>CN</u>	<input type="checkbox"/> process "as is"
<input type="checkbox"/> by telephone	<input type="checkbox"/> re-sample
<input type="checkbox"/> by facsimile	<input type="checkbox"/> on hold until _____
<input type="checkbox"/> other (explain)	<input type="checkbox"/> other (explain)

Project Manager (signature and date): [Signature] 9/2/98

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

PAGE 2 OF 2

LOG#: RD-98-

Corrective Action

Root Cause

Initial and date:

uncertain cause for increased quench MP 8-27-98

Corrective Action

Initial and Date:

Data accepted. The blank result is approx. 2.6 pCi/g relative to the MDA of 7.8 pCi/g. Client's RDL is 30 pCi/g therefore the blank doesn't show any indication of contamination. MP 8-27-98

Responsibility for performing CA assigned to:

Actions to prevent recurrence

Initial and Date:

N/A

First Level Supervisor:

Date:

Jill Thompson

8-27-98

Responsible Manager:

Date:

[Signature]

9/10/98

Quality Assurance Review

Anomaly

Deficiency

Rerun

Further action required:

N/A

Assigned to:

QA signature:

C Black

Date:

9/10/98

Corrective Action Verification

Verified

Cannot Verify (specify reason):

N/A

Nonconformance Memo Closure

QA signature/date:

C Black

9/10/98



Richland Laboratory
Data Review Check List
METALS

Work Order Number(s): 808193				
Lab Sample Numbers or SDG: W02494				
Method/Test/Parameter: CR+6 in SOIL				
Review Item	Yes (✓)	No (✓)	N/A (✓)	2 nd Level Review (✓)
A. Initial Calibration				
1. Performed at required frequency with required number of levels?	✓			✓
2. Correlation coefficient within QC limits?	✓			✓
3. Initial calibration verification (ICV) analyzed immediately after calibration and results within QC limits?	✓			✓
4. Initial calibration blank (ICB) analyzed immediately after ICV and concentrations of all parameters \leq reporting limit?	✓			✓
B. Continuing Calibration				
1. CCV analyzed at required frequency and all parameters within QC limits?	✓			✓
2. CCB analyzed at required frequency and all results \leq reporting limit?	✓			✓
C. Sample Analysis				
1. Were any samples with concentrations above the linear range for any parameter diluted and reanalyzed?	✓			✓
2. Were all sample holding times met?	✓			✓
D. QC Samples				
1. All results for the preparation blank below limits?	✓			✓
2. MS or MS/MSD recoveries within QC limits and %RPD (for MSD) acceptable?	✓			✓
3. LCS percent recovery within QC limits and %RPD (for LCSD) acceptable?	✓			✓
4. Analytical spikes within QC limits where applicable?			✓	✓
5. ICP only: One serial dilution performed per SDG?			✓	✓
6. ICP only: CRDL standard (CRI or CRA) analyzed at required frequency?			✓	✓
7. ICP only: Interference check samples (ICSA, ICSAB) and HICAL analyzed at the required frequencies and within QC limits?			✓	✓

CHAIN OF CUSTODY FORMS

Collector ID Jacques/Rick Kerkow <i>MAT Stankovich</i>	Company Contact Mike Stankovich	Telephone No. 531-7620	Project Coordinator KOERNER, CC	Data Turnaround 15 Days
Project Designation 100 D Areas - Full Protocol	Sampling Location 116-D-7	SAF No. B98-022		
Ice Chest No.	Field Logbook No. EL-1339-3	Method of Shipment Hand Delivered - Gov. Vehicle		
Shipped To Quanterra Incorporated	Offsite Property No.	Bill of Lading/Air Bill No.		

Waste Designation Client determined no waste codes associated with this project. COA

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

SAMPLE ANALYSIS	Activity Scan	Chromium Hex - 7196	Americium-241; Isotopic Plutonium; <i>subsequent</i>	See item (1) in Special Instructions.	Mercury - 7471 - (CV)	Nickel-63	Strontium-89,90 - Total Sr	See item (2) in Special Instructions.		
	<i>SDA</i>	<i>W024879</i>	<i>94</i>	<i>8/18/98</i>	<i>808193</i>	<i>80819301</i>				

Sample No.	Matrix *	Sample Date	Sample Time	Activity Scan	Chromium Hex - 7196	Americium-241; Isotopic Plutonium; subsequent	See item (1) in Special Instructions.	Mercury - 7471 - (CV)	Nickel-63	Strontium-89,90 - Total Sr	See item (2) in Special Instructions.		
BOPK16 <i>01</i>	Soil	<i>8-10-98</i>	<i>0640</i>	<i>x</i>	<i>x</i>	<i>x</i>	<i>x</i>	<i>x</i>	<i>x</i>	<i>x</i>	<i>x</i>	<i>978</i>	<i>C7</i>

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS	Matrix *
Relinquished By <i>Stankovich</i> Date/Time <i>8-10-98 1515</i>	Received By <i>R. Nielson</i> Date/Time <i>8/10/98</i>	COA - R116D7 2F00 (1) ICP Metals - 6010A (Supertrace) (Arsenic, Barium, Cadmium, Chromium, Lead, Silver) (2) Gamma Spectroscopy (Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155); Gamma Spec - Add-on (Americium-241, Uranium-238)	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
Relinquished By <i>R. Nielson</i> Date/Time <i>8/12/98 1500</i>	Received By <i>R. Nielson</i> Date/Time <i>8/12/98 1600</i>		
Relinquished By _____ Date/Time _____	Received By <i>Z100upm</i> Date/Time _____		
Relinquished By _____ Date/Time _____	Received By _____ Date/Time _____		

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

GAMMA-RAY ENERGY ANALYSIS REPORT
 Thermo Hazard Inc.
 Radiological Counting Facility TM - RCF

Project Customer ID 116-0-7
 RCF ID RCF-3078

Sample BM, GBM 840
 Analysis date 8/10/98

Isotope Activity (cpm) 2.0 hr Cpm

Isotope	Activity (cpm)	2.0 hr	Cpm
K40	9.2e+02 +/-	1.7e+00	8.8e+12
Ca60	4.5e+02 +/-	3.1e-01	4.8e+12
Th230	2.0e+02		2.0e+12
Co137	2.4e+01 +/-	1.2e+00	2.4e+11
Eu152	1.2e+01 +/-	8.1e-01	1.2e+11
Ba134	2.4e+02 +/-	4.0e-01	2.4e+12
Eu154	2.1e+01		2.1e+11
Th232dau	7.2e+01 +/-	4.2e-01	7.2e+11
U235	4.2e+01		4.8e+11
U238	1.4e+01		1.4e+11
U238dau	8.9e+01 +/-	2.2e-01	9.0e+11
Nb237	2.1e+01		2.1e+11
Am241	1.2e+01		1.2e+11
Total Act (sum 60cpm)	5.6e+01		5.8e+11

Y/Sr-90 < N/A
 Gross Alpha < 1.2e+00
 Gross Beta < 4.1e+01
 AEA Total < N/A

Total Activity (U/CPM) 5.8e+01
 (CPM) 5.8e+11

Model 152-Eu is not a 100% Beta emitter.

Handwritten notes:
 1.3 pCi/g * 1240g = 1.6 x 10³ pCi/g
 41 pCi/g * 1240g = 5.08 x 10⁴ pCi/g
 Cat I
 8/13/98

Observations:
 All items measured at 2 separate locations.
 A. Analyzed as received from Thermo Hazardous Waste for soils and surface samples, the following applies:
 The analysis of U238 is based on the analysis of Th232m.
 The analysis of Th232 is based on the analysis of Pa230.
 U238 and the activity of Pa230 and Th232, short lived daughter products of U238. Equilibrium between parent and daughter products is assumed unless noted as otherwise indicated.
 Th232m is the activity of Ac228, Pa230, and Th232, short lived daughter products of U238. Equilibrium between parent and daughter products is assumed unless noted as otherwise indicated.
 Other analyses, not including medical samples, may have predictable errors for the Th, U, plutonium and daughter products. The results must then be adjusted for the given alpha energies.
 All results are based on samples not requested.

CHESTERLAND
 Radiological analyst Date 8-16-98
Albert L. Davis
 Radiological Manager Date 8/15/98

Figure 1

SAMPLE CHECK-IN LIST

Date/Time Received: 8/12 1455 SG#: W02494
Work Order Number: 808192 + 193 SAF #: B98-001 B98-022
Shipping Container ID: 616E Chain of Custody # B98-001-56
B98-022-19

1. Custody Seals on shipping container intact? Yes [] No []
2. Custody Seals dated and signed? Yes [] No []
3. Chain-of-Custody record present? Yes [] No []
4. Cooler temperature 4°
5. Vermiculite/packing materials is Wet [] Dry [] Wna
6. Number of samples in shipping container: 18
7. Sample holding times exceeded? Yes [] No []

8. Samples have: <input checked="" type="checkbox"/> tape <input checked="" type="checkbox"/> custody seals <input type="checkbox"/> hazard labels <input type="checkbox"/> appropriate sample labels
9. Samples are: <input checked="" type="checkbox"/> in good condition <input type="checkbox"/> broken <input type="checkbox"/> leaking <input type="checkbox"/> have air bubbles

10. Where any anomalies identified in sample receipt? Yes [] No []
11. Description of anomalies (include sample numbers): _____

Sample Custodian/Laboratory: [Signature] Date: 8/12/98
Telephoned To: _____ On _____ By _____

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

13-Aug-1998

Date
8-27-98

CUSTOMER: BHI

SAMPLE DELIVERY GROUP W02482 *9/13/98*

MATRIX : SOIL

B98-022

BATCH NUMBER 08-193

QES ID	DUP	ACCOUNT	CUSTOMER ID	COMMENTS
--------	-----	---------	-------------	----------

1)		80819301	BHI	BOPK16
-----	--	----------	-----	--------

D0819301

J081931B

ACTIONS (Initial & Date)

1) INITIATED

JH 8/13/98

5) COUNTING/MEASUREMENT LAB Ⓟ 8/24/98

SOP(S) #

RD 0800

SOP(S) # RICR00008.RD

2) PREP LAB RECEIVED

JW 8-14-98

6) DATA REVIEWED AND ANALYTICAL PREP STORED

BAR RICR 5019

8/20/98

SOP(S) #

MS 8/27/98

SOP(S) #

RICR00002

3) SAMPLE REMAINDER STORED

SOP(S) #

5 8/25/98

4) SEPARATION LAB RECEIVED

RB 8/24/98

SOP(S) #

RICR005057

coppt. B9 RICR 5003.1 8-26-98

2nd prep PK 8-18-98

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

13-Aug-1998
Page 1

Paul
8-27-98

CUSTOMER: BHI

SAMPLE DELIVERY GROUP

W0248294 *8/13/98*

MATRIX : SOIL

B98-022

BATCH NUMBER

08-193

QES ID	DUP	ACCOUNT	CUSTOMER ID	COMMENTS
--------	-----	---------	-------------	----------

1)		80819301	BHI	BOPK16
-----	--	----------	-----	--------

D0819301

J081931B

J081931E

ACTIONS (Initial & Date)

1) INITIATED

JH 8/13/98

5) COUNTING/MEASUREMENT LAB

8/26/98

SOP(S) #

RD 7000

SOP(S) #

RICHED0008 R.D

2) PREP LAB RECEIVED

JW 8-14-98

6) DATA REVIEWED AND ANALYTICAL PREP STORED

MC 8-27-98

BAB 8/20/98

RICHRC5019 SOP(S) #

SOP(S) #

RICHRC0007

3) SAMPLE REMAINDER STORED

SOP(S) #

4) SEPARATION LAB RECEIVED

PS 8/24/98

SOP(S) #

RICHRC5057

E.D. 8-26-98 RICHRC5039.1

2nd prep PK 8-18-98

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

13-Aug-1998

Due 8-27-98

CUSTOMER: BHI

SAMPLE DELIVERY GROUP

947
Page 1
W02482
8-13-98

MATRIX : SOIL

B98-022

BATCH NUMBER

08-193

QES ID	DUP	ACCOUNT	CUSTOMER ID	COMMENTS
--------	-----	---------	-------------	----------

1)		80819301	BHI	BOPK16
-----	--	----------	-----	--------

Do 819301

Do 8193 IX

IM

ACTIONS (Initial & Date)

1) INITIATED

JH 8/13/98

5) COUNTING/MEASUREMENT LAB

8/24/98 ad

SOP(S) #

RD 2800

SOP(S) #

RICH200007

2) PREP LAB RECEIVED

JW 8-14-98

6) DATA REVIEWED AND ANALYTICAL PREP STORED

JF 8-27-98

SOP(S) #

RICHREC5017-1
RICHREC5015-0

SOP(S) #

RICHREC0002

3) SAMPLE REMAINDER STORED

8-24-98 on

SOP(S) #

NLA

4) SEPARATION LAB RECEIVED

SOP(S) #

J

Adm 0238048
Am291147
REV

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

13-Aug-1998
Page 1

Due
8-27-98

CUSTOMER: BHI

SAMPLE DELIVERY GROUP W0248294 *8/13/98*

MATRIX : SOIL

B98-022

BATCH NUMBER 08-193

QES ID	DUP	ACCOUNT	CUSTOMER ID	COMMENTS
--------	-----	---------	-------------	----------

1)	80819301	BHI	BOPK16	
	00819301			
	10819318			
	15			

ACTIONS (Initial & Date)

1) INITIATED

JH 8/13/98

5) COUNTING/MEASUREMENT LAB

8/26/98

SOP(S) #

RD 7800

SOP(S) #

RICHR00003

2) PREP LAB RECEIVED

JW 8-14-98

6) DATA REVIEWED AND ANALYTICAL PREP STORED

JW 8-29-98

SOP(S) # *RICHR5013-0*

SOP(S) #

RICHR0002 fw2

3) SAMPLE REMAINDER STORED

8-18-98 doc

SOP(S) #

-6

4) SEPARATION LAB RECEIVED

RTM 8/24/98

SOP(S) #

RichRL5006/2

*Prep 2 need: 8-19-98 doc
RICHR5013-0*

Dul
8-27-98

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

13-Aug-1998

Page 1

CUSTOMER: BHI

SAMPLE DELIVERY GROUP

964
W02482 8-13-98

MATRIX : SOIL

B98-022

BATCH NUMBER

08-193

GES ID	DUP	ACCOUNT	CUSTOMER ID	COMMENTS
--------	-----	---------	-------------	----------

1)		80819301	BHI BOPK16	
-----	--	----------	------------	--

ACTIONS (Initial & Date)

1) INITIATED

JH 8/13/98
RD 8800

SOP(S) #

5) COUNTING/MEASUREMENT LAB

8/26/98

SOP(S) #

RICH00001

2) PREP LAB RECEIVED

BAB 8/30/98

JV 8-14-98

6) DATA REVIEWED AND ANALYTICAL PREP STORED

27 MS-2

MS-2698

RICHRC 5019 SOP(S) #

SOP(S) #

RICHRC0002

3) SAMPLE REMAINDER STORED

SOP(S) #

4) SEPARATION LAB RECEIVED

EB 8/25/98

SOP(S) #

RICHRC5069

Cr+6 CHAIN OF CUSTODY

QC REQUIRED

CLIENT: BHI_15

MATRIX: SOIL

DUE DATE: 08/27/98

PROJECT ID: SAF B98-022

SDG W02494

BATCH: 08-193

SAMPLE #	CLIENT ID	COMMENTS
W808193 01A	B0PK16	

Comments: _____

	INITIALS	DATE	SOP#
COC INITIATED	DH	8/13/98	N/A (B) 8/14/98
SAMPLE PREPARATION	(B)	8/14/98	RICHWC500 ⁵ Rev 2
SAMPLE ANALYSIS	(B)	8/14/98	RICHWC500 ⁵ Rev 2
DATA REVIEW		8/17/98	RICHWC500 ⁵ Rev 2

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

August 28, 1998

Attention: Joan Kessner



Project Number	:	550.181
SDG	:	W02494
Number of Samples	:	One (1)
Sample Matrix	:	Soil
Data Deliverable	:	Summary
Date SDG Closed	:	August 12, 1998

II. Introduction

On August 12, 1998, one (1) "soil" sample was 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 #</u>	<u>Matrix</u>	<u>Date of Receipt</u>
18619-001	B0PK16	B98-022	Soil	12-AUG-98

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.

Analyses requested: ICP Metals by EPA method 6010 {Supertrace}(Arsenic, Barium, Cadmium, Chromium, Lead, Silver)
Mercury by EPA 7471.

Deviation from Request: No Deviation from requested methods.

000002

Bechtel Hanford Incorporated
August 28, 1998
Project Number: 550.181
SDG: W02494
Page 2

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

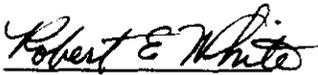
General: There were no general comments noted for this Sample Delivery Group.

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.

The recoveries for the Mercury matrix spike (44.1%) and the matrix spike duplicate (151.1%) were not within the 80%-120% range therefore all associated data was flagged with a "N". The recoveries of the matrix spike and the matrix spike duplicate for Chromium were also out side the range but the data did not require flagging because the concentration of Chromium in the sample was greater than 4 X the spiking level.

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

Reviewed and approved:



Robert E. White
Project Manager

W02494

Quanterra August 14, 1998 01:41 pm
Account: 10722 Project: 550.181 Quanterra-Richland QAS No. 550.181 Rev. 4
Master Sample Login: 18619

Project Manager: R. White

Draft: Final Entered and Reviewed by: [Signature] PM Review: Robert E. White

Sample Header Template:

Sample No.	Client ID	C-Matrix	Date: Collected	Received	Due	Shipper	Rad Category	Rad Sample No.
#	Container Type	Analysis	Class	Preservative	Anal. Due Date	Hold Date Site	(Container Numbers:% Filled)	
18619-001	BOPK16	Soil	10-AUG-98 06:40	12-AUG-98 16:00	27-AUG-98	AIRBORNE	1	Screening not Required
	SAF B98-022 ****ICAPT/6010 = AS, BA, CD, CR, PB, AG							
1	AN - Amber Glass-60ML	HG/7471/Q4	S	COLD	24-AUG-98	07-SEP-98 TF7		(397493:99)
1		ICAPT/6010/Q4	S	COLD	24-AUG-98	06-FEB-99 TF7		(397492:100)
1		PM/IT/Q4	S	COLD	24-AUG-98	06-FEB-99 TF7		(397492:100)
18619-001MS	BOPK16	Soil	10-AUG-98 06:40	12-AUG-98 16:00	27-AUG-98	AIRBORNE	1	Screening not Required
	SAF B98-022 ****ICAPT/6010 = AS, BA, CD, CR, PB, AG							
1	AN - Amber Glass-60ML	HG/7471/Q4	S	COLD	24-AUG-98	07-SEP-98 TF7		(397493:99)
1		ICAPT/6010/Q4	S	COLD	24-AUG-98	06-FEB-99 TF7		(397492:100)
1		PM/IT/Q4	S	COLD	24-AUG-98	06-FEB-99 TF7		(397492:100)
18619-001MSD	BOPK16	Soil	10-AUG-98 06:40	12-AUG-98 16:00	27-AUG-98	AIRBORNE	1	Screening not Required
	SAF B98-022 ****ICAPT/6010 = AS, BA, CD, CR, PB, AG							
1	AN - Amber Glass-60ML	HG/7471/Q4	S	COLD	24-AUG-98	07-SEP-98 TF7		(397493:99)
1		ICAPT/6010/Q4	S	COLD	24-AUG-98	06-FEB-99 TF7		(397492:100)
1		PM/IT/Q4	S	COLD	24-AUG-98	06-FEB-99 TF7		(397492:100)

000004

3*=Sample has not been rad screened.

Chain of Custody Record

temp 4°C cur # 016137
ST Louis



QUA-4124 0797

Client Bechtel	Project Manager A. Kopruta	Date 8-13-98	Chain of Custody Number 09907
Address	Telephone Number (Area Code)/Fax Number	Lab Number	Page 1 of 1

Sample I.D. No. and Description <small>(Containers for each sample may be combined on one line)</small>	Date	Time	Matrix			Containers & Preservatives						Analysis (Attach list if more space is needed)	Special Instructions/ Conditions of Receipt
			Unpres	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH					
80819201 BOPK16	Chemical Analysis	Bottles										SEE CDC	

Possible Hazard Identification			Sample Disposal			(A fee may be assessed if samples are retained longer than 3 months)		
<input type="checkbox"/> Non-Hazard	<input type="checkbox"/> Flammable	<input type="checkbox"/> Skin Irritant	<input type="checkbox"/> Poison B	<input checked="" type="checkbox"/> Unknown	<input checked="" type="checkbox"/> Return To Client	<input type="checkbox"/> Disposal By Lab	<input type="checkbox"/> Archive For _____ Months	
Turn Around Time Required			QC Requirements (Specify)					
<input type="checkbox"/> 24 Hours	<input type="checkbox"/> 48 Hours	<input type="checkbox"/> 7 Days	<input type="checkbox"/> 14 Days	<input type="checkbox"/> 21 Days	<input checked="" type="checkbox"/> Other 8-27-98	SDG W02494		
1. Relinquished By Bludenberg QES	Date 8-13-98	Time 1600	1. Received By Joe Termin	Date 8-14-98	Time 0700			
2. Relinquished By CT	Date	Time	2. Received By	Date	Time			
3. Relinquished By	Date	Time	3. Received By	Date	Time			

Comments

Bechtel Hanford Inc.		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST						B98-022-19		Page 1 of 1				
Collector ID Jacques/Rick Kerkow <i>MT Stankovich</i>		Company Contact Mike Stankovich		Telephone No. 531-7620		Project Coordinator KOERNER, CC		Data Turnaround 15 Days						
Project Designation 100 D Areas - Full Protocol		Sampling Location 116-D-7		SAF No. B98-022										
Ice Chest No.		Field Logbook No. EL-1339-3		Method of Shipment Hand Delivered - Gov. Vehicle										
Shipped To Quanterra Incorporated		Offsite Property No.		Bill of Lading/Air Bill No.										
Waste Designation Client determined no waste codes associated with this project.				COA										
POSSIBLE SAMPLE HAZARDS/REMARKS				Preservation	None	Cool 4C	None	None	None	None	None	None		
				Type of Container	P	aG	aG	aG	aG	aG	aG	P		
				No. of Container(s)	1	1	1	1	1	1	1	2		
Special Handling and/or Storage				Volume	20mL	60mL	60mL	60mL	60mL	60mL	60mL	1000mL.		
SAMPLE ANALYSIS <i>808192</i>				Activity Scan	Chromium Hex - 7196	Americium-241, Isotopic Plutonium, Uranium-238	See item (1) in Special Instructions.	Mercury - 7471 - (CV)	Nickel-63	Strontium-89,90 -- Total Sr	See item (2) in Special Instructions			
					<i>SDA</i> <i>W02487</i> <i>94</i>	<i>808193</i>		<i>80819301</i>						
Sample No.	Matrix *	Sample Date	Sample Time											
BOPK16	<i>01</i>	<i>Soil</i>	<i>8-10-98</i>	<i>0640</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>378</i>	<i>C7</i>
							<i>100%</i>	<i>100%</i>						
CHAIN OF POSSESSION				SPECIAL INSTRUCTIONS				Matrix *						
Sign/Print Names				COA - R116D7 2F00				<ul style="list-style-type: none"> 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 						
Relinquished By	Date/Time	Received By	Date/Time	(1) ICP Metals - 6010A (Supertrace) (Arsenic, Barium, Cadmium, Chromium, Lead, Silver) (2) Gamma Spectroscopy (Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155); Gamma Spec - Add-on (Americium-241, Uranium-238)										
<i>Stankovich</i>	<i>8-10-98</i>	<i>R. Nielsen</i>	<i>8/10/98</i>											
Relinquished By	Date/Time	Received By	Date/Time											
<i>R. Nielsen</i>	<i>8/12/98</i>	<i>David L...</i>	<i>8/29/98</i>											
Relinquished By	Date/Time	Received By	Date/Time											
		<i>Joe T...</i>	<i>9-14-98</i>											
LABORATORY SECTION	Received By	Title						Date/Time						
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By						Date/Time						

Figure 1

SAMPLE CHECK-IN LIST

Date/Time Received: 8/12 1455 SG#: W02494
Work Order Number: 808192 + 193 SAF #: B98-001 B98-022
Shipping Container ID: 616E Chain of Custody #: B98-001-56
B98-022-19

1. Custody Seals on shipping container intact? Yes [] No []
2. Custody Seals dated and signed? Yes [] No []
3. Chain-of-Custody record present? Yes [] No []
4. Cooler temperature 4°
5. Vermiculite/packing materials is Wet [] Dry []
6. Number of samples in shipping container: 18
7. Sample holding times exceeded? Yes [] No []

8. Samples have: <input checked="" type="checkbox"/> tape <input checked="" type="checkbox"/> custody seals <input type="checkbox"/> hazard labels <input type="checkbox"/> appropriate sample labels
9. Samples are: <input checked="" type="checkbox"/> in good condition <input type="checkbox"/> broken <input type="checkbox"/> leaking <input type="checkbox"/> have air bubbles

10. Where any anomalies identified in sample receipt? Yes [] No []

11. Description of anomalies (include sample numbers): _____

Sample Custodian/Laborator: [Signature] Date: 8/12/98
Telephoned To: _____ On _____ By _____

GAMMA-RAY ENERGY ANALYSIS REPORT
 Thermo Hazard Inc.
 Radiological Counting Facility 114-RCF

Project: 114-D-7
 Customer ID: RCP205 SWS
 RCF ID: RCF3076
 Sample Name, date: 840
 Analysis date: 8/10/98

Isotope: Activity: 100cpm 21cpm 0cpm

Isotope	Activity	100cpm	21cpm	0cpm
K40	8.2e+00	+	1.7e+00	1.8e-12
Ca60	4.5e+00	+	3.1e-01	4.8e-12
N28	2.0e+00			2.8e-12
Ca137	2.4e+01	+	1.3e+00	2.4e-11
Eu152	1.2e+01	+	8.1e-01	1.2e-11
Eu154	2.4e+00	+	4.8e-01	2.4e-12
Eu155	2.1e-01			2.1e-13
Th232da	7.0e-01	+	4.3e-01	7.0e-13
U235	4.0e-01			4.0e-13
U238	1.4e+01			1.4e-11
U238du	3.0e-01	+	2.2e-01	8.0e-13
Pa231	2.1e-01			2.1e-13
Am241	1.3e-01			1.3e-13
Tot Ac (sum decay)	6.5e+01		0cpm	5.8e-11
Yb-90	N/A			
Cr60 Alpha	1.2e+00			1.2e-12
Cr60 Beta	4.1e-01	+	8.0e+00	4.1e-11
AEA Total	N/A			

Note: 152Eu is not a 100% Beta emitter.

Observations:
 All in situ measures at 2 separate locations
 A. Assigned an overall limit then GammaGals limits
 for each and report values, the following applies
 The analysis of U238 is based on the activity of Pa231
 The analysis of Pa231 is based on the activity of Pu233
 U238du or the activity of Pu231 and Pu233, great least daughter products of U238. Equilibrium between parent and daughter
 products probably does not exist in this situation.
 Totality is the activity of Ac228, Pa212, and Th232. Other least daughter products of Ac228. Equilibrium between parent and daughter
 products may not exist in this situation.
 Other samples, not including material presented, may have significant results for the Th, U, Radium and daughter
 products. The results shall then be submitted for the given alpha energy.
 N/A means no result or analysis not requested.

CHESTER L. AND
 Radiological Analyst Date: 8.10.98

Albert L. Davis
 Radiological Manager Date: 8/13/98

BDR PV 8/10
 BDR PV 8/10
 BDR PV 1/10

C7

$1.3 \text{ pCi/g} * 1240 \text{ g} = 1.6 \times 10^3 \text{ pCi}$
 $41 \text{ pCi/g} * 1240 \text{ g} = 5.08 \times 10^4 \text{ pCi}$
 Cat I
 8/13/98

Login No.: 18619

**Condition Upon Receipt Variance Report
St. Louis Laboratory**

Client: BHI - Richland
Project No: 550-181
Shipper/No: Airborne

Date: 8-14-99 Time: 0700
Initiated by: JCE TIERMAN
RFA/COC Numbers: 09907

Condition/Variance (Check all that apply):

1. <input type="checkbox"/> Sample received broken/leaking.	8. <input type="checkbox"/> Sample ID on container does not match sample ID on paperwork. Explain: _____
2. <input type="checkbox"/> Sample received without proper preservative. <input type="checkbox"/> Cooler temperature not within 4°C ± 2°C Record temperature: _____ <input type="checkbox"/> pH _____ <input type="checkbox"/> other: _____	9. <input type="checkbox"/> All coolers on airbill not received with shipment.
3. <input type="checkbox"/> Sample received in improper container.	10. <input type="checkbox"/> Other (explain below): _____
4. <input type="checkbox"/> Sample received without proper paperwork. Explain: _____	
5. <input type="checkbox"/> Paperwork received without sample.	
6. <input type="checkbox"/> No sample ID on sample container.	
7. <input type="checkbox"/> Custody tape disturbed/broken/missing.	

No variances were noted during sample receipt.

Cooler Temperature Upon Receipt: 4°C

Notes:

Corrective Action:

- Client's Name: _____ Informed verbally on: _____ By: _____
- Client's Name: _____ Informed in writing on: _____ By: _____
- Sample(s) processed "as is".
- Sample(s) on hold until: _____ If released, notify: _____

Sample Control Supervisor Review: (or designate) JCE Tierman Date: 8-14-99

Project Management Review: Robert E. White Date: 8-14-99

SIGNED ORIGINAL MUST BE RETAINED IN THE PROJECT FILE



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

Project: 550.181

Category: ICAP Metals
Method: EPA 6010
Matrix: SOLID

Sample Date : 08/10/98
Receipt Date : 08/12/98
Report Date : 08/26/98

Client ID: B0PK16

Quanterra ID : 18619-001

Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dilution
Arsenic	7440-38-2	QCBLK181959-1	08/20/98	08/20/98	0.25	MG/KG	U	1.2	1
Barium	7440-39-3	QCBLK181959-1	08/20/98	08/20/98	139	MG/KG		24.7	1
Cadmium	7440-43-9	QCBLK181959-1	08/20/98	08/20/98	0.61	MG/KG	B	0.62	1
Chromium	7440-47-3	QCBLK181959-1	08/20/98	08/20/98	209	MG/KG		1.2	1
Lead	7439-92-1	QCBLK181959-1	08/20/98	08/20/98	5.2	MG/KG		0.37	1
Silver	7440-22-4	QCBLK181959-1	08/20/98	08/20/98	0.11	MG/KG	U	1.2	1

000011



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

Project: 550.181

Category: ICAP Metals
Method: EPA 6010
Matrix: SOLID

Sample Date : 08/10/98
Receipt Date : 08/12/98
Report Date : 08/26/98

Client ID: BOPK16

Quanterra ID : 18619-001MS

Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result Unit	Qual.	Detection Limit	Dilution
Arsenic	7440-38-2	QCBLK181959-1	08/20/98	08/20/98	94	†REC		1
Barium	7440-39-3	QCBLK181959-1	08/20/98	08/20/98	104	†REC		1
Cadmium	7440-43-9	QCBLK181959-1	08/20/98	08/20/98	89	†REC		1
Chromium	7440-47-3	QCBLK181959-1	08/20/98	08/20/98	206	†REC		1
Lead	7439-92-1	QCBLK181959-1	08/20/98	08/20/98	88	†REC		1
Silver	7440-22-4	QCBLK181959-1	08/20/98	08/20/98	98	†REC		1

000012



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

Project: 550.181

Category: ICAP Metals
Method: EPA 6010
Matrix: SOLID

Sample Date : 08/10/98
Receipt Date : 08/12/98
Report Date : 08/26/98

Client ID: BOPK16

Quanterra ID : 18619-001MSD

Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result Unit	Qual.	Detection Limit	Dilution
Arsenic	7440-38-2	QCBLK181959-1	08/20/98	08/20/98	94	REC		1
Barium	7440-39-3	QCBLK181959-1	08/20/98	08/20/98	111	REC		1
Cadmium	7440-43-9	QCBLK181959-1	08/20/98	08/20/98	91	REC		1
Chromium	7440-47-3	QCBLK181959-1	08/20/98	08/20/98	149	REC		1
Lead	7439-92-1	QCBLK181959-1	08/20/98	08/20/98	89	REC		1
Silver	7440-22-4	QCBLK181959-1	08/20/98	08/20/98	98	REC		1

000013



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

Project: 550.181

Category: Mercury
Method: SW846 7471
Matrix: Soil

Sample Date : 08/10/98
Receipt Date : 08/12/98
Report Date : 08/26/98

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOPK16	18619-001	Mercury	7439-97-6	QCBLK181774-1	08/19/98	08/19/98	0.59	MG/KG	N	0.041	1
BOPK16	18619-001MS	Mercury	7439-97-6	QCBLK181774-1	08/19/98	08/19/98	44	%REC	N		1
BOPK16	18619-001MSD	Mercury	7439-97-6	QCBLK181774-1	08/19/98	08/19/98	151	%REC	N		1
NA	QCCLS181774-1	Mercury	7439-97-6	QCBLK181774-1	08/19/98	08/19/98	100	%REC			1
NA	QCBLK181774-1	Mercury	7439-97-6	QCBLK181774-1	08/19/98	08/19/98	0.017	MG/KG	U	0.033	1

000016

U.S. EPA - CLP

COVER PAGE - INORGANIC ANALYSES DATA PACKAGE

Lab Name: QUANTERRA_MO Contract: 550.181
Lab Code: ITMO Case No.: SAS No.: SDG No.: W02494
SOW No.: SW846

Table with 2 columns: EPA Sample No. and Lab Sample ID. Rows include BOPK16, BOPK16SD, BOPK16S and their corresponding Lab Sample IDs.

Were ICP interelement corrections applied ? Yes/No YES
Were ICP background corrections applied ? Yes/No YES
If yes - were raw data generated before application of background corrections ? Yes/No NO

Comments:

Blank lines for comments.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature: Name:
Date: Title:

