W02194

Quanterra

Environmental Services

Quanterra Incorporated
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Richland, Washington 99352

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0049196

CERTIFICATE OF ANALYSIS

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

March 6, 1998

Attention: Joan Kessner

MAY 1998 RECEIVED EDMC

MAR 1998 RECEIVED Data Log In

SAF Number	:	B98-049
Date SDG Closed	:	January 20, 1998
Number of Samples	:	One (1)
Sample Type	:	Other-Liquid
SDG Number	:	W02194
Data Deliverable	:	Summary

I. Introduction

Between January 16, 1998, one other-liquid 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:

QESRL ID#	BHI ID#	MATRIX	DATE OF RECEIPT
80122701	B0MXN2	Other-Liquid	1/16/98

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, Curium-244 by method RICH-RC-5072
Neptunium-237 by method RC-3208
Plutonium-238, -239/40 by method RICH-RC-5010

Gamma Spectroscopy
Gamma Scan by method RICH-RC-5017
Gas Proportional Counting
Gross Alpha by method RICH-RC-5014
Gross Beta by method RICH-RC-5014
Liquid Scintillation Counting
Plutonium-241 by method RICH-RC-5010

III. Quality Control

The analytical results for each analysis performed under SDG W02194 include a minimum of two Laboratory Control Samples (LCS) and one method (reagent) blank. Any exceptions have been noted in the "Comments" section.

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

IV. Comments

MDA values may not be met in some of the tests since the sample volume used in these analyses was reduced based on the elevated level of activity observed from sample screening. The reporting units for this "other"- liquid sample are in pCi/liter.

Alpha Spectroscopy

Americium-241, Curium-244 by method RICH-RC-5072
The LCS, batch blank, sample duplicate (B0MXN2) and sample results are within contractual requirements. The original results from the duplicate analysis was not within contractual requirements, therefore, the duplicate and target sample were recount. The results from the recount of the duplicate and target sample are within the contractual requirements. The region of interest in the LCS was manually integrated on account of Am-241 tailing into the Am-243 region of interest. Sample activity for Am-241 was greater than the MDA value. The MDA value for Cm-244 did not meet the contractual value.

Neptunium-237 by method RC-3208
The LCS, batch blank and sample duplicate (B0MXN2) are within contractual requirements. The sample volume used in this analysis was reduced based on the elevated level of activity observed from sample screening. Therefore, the water MDA values were not met.

Plutonium-238, -239/40 by method RICH-RC-5010
The LCS, batch blank, sample duplicate (B0MXN2) and sample results are within contractual requirements. Sample activity was greater than the MDA value.

Gamma Spectroscopy

Gamma Scan by method RICH-RC-5017
The LCS, batch blank and sample duplicate (B0MXN2) are within contractual requirements. The sample volume used in this analysis was reduced based on the elevated level of activity observed from sample screening, therefore, the water MDA values were not met.

Gas Proportional Counting

Gross Alpha by method RICH-RC-5014
The LCS, batch blank, sample duplicate (B0MXN2) and sample results are within contractual requirements. Sample activity was greater than the MDA value.

Gross Beta by method RICH-RC-5014
The LCS, batch blank, sample duplicate (B0MXN2) and sample results are within contractual requirements. Sample activity was greater than the MDA value.

Liquid Scintillation Counting

Plutonium-241 by method RICH-RC-5010
The LCS, batch blank, sample duplicate (B0MXN2) and sample results are within contractual requirements. Sample activity was greater than the MDA value.

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

Quanterra
Environmental Services

SAMPLE RESULTS

LAB NAME:	**QUANTERRA, Richland**	**SDG: /RPT GRP:**	W02194 / 4609
LAB SAMPLE ID:	80122701	**MATRIX:**	OTHER
CLIENT ID:	B0MXN2	**DATE RECEIVED:**	1/16/1998 2:30:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
AM-241	1.27E+06		8.7E+04	2.1E+05	4.07E+03	pCi/L	91.20%	RICHRC5072-A
CM-242	-1.35E+02	U	2.7E+02	2.7E+02	6.79E+03	pCi/L	91.20%	RICHRC5057
CM-244	-1.21E+02	U	2.4E+02	2.4E+02	6.07E+03	pCi/L	91.20%	RICHRC5057
NP-237	2.48E+03	U	3.5E+03	3.6E+03	3.36E+03	pCi/L	100.00%	RICHRC5064
PU-238	1.45E+05		2.7E+04	3.4E+04	5.04E+03	pCi/L	84.90%	RICHRC5010
PU-241	6.98E+06		3.2E+05	1.1E+06	3.54E+05	pCi/L	85.00%	ICHRC5010-LS
PU239/40	6.26E+06		1.8E+05	9.1E+05	5.72E+03	pCi/L	84.90%	RICHRC5010
AM-241	1.51E+03		6.0E+00	1.5E+02	N/A	pCi/g	N/A	RICHRC5017
CO-60	2.07E+01	U	6.1E+01	6.1E+01	1.23E+02	pCi/L	N/A	RICHRC5017
CS-137DA	5.16E+01	U	5.3E+01	5.4E+01	1.06E+02	pCi/L	N/A	RICHRC5017
EU-152	-1.25E+01	U	1.4E+02	1.4E+02	2.43E+02	pCi/L	N/A	RICHRC5017
EU-154	7.72E+01	U	2.1E+02	2.1E+02	3.87E+02	pCi/L	N/A	RICHRC5017
EU-155	-8.32E+02	U	2.1E+02	2.2E+02	2.60E+02	pCi/L	N/A	RICHRC5017
ALPHA	6.26E+06		1.5E+05	1.3E+06	7.99E+03	pCi/L	100.00%	RICHRC5014
BETA	1.44E+05		2.9E+04	3.2E+04	4.18E+04	pCi/L	100.00%	RICHRC5014-B

Number of Results: 15

Result = IDL When Not Detected
(Q)ualifiers: U = Analyte result < MDA/IDL,
J = No U qualifier and result < RDL.

Quanterra Data Review Checklist
RADIOCHEMISTRY

Work Order number(s):	801227
Client ID:	BHI
Due Date:	3-6-98
Lab Sample Number or SDG:	W02194
Method Test Parameters:	AM / CM ISO
Matrix:	Other

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd 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?	AAC	—		✓
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?	NCM			✓
2. Are all required forms filed out?	—			✓
3. Correct methodology used?	—			
4. Transcription checked? DM 2-10-98	—			
5. Were all calculations checked at a minimum frequency?	—			
6. Units checked?	—			

Comments on any "No" response: _____

Recalc QC JTK 3-5-98

First Level Review: [signature] Date: 2-13-98

Second Level Review: [signature] Date: 2/6/98 2-13-98 JTK

Form #: LS-038.2/96, Rev.4

Transfer recount results for 80122701, ~~801227~~ D0122701

000011

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

LOG #: RD-98-_____

Project ID: BHI NCM Initiated by: JK 2-13-98

Sample Numbers: 80122701, D0122701, J0122715

Tests: Am, Cm, 50

Matrix: Other

Analytical Area (check appropriate area):

- ☐ Sample control
- ☐ Organic preparation
- ☐ Inorganic preparation
- ☐ GC
- ☐ HPLC
- ☐ GC/MS
- ☐ Wet chemistry
- ☐ Metals
- ☐ Reporting
- ☒ Data review
- ☒ Radiochemistry
- ☐ 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):* Bone smearing of spectra

Comments/Explanation: Am 241, Am 243 regions of interest reevaluated by data ~~reviewer~~ JK 2-13-98 reviewer and changes marked on channel by channel report of spectrum.

Notification (check appropriate area):

Client notified by (name and date): _____

- ☒ in writing CN
- ☐ by telephone
- ☐ by facsimile
- ☐ other (explain)

Client's name and response: _____

- ☐ process "as is"
- ☐ on hold until _____
- ☐ re-sample
- ☐ other (explain)

Project Manager (signature and date): MJW 3/6/98

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

LOG#: RD-98-_____

Corrective Action

Root Cause Initial and date: JK 2-13-98

failing of Am241 into Am243 region of interest

Corrective Action Initial and Date: JK 2-13-98

New region of interest used to calculate sample + duplicate + LCS. LCS results OK, sample + duplicate RPD was 23.5%. Sample + Duplicate recounted. Recount data accepted at 6% RPD. Recount results agree with initial results within 3σ error.

Responsibility for performing CA assigned to: _____

Actions to prevent recurrence N/A Initial and Date: _____

First Level Supervisor: [signature] Date: 2-13-98

Responsible Manager: [signature] Date: 3/6/98

Quality Assurance Review

☐ Anomaly ☐ Deficiency ☒ Rerun

☐ Further action required: _____

Assigned to: _____

QA signature: [signature] Date: 3/6/98

Corrective Action Verification

☐ Verified

☐ Cannot Verify (specify reason): N/A

Nonconformance Memo Closure

QA signature/date: [signature] 3/6/98

Quanterra Data Review Checklist
RADIOCHEMISTRY

Work Order number (s):	801227
Client ID:	BHI
Due Date:	3-6-98
Lab Sample Number or SDG:	W02194
Method Test Parameters:	NP-237
Matrix:	Other

Review Item	Yes (✓)	No (✓)	NA (✓)	2nd 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?	JFK	— NCM		✓
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?	1 NCM			
2. Are all required forms filed out?	—			✓
3. Correct methodology used?	—			✓
4. Transcription checked? JM 2-9-98	—			
5. Were all calculations checked at a minimum frequency?	—			
6. Units checked?	—			

Comments on any "No" response: _____

First Level Review: Joel Kempema Date: 2-11-98

Second Level Review: [signature] Date: 3/6/98

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

Recalc OK MC 3-5-98

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

LOG #: RD-98-_____

Project ID: BHI NCM Initiated by: JK 2-11-98

Sample Numbers: 80122701, D0122701, W0122701

Tests: Np237

Matrix: Other

Analytical Area (check appropriate area):

- ☐ Sample control
- ☐ Organic preparation
- ☐ Inorganic preparation
- ☐ GC
- ☐ HPLC
- ☐ GC/MS
- ☐ Wet chemistry
- ☐ Metals
- ☐ Reporting
- ☒ Data review
- ☒ Radiochemistry
- ☐ 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):* Reduced sample volume analyzed

Comments/Explanation: _____

Notification (check appropriate area): A 3/6/98

Client notified by (name and date): N/A

- ☒ in writing CN
- ☐ by telephone
- ☐ by facsimile
- ☐ other (explain)

Client's name and response: _____

- ☐ process "as is"
- ☐ on hold until _____
- ☐ re-sample
- ☐ other (explain)

Project Manager (signature and date): [signature] 3/6/98

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

LOG#: RD-98-

Corrective Action

Root Cause Initial and date: JR 2-11-98

high screening activity

Corrective Action Initial and Date: JR 2-11-98

Data accepted with MDAS achieved

Responsibility for performing CA assigned to:

Actions to prevent recurrence N/A Initial and Date:

First Level Supervisor: Date: 2-11-98

Responsible Manager: Date: 3/6/98

Quality Assurance Review

☒ Anomaly ☐ Deficiency ☐ Rerun

☐ Further action required:

Assigned to:

QA signature: Date: 3/6/98

Corrective Action Verification

☐ Verified

☐ Cannot Verify (specify reason): N/A

Nonconformance Memo Closure

QA signature/date: 3/6/98

Quanterra Data Review Checklist
RADIOCHEMISTRY

Work Order number (s): 801227

Client ID: BNI

Due Date: 3-6-98

Lab Sample Number or SDG: W02194

Method Test Parameters: Plutonium

Matrix: Other

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd 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?	AIR	✓ Activity >> MDA		✓
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? JM 2-9-98	—			
5. Were all calculations checked at a minimum frequency?	—			
6. Units checked?	—			—

Comments on any "No" response: _____

First Level Review: Joel T Kempsema Date: 2-10-98

Second Level Review: [signature] Date: 3/6/98

Form #: LS-038.2 /96, Rev.4

Reviewed dc MC 3-5-98

Quanterra Data Review Checklist
RADIOCHEMISTRY

Work Order number (s):	801227
Client ID:	BHI
Due Date:	3-6-98
Lab Sample Number or SDG:	WØ2194
Method Test Parameters:	Gamma
Matrix:	Other

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
A. Calibration				
1. Is the calibration documentation included where applicable?			✓	
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?	AAE		✓	
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?	1 Nonc			✓
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: Joel Kempema Date: 2-12-98

Second Level Review: [signature] Date: 3/6/98

Form #: LS-038.2 /96, Rev 4

Report BHI "5" + Am 241 HP for sample + duplicate.

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

LOG #: RD-98-_____

Project ID: BHI NCM Initiated by: [illegible] 2-12-98

Sample Numbers: 80122701, D0122701

Tests: Gamma

Matrix: Other

Analytical Area (check appropriate area):

- ☐ Sample control
- ☐ Organic preparation
- ☐ Inorganic preparation
- ☐ GC
- ☐ HPLC
- ☐ GC/MS
- ☐ Wet chemistry
- ☐ Metals
- ☐ Reporting
- ☒ Data review
- ☒ Radiochemistry
- ☐ 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):* _____

Comments/Explanation: _____

Notification (check appropriate area):

Client notified by (name and date): _____

- ☑ in writing
- ☐ by telephone
- ☐ by facsimile
- ☐ other (explain)

Client's name and response: _____

- ☐ process "as is"
- ☐ on hold until _____
- ☐ re-sample
- ☐ other (explain)

Project Manager (signature and date): [signature] 3/6/98

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

LOG#: RD-98-_____

Corrective Action

Root Cause Initial and date: MK 2-12-98

Reduced sample volume analyzed due to high screening activity.

Corrective Action Initial and Date: MK 2-12-98

Data accepted with MDA achieved.

Responsibility for performing CA assigned to: _____

Actions to prevent recurrence N/A Initial and Date: _____

First Level Supervisor: [signature] Date: 2-12-98

Responsible Manager: [signature] Date: 3/6/98

Quality Assurance Review

☒ Anomaly ☐ Deficiency ☐ Rerun

☐ Further action required: _____

Assigned to: _____

QA signature: [signature] Date: 3/6/98

Corrective Action Verification

☐ Verified

☐ Cannot Verify (specify reason): N/A

Nonconformance Memo Closure

QA signature/date: [signature] 3/6/98

Quanterra Data Review Checklist
RADIOCHEMISTRY

Work Order number (s):	801227
Client ID:	BH I
Due Date:	3-6-98
Lab Sample Number or SDG:	WØ2194
Method Test Parameters:	Alpha
Matrix:	Other

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
A. Calibration				
1. Is the calibration documentation included where applicable?			✓	
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?	APK		✓	
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?	✓		APK	✓
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? JM 2-3-98	✓			
5. Were all calculations checked at a minimum frequency?	✓			
6. Units checked?	✓			✓

Comments on any "No" response: _____

First Level Review: Joel Kempczuna Date: 2-5-98

Second Level Review: [signature] Date: 3/6/98

Form #: LS-038.2 /96, Rev.4

Resolve OK APK 3-5-98

Quanterra Data Review Checklist
RADIOCHEMISTRY

Work Order number (s): 801227

Client ID: BHI

Due Date: 3-6-98

Lab Sample Number or SDG: WQ2194

Method Test Parameters: Beta

Matrix: Other

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd 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? DM 2-3-98	✓			
5. Were all calculations checked at a minimum frequency?	✓			
6. Units checked?	✓			✓

Comments on any "No" response: _____

First Level Review: Jack T Kenzema Date: 2-5-98

Second Level Review: [illegible] Date: 3/6/98

Form #: LS-038.2/96, Rev.4

Recalc ok JTK 3-5-98

Quanterra Data Review Checklist
RADIOCHEMISTRY

Work Order number(s): 801227	
Client ID: BHI	
Due Date: 3-6-98	
Lab Sample Number or SDG: W02194	
Method Test Parameters: PU-241	
Matrix: Other	

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd 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?	✓	NCM		✓
D. Other				
1. Are all Nonconformances included and noted?	1 NCM			✓
2. Are all required forms filed out?	✓			✓
3. Correct methodology used?	✓			✓
4. Transcription checked? JM 2-19-98	✓			
5. Were all calculations checked at a minimum frequency?	✓			
6. Units checked?	✓			✓

Comments on any "No" response: _____

First Level Review: [signature] Date: 2-19-98

Second Level Review: [signature] Date: 2/20/98

Form #: LS-038.2/96, Rev 4

Recalc OK JTC 3-5-98

000023

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

LOG #: RD-98-

Project ID: BHI NCM Initiated by: MC 2-19-98

Sample Numbers: 80122701, D0122701

Tests: 8241

Matrix: Other

Analytical Area (check appropriate area):

- ☐ Sample control
- ☐ Organic preparation
- ☐ Inorganic preparation
- ☐ GC
- ☐ HPLC
- ☐ GC/MS
- ☐ Wet chemistry
- ☐ Metals
- ☐ Reporting
- ☒ Data review
- ☒ Radiochemistry
- ☐ 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):* Duplicate agreement at 21.3% RPD

Comments/Explanation: This sample is classified as an "other" and the RPD limit is ≤ 35%. Report results.

Notification (check appropriate area):

Client notified by (name and date): N/A

- ☐ in writing
- ☐ by facsimile
- ☐ by telephone
- ☐ other (explain)

Client's name and response:

- ☐ process "as is"
- ☐ re-sample
- ☐ on hold until _____
- ☐ other (explain)

Project Manager (signature and date): [signature] 2/20/98

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

LOG#: RD-98-_____

Corrective Action

Root Cause Initial and date: JK 2-19-98

Uncertain, Pu30 results agree with each other, possible not a quantitative removal / transfer from ED2BK to liquid scintillation vial.

Corrective Action Initial and Date: JK 2-19-98

Data accepted

Responsibility for performing CA assigned to: _____

Actions to prevent recurrence N/A Initial and Date: _____

First Level Supervisor: [signature] Date: 2-19-98

Responsible Manager: [signature] Date: 3/6/98

Quality Assurance Review

☒ Anomaly ☐ Deficiency ☐ Rerun

☐ Further action required: _____

Assigned to: _____

QA signature: Jodie G[signature] Date: 3/6/98

Corrective Action Verification

☐ Verified

☐ Cannot Verify (specify reason): N/A

Nonconformance Memo Closure

QA signature/date: Jodie G[signature] 3/6/98

CHAIN OF

CUSTODY FORMS

Bechtel Hanford Inc.	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	B98-049-02	Page 1 of 1

Collector R.Fahlberg	**Company Contact** Dave Encke	**Telephone No.** 373-3461	**Project Coordinator** WEISS, RL	**Data Turnaround** 45 Days
Project Designation 233-S Plutonium Concentration Facility - Other Liquid	**Sampling Location** 200W		**SAF No.** B98-049	
Ice Chest No.	**Field Logbook No.** EL-1281		**Method of Shipment** Hand Delivered	
Shipped To Quanterra Incorporated	**Offsite Property No.**		**Bill of Lading/Air Bill No.**	

POSSIBLE SAMPLE HAZARDS/REMARKS
Radioactive and Carrosive

Special Handling and/or Storage

Preservation	None	None									
Type of Container	P	P									
No. of Container(s)	0	1									
Volume	125ml	125ml									
SAMPLE ANALYSIS SDC W002194 80122601	See item (1) in Special Instructions. 801227 01	See item (2) in Special Instructions.									

Sample No.	Matrix *	Sample Date	Sample Time										
B0MXN2	Other Liquid	1-16-98	1150	X	X								

CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By R. Fahlberg / R. Fahlberg 1-16-98	Date/Time 1430	Received By	Date/Time 1-16-98 1430
Relinquished By	Date/Time	Received By 4100cpm	Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

SPECIAL INSTRUCTIONS

(1) Gross Alpha; Gross Beta; Gamma Spectroscopy {Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155}, Americium-241/Curium-244, Neptunium-237; Isotopic Plutonium, Plutonium-241; Activity Scan
(2) ICP Metals - 6010A (TAL), ICP Metals - 6010A (Add-on) {Arsenic, Lead}; Mercury - 7471 - (CV), IC Anions - 300.0 {Chloride, Fluoride, Nitrogen in Nitrate, Nitrogen in Nitrite, Phosphate, Sulfate}; pH (Soil) - 9045

Both analytes in one Bottle

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

00002

CH2MHILL SUBJECT _____ BY _____
SHEET NO. ____ of ____ DATE _____
PROJECT NO _____

233-S Pu-Facility - Other Liquids

Weight:

Liquid @ 250 ml ⇒ 250 gm

Have:

Am-241 1.1×10^{3} pCi/gm = 1.1×10^{-9} Ci/gm ⇒ 2.75×10^{-7} Ci

Pu-238,239 5.4×10^{3} pCi/gm = 5.4×10^{-9} Ci/gm ⇒ 1.35×10^{-6} Ci

TOTAL Ci = 1.6×10^{-6} Ci

TOTAL Bq = 6.0×10^{-8} Bq

Allowed:

	A_2	$A_2(10^{-4})$
Am-241	5.4×10^{-3} Ci	5.4×10^{-7} Ci
Pu-238,239	5.4×10^{-3} Ci	5.4×10^{-7} Ci

NOT Ltd qty

TYPE A / TYPE B:

Total have < most Restrictive

1.6×10^{-6} Ci < 5.4×10^{-3} Ci

∴ DOT TYPE A

Post-it® Fax Note 7671

To Lucy Eckel berg		Date 1/...	# of pages ▶ 2
Co./Dept		From A I Davis	
Phone #		Phone # 373-9731	
Fax # 376-8851		Fax #	

GAMMA-RAY ENERGY ANALYSIS REPORT

Thermo Hanford Inc.
Radiological Counting Facility THI - RCF

Project 233-S Pu facility
Customer ID 80MW41 Other Liquid
RCF ID RCF2601
Sample time, date 1331 1/8/98
Analysis date 1/13/98

Isotope		Activity pCi/gm		2 s err	Ci/gm
K40	<	5.0e+02			5.0e-10
Co60	<	8.7e+01			8.7e-11
I129	<	2.1e+03			2.1e-09
Cs137	<	4.7e+01			4.7e-11
Eu152	<	1.2e+02			1.2e-10
Eu154	<	1.1e+02			1.1e-10
Eu155	<	1.9e+02			1.9e-10
Th32dau	<	2.6e+02			2.6e-10
U235	<	2.6e+02			2.6e-10
U238	<	6.1e+03			6.1e-09
U238dau	<	1.0e+02			1.0e-10
Np237	<	8.2e+01			8.2e-11
Am241		1.1e+03	+/-	9.7e+01	1.1e-09
Tot Act Gam (pCi/gm)		1.1e+03		Ci/gm	1.1e-09
Y/Sr-90	<	4.3e+01			
Pu → Gross Alpha		5.4e+03	+/-	2.8e+02	5.4e-09
Gross Beta		4.3e+02	+/-	3.3e+01	4.3e-10 Reported as 137-Cs Betas.
AEA total		6.5e+03	+/-	7.8e+02	
Total Activity (pCi/gm)					~~1.4e+00~~ 5.4×10³ pCi/gm
(Ci/gm)					1.4e-12

Note! 152-Eu is not a 100% Beta emitter.

The alpha spectrum indicated 239/240 Pu and 241-Am but the majority was scattered to the lower alpha energies.

That may be due to the other chemicals in the liquid.

N/R means no result or analysis not requested.

S E Hoffman 1-14-98
Radiological Analyst Date

Albert I. Davis 1/14/98
Radiological Manager Date

RADIOACTIVE SHIPMENT RECORD

100905 3.

Page 1 of 1

1. SHIP FROM U.S. DEPT. OF ENERGY C/O

Company: Bechtel Hanford, Inc
Address: 233-S Facility, 200 West
City, State, Zip: Richland, WA 99352
Contact: David St. John
Phone: 509-376-8540

Ship: [X] Prepaid [ ] Collect 4.

Via: [X] Motor [ ] Air Psgr [ ] UPS [ ] Rail [ ] Air Cargo [ ] Site Carrier

SHIPMENT AUTHORIZATION NUMBER

2. SHIP TO

Company: Quanterra Laboratory
Address: 2800 George Washington Way
City, State, Zip: Richland WA 99352
Attention: Karen Ackenburg
Phone: 509-375-3131

Markings Applied 6.

- [ ] Radioactive - LSA
- [ ] Radioactive - SCO
- [X] Type A
- [ ] Type B with trefoil

LSA Description 8.

- [ ] LSA-I
- [ ] LSA-II
- [ ] LSA-III
- [ ] SCO-I
- [ ] SCO-II

N/A

Labels Applied 10.

- [ ] Empty
- [X] Radioactive White - I
- [ ] Radioactive Yellow - II
- [ ] Radioactive Yellow - III
- [X] Subsidiary Hazard

Corrosive Class 8

For Normal Form only 7.

Identify

Physical Form: [X] Liquid [ ] Gas [ ] Solid

Chemical Form: [X] Elemental [ ] Metal [ ] Nitrate [ ] Oxide [ ] Mixture [ ] Other

EMERGENCY RESPONSE 9.

Telephone: 509-373-3800

Emergency Response Guide(s): 163 154

- Highway Route Controlled Quantity [ ]
- Exclusive Use Shipment with instructions [ ]
- Placards Applied [ ]
- If Rail Specify:
- Fissile Excepted, Grams: <15 gms [X]
- Excepted Package Statement [ ]

5. HM Proper Shipping Name: _____ Radioactive Material,

	excepted package - empty packaging	7	UN2910
	excepted package - instruments or articles	7	UN2910
	excepted package - limited quantity of material	7	UN2910
	excepted package - articles manufactured from natural or depleted uranium or natural thorium	7	UN2910
	Special Form, n.o.s.	7	UN2974
	Low Specific Activity, n.o.s.	7	UN2912
X	n.o.s.	7	UN2982
	Fissile, n.o.s.	7	UN2918
	Surface Contaminated Object	7	UN2913

Warning – Fissile Material Controlled Shipment. Do Not Load More Than N/A Packages Per Vehicle. In Loading and Storage Areas, Keep at Least 20 Feet From Other Packages Bearing Radioactive Labels.

11.

No. Pkg.	Model Package	COC/Spec	Serial No.	Seal No.	Isotopes	T.I.	Bq/Package	Gr. Wt. Kg.
1	SafeSend	DOT 7A	N/A	Tape	Am-241, Pu-238, Pu-239/240	0	6.0×10^{8} Bq	3.18 Kgs
4 Poly container sample NO SafeSend containing (in Nitric acid)					in double bags	0		w/
					TOTALS	0	6.0×10^{8} Bq	3.18 Kgs

(Shipper may describe package in detail on one of the unused lines above)

12. This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Certifier's Signature: [signature] On behalf of DOE-RL | Date: 1-16-98 | Organization: ERC Analytical Fld. Svc. | Complete Cost Code (Inc. End Function): DB-3007

13. Surface Dose Rate of Package: [X] <0.005 or _____ mSv/hr; <0.5 or _____ mrem/hr (N+ß γ)

Dose Rate @ 1 Meter from Surface of Package: [X] <0.005 or _____ mSv/hr; <0.5 or _____ mrem/hr (N+ß γ)

Smears of Outer Container:
- [ ] <0.41 Bq (22 dpm) ß γ /cm²
- [X] <0.04 Bq (2.2 dpm) α /cm²
- [ ] <Tbl. 2-2 HSRCM Onsite Limits

TRUCK LOAD OR EXCLUSIVE USE:
- Surface: [X] <2 mSv/hr (200 mrem/hr)
- @ 2 meters: [X] <0.1 mSv/hr (10 mrem/hr)
- @ Cab or sleeper: [X] <0.02 mSv/hr (2 mrem/hr) (Using N+ß γ)

Additional Data and Instructions (inc. Readings on Internal Packaging)

Signature - Radiation Monitoring: [signature] | Bldg.: 2335 | Survey No.: 2331-91-0047 | Date: 1-16-98

14. TRANSPORTER

Vehicle Number: 11/16 1533 | DRIVER SIGNATURE: [signature]

RECEIVER

RECEIVER SIGNATURE: [signature] | Date: 1-16 981430

15. OFFSITE AUTHORIZATION

Shipment has been inspected and verified to be in compliance with DOT regulations

Authorized Signature: [signature] | Printed Name: Keith R. Smith | Date: 1-16-97

16. AUTHORIZATION FOR SHIPMENT

AIR TRANSPORT CERTIFICATION: [X] N/A

CARGO AIRCRAFT: [ ] Cargo Aircraft Only Labels Applied

PASSENGER AIRCRAFT: [ ] Ltd Qty [ ] <3 T.I. [ ] Research/Medical Diagnosis [ ] Human Medical Research

Pkg. Dimensions (cm): 000030

17. OFFSITE AUTHORIZATION

Tracking No.	Date Shipped	Routing	ETA
CMA# 2166	1-16-98	Bechtel Vehicle	1-16-98
Surveyed By	**Date**	**Approved for Shipment Offsite**	**Date**
		[signature]	1-16-98

54-6000-088 (06/97)

Figure 1

SAMPLE CHECK-IN LIST

Date/Time Received: 1-16-98 1430 SG#: W02194

Work Order Number: 801226 +227 SAF #: B98-049

Shipping Container ID: None Chain of Custody # B98-04902

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 N/A
5. Vermiculite/packing materials is Wet [ ] Dry [✓]
6. Number of samples in shipping container: 1
7. Sample holding times exceeded? Yes [ ] No [✓]

8. Samples have:
   - ✓ tape
   - ✓ custody seals
   - ____ hazard labels
   - ____ appropriate sample labels

9. Samples are:
   - ✓ in good condition
   - ____ broken
   - ____ leaking
   - ____ 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: 1-16-98

Telephoned To: _____ On _____ By _____

000031

801226 Chem 801227 Rad.

Client Sample Screening Results

19-Jan-98

M.N L 1/19/98

CLIENT CODE ID	MATRIX	RECEIVED	DETECTOR	ACQ DATE	SAMPLE	MINUTES	CNTS A	NET CPM A	CNTS B	NET CPM B
BHI B0MXN2		1/19/1998	QUAD21B	1/19/1998 9:33:41 AM	B0MXN2	30	93817	3127.16619	14610	486.07571
01	LIQUID		Bkg:	1/19/1998 10:43:17 AM	BKG	700	47	[illegible]	647	[illegible]

Anl Date:	1/19/1998	Tot Sa, Alq:	1.25E-01	,	1.00E+00	Alp;	(Dpm/	1.32E+04	(uCi/	7.41E-01	(pCi/	5.93E+06	± 1.7E+04	CAT III	4.2E-06	Lab Alq L/g
Ppt mg:	26.3	Units:	L	,	ml	Bet;	Alq):	-6.65E+02	Sa):	-3.75E-02	L/g):	-3.00E+05	± 3.0E+03		1.3E-01	

000032

Quanterra Environmental Services

DUE DATE 3-6-98

*** RECOUNT REQUEST ***

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

CUSTOMER BHF

MATRIX Other

ANALYSIS Am Cm 130

SAMPLE DELIVERY GROUP W02194

BATCH NUMBER

	LAB SAMPLE ID	CUSTOMER ID	COMMENTS
1)	80122701		
2)	D0122701		
3)			
4)			
5)			
6)			
7)			
8)			
9)			
10)			
11)			
12)			
13)			
14)			
15)			
16)			
17)			
18)			
19)			
20)			

ACTIONS (Initial & Date)

1) INITIATED 2-12-98
SOP(S) # RICHRC0002

2) COUNTING/MEASUREMENT
LAB RECEIVED 12/12/98
SOP(S) # RICHRC0002

3) DATA REVIEWED AND
ANALYTICAL PREP STORED 2-13-98
SOP(S) # RICHRC0002 Rev

RC-126 10/96 REV 0

*** AM/CMISO ***

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD 19-Jan-1998

Page 1

CUSTOMER: BHI SAF SAMPLE DELIVERY GROUP W02194

MATRIX : OTHER B98-049 BATCH NUMBER 01-227

QES ID	DUP	ACCOUNT	CUSTOMER ID	COMMENTS
~~J0122718~~				
1S				
1) 80122701		BHI	80MXN2	pH<2, Acidified
~~D0122701~~				

ACTIONS (Initial & Date)

1) INITIATED JH 1/19/98

SOP(S) # RD 3800

2) PREP LAB RECEIVED 2/2/98 Bg

SOP(S) # RICHRC5016r1

3) SAMPLE REMAINDER STORED _____

SOP(S) # _____

4) SEPARATION LAB RECEIVED 02/03/98 [illegible]

SOP(S) # RICHRC 5072

Cppt RB 2/4/98
RichRC5003

5) COUNTING/MEASUREMENT LAB [illegible] 2/9/98

SOP(S) # RICHRC0001

6) DATA REVIEWED AND ANALYTICAL PREP STORED [illegible] 2-11-98

SOP(S) # RICHRC0002

Seq Pu/Pu241/Am/Cm Rec'd

$Ca_3(PO_4)_2$ precip
2/5/98 Bg RICHRC 5072r1

*** NP-DOT ***

3-6

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

19-Jan-1998
Page 1

CUSTOMER: BHI SAF SAMPLE DELIVERY GROUP W02194

MATRIX : OTHER B98-049 BATCH NUMBER 01-227

QES ID	DUP	ACCOUNT	CUSTOMER ID	COMMENTS
~~J0122718~~				
15				
1) 30122701		BHI	BOMXN2	pH<2, acidified
~~D0122701~~				
~~W0122701~~				

ACTIONS (Initial & Date)

1) INITIATED JH 1/19/98
SOP(S) # RD 3800

2) PREP LAB RECEIVED 2/2/98 BG
SOP(S) # RICHRC5016r1

3) SAMPLE REMAINDER STORED _____
SOP(S) # _____

4) SEPARATION LAB RECEIVED 2/3/98 DM
SOP(S) # RD 3208, Rev 1

Co-precip 2/5/98 DM
RICHRC 5003, R1

5) COUNTING/MEASUREMENT LAB 2/5/98
SOP(S) # RICHRD2008

6) DATA REVIEWED AND ANALYTICAL PREP STORED 2-11-98
SOP(S) # RICHRC0002
Rev 1

*** PUISO ***

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

19-Jan-1998
Page 1

3.6

CUSTOMER: BHI SAF SAMPLE DELIVERY GROUP W02194

MATRIX : OTHER B98-049 BATCH NUMBER 01-227

QES ID	DUP	ACCOUNT	CUSTOMER ID	COMMENTS
J0122718				
1) 80122701		BHI	BOMXN2	pH/2 Acidified
D0122701				

ACTIONS (Initial & Date)

1) INITIATED JH 1/19/98
SOP(S) # RD 8800

2) PREP LAB RECEIVED 2/2/98
SOP(S) # RICHRC5016r1

3) SAMPLE REMAINDER STORED _____
SOP(S) # _____

4) SEPARATION LAB RECEIVED 02/03/98 [illegible]
SOP(S) # RICHRC 5010

ED KB 2-6-98
RichRC5039

5) COUNTING/MEASUREMENT LAB (R) 2/6/98
SOP(S) # RICHRD0005 RD

6) DATA REVIEWED AND ANALYTICAL PREP STORED [illegible] 2-10-98
SOP(S) # RICHRC5002 Rev 1

Pu/Pu241/Am/Cm Seq

*** GAMMA ***

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD 19-Jan-1998

Page 1

CUSTOMER: BHI SAF SAMPLE DELIVERY GROUP W02194

MATRIX : OTHER B98-049 BATCH NUMBER 01-227

QES ID	DUP	ACCOUNT	CUSTOMER ID	COMMENTS
~~J01222~~		~~J0122271B~~ 1S		
1) 80122701		BHI	BOMXN2	pH<2, Acidified
		~~D0122701~~		

ACTIONS (Initial & Date)

1) INITIATED JH 1/19/98

SOP(S) # RD 8800

2) PREP LAB RECEIVED 2/2/98 by

SOP(S) # RICHRC50171

3) SAMPLE REMAINDER STORED _____

SOP(S) # _____

4) SEPARATION LAB RECEIVED N/A

SOP(S) # _____

5) COUNTING/MEASUREMENT LAB 2/2/98

SOP(S) # RICHRD0007

6) DATA REVIEWED AND ANALYTICAL PREP STORED MC 2-11-98

SOP(S) # RICHRC0202 Rev 1

actual Sa used for aliquot

No Add on Isotopes listed on Client COC. MC 2-11-98

*** ALPHA ***

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

19-Jan-1998
Page 1

CUSTOMER: BHI SAF SAMPLE DELIVERY GROUP W02194

MATRIX : OTHER B98-049 BATCH NUMBER 01-227

QES ID	DUP	ACCOUNT	CUSTOMER ID	COMMENTS
J0122718				
1) 80122701		BHI	00MXN2	Acidified
D0122701				

ACTIONS (Initial & Date)

1) INITIATED JH 1/19/98
SOP(S) # RD 3000

2) PREP LAB RECEIVED 2/2/98 [illegible]
SOP(S) # RICHRC5074.0

3) SAMPLE REMAINDER STORED _____
SOP(S) # _____

4) SEPARATION LAB RECEIVED N/A
SOP(S) # _____

5) COUNTING/MEASUREMENT LAB 2/2/98 [illegible]
SOP(S) # RICHRD0003

6) DATA REVIEWED AND ANALYTICAL PREP STORED [illegible] 2-4-98
SOP(S) # RICHRC0002 Rev 1

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

19-Jan-1998
Page 1

CUSTOMER: BHI SAF SAMPLE DELIVERY GROUP W02194

MATRIX : OTHER B98-049 BATCH NUMBER 01-227

QES ID	DUP	ACCOUNT	CUSTOMER ID	COMMENTS
~~J0122718~~ 15				
1) 80122701		BHI	80MXN2 Audified	
D0122701				

ACTIONS (Initial & Date)

1) INITIATED JH 1/19/98
SOP(S) # RD 0000

2) PREP LAB RECEIVED 2/2/98
SOP(S) # RICHRC5014rc

3) SAMPLE REMAINDER STORED _____
SOP(S) # _____

4) SEPARATION LAB RECEIVED N/A
SOP(S) # _____

5) COUNTING/MEASUREMENT LAB 2/2/98 [illegible]
SOP(S) # RICHRD0003

6) DATA REVIEWED AND ANALYTICAL PREP STORED 1/23-98
SOP(S) # RICHRC0002
Rev 1

*** PU-241 ***

Due 3/6

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

19-Jan-1998
Page 1

CUSTOMER: BHI SAF SAMPLE DELIVERY GROUP W02194

MATRIX : OTHER B98-049 BATCH NUMBER 01-227

GES ID	DUP	ACCOUNT	CUSTOMER ID	COMMENTS
J012271B			55.696 ± 0.58322 DPM	Vols 2.0(g)
1S		EQAL018 Pr.2/2/98 Ex.2/2/99		2.0(g)
1) 80122701		BHI	80MXN2 pH<2, Acidified	0.005909(g)
D0122701				0.006769(g)

ACTIONS (Initial & Date)

1) INITIATED JH 1/19/98
SOP(S) # RD 3500

2) PREP LAB RECEIVED 2/2/98 BG
SOP(S) RICHRC5016r1

3) SAMPLE REMAINDER STORED _____
SOP(S) # _____

4) SEPARATION LAB RECEIVED RB 2/13/98
SOP(S) # RichRC5010

5) COUNTING/MEASUREMENT LAB R3 2/13/98
SOP(S) # RICHRD0001 R.0

6) DATA REVIEWED AND ANALYTICAL PREP STORED JMK 2-19-98
SOP(S) # RICHRC0002 Rev 1

Sa Vol (g)

80122701
0.55 x0.010745 = 0.005909 g

D0122701
0.63 x0.010745 = 0.006769 g

Pu/Pu241/Am/Cm Seq

000040

Quanterra Environmental Services

Quanterra Incorporated
13715 Rider Trail North
Earth City, Missouri 63045

314 298-8566 Telephone
314 298-8757 Fax

CASE NARRATIVE

FEB 1998
RECEIVED
Data
Log In

Bechtel Hanford Incorporated
3350 George Washington Way
Richland, Washington 99352

February 25, 1998

Attention: Joan Kessner

Project Number	:	550.202
Date Received by Lab	:	January 16, 1998
Number of Samples	:	One (1)
Sample Type	:	Other Liquid
SDG Number	:	W02194
Data Deliverable	:	Summary

I. Introduction

On January 16, 1998, one (1) other liquid sample was received by Quanterra, Richland and was transferred to Quanterra, St. Louis for chemical analyses. Upon receipt, the sample was given the following laboratory ID number to correspond with the specific client ID:

St. Louis ID	BHI ID	Richland ID	Matrix	Date of Receipt
16808-001	B0MXN2	80122601	Other Liquid	16-JAN-98

II. Analytical Results/ Methodology

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

Analyses requested

Anions (Chloride, Fluoride, Nitrate, Nitrite, Sulfate and Phosphate) by EPA Method 300.0, pH by EPA Method 9045, ICP Metals (TAL plus Arsenic and Lead) by EPA Method 6010, and Mercury by EPA Method 7470.

III. Quality Control

A Laboratory Control Sample and Method Blank were analyzed with each preparation batch. Matrix Spike and Matrix Spike Duplicate or Sample Duplicate were performed per the protocol for each analyte in this SDG. pH analyses require only a Sample Duplicate for matrix QC.

IV. Definitions

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

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

V. Comments

Shipping and Receiving
There are no comments or nonconformances associated with the shipping and receiving of these samples.

Wet Chemistry
The pH analysis for sample 16808-001 is reported with a 'U' flag to denote that the sample result was less than two (<2). The less than sign was not put on the report due to EDD specifications.

Metals
Both the ICP and Mercury digestions were prepped 1 ml to 100 mls due to limited sample volume.

The recoveries of the Silver matrix spike (75.9%) and the matrix spike duplicate (78.4%) were less than 80%, therefore all associated data was flagged with a "N". The recoveries of the matrix spike and the matrix duplicate for Chromium, Iron and Nickel were also outside the 80%-120% range but the data did not require flagging because the sample concentration for these elements were 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

Robert E. White
Project Manager

WO 2194

Quanterra February 05, 1998 02:52 pm
Account: 10722 Project: 550.202 Quanterra-Richland QAS No. 550.202 Rev. 2
Master Sample Login: 16808

Project Manager: W. Price

Draft: (Final) Entered and Reviewed by: [illegible] PM Review: Robert E. White

Sample Header Template:

Sample No. / Comments / Data:	Client ID	C-Matrix	Date: Collected	Received	Due	Shipper	Rad Category	Rad Sample No.
16808-001	BOMXN2	Liquid	16-JAN-98 11:50	16-JAN-98 14:30	10-FEB-98	AIRBORNE	3	R6896-001
RICHLAND I.D. 80122601//ICAP = TAL + AS & PB.								

#	Container Type	Analysis	Class	Preservative	Anal. Due Date	Hold Date	Site	(Container Numbers:% Filled)
1	PN - Plastic-250ml	CL/300.0/Q4	S	COLD	05-FEB-98	13-FEB-98	R1B	(354604:80)
1		FL/300.0/Q4	S	COLD	05-FEB-98	13-FEB-98	R1B	(354604:80)
1		HG/7470/Q4	S	COLD	05-FEB-98	13-FEB-98	R1B	(354604:80)
1		ICAP/6010/Q4	S	COLD	05-FEB-98	15-JUL-98	R1B	(354604:80)
1		NO2/300.0/Q4	S	COLD	05-FEB-98	18-JAN-98	R1B	(354604:80)
1		NO3/300.0/Q4	S	COLD	05-FEB-98	18-JAN-98	R1B	(354604:80)
1		OPHOS/300.0/Q4	S	COLD	05-FEB-98	18-JAN-98	R1B	(354604:80)
1		PH/9045/Q4	S	COLD	05-FEB-98	17-JAN-98	R1B	(354604:80)
1		SO4/300.0/Q4	S	COLD	05-FEB-98	13-FEB-98	R1B	(354604:80)

16808-001DUP	BOMXN2	Liquid	16-JAN-98 11:50	16-JAN-98 14:30	10-FEB-98	AIRBORNE	3	R6896-001
RICHLAND I.D. 80122601//ICAP = TAL + AS & PB.								

#	Container Type	Analysis	Class	Preservative	Anal. Due Date	Hold Date	Site	(Container Numbers:% Filled)
1	PN - Plastic-250ml	CL/300.0/Q4	S	COLD	05-FEB-98	13-FEB-98	R1B	(354604:80)
1		FL/300.0/Q4	S	COLD	05-FEB-98	13-FEB-98	R1B	(354604:80)
1		NO2/300.0/Q4	S	COLD	05-FEB-98	18-JAN-98	R1B	(354604:80)
1		NO3/300.0/Q4	S	COLD	05-FEB-98	18-JAN-98	R1B	(354604:80)
1		OPHOS/300.0/Q4	S	COLD	05-FEB-98	18-JAN-98	R1B	(354604:80)
1		PH/9045/Q4	S	COLD	05-FEB-98	17-JAN-98	R1B	(354604:80)
1		SO4/300.0/Q4	S	COLD	05-FEB-98	13-FEB-98	R1B	(354604:80)

16808-001MS	BOMXN2	Liquid	16-JAN-98 11:50	16-JAN-98 14:30	10-FEB-98	AIRBORNE	3	R6896-001
RICHLAND I.D. 80122601//ICAP = TAL + AS & PB.								

#	Container Type	Analysis	Class	Preservative	Anal. Due Date	Hold Date	Site	(Container Numbers:% Filled)
1	PN - Plastic-250ml	CL/300.0/Q4	S	COLD	05-FEB-98	13-FEB-98	R1B	(354604:80)
1		FL/300.0/Q4	S	COLD	05-FEB-98	13-FEB-98	R1B	(354604:80)
1		HG/7470/Q4	S	COLD	05-FEB-98	13-FEB-98	R1B	(354604:80)
1		ICAP/6010/Q4	S	COLD	05-FEB-98	15-JUL-98	R1B	(354604:80)
1		NO2/300.0/Q4	S	COLD	05-FEB-98	18-JAN-98	R1B	(354604:80)
1		NO3/300.0/Q4	S	COLD	05-FEB-98	18-JAN-98	R1B	(354604:80)
1		OPHOS/300.0/Q4	S	COLD	05-FEB-98	18-JAN-98	R1B	(354604:80)
1		SO4/300.0/Q4	S	COLD	05-FEB-98	13-FEB-98	R1B	(354604:80)

16808-001MSD	BOMXN2	Liquid	16-JAN-98 11:50	16-JAN-98 14:30	10-FEB-98	AIRBORNE	3	R6896-001
RICHLAND I.D. 80122601//ICAP = TAL + AS & PB.								

#	Container Type	Analysis	Class	Preservative	Anal. Due Date	Hold Date	Site	(Container Numbers:% Filled)
1	PN - Plastic-250ml	HG/7470/Q4	S	COLD	05-FEB-98	13-FEB-98	R1B	(354604:80)
1		ICAP/6010/Q4	S	COLD	05-FEB-98	15-JUL-98	R1B	(354604:80)

3*=Sample has not been rad screened.

00005

Bechtel Hanford Inc.	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	B98-049-02	Page 1 of 1

Collector R.Fahlberg	**Company Contact** Dave Encke	**Telephone No.** 373-3461	**Project Coordinator** WEISS, RL	**Data Turnaround** 45 Days
Project Designation 233-S Plutonium Concentration Facility - Other Liquid	**Sampling Location** 200W		**SAF No.** B98-049	
Ice Chest No.	**Field Logbook No.** EL-1281		**Method of Shipment** Hand Delivered	
Shipped To Quanterra Incorporated	**Offsite Property No.**		**Bill of Lading/Air Bill No.**	

POSSIBLE SAMPLE HAZARDS/REMARKS
Radioactive and Corrosive

Special Handling and/or Storage

Preservation	None	None									
Type of Container	P	P									
No. of Container(s)	0	1									
Volume	125ml	~~125ml~~ 250ml									
SAMPLE ANALYSIS	See item (1) in Special Instructions 801227 01	See item (2) in Special Instructions									

SDC
W02194
80122601

Sample No.	Matrix *	Sample Date	Sample Time										
B0MXN2	Other Liquid	1-16-98	1150	X	X								
					80%								

CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By R.Fahlberg / R.Fahlberg 1-16-98	Date/Time 1430	Received By	Date/Time 1-16-98 1430
Relinquished By	Date/Time	Received By 4100cpm	Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

SPECIAL INSTRUCTIONS

(1) Gross Alpha; Gross Beta; Gamma Spectroscopy {Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155}; Americium-241/Curium-244; Neptunium-237; Isotopic Plutonium, Plutonium-241; Activity Scan
(2) ICP Metals - 6010A (TAL); ICP Metals - 6010A (Add-on) {Arsenic, Lead}; Mercury - 7471 - (CV); IC Anions - 300.0 {Chloride, Fluoride, Nitrogen in Nitrate, Nitrogen in Nitrite, Phosphate, Sulfate}; pH (Soil) - 9045

Both analytes in one Bottle

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

R 1B Temp 4°C Cur# 13901

ST Louis

Chain of Custody Record

Quanterra QC

QUA-4124 0797

Client	Project Manager	Date	Chain of Custody Number
Bechtel	A. Kopriwa	1-19-98	00374
Address	Telephone Number (Area Code)/Fax Number	Lab Number	Page 1 of 1
City / State / Zip Code	Site Contact / Lab Contact	Analysis (Attach list if more space is needed)	
Project Name: SAF B98-049	Carrier/Waybill Number	SEE WC	Special Instructions/ Conditions of Receipt
Contract/Purchase Order/Quote No.			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNOS	HCl	NaOH	ZnAc/NaOH	Analysis	Special Instructions/ Conditions of Receipt
80122601 BOMXN2	Chemical Analysis Bottle												

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☒ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months (A fee may be assessed if samples are retained longer than 3 months)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☒ Other ____

QC Requirements (Specify): SDG W02194

	Date	Time		Date	Time
1. Relinquished By: Heidelberg QES	1-19-98	16:00	1. Received By: [signature]	1-21-98	0815
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Stays with the Sample; CANARY - Returned to Client with Report; PINK - Field Copy

SHEET NO. ____ of ____ DATE ____

PROJECT NO. ____

233-S Pu - Facility - Other Liquids

Weight:

Liquid @ 250 ml ⇒ 250 gm

Have:

Am-241 1.1×10^{3} pCi/gm = 1.1×10^{-9} Ci/gm ⇒ 2.75×10^{-7} Ci

Pu-238,239 5.4×10^{3} pCi/gm = 5.4×10^{-9} Ci/gm ⇒ 1.35×10^{-6} Ci

TOTAL Ci = 1.6×10^{-6} Ci

TOTAL Bq = 6.0×10^{-8} Bq

Allowed:

	A2	A2 (10^{-4})
Am-241	5.4×10^{-3} Ci	5.4×10^{-7} Ci
Pu-238,239	5.4×10^{-3} Ci	5.4×10^{-7} Ci

NOT LTd qty

TYPE A / TYPE B:

Total have < most Restrictive

1.6×10^{-6} Ci < 5.4×10^{-3} Ci

∴ DOT TYPE A

C00008

REV 10/96 FORM 18

Post-It® Fax Note 7671 | Date 1/14 | # of pages ▶ 2
To Jim Hubberg | From A I Davis
Co./Dept. | Co.
Phone # | Phone # 373-9731
Fax # 376-6851 | Fax #

GAMMA-RAY ENERGY ANALYSIS REPORT
Thermo Hanford Inc
Radiological Counting Facility THI - RCF

Project: 233-S Pu facility
Customer ID: B08MW41 Other Liquid
RCF ID: RCF2601
Sample time, date: 1331 1/8/98
Analysis date: 1/13/98

Isotope		Activity pCi/gm		2 s err	Ci/gm
K40	<	5.0e+02			5.0e-10
Co60	<	8.7e+01			8.7e-11
I129	<	2.1e+03			2.1e-09
Cs137	<	4.7e+01			4.7e-11
Eu152	<	1.2e+02			1.2e-10
Eu154	<	1.1e+02			1.1e-10
Eu155	<	1.9e+02			1.9e-10
Th32dau	<	2.6e+02			2.6e-10
U235	<	2.6e+02			2.6e-10
U238	<	6.1e+03			6.1e-09
U238dau	<	1.0e+02			1.0e-10
Np237	<	8.2e+01			8.2e-11
Am241		1.1e+03	+/-	9.7e+01	1.1e-09
Tot Act Gam (pCi/gm)		1.1e+03		Ci/gm	1.1e-09
Y/Sr-90	<	4.3e+01			
Pu → Gross Alpha		5.4e+03	+/-	2.8e+02	5.4e-08
Gross Beta		4.3e+02	+/-	3.3e+01	4.3e-10 Reported as 137-Cs Betas.
AEA total		6.5e+03	+/-	7.8e+02	

Total Activity (pCi/gm) ~~1.4e+00~~ 5.4×10^3 pCi/gm
(Ci/gm) 1.4e-12

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

The alpha spectrum indicated 239/240 Pu and 241-Am but the energy was scattered to the lower alpha energies.

That may be due to the other chemicals in the liquid.

N/R means no result or analysis not requested.

S E Huff 1-14-98
Radiological analyst Date

Albert I. Davis 1/14/98
Albert I. Davis Date
Radiological Manager

Figure 1

SAMPLE CHECK-IN LIST

Date/Time Received: 1-16-98 1430 SG#: W02194

Work Order Number: 801226 +227 SAF #: B98-049

Shipping Container ID: None Chain of Custody # B98-04902

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 N/A
5. Vermiculite/packing materials is Wet [ ] Dry [✓]
6. Number of samples in shipping container: 1
7. Sample holding times exceeded? Yes [ ] No [✓]

8. Samples have:
   - ✓ tape
   - ✓ custody seals
   - ____ hazard labels
   - ____ appropriate sample labels

9. Samples are:
   - ✓ in good condition
   - ____ broken
   - ____ leaking
   - ____ 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: 1-16-98

Telephoned To: _____ On _____ By _____

000010

RADIOACTIVE SHIPMENT RECORD

100905 3.

Page 1 of 1

1. SHIP FROM U.S. DEPT. OF ENERGY C/O

Company: Bechtel Hanford, Inc
Address: 233-S Facility, 200-West
City, State, Zip: Richland, WA 99352
Contact: David St. John
Phone: 509-376-8540

Ship: [X] Prepaid [ ] Collect 4.

Via: [X] Motor [ ] Air Pkgs [ ] UPS [ ] Rail [ ] Air Cargo [ ] Site Carrier

SHIPMENT AUTHORIZATION NUMBER

2. SHIP TO

Company: Quanterra Laboratory
Address: 2800 George Washington Way
City, State, Zip: Richland WA 99352
Attention: Karen Ackenberg
Phone: 509-375-3131

Shipping Applied 6.
- Radioactive - LSA [ ]
- Radioactive - SCO [ ]
- Type A [X]
- Type B with trefoil [ ]

LSA Classification
- LSA-I [ ]
- LSA-II [ ]
- LSA-III [ ]
- SCO-I [ ]
- SCO-II [ ]

N/A

For Normal Form only Identify 7.
- Physical Form: [X] Liquid [ ] Gas [ ] Solid
- Chemical Form: [X] Elemental [ ] Metal [ ] Nitrate [ ] Oxide [ ] Mixture [ ] Other

Emergency Response Telephone: 509-373-3800

Emergency Response Guidebook: 165

5. HM Proper Shipping Name: _____ Radioactive Material,

	excepted package - empty packaging	7	UN2910
	excepted package - instruments or articles	7	UN2910
	excepted package - limited quantity of material	7	UN2910
	excepted package - articles manufactured from natural or depleted uranium or natural thorium	7	UN2910
	Special Form, n.o.s.	7	UN2974
	Low Specific Activity, n.o.s.	7	UN2912
X	n.o.s.	7	UN2982
	Fissile, n.o.s.	7	UN2918
	Surface Contaminated Object	7	UN2913

Labels Applied 10.
- Empty [ ]
- Radioactive White - I [X]
- Radioactive Yellow - II [ ]
- Radioactive Yellow - III [ ]
- Subsidiary Hazard [X]

Corrosive Class 8

- Highway Route Controlled Quantity [ ]
- Exclusive Use Shipment with instructions [ ]
- Placards Applied [ ]
- If Rail Specify: _____
- Fissile Excepted, Grams <15gms [X]
- Excepted Package Statement [ ]

Warning – Fissile Material Controlled Shipment. Do Not Load More Than N/A Packages Per Vehicle. In Loading and Storage Areas, Keep at Least 20 Feet From Other Packages Bearing Radioactive Labels.

11. No. Pkg.	Model/Package	COC/Spec	Serial No.	Seal No.	Isotopes	T.I.	Bq/Package	Gr. Wt. Kg.
1	SafeSend	DOT 7A	N/A	Tape	Am-241, Pu-238, Pu-239/240	0	6.0×10^{-3} Bq	3.18 Kgs
1, Poly container sample No. Selenium cushioning (in Nitric acid)					in double poly bags w/			
(Shipper may describe package in detail on one of the unused lines above)					TOTALS	0	6.0×10^{-3} Bq	3.18 Kgs

12. This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Certifier's Signature: David St. John — On behalf of DOE-RL — Date: 1-16-98 — Organization: ERC Analytical Fld. Svc. — Complete Cost Code (Inc. End Function): DB-8007

13. Surface Dose Rate of Package: [X] <0.005 or _____ mSv/hr; <0.5 or _____ mrem/hr (N+β γ)

Dose Rate @ 1 Meter from Surface of Package: [X] <0.005 or _____ mSv/hr; <0.5 or _____ mrem/hr (N+β γ)

Smears of Outer Container: [ ] <0.41 Bq (22 dpm) β γ /cm² [X] <0.04 Bq (2.2 dpm) α /cm² [ ] <Tbl. 2-2 HSRCM Onsite Limits

TRUCK LOAD OR EXCLUSIVE USE: Surface [X] <2 mSv/hr (200 mrem/hr); @ 2 meters [X] <0.1 mSv/hr (10 mrem/hr); @ Cab or sleeper [X] <0.02 mSv/hr (2 mrem/hr) (Using N+β γ)

Additional Data and Instructions (inc. Readings on Internal Packaging)

Signature - Radiation Monitoring: [signature] — Bldg.: 2335 — Survey No.: 2335-98-0047 — Date: 1-16-98

14. TRANSPORTER: Vehicle Number: 11/16 1588 — DRIVER SIGNATURE: R. Earl Frazier

RECEIVER: RECEIVER SIGNATURE: [signature] — Date: 1-16 981430

15. OFFSITE AUTHORIZATION: Shipment has been inspected and verified to be in compliance with DOT regulations. Authorized Signature: [signature] — Printed Name: Keith R. Smith — Date: 1-16-97

16. AUTHORIZATION FOR SHIPMENT

AIR TRANSPORT CERTIFICATION: [X] N/A

CARGO AIRCRAFT: [ ] Cargo Aircraft Only Labels Applied

PASSENGER AIRCRAFT: [ ] Ltd Qty [ ] <3 T.I. [ ] Research/Medical Diagnosis [ ] Human Medical Research

Pkg. Dimensions (cm)

17. OFFSITE AUTHORIZATION

Tracking No.	Date Shipped	Routing	ETA
KMgH-2166	1-16-98	Bechtel Vehicle	1-16-98
Surveyed By	Date	Approved for Shipment Offsite	Date
		[signature]	1-16-98

54-6000-088 (06/97)

Client Sample Screening Results

19-Jan-98

M.N. 1/19/98

CLIENT CODE	ID	MATRIX	RECEIVED	DETECTOR	ACQ DATE	SAMPLE	MINUTES	CNTS A	NET CPM A	CNTS B	NET CPM B
BHI	B0MXN2		1/19/1998	QUAD21B	1/19/1998 9:33:41 AM	B0MXN2	30	93817	3127.16619	14610	486.07571
		LIQUID		Bkg:	1/17/1998 12:43:17 AM	BKO	700	47	0.06714286	647	0.9242857

Anl Date:	1/19/1998	Tot Sa, Alq:	1.25E-01	,	1.00E+00	Alp;	(Dpm/	1.32E+04	(uCi/	7.41E-01	(pCi/	5.93E+06	± 1.7E+04	CAT III	4.2E-06	Lab Alq	
Ppt mg:	26.3	Units:	L	,	ml	Bet;	Alq):	-6.65E+02	Sa):	-3.75E-02	L|g):	-3.00E+05	± 3.0E+03		1.3E-01	L|g	

000012

Quanterra Environmental Services

BWSWP

013901

Login No.: 16808

Condition Upon Receipt Variance Report
St. Louis Laboratory

Client: Richland

Project No: 550.202

Shipper/No: Airborne

Date: 1-21-98 Time: 0815

Initiated by: Fred Mitchell

RFA/COC Numbers: 374

Condition/Variance (Check all that apply):

1. ☐ Sample received broken/leaking.
2. ☐ Sample received without proper preservative.
   - ☐ Cooler temperature not within 4°C ± 2°C
     Record temperature: _____
   - ☐ pH _____
   - ☐ other: _____
3. ☐ Sample received in improper container.
4. ☐ Sample received without proper paperwork. Explain: _____
5. ☐ Paperwork received without sample.
6. ☐ No sample ID on sample container.
7. ☐ Custody tape disturbed/broken/missing.
8. ☐ Sample ID on container does not match sample ID on paperwork. Explain: _____
9. ☐ All coolers on aircraft not received with temperature.
10. ☐ Other explain below:

☑ No variances were noted during sample receipt. Cooler Temperature Upon Receipt: 4°C

Notes: (QAS rec'd. 1-30-92, 1630. SW)

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 designee) Fred Mitchell Date: 1-21-98

Project Management Review: Robert E. White Date: 2-02-98

SIGNED ORIGINAL MUST BE RETAINED IN THE PROJECT FILE

SL-ADMIN-0004 Revision 11/14/95

Bechtel Hanford Incorporated
3350 George Washington Way
Richland, WA 99352

Project: 550.202

Category: ICAP Metals
Method: EPA 6010
Matrix: LIQUID

Sample Date : 01/16/98
Receipt Date : 01/16/98
Report Date : 02/10/98

Client ID: BOMXN2

Quanterra ID : 16808-001

Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dilution
Aluminum	7429-90-5	QCBLK164304-1	02/04/98	02/05/98	3130	UG/L	U	200	1
Antimony	7440-36-0	QCBLK164304-1	02/04/98	02/05/98	15900	UG/L		60.0	1
Arsenic	7440-38-2	QCBLK164304-1	02/04/98	02/05/98	11200	UG/L	B	300	1
Barium	7440-39-3	QCBLK164304-1	02/04/98	02/05/98	585	UG/L	B	200	1
Beryllium	7440-41-7	QCBLK164304-1	02/04/98	02/05/98	40.0	UG/L	U	5.0	1
Cadmium	7440-43-9	QCBLK164304-1	02/04/98	02/05/98	1460	UG/L		5.0	1
Calcium	7440-70-2	QCBLK164304-1	02/04/98	02/05/98	24900	UG/L	B	5000	1
Chromium	7440-47-3	QCBLK164304-1	02/04/98	02/05/98	1700000	UG/L		10.0	1
Cobalt	7440-48-4	QCBLK164304-1	02/04/98	02/05/98	17300	UG/L		50.0	1
Copper	7440-50-8	QCBLK164304-1	02/04/98	02/05/98	16100	UG/L		25.0	1
Iron	7439-89-6	QCBLK164304-1	02/05/98	02/05/98	6530000	UG/L		100	1
Lead	7439-92-1	QCBLK164304-1	02/04/98	02/05/98	3030	UG/L	U	100	1
Magnesium	7439-95-4	QCBLK164304-1	02/04/98	02/05/98	5450	UG/L	U	5000	1
Manganese	7439-96-5	QCBLK164304-1	02/04/98	02/05/98	213000	UG/L		15.0	1
Nickel	7440-02-0	QCBLK164304-1	02/04/98	02/05/98	2170000	UG/L		40.0	1
Potassium	7440-09-7	QCBLK164304-1	02/04/98	02/05/98	218000	UG/L	U	5000	1
Silver	7440-22-4	QCBLK164304-1	02/04/98	02/05/98	699	UG/L	BN	10.0	1
Sodium	7440-23-5	QCBLK164304-1	02/04/98	02/05/98	37000	UG/L	B	5000	1
Vanadium	7440-62-2	QCBLK164304-1	02/04/98	02/05/98	4410	UG/L	B	50.0	1
Zinc	7440-66-6	QCBLK164304-1	02/04/98	02/05/98	14600	UG/L		20.0	1

Bechtel Hanford Incorporated
3350 George Washington Way
Richland, WA 99352

Project: 550.202

Category: ICAP Metals
Method: EPA 6010
Matrix: Liquid

Client ID: BOMXN2

Sample Date : 01/16/98
Receipt Date : 01/16/98
Report Date : 02/23/98

Quanterra ID : 16808-001MS

Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dilution
Aluminum	7429-90-5	QCBLK164304-1	02/04/98	02/05/98	97	%REC			1
Antimony	7440-36-0	QCBLK164304-1	02/04/98	02/05/98	98	%REC			1
Arsenic	7440-38-2	QCBLK164304-1	02/04/98	02/05/98	87	%REC			1
Barium	7440-39-3	QCBLK164304-1	02/04/98	02/05/98	93	%REC			1
Beryllium	7440-41-7	QCBLK164304-1	02/04/98	02/05/98	99	%REC			1
Cadmium	7440-43-9	QCBLK164304-1	02/04/98	02/05/98	87	%REC			1
Calcium	7440-70-2	QCBLK164304-1	02/04/98	02/05/98	97	%REC			1
Chromium	7440-47-3	QCBLK164304-1	02/04/98	02/05/98	-40	%REC			1
Cobalt	7440-48-4	QCBLK164304-1	02/04/98	02/05/98	90	%REC			1
Copper	7440-50-8	QCBLK164304-1	02/04/98	02/05/98	95	%REC			1
Iron	7439-89-6	QCBLK164304-1	02/04/98	02/05/98	2	%REC			1
Lead	7439-92-1	QCBLK164304-1	02/04/98	02/05/98	87	%REC			1
Magnesium	7439-95-4	QCBLK164304-1	02/04/98	02/05/98	101	%REC			1
Manganese	7439-96-5	QCBLK164304-1	02/04/98	02/05/98	87	%REC			1
Nickel	7440-02-0	QCBLK164304-1	02/04/98	02/05/98	-27	%REC			1
Potassium	7440-09-7	QCBLK164304-1	02/04/98	02/05/98	93	%REC			1
Silver	7440-22-4	QCBLK164304-1	02/04/98	02/05/98	76	%REC			1
Sodium	7440-23-5	QCBLK164304-1	02/04/98	02/05/98	96	%REC			1
Vanadium	7440-62-2	QCBLK164304-1	02/04/98	02/05/98	94	%REC			1
Zinc	7440-66-6	QCBLK164304-1	02/04/98	02/05/98	92	%REC			1

Bechtel Hanford Incorporated
3350 George Washington Way
Richland, WA 99352

Project: 550.202

Category: ICAP Metals
Method: EPA 6010
Matrix: LIQUID

Sample Date : 01/16/98
Receipt Date : 01/16/98
Report Date : 02/10/98

Client ID: BOMXN2

Quanterra ID : 16808-001MSD

Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dilution
Aluminum	7429-90-5	QCBLK164304-1	02/04/98	02/05/98	98	%REC			1
Antimony	7440-36-0	QCBLK164304-1	02/04/98	02/05/98	96	%REC			1
Arsenic	7440-38-2	QCBLK164304-1	02/04/98	02/05/98	89	%REC			1
Barium	7440-39-3	QCBLK164304-1	02/04/98	02/05/98	93	%REC			1
Beryllium	7440-41-7	QCBLK164304-1	02/04/98	02/05/98	99	%REC			1
Cadmium	7440-43-9	QCBLK164304-1	02/04/98	02/05/98	84	%REC			1
Calcium	7440-70-2	QCBLK164304-1	02/04/98	02/05/98	98	%REC			1
Chromium	7440-47-3	QCBLK164304-1	02/04/98	02/05/98	-30	%REC			1
Cobalt	7440-48-4	QCBLK164304-1	02/04/98	02/05/98	90	%REC			1
Copper	7440-50-8	QCBLK164304-1	02/04/98	02/05/98	96	%REC			1
Iron	7439-89-6	QCBLK164304-1	02/05/98	02/05/98	2	%REC			1
Lead	7439-92-1	QCBLK164304-1	02/04/98	02/05/98	99	%REC			1
Magnesium	7439-95-4	QCBLK164304-1	02/04/98	02/05/98	102	%REC			1
Manganese	7439-96-5	QCBLK164304-1	02/04/98	02/05/98	87	%REC			1
Nickel	7440-02-0	QCBLK164304-1	02/04/98	02/05/98	-11	%REC			1
Potassium	7440-09-7	QCBLK164304-1	02/04/98	02/05/98	94	%REC			1
Silver	7440-22-4	QCBLK164304-1	02/04/98	02/05/98	78	%REC	N		1
Sodium	7440-23-5	QCBLK164304-1	02/04/98	02/05/98	96	%REC			1
Vanadium	7440-62-2	QCBLK164304-1	02/04/98	02/05/98	95	%REC			1
Zinc	7440-66-6	QCBLK164304-1	02/04/98	02/05/98	93	%REC			1

Bechtel Hanford Incorporated
3350 George Washington Way
Richland, WA 99352

Project: 550.202

Category: MERCURY
Method: EPA 7470
Matrix: LIQUID

Sample Date : 01/16/98
Receipt Date : 01/16/98
Report Date : 02/10/98

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOMXN2	16808-001	Mercury	7439-97-6	QCBLK164396-1	02/05/98	02/05/98	10.0	UG/L	U	0.20	1
BOMXN2	16808-001MS	Mercury	7439-97-6	QCBLK164396-1	02/05/98	02/05/98	96	%REC			1
BOMXN2	16808-001MSD	Mercury	7439-97-6	QCBLK164396-1	02/05/98	02/05/98	95	%REC			1
NA	QCLCS164396-1	Mercury	7439-97-6	QCBLK164396-1	02/05/98	02/05/98	92	%REC			1
NA	QCBLK164396-1	Mercury	7439-97-6	QCBLK164396-1	02/05/98	02/05/98	0.10	UG/L	U	0.20	1

U.S. EPA - CLP

COVER PAGE - INORGANIC ANALYSES DATA PACKAGE

Lab Name: QUANTERRA_MO_____ Contract: 550.202___

Lab Code: ITMO__ Case No.: _____ SAS No.: _____ SDG No.: W02194_____

SOW No.: SW846

EPA Sample No.	Lab Sample ID
B0MXN2	16808-001
B0MXN2SD	16808-001SD
B0MXN2S	16808-001S

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:

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: _____

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

B0MXN2

Lab Name: QUANTERRA_MO Contract: 550.202
Lab Code: ITMO Case No.: SAS No.: SDG No.: W02194
Matrix (soil/water): WATER Lab Sample ID: 16808-001
Level (low/med): LOW Date Received: 01/16/98
% Solids: 0.0

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3130	U		P
7440-36-0	Antimony	15900			P
7440-38-2	Arsenic	11200	B		P
7440-39-3	Barium	585	B		P
7440-41-7	Beryllium	40.0	U		P
7440-43-9	Cadmium	1460			P
7440-70-2	Calcium	24900	B		P
7440-47-3	Chromium	1700000			P
7440-48-4	Cobalt	17300			P
7440-50-8	Copper	16100			P
7439-89-6	Iron	6530000			P
7439-92-1	Lead	3030	U		P
7439-95-4	Magnesium	5450	U		P
7439-96-5	Manganese	213000			P
7439-97-6	Mercury	10.0	U		CV
7440-02-0	Nickel	2170000			P
7440-09-7	Potassium	218000	U		P
7440-22-4	Silver	699	B	N	P
7440-23-5	Sodium	37000	B		P
7440-62-2	Vanadium	4410	B		P
7440-66-6	Zinc	14600			P

Color Before: Clarity Before: Texture:
Color After: Clarity After: Artifacts:

Comments:

FORM I - IN

SW-846

Bechtel Hanford Incorporated
3350 George Washington Way
Richland, WA 99352

Project: 550.202

Category: Anions - EPA 300.0
Method: EPA 300.0
Matrix: LIQUID

Client ID: B0MXN2

Sample Date : 01/16/98
Receipt Date : 01/16/98
Report Date : 02/23/98

Quanterra ID : 16808-001

Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dilution
Fluoride	16984-48-8	QCBLK164548-1	02/06/98	02/06/98	20.0	UG/G	U	20.0	20
Chloride	16887-00-6	QCBLK164548-1	02/06/98	02/06/98	530	UG/G		400	200
Sulfate	14808-79-8	QCBLK164548-1	02/06/98	02/06/98	99.9	UG/G	U	99.9	20
Nitrate	NO3-N	QCBLK164548-1	02/06/98	02/06/98	123000	UG/G		4000	20000
O-phosphate-P	14265-44-2	QCBLK164548-1	02/06/98	02/06/98	200	UG/G	U	200	40
Nitrite	NO2-N	QCBLK164548-1	02/06/98	02/06/98	40.0	UG/G	U	40.0	200

Bechtel Hanford Incorporated
3350 George Washington Way
Richland, WA 99352

Project: 550.202

Category: Anions - EPA 300.0
Method: EPA 300.0
Matrix: LIQUID

Client ID: BOMXN2

Sample Date : 01/16/98
Receipt Date : 01/16/98
Report Date : 02/23/98

Quanterra ID : 16808-001DUP

Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dilution
Fluoride	16984-48-8	QCBLK164548-1	02/06/98	02/06/98	20.0	UG/G	U	20.0	20
Chloride	16887-00-6	QCBLK164548-1	02/06/98	02/06/98	696	UG/G		400	200
Sulfate	14808-79-8	QCBLK164548-1	02/06/98	02/06/98	99.9	UG/G	U	99.9	20
Nitrate	NO3-N	QCBLK164548-1	02/06/98	02/06/98	125000	UG/G		4000	20000
O-phosphate-P	14265-44-2	QCBLK164548-1	02/06/98	02/06/98	200	UG/G	U	200	40
Nitrite	NO2-N	QCBLK164548-1	02/06/98	02/06/98	40.0	UG/G	U	40.0	200

Bechtel Hanford Incorporated
3350 George Washington Way
Richland, WA 99352

Project: 550.202

Category: Anions - EPA 300.0
Method: EPA 300.0
Matrix: LIQUID

Sample Date : 01/16/98
Receipt Date : 01/16/98
Report Date : 02/10/98

Client ID: 80MXN2

Quanterra ID : 16808-001MS

Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dilution
Fluoride	16984-48-8	QCBLK164548-1	02/06/98	02/06/98	0	%REC	*		1
Chloride	16887-00-6	QCBLK164548-1	02/06/98	02/06/98	0	%REC	*		1
Sulfate	14808-79-8	QCBLK164548-1	02/06/98	02/06/98	0	%REC	*		1
Nitrate	NO3-N	QCBLK164548-1	02/06/98	02/06/98	0	%REC	*		1
O-phosphate-P	14265-44-2	QCBLK164548-1	02/06/98	02/06/98	0	%REC	*		1
Nitrite	NO2-N	QCBLK164548-1	02/06/98	02/06/98	0	%REC	*		1

Bechtel Hanford Incorporated
3350 George Washington Way
Richland, WA 99352

Project: 550.202

Category: pH
Method: EPA 9045
Matrix: LIQUID

Sample Date : 01/16/98
Receipt Date : 01/16/98
Report Date : 02/10/98

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOMXN2	16808-001	pH	PH	QCBLK164549-1	02/06/98	02/06/98	2.00	PH	U		1
BOMXN2	16808-001DUP	pH	PH	QCBLK164549-1	02/06/98	02/06/98	2.00	PH	U		1
NA	QCBLK164549-1	pH	PH	QCBLK164549-1	02/06/98	02/06/98	4.68	PH			1