0064352

SAF-B02-063
100 K Area – Full Protocol
FINAL VALIDATION PACKAGE

COMPLETE COPY OF DATA PACKAGE TO:

Stacey Callison X3-16 — 3.29.05 INITIAL/DATE

Jeanette Duncan — 3.29.05 INITIAL/DATE

Matt Cutlip — 3.29.05 INITIAL/DATE

RECEIVED
APR 05 2005
EDMC

COMMENTS:

SDG H2990 SAF-B02-063

Waste Site: 116-KE-4

Date: 14 March 2005
To: Bechtel Hanford Inc. (technical representative)
From: TechLaw, Inc.
Project: 100 K Area - Full Protocol - Waste Site 116-KE-4
Subject: Wet Chemistry - Data Package No. H2990-LLI (SDG No. H2990)

INTRODUCTION

This memo presents the results of data validation on Data Package No. H2990-LLI prepared by Lionville Laboratory Inc. (LLI). A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

Sample ID	Sample Date	Media	Validation	Analysis
J026V5	1/26/05	Soil	C	Chromium VI by 7196A
J026V6	1/26/05	Soil	C	Chromium VI by 7196A
J026V7	1/26/05	Soil	C	Chromium VI by 7196A
J026V8	1/26/05	Soil	C	Chromium VI by 7196A
J026V9	1/26/05	Soil	C	Chromium VI by 7196A
J026W0	1/26/05	Soil	C	Chromium VI by 7196A
J026W1	1/26/05	Soil	C	Chromium VI by 7196A
J026W2	1/26/05	Soil	C	Chromium VI by 7196A

Data validation was conducted in accordance with the Bechtel Hanford Incorporated (BHI) validation statement of work and the 100 Area Remedial Action Sampling and Analysis Plan (DOE/RL-96-22, December 2001). Appendices 1 through 6 provide the following information as indicated below:

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

DATA QUALITY PARAMETERS

- **Holding Times**

Analytical holding times for metals are assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: Soil samples must be analyzed within 30 days for chromium VI.

If holding times are exceeded, but not by greater than two times the limit, all associated sample results are qualified as estimates and flagged "J" for detects and "UJ" for non-detects. If holding times are exceeded by greater than two times the limit, all associated detectable sample results are qualified as estimates and flagged "J" and all non-detects are rejected and flagged "UR".

All holding times were acceptable.

- **Method Blanks**

Method Blanks

Method blank analyses are performed to determine the extent of laboratory contamination introduced through sampling, sample preparation and analysis. At least one acceptable method blank analysis must be conducted for every 20 samples. No contaminants should be present in the method blank. All blank results must fall below the contract required detection limit (CRQL) to be acceptable.

All method blank results were acceptable.

Field (Equipment) Blank

No equipment blanks were submitted for analysis.

- **Accuracy**

Matrix Spike and Laboratory Control Sample

Matrix spike (MS) and laboratory control sample (LCS) analyses are used to assess the analytical accuracy of the reported data. The matrix spike is used to assess the effect of the matrix on the ability to accurately quantify sample concentrations. Recoveries must fall within the range of 70% to 130%. Samples with a recovery of less than 30% and a sample result below the IDL are rejected and flagged "UR". Samples with a recovery of 30% to 69% and a sample result less than the IDL are qualified "UJ". Samples with a recovery of greater than 130% or less than 70% and a sample result greater than the IDL are qualified as estimates and flagged "J". Finally, for samples with a recovery greater than 130% and a sample result less than the IDL, no qualification is required.

All accuracy results were acceptable.

- **Precision**

Laboratory Duplicate Samples

Analytical precision is expressed by the relative percent differences (RPD) between the recoveries of matrix spike duplicate (MSD) analyses performed on a sample in the analytical batch. Precision may alternatively be assessed using unspiked duplicate analyses performed on a sample in the analytical batch. If both sample and replicate activities (concentrations) are greater than five times the CRDL and the RPD is less than 30%, no qualification is required. If either activity (concentration) is less than five times the CRDL, the RPD control limit is less than or equal to two times the CRDL. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

All laboratory duplicate results were acceptable.

Field Duplicate

No field duplicates were submitted for analysis.

- **Analytical Detection Levels**

Reported analytical detection levels are compared against the required quantitation limits (RQLs) to ensure that laboratory detection levels meet the required criteria. All undetected chromium VI results exceeded the RQL. Under the BHI statement of work, no qualification is required.

- **Completeness**

Data package No. H2990-LLI was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

All undetected chromium VI results exceeded the RQL. Under the BHI statement of work, no qualification is required.

REFERENCES

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

DOE/RL-96-22, Rev. 3, *100 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, December 2001.

Appendix 1

Glossary of Data Reporting Qualifiers

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

U - Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.

UJ - Indicates the compound or analyte was analyzed for and not detected in the sample. Due to a minor QC deficiency identified during the data validation, the associated quantitation limit is an estimate.

J - Indicates the compound or analyte was analyzed for and detected. Due to a minor QC deficiency identified during the data validation, the associated concentration is an estimate, but the data are usable for decision-making purposes.

BJ - Applied to inorganic analyses only. Indicates the analyte concentration was greater than the IDL but less than the CRDL and is considered an estimated value.

R - Indicates the compound or analyte was analyzed for, detected, and due to an identified major QC deficiency, the data are unusable.

UR - Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data is unusable due to an identified major QC deficiency.

NJ - Indicates presumptive evidence of a compound at an estimated value. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).

N - Indicates presumptive evidence of a compound. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).

Appendix 2

Summary of Data Qualification

WET CHEMISTRY DATA QUALIFICATION SUMMARY*

SDG: H2990	REVIEWER: TLI	DATE: 3/14/05	PAGE_1_OF_1_
COMMENTS: No qualifiers assigned			

* - The Qualified Data Summary Table includes laboratory applied "U" qualifiers not specifically identified here. The laboratory applied "U" qualifiers are included to minimize misinterpretation of results contained in the table.

Appendix 3

Qualified Data Summary and Annotated Laboratory Reports

WET CHEMISTRY ANALYSIS, SOIL MATRIX, MG/KG

Project: BECHTEL-HANFORD																	
Laboratory: LLI																	
Case	SDG: H2990																
Sample Number		J026V5		J026V6		J026V7		J026V8		J026V9		J026W0		J026W1		J026W2	
Remarks																	
Sample Date		01/26/06		01/26/06		01/26/06		01/26/06		01/26/06		01/26/06		01/26/06		01/26/06	
Wet Chemistry	RQL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Chromium VI	0.1	0.84		1.3		0.40		0.32		0.22	U	0.22	U	0.21	U	1.0	

Laboratory applied non-detect qualifiers "U" have been included in this table to minimize miss-interpretation of results. All other qualifiers shown were applied during validation.

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Lionville Laboratory, Inc.

INORGANICS DATA SUMMARY REPORT 02/04/05

CLIENT: TNUHANFORD B02-063 H2990 LVL LOT #: 0501L693
WORK ORDER: 11343-606-001-9999-00

SAMPLE	SITE ID	ANALYTE	RESULT	UNITS	REPORTING LIMIT	DILUTION FACTOR
-001	J026V9	% Solids	92.4	%	0.01	1.0
		Chromium VI	0.22 u	MG/KG	0.22	1.0
-002	J026W0	% Solids	92.0	%	0.01	1.0
		Chromium VI	0.22 u	MG/KG	0.22	1.0
-003	J026W1	% Solids	93.6	%	0.01	1.0
		Chromium VI	0.21 u	MG/KG	0.21	1.0
-004	J026W2	% Solids	95.0	%	0.01	1.0
		Chromium VI	1.0	MG/KG	0.21	1.0
-005	J026V5	% Solids	95.0	%	0.01	1.0
		Chromium VI	0.84	MG/KG	0.21	1.0
-006	J026V6	% Solids	93.5	%	0.01	1.0
		Chromium VI	1.3	MG/KG	0.21	1.0
-007	J026V7	% Solids	93.6	%	0.01	1.0
		Chromium VI	0.40	MG/KG	0.21	1.0
-008	J026V8	% Solids	92.5	%	0.01	1.0
		Chromium VI	0.32	MG/KG	0.22	1.0

3/12/05

Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

LIONVILLE LABORATORY INC.

Analytical Report

Client: TNU-HANFORD B02-063 H2990
LVL#: 0501L693

W.O.#: 11343-606-001-9999-00
Date Received: 01-28-05

INORGANIC NARRATIVE

1. This narrative covers the analyses of 8 soil samples.

2. The samples were prepared and analyzed in accordance with the methods checked on the attached glossary.

3. Sample holding times as required by the method and/or contract were met.

4. The results presented in this report are derived from samples that met LvLI's sample acceptance policy.

5. The method blank for Chromium VI was within the method criteria.

6. The Laboratory Control Samples (LCS) for Chromium VI were within the laboratory control limits.

7. The matrix spike recoveries for Chromium VI were within the 75-125% control limits.

8. The replicate analyses for Percent Solids and Chromium VI were within the 20% Relative Percent Difference (RPD) control limit.

9. Results for solid samples are reported on a dry weight basis.

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

Iain Daniels
Laboratory Manager
Lionville Laboratory Incorporated

2/9/05
Date

njp\i01-693

The results presented in this report relate to the analytical testing and conditions of the samples upon receipt and during storage. All pages of this report are integral parts of the analytical data. Therefore, this report should only be *reproduced* in its entirety of 13 pages.

208 Welsh Pool Road • Exton, PA 19341- 1313 • (610) 280-3000 • Fax (610) 280-3041

Bechtel Hanford Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

B02-063-48 | Page 1 of 2

Collector: RTC 1/26/05 ~~NEAL~~ TRICE / COFFMAN	Company Contact: RTC ~~Cindy Neal~~ R. Coffman	Telephone No.: RTC ~~528-7200~~ 528-6409	Project Coordinator: KESSNER, JH
Price Code: Air Quality	Data Turnaround: ~~21~~ 14 Days		
Project Designation: 100 K Area - Full Protocol	Sampling Location: 116-KE-4	SAF No.: B02-063	
Ice Chest No.: ERC 02 009, 501 ~~ERC-99-065~~ 1/26/05	Field Logbook No.: EL-1572-2	COA: R16KE42000	Method of Shipment: FEDEX RTC 1/26/04
Shipped To: EBERLINE SERVICES (Formerly TMA) LVLJ	Offsite Property No.: A050 084		Bill of Lading/Air Bill No.: SEE OSPC

POSSIBLE SAMPLE HAZARDS/REMARKS

RAD

Special Handling and/or Storage

4 DEGREES COOL

HISTORICAL DATA INDICATES THAT SAMPLES ARE LESS THAN 2000 pCi/gram.

Preservation	Cool 4C	None	None	None	AP 12705						
Type of Container	G/P	G/P	G/P	G/P							
No. of Container(s)	1	1	1	1							
Volume	125mL	1000mL	60mL	60mL							
SAMPLE ANALYSIS	Chromium Hex - 7196	See item (1) in Special Instructions.	Isotopic Plutonium; Isotopic Uranium; Americium-241	Strontium-89,90 -- Total Sr; Nickel-63; Carbon-14							
Sample No.	Matrix *	Sample Date	Sample Time								
~~J026V4~~	~~SOIL~~										
J026V5	SOIL	1-26-05	0810	X	X	X	X				S C9
J026V6	SOIL	(	0820	X	X	X	X				S C10
J026V7	SOIL	(	0835	X	X	X	X				S C1
J026V8	SOIL	1-26-05	0850	X	X	X	X				S C2

CHAIN OF POSSESSION — Sign/Print Names

Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
RTCOFFMAN/RTCoffman	1/26/05 1520	REFER #1-A	1/26/05 1520
REF 1A	12705 1000	SJGALE	12705 1000
SJGALE	12705 1000	FEDEX	
FEDEX	1-28-05 0925		1-28-05 0925

SPECIAL INSTRUCTIONS

(1) Gamma Spectroscopy (TCL List) (Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155)

Personnel not available to relinquish samples from 3728 Ref # 1A on 1/27/05

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

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

Bechtel Hanford Inc.	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	B02-063-48	Page 2 of 2

Collector ~~NEAL~~ RTC 1/26/05 TRICE/COFFMAN	Company Contact ~~Cindy Neal~~ RTC R. COFFMAN Telephone No. ~~528-7260~~ RTC 528-6409	Project Coordinator KESSNER, JH	Price Code Air Quality / Data Turnaround ~~21~~ 14 Days RTC 1/26/05
Project Designation 100 K Area - Full Protocol	Sampling Location 116-KE-4	SAF No. B02-063	
Ice Chest No. ERC 02 009, 501 ~~ERC-99-065~~ 12705	Field Logbook No. EL-1572-2 / COA R16KE42000	Method of Shipment FEDEX	
Shipped To EBERLINE SERVICES (Formerly TMA) LVL1	Offsite Property No. A050 084	Bill of Lading/Air Bill No. SEE OSPC	

POSSIBLE SAMPLE HAZARDS/REMARKS

RAD

Special Handling and/or Storage

4 DEGREES COOL HISTORICAL DATA INDCATES THAT SAMPLES ARE LESS THAN 2000 pCi/gram.

Preservation				Cool 4C	None	None	None						
Type of Container				G/P	G/P	G/P	G/P						
No. of Container(s)				1	1	1	1						
Volume				125mL	1000mL	60mL	60mL						
SAMPLE ANALYSIS				Chromium Hex - 7196	See item (1) in Special Instructions.	Isotopic Plutonium; Isotopic Uranium; Americium-241	Strontium-89,90 -- Total Sr; Nickel-63; Carbon-14						
Sample No.	Matrix *	Sample Date	Sample Time										
J026V9	SOIL	1-26-05	0805	X	X	X	X					S	D3
J026W0	SOIL		0838	X	X	X	X					S	D4
J026W1	SOIL		0825	X	X	X	X					S	D5
J026W2	SOIL	1-26-05	0814	X	X	X	X					S	D6

000015

CHAIN OF POSSESSION		Sign/Print Names	
Relinquished By/Removed From	Date/Time 1520	Received By/Stored In	Date/Time 1520
RT COFFMAN / RT Coffman	1/26/05	REFER # 1-A	1/26/05
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
REF 1A 12705	1000	SJ GALE [signature]	12705 1000
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
SJ GALE [signature]	12705 1000	FEDEX	
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
FedEx	1-28-05 0925	[signature]	1-28-05 0925
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time

SPECIAL INSTRUCTIONS

(1) Gamma Spectroscopy (TCL List) [Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155]

Personnel not available to Relinquish samples from 3728 Ref # 1A on 1/27/05

Matrix *
S=Soil
SE=Sediment
SO=Solid
SI=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

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

Appendix 5

Data Validation Supporting Documentation

GENERAL CHEMISTRY ANALYSIS DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
PROJECT: 100K 116-KE-4			DATA PACKAGE: H2996		
VALIDATOR: TLI		LAB: LLI		DATE: 3/9/05	
			SDG: H2996		
ANALYSES PERFORMED					
Anions/IC	TOC	TOX	TPH-418.1	Oil and Grease	Alkalinity
Ammonia	BOD/COD	Chloride	Chromium-VI	pH	NO_3/NO_2
Sulfate	TDS	TKN	Phosphate		
SAMPLES/MATRIX					
J026V5 J026V6 J026V7 J026V8 J026V9					
J026W0 J026W1 J026W2					
					Soil

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

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

Comments:

2. INSTRUMENT PERFORMANCE AND CALIBRATIONS (Levels D and E)

Initial calibrations performed on all instruments? ..... Yes No N/A

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

ICV and CCV checks performed on all instruments? ..... Yes No N/A

ICV and CCV checks acceptable? ..... Yes No N/A

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

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

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

Comments:

GENERAL CHEMISTRY ANALYSIS DATA VALIDATION CHECKLIST

3. BLANKS (Levels B, C, D, and E)

ICB and CCB checks performed for all applicable analyses? (Levels D, E) ..... Yes No N/A

ICB and CCB results acceptable? (Levels D, E) ..... Yes No N/A

Laboratory blanks analyzed? ..... Yes No N/A

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

Field blanks analyzed? (Levels C, D, E) ..... Yes No N/A

Field blank results acceptable? (Levels C, D, E) ..... Yes No N/A

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

Comments: No FB

4. ACCURACY (Levels C, D, and E)

Spike samples analyzed? ..... Yes No N/A

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

Sike standards NIST traceable? (Levels D, E) ..... Yes No N/A

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

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

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

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

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

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

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

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

Comments: No PAS

GENERAL CHEMISTRY ANALYSIS DATA VALIDATION CHECKLIST

5. PRECISION (Levels C, D, and E)

Duplicate RPD values acceptable? ..... Yes No N/A

Duplicate results acceptable? ..... Yes No N/A

MS/MSD standards NIST traceable? (Levels D, E) ..... Yes No N/A

MS/MSD standards expired? (Levels D, E) ..... Yes No N/A

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

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

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

Comments:

6. HOLDING TIMES (all levels)

Samples properly preserved? ..... Yes No N/A

Sample holding times acceptable? ..... Yes No N/A

Comments:

GENERAL CHEMISTRY ANALYSIS DATA VALIDATION CHECKLIST

7. RESULT QUANTITATION AND DETECTION LIMITS (all levels)

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

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

Samples properly prepared? (Levels D, E) ..... Yes No N/A

Detection limits meet RDL? ..... Yes No N/A

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

Comments: all unbatched over

Appendix 6

Additional Documentation Requested by Client

Lionville Laboratory, Inc.

INORGANICS METHOD BLANK DATA SUMMARY PAGE 02/04/05

CLIENT: TNUHANFORD B02-063 H2990 LVL LOT #: 0501L693

WORK ORDER: 11343-606-001-9999-00

SAMPLE	SITE ID	ANALYTE	RESULT	UNITS	REPORTING LIMIT	DILUTION FACTOR
BLANK10	05LVI010-MB1	Chromium VI	0.20 u	MG/KG	0.20	1.0

Lionville Laboratory, Inc.

INORGANICS ACCURACY REPORT 02/04/05

CLIENT: TNUHANFORD B02-063 H2990 LVL LOT #: 0501L693

WORK ORDER: 11343-606-001-9999-00

SAMPLE	SITE ID	ANALYTE	SPIKED SAMPLE	INITIAL RESULT	SPIKED AMOUNT	%RECOV	DILUTION FACTOR(SPK)
-001	J026V9	Chromium VI	4.7	0.16	4.3	106.0	1.0
		Chromium VI MSD	1180	0.16	1100	107.5	100
BLANK10	05LVI010-MB1	Chromium VI	4.0	0.20u	4.0	101.2	1.0
		Chromium VI MSD	1120	0.20u	1040	107.7	100

Lionville Laboratory, Inc.

INORGANICS PRECISION REPORT 02/04/05

CLIENT: TNUHANFORD B02-063 H2990 LVL LOT #: 0501L693

WORK ORDER: 11343-606-001-9999-00

SAMPLE	SITE ID	ANALYTE	INITIAL RESULT	REPLICATE	RPD	DILUTION FACTOR(REP)
-001REP	J026V9	Chromium VI	0.22u	0.28	NC	1.0
-004REP	J026W2	% Solids	95.0	94.2	0.92	1.0

Date: 14 March 2005
To: Bechtel Hanford Inc. (technical representative)
From: TechLaw, Inc.
Project: 100 K Area - Full Protocol - Waste Site 116-KE-4
Subject: Radiochemistry - Data Package No. H2990-LLI (SDG No. H2990)

INTRODUCTION

This memo presents the results of data validation on Data Package No. H2990-LLI prepared by Lionville Laboratory Inc. (LLI). A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

Sample ID	Sample Date	Media	Validation	Analysis
J026V5	1/26/05	Soil	C	See note 1
J026V6	1/26/05	Soil	C	See note 1
J026V7	1/26/05	Soil	C	See note 1
J026V8	1/26/05	Soil	C	See note 1
J026V9	1/26/05	Soil	C	See note 1
J026W0	1/26/05	Soil	C	See note 1
J026W1	1/26/05	Soil	C	See note 1
J026W2	1/26/05	Soil	C	See note 1

1- Gamma spectroscopy, alpha spectroscopy, total strontium, nickel-63, carbon-14.

Data validation was conducted in accordance with the Bechtel Hanford Incorporated (BHI) validation statement of work and the 100 Area Remedial Action Sampling and Analysis Plan (DOE/RL December 2001). Appendices 1 through 6 provide the following information as indicated below:

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

DATA QUALITY PARAMETERS

- **Holding Times**

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

All holding times were acceptable.

- **Preparation (Method) Blanks**

Laboratory Blanks

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

All blank results were acceptable.

Field (Equipment) Blank

No equipment blanks were submitted for analysis.

- **Accuracy**

Accuracy is evaluated from laboratory control sample (LCS) or blank spike sample (BSS) batch samples and spiked samples from the analytical batch. Measured activities are compared to the known added amounts. The acceptable LCS or BSS and matrix spike (MS) recovery range is 70-130%. In addition, samples may be spiked with a radiochemical tracer to assist in isolating the radioisotope of interest with the yield of the tracer being used in calculating sample activity. The acceptable range for tracer recovery is 20% to 105%. Spike sample results outside the above ranges result in associated sample results being qualified as estimates, or not qualified, depending on the activity of the individual sample. Results are rejected for LCS/BSS recoveries of less than 30% and tracer recoveries of less than 20%, and tracer recoveries of greater than 115% for detected results.

Due to the lack of a matrix spike analysis, all carbon-14 and nickel-63 results were qualified as estimates and flagged "J".

All other accuracy results were acceptable.

- **Laboratory Duplicates**

Analytical precision is expressed by the relative percent differences (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample in the analytical batch. Precision may alternatively be assessed using unspiked duplicate analyses performed on a sample in the analytical batch. If both sample and replicate activities (concentrations) are greater than five times the contract required detection limit (CRDL) and the RPD is less than 30%, no qualification is required. If either activity (concentration) is less than five times the CRDL, the RPD control limit is less than or equal to two times the CRDL. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

All duplicate results were acceptable.

Field Duplicates

No field duplicates were submitted for analysis.

- **Detection Levels**

Reported analytical detection levels for undetected analytes are compared against the remaining waste sites RQLs to ensure that laboratory detection levels meet the required criteria. Eighteen analytes were reported above their RQL. Under the BHI statement of work, no qualification is required. All other reported results met the analyte specific RQL.

- **Completeness**

Data package No. H2990 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

Due to the lack of a matrix spike analysis, all carbon-14 and nickel-63 results were qualified as estimates and flagged "J". Data flagged "J" indicates that the associated concentration is an estimate, but under the BHI statement of work, the data may be usable for decision-making purposes. All other validated results are considered accurate within the standard error associated with the methods.

Eighteen analytes were reported above their RQL. Under the BHI statement of work, no qualification is required.

REFERENCES

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

DOE/RL-96-22, Rev. 3, *100 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, December 2001.

Appendix 1

Glossary of Data Reporting Qualifiers

Qualifiers which may be applied by data validators in compliance with the BHI statement of work are as follows:

U - Indicates the compound or analyte was analyzed for and not detected above the minimum detectable activity (MDA) in the sample. The value reported is the sample result corrected for sample dilution and moisture content by the laboratory. The data is usable for decision making purposes.

UJ - Indicates the compound or analyte was analyzed for and not detected at concentrations above the minimum detectable activity (MDA) in the sample. Due to a minor QC deficiency identified during the data validation, the associated quantitation limit is an estimate, but is usable for decision making purposes.

J - Indicates the compound or analyte was analyzed for and detected. Due to a minor QC deficiency identified during the data validation, the associated concentration is an estimate, but the data are usable for decision-making purposes.

R - Indicates the compound or analyte was analyzed for, detected, and due to an identified major QC deficiency, the data are unusable.

UR - Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data is unusable due to an identified major QC deficiency.

Appendix 2

Summary of Data Qualification

RADIOCHEMISTRY DATA QUALIFICATION SUMMARY*

SDG: H2990	REVIEWER: TLI	DATE: 3/14/05	PAGE_1_OF_1_
COMMENTS:			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Carbon-14 Nickel-63	J	All	No MS analysis

* - The Qualified Data Summary Table includes laboratory applied "U" qualifiers not specifically identified here. The laboratory applied "U" qualifiers are included to minimize misinterpretation of results contained in the table.

Appendix 3

Qualified Data Summary and Annotated Laboratory Reports

RADIOCHEMISTRY ANALYSIS, SOIL MATRIX, (PCi/G)

Project: BECHTEL-HANFORD																	
Laboratory: EB																	
Case	SDG: H2990																
Sample Number		J026V5		J026V6		J026V7		J026V8		J026V9		J026W0		J026W1		J026W2	
Remarks																	
Sample Date		1/26/06		1/26/06		1/26/06		1/26/06		1/26/06		1/26/06		1/26/06		1/26/06	
Radiochemistry	RQL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Carbon-14	50	-0.286	UJ	-0.237	UJ	0.554	UJ	0.576	UJ	0.147	UJ	0.079	UJ	-0.426	UJ	0.965	UJ
Nickel-63	30	9.00	J	6.56	J	2.36	UJ	-0.871	UJ	0.872	UJ	4.92	J	2.50	UJ	187	J
Total strontium	1	0.334		0.259		0.273		0.078	U	0.076	U	0.023	U	0.022	U	0.499	
Uranium-233/234	1	0.624		0.755		0.442		0.512		0.528		0.840		0.387		0.536	
Uranium-235	1	0.060	U	0.033	U	0.030	U	0.033	U	0.028	U	0.054	U	0	U	0.056	U
Uranium-238	1	0.449		0.324		0.688		0.620		0.436		0.641		0.516		0.442	
Plutonium-238	1	0	U	0.028	U	0	U	0	U	0	U	0	U	0	U	0	U
Plutonium-239/240	1	0.064	U	0.056	U	0.027	U	0	U	0	U	0.019	U	0.021	U	0.456	
Americium-241	1	0.098	U	-0.021	U	0.030	U	0	U	-0.025	U	0	U	0	U	0.257	
Potassium-40		4.58		9.44		8.50		5.74		9.93		5.00		11.6		12.4	
Cobalt 60	0.05	U	U	0.086		U	U	U	U	U	U	U	U	U	U	1.48	
Cesium 137	0.1	0.128		0.869		0.085		0.059		0.067		U	U	0.073		1.90	
Radium-226		0.259		0.430		0.374		0.257		0.405		0.307		0.476		0.609	
Radium-228		0.397		0.678		0.724		0.346		0.711		0.275		0.520		0.712	
Europium 152	0.1	0.687		2.08		U		0.217		0.282		0.764		0.688		35.5	
Europium 154	0.1	U	U*	0.281		U	U*	U	U*	U	U*	0.135		U	U*	4.16	
Europium 155	0.1	U	U	U	U*	U	U*	U	U	U	U*	U	U	U	U*	U	U*
Thorium-228		0.308		0.490		0.675		0.273		0.480		0.191		0.514		0.532	
Thorium-232		0.397		0.678		0.724		0.346		0.711		0.275		0.520		0.712	
Uranium-235(gea)	1	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Uranium-238(gea)	1	U	U*	U	U*	U	U*	U	U*	U	U*	U	U*	U	U*	U	U*
Americium-241(gea)	1	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U

000010

* - RQL exceeded

Laboratory applied non-detect qualifiers "U" have been included in this table to minimize potential miss-interpretation of results. All other qualifiers shown were applied during validation.

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP H2990

R501230-01 J026V5

DATA SHEET

SDG	7765	Client/Case no	Hanford	SDG H2990	
Contact	Melissa C. Mannion	Contract	No. 630		
Lab sample id	R501230-01	Client sample id	J026V5		
Dept sample id	7765-001	Location/Matrix	100-KE-4	SOLID	
Received	01/28/05	Collected/Weight	01/26/05 08:10	1852 g	
% solids	94.6	Custody/SAF No	B02-063-48	B02-063	

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Carbon 14	14762-75-5	-0.286	1.3	2.3	50	U J	C
Nickel 63	13981-37-8	9.00	2.2	3.2	30	J	NI_L
Total Strontium	SR-RAD	0.334	0.12	0.18	1.0		SR
Uranium 233/234	U-233/234	0.624	0.25	0.19	1.0		U
Uranium 235	15117-96-1	0.060	0.061	0.23	1.0	U	U
Uranium 238	U-238	0.449	0.20	0.19	1.0		U
Plutonium 238	13981-16-3	0	0.064	0.25	1.0	U	PU
Plutonium 239/240	PU-239/240	0.064	0.064	0.25	1.0	U	PU
Americium 241	14596-10-2	0.098	0.098	0.19	1.0	U	AM
Potassium 40	13966-00-2	4.58	0.60	0.33			GAM
Cobalt 60	10198-40-0	U		0.048	0.050	U	GAM
Cesium 137	10045-97-3	0.128	0.038	0.048	0.10		GAM
Radium 226	13982-63-3	0.259	0.069	0.072	0.10		GAM
Radium 228	15262-20-1	0.397	0.18	0.18	0.20		GAM
Europium 152	14683-23-9	0.687	0.080	0.082	0.10		GAM
Europium 154	15585-10-1	U		0.17	0.10	U	GAM
Europium 155	14391-16-3	U		0.094	0.10	U	GAM
Thorium 228	14274-82-9	0.308	0.033	0.036			GAM
Thorium 232	TH-232	0.397	0.18	0.18			GAM
Uranium 235	15117-96-1	U		0.13		U	GAM
Uranium 238	U-238	U		4.1		U	GAM
Americium 241	14596-10-2	U		0.12		U	GAM

100 K Area - Full Protocol

3/12/05

Lab id	EBRLNE
Protocol	Hanford
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	02/13/05

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP H2990

R501230-02 J026V6

DATA SHEET

SDG	7765	Client/Case no	Hanford	SDG_H2990
Contact	Melissa C. Mannion	Contract	No. 630	
Lab sample id	R501230-02	Client sample id	J026V6	
Dept sample id	7765-002	Location/Matrix	100-KE-4	SOLID
Received	01/28/05	Collected/Weight	01/26/05 08:20	1778 g
% solids	92.2	Custody/SAF No	B02-063-48	B02-063

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Carbon 14	14762-75-5	-0.237	1.5	2.5	50	U J	C
Nickel 63	13981-37-8	6.56	2.1	3.2	30	J	NI_L
Total Strontium	SR-RAD	0.259	0.12	0.18	1.0		SR
Uranium 233/234	U-233/234	0.755	0.28	0.21	1.0		U
Uranium 235	15117-96-1	0.033	0.065	0.25	1.0	U	U
Uranium 238	U-238	0.324	0.16	0.21	1.0		U
Plutonium 238	13981-16-3	0.028	0.056	0.21	1.0	U	PU
Plutonium 239/240	PU-239/240	0.056	0.056	0.21	1.0	U	PU
Americium 241	14596-10-2	-0.021	0.042	0.16	1.0	U	AM
Potassium 40	13966-00-2	9.44	0.66	0.33			GAM
Cobalt 60	10198-40-0	0.086	0.034	0.032	0.050		GAM
Cesium 137	10045-97-3	0.869	0.060	0.051	0.10		GAM
Radium 226	13982-63-3	0.430	0.084	0.088	0.10		GAM
Radium 228	15262-20-1	0.678	0.16	0.17	0.20		GAM
Europium 152	14683-23-9	2.08	0.11	0.091	0.10		GAM
Europium 154	15585-10-1	0.281	0.11	0.12	0.10		GAM
Europium 155	14391-16-3	U		0.15	0.10	U	GAM
Thorium 228	14274-82-9	0.490	0.040	0.048			GAM
Thorium 232	TH-232	0.678	0.16	0.17			GAM
Uranium 235	15117-96-1	U		0.18		U	GAM
Uranium 238	U-238	U		5.3		U	GAM
Americium 241	14596-10-2	U		0.33		U	GAM

100 K Area - Full Protocol

3/12/05

Lab id	EBRLNE
Protocol	Hanford
Version	Ver 1.0
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Report date	02/13/05

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP H2990

R501230-03 J026V7

DATA SHEET

SDG	7765	Client/Case no	Hanford	SDG H2990	
Contact	Melissa C. Mannion	Contract	No. 630		
Lab sample id	R501230-03	Client sample id	J026V7		
Dept sample id	7765-003	Location/Matrix	100-KE-4	SOLID	
Received	01/28/05	Collected/Weight	01/26/05 08:35	1835 g	
% solids	94.7	Custody/SAF No	B02-063-48	B02-063	

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Carbon 14	14762-75-5	0.554	1.4	2.3	50	U J	C
Nickel 63	13981-37-8	2.36	2.0	3.2	30	U J	NI_L
Total Strontium	SR-RAD	0.273	0.11	0.17	1.0		SR
Uranium 233/234	U-233/234	0.442	0.20	0.19	1.0		U
Uranium 235	15117-96-1	0.030	0.060	0.23	1.0	U	U
Uranium 238	U-238	0.688	0.25	0.19	1.0		U
Plutonium 238	13981-16-3	0	0.055	0.21	1.0	U	PU
Plutonium 239/240	PU-239/240	0.027	0.055	0.21	1.0	U	PU
Americium 241	14596-10-2	0.030	0.059	0.23	1.0	U	AM
Potassium 40	13966-00-2	8.50	0.60	0.37			GAM
Cobalt 60	10198-40-0	U		0.049	0.050	U	GAM
Cesium 137	10045-97-3	0.085	0.029	0.037	0.10		GAM
Radium 226	13982-63-3	0.374	0.077	0.075	0.10		GAM
Radium 228	15262-20-1	0.724	0.16	0.16	0.20		GAM
Europium 152	14683-23-9	U		0.16	0.10	U	GAM
Europium 154	15585-10-1	U		0.16	0.10	U	GAM
Europium 155	14391-16-3	U		0.084	0.10	U	GAM
Thorium 228	14274-82-9	0.675	0.070	0.063			GAM
Thorium 232	TH-232	0.724	0.16	0.16			GAM
Uranium 235	15117-96-1	U		0.14		U	GAM
Uranium 238	U-238	U		5.7		U	GAM
Americium 241	14596-10-2	U		0.053		U	GAM

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Lab id	EBRLNE
Protocol	Hanford
Version	Ver 1.0
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Version	3.06
Report date	02/13/05

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP H2990

R501230-04 J026V8

DATA SHEET

SDG	7765	Client/Case no	Hanford	SDG_H2990	
Contact	Melissa C. Mannion	Contract	No. 630		
Lab sample id	R501230-04	Client sample id	J026V8		
Dept sample id	7765-004	Location/Matrix	100-KE-4	SOLID	
Received	01/28/05	Collected/Weight	01/26/05 08:50	1909 g	
% solids	94.4	Custody/SAF No	B02-063-48	B02-063	

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Carbon 14	14762-75-5	0.576	1.7	2.9	50	U J	C
Nickel 63	13981-37-8	-0.871	1.7	3.0	30	U J	NI_L
Total Strontium	SR-RAD	0.078	0.13	0.25	1.0	U	SR
Uranium 233/234	U-233/234	0.512	0.22	0.21	1.0		U
Uranium 235	15117-96-1	0.033	0.065	0.25	1.0	U	U
Uranium 238	U-238	0.620	0.27	0.21	1.0		U
Plutonium 238	13981-16-3	0	0.056	0.22	1.0	U	PU
Plutonium 239/240	PU-239/240	0	0.056	0.22	1.0	U	PU
Americium 241	14596-10-2	0	0.043	0.16	1.0	U	AM
Potassium 40	13966-00-2	5.74	0.64	0.33			GAM
Cobalt 60	10198-40-0	U		0.036	0.050	U	GAM
Cesium 137	10045-97-3	0.059	0.032	0.038	0.10		GAM
Radium 226	13982-63-3	0.257	0.061	0.063	0.10		GAM
Radium 228	15262-20-1	0.346	0.11	0.12	0.20		GAM
Europium 152	14683-23-9	0.217	0.066	0.081	0.10		GAM
Europium 154	15585-10-1	U		0.12	0.10	U	GAM
Europium 155	14391-16-3	U		0.084	0.10	U	GAM
Thorium 228	14274-82-9	0.273	0.034	0.038			GAM
Thorium 232	TH-232	0.346	0.11	0.12			GAM
Uranium 235	15117-96-1	U		0.13		U	GAM
Uranium 238	U-238	U		4.2		U	GAM
Americium 241	14596-10-2	U		0.12		U	GAM

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EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP H2990

R501230-05 J026V9

DATA SHEET

SDG	7765	Client/Case no	Hanford	SDG H2990	
Contact	Melissa C. Mannion	Contract	No. 630		
Lab sample id	R501230-05	Client sample id	J026V9		
Dept sample id	7765-005	Location/Matrix	100-KE-4	SOLID	
Received	01/28/05	Collected/Weight	01/26/05 08:05	1747 g	
% solids	92.4	Custody/SAF No	B02-063-48	B02-063	

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Carbon 14	14762-75-5	0.147	1.7	2.8	50	U J	C
Nickel 63	13981-37-8	0.872	1.9	3.3	30	U J	NI_L
Total Strontium	SR-RAD	0.076	0.12	0.24	1.0	U	SR
Uranium 233/234	U-233/234	0.528	0.23	0.18	1.0		U
Uranium 235	15117-96-1	0.028	0.056	0.21	1.0	U	U
Uranium 238	U-238	0.436	0.19	0.18	1.0		U
Plutonium 238	13981-16-3	0	0.022	0.086	1.0	U	PU
Plutonium 239/240	PU-239/240	0	0.022	0.086	1.0	U	PU
Americium 241	14596-10-2	-0.025	0.10	0.19	1.0	U	AM
Potassium 40	13966-00-2	9.93	0.66	0.30			GAM
Cobalt 60	10198-40-0	U		0.031	0.050	U	GAM
Cesium 137	10045-97-3	0.067	0.041	0.043	0.10		GAM
Radium 226	13982-63-3	0.405	0.071	0.074	0.10		GAM
Radium 228	15262-20-1	0.711	0.15	0.15	0.20		GAM
Europium 152	14683-23-9	0.282	0.065	0.073	0.10		GAM
Europium 154	15585-10-1	U		0.12	0.10	U	GAM
Europium 155	14391-16-3	U		0.12	0.10	U	GAM
Thorium 228	14274-82-9	0.480	0.041	0.042			GAM
Thorium 232	TH-232	0.711	0.15	0.15			GAM
Uranium 235	15117-96-1	U		0.14		U	GAM
Uranium 238	U-238	U		4.1		U	GAM
Americium 241	14596-10-2	U		0.27		U	GAM

100 K Area - Full Protocol

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Lab id	EBRLNE
Protocol	Hanford
Version	Ver 1.0
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EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP H2990

R501230-06 J026W0

DATA SHEET

SDG	7765	Client/Case no	Hanford	SDG H2990	
Contact	Melissa C. Mannion	Contract	No. 630		
Lab sample id	R501230-06	Client sample id	J026W0		
Dept sample id	7765-006	Location/Matrix	100-KE-4	SOLID	
Received	01/28/05	Collected/Weight	01/26/05 08:38	1760 g	
% solids	92.8	Custody/SAF No	B02-063-48	B02-063	

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Carbon 14	14762-75-5	0.079	1.5	2.5	50	U J	C
Nickel 63	13981-37-8	4.92	2.1	3.2	30	J	NI_L
Total Strontium	SR-RAD	0.023	0.11	0.23	1.0	U	SR
Uranium 233/234	U-233/234	0.840	0.27	0.17	1.0		U
Uranium 235	15117-96-1	0.054	0.054	0.20	1.0	U	U
Uranium 238	U-238	0.641	0.23	0.17	1.0		U
Plutonium 238	13981-16-3	0	0.019	0.073	1.0	U	PU
Plutonium 239/240	PU-239/240	0.019	0.019	0.073	1.0	U	PU
Americium 241	14596-10-2	0	0.046	0.18	1.0	U	AM
Potassium 40	13966-00-2	5.00	0.56	0.19			GAM
Cobalt 60	10198-40-0	U		0.043	0.050	U	GAM
Cesium 137	10045-97-3	U		0.056	0.10	U	GAM
Radium 226	13982-63-3	0.307	0.072	0.076	0.10		GAM
Radium 228	15262-20-1	0.275	0.13	0.15	0.20		GAM
Europium 152	14683-23-9	0.764	0.085	0.085	0.10		GAM
Europium 154	15585-10-1	0.135	0.10	0.12	0.10		GAM
Europium 155	14391-16-3	U		0.096	0.10	U	GAM
Thorium 228	14274-82-9	0.191	0.044	0.056			GAM
Thorium 232	TH-232	0.275	0.13	0.15			GAM
Uranium 235	15117-96-1	U		0.13		U	GAM
Uranium 238	U-238	U		3.8		U	GAM
Americium 241	14596-10-2	U		0.12		U	GAM

100 K Area - Full Protocol

R 3/12/05

Lab id	EBRLNE
Protocol	Hanford
Version	Ver 1.0
Form	DVD-DS
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EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP H2990

R501230-07 J026W1

DATA SHEET

SDG	7765	Client/Case no	Hanford	SDG H2990	
Contact	Melissa C. Mannion	Contract	No. 630		
Lab sample id	R501230-07	Client sample id	J026W1		
Dept sample id	7765-007	Location/Matrix	100-KE-4	SOLID	
Received	01/28/05	Collected/Weight	01/26/05 08:25	1735 g	
% solids	94.8	Custody/SAF No	B02-063-48	B02-063	

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Carbon 14	14762-75-5	-0.426	1.6	2.7	50	U J	C
Nickel 63	13981-37-8	2.50	2.0	3.3	30	U J	NI_L
Total Strontium	SR-RAD	0.022	0.12	0.25	1.0	U	SR
Uranium 233/234	U-233/234	0.387	0.21	0.20	1.0		U
Uranium 235	15117-96-1	0	0.062	0.24	1.0	U	U
Uranium 238	U-238	0.516	0.21	0.20	1.0		U
Plutonium 238	13981-16-3	0	0.021	0.081	1.0	U	PU
Plutonium 239/240	PU-239/240	0.021	0.021	0.081	1.0	U	PU
Americium 241	14596-10-2	0	0.044	0.17	1.0	U	AM
Potassium 40	13966-00-2	11.6	0.78	0.38			GAM
Cobalt 60	10198-40-0	U		0.044	0.050	U	GAM
Cesium 137	10045-97-3	0.073	0.035	0.044	0.10		GAM
Radium 226	13982-63-3	0.476	0.078	0.078	0.10		GAM
Radium 228	15262-20-1	0.520	0.19	0.20	0.20		GAM
Europium 152	14683-23-9	0.688	0.078	0.085	0.10		GAM
Europium 154	15585-10-1	U		0.14	0.10	U	GAM
Europium 155	14391-16-3	U		0.14	0.10	U	GAM
Thorium 228	14274-82-9	0.514	0.042	0.043			GAM
Thorium 232	TH-232	0.520	0.19	0.20			GAM
Uranium 235	15117-96-1	U		0.17		U	GAM
Uranium 238	U-238	U		5.2		U	GAM
Americium 241	14596-10-2	U		0.30		U	GAM

100 K Area - Full Protocol

3/12/05

Lab id	EBRLNE
Protocol	Hanford
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	02/13/05

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP H2990

R501230-08 J026W2

DATA SHEET

SDG	7765	Client/Case no	Hanford SDG H2990
Contact	Melissa C. Mannion	Contract	No. 630
Lab sample id	R501230-08	Client sample id	J026W2
Dept sample id	7765-008	Location/Matrix	100-KE-4 SOLID
Received	01/28/05	Collected/Weight	01/26/05 08:14 1718 g
% solids	94.6	Custody/SAF No	B02-063-48 B02-063

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Carbon 14	14762-75-5	0.965	1.7	2.9	50	U J	C
Nickel 63	13981-37-8	187	6.1	3.4	30	J	NI_L
Total Strontium	SR-RAD	0.499	0.14	0.18	1.0		SR
Uranium 233/234	U-233/234	0.536	0.24	0.18	1.0		U
Uranium 235	15117-96-1	0.056	0.057	0.22	1.0	U	U
Uranium 238	U-238	0.442	0.19	0.18	1.0		U
Plutonium 238	13981-16-3	0	0.051	0.19	1.0	U	PU
Plutonium 239/240	PU-239/240	0.456	0.21	0.19	1.0		PU
Americium 241	14596-10-2	0.257	0.19	0.18	1.0		AM
Potassium 40	13966-00-2	12.4	0.88	0.52			GAM
Cobalt 60	10198-40-0	1.48	0.099	0.070	0.050		GAM
Cesium 137	10045-97-3	1.90	0.14	0.16	0.10		GAM
Radium 226	13982-63-3	0.609	0.21	0.26	0.10		GAM
Radium 228	15262-20-1	0.712	0.43	0.54	0.20		GAM
Europium 152	14683-23-9	35.5	0.53	0.41	0.10		GAM
Europium 154	15585-10-1	4.16	0.33	0.29	0.10		GAM
Europium 155	14391-16-3	U		0.50	0.10	U	GAM
Thorium 228	14274-82-9	0.532	0.091	0.14			GAM
Thorium 232	TH-232	0.712	0.43	0.54			GAM
Uranium 235	15117-96-1	U		0.51		U	GAM
Uranium 238	U-238	U		19		U	GAM
Americium 241	14596-10-2	U		0.95		U	GAM

100 K Area - Full Protocol

3/12/05

Lab id	EBRLNE
Protocol	Hanford
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	02/13/05

Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

1.0 GENERAL

Bechtel Hanford Inc. (BHI) Sample Delivery Group H2990 was composed of eight soil samples designated under SAF No. B02-063 with a Project Designation of: 100 K Area – Full Protocol.

The samples were received as stated on the Chain-of-Custody documents. Any discrepancies are noted on the Eberline Services Sample Receipt Checklist. The results were transmitted to BHI via e-mail on February 14, 2005. The electronic data deliverable (EDD) was transmitted to BHI via e-mail on February 14, 2005.

2.0 ANALYSIS NOTES

2.1 Carbon-14 Analyses

No problems were encountered during the course of the analyses.

2.2 Nickel-63 Analyses

No problems were encountered during the course of the analyses.

2.3 Total Strontium Analyses

No problems were encountered during the course of the analyses.

2.4 Isotopic Uranium Analyses

No problems were encountered during the course of the analyses.

2.5 Isotopic Plutonium Analyses

No problems were encountered during the course of the analyses.

2.6 Americium-241 Analyses

No problems were encountered during the course of the analyses.

2.7 Gamma Spectroscopy Analyses

No problems were encountered during the course of the analyses.

Case Narrative Certification Statement

"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 obtained in this hard copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature."

Melissa C. Mannion
Senior Program Manager

2/14/5
Date

Bechtel Hanford Inc.	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	B02-063-48	Page 1 of 2

Collector ~~NEAL~~ RTC 1/26/05 TRICE / COFFMAN	Company Contact ~~Cindy Neal~~ RTC R. COFFMAN	Telephone No. ~~528-7260~~ RTC 528-6409	Project Coordinator KESSNER, JH
Project Designation 100 K Area - Full Protocol	Sampling Location 116-KE-4 H2990 (7765)		SAF No. B02-063
Ice Chest No. AFS 04 010 ~~ERC-99-065~~ 4/D 12705	Field Logbook No. EL-1572-2	COA R16KE42000	Method of Shipment FEDEX
Shipped To EBERLINE SERVICES (Formerly TMA)	Offsite Property No. A050 100		Bill of Lading/Air Bill No. SEE OSPC

Price Code: Air Quality

Data Turnaround: ~~21~~ 14 Days

RTC 1/26/04

POSSIBLE SAMPLE HAZARDS/REMARKS

RAD

Special Handling and/or Storage

4 DEGREES COOL HISTORICAL DATA INDCATES THAT SAMPLES ARE LESS THAN 2000 pCi/gram.

000022

Preservation	Cool 4C	None	None	None						
Type of Container	G/P	G/P	G/P	G/P						
No. of Container(s)	1	1	1	1						
Volume	125mL	1000mL	60mL	60mL						
SAMPLE ANALYSIS	Chromium Hex - 7196	See item (1) in Special Instructions	Isotopic Plutonium; Isotopic Uranium; Americium-241	Strontium-89,90 -- Total Sr; Nickel-63; Carbon-14						

Sample No.	Matrix *	Sample Date	Sample Time										
~~J026V4~~	~~SOIL~~												
J026V5	SOIL	1-26-05	0810	X	X	X	X					S	C9
J026V6	SOIL		0820	X	X	X	X					S	C10
J026V7	SOIL		0835	X	X	X	X					S	C1
J026V8	SOIL	1-26-05	0850	X	X	X	X					S	C2

CHAIN OF POSSESSION	Sign/Print Names	
Relinquished By/Removed From: RTCOFFMAN/RT Coffman Date/Time 1/26/05 1520	Received By/Stored In: REFER #1-A Date/Time 1/26/05 1520	
Relinquished By/Removed From: REF 1A Date/Time 12705 1000	Received By/Stored In: SJGALE Date/Time 12705 1000	
Relinquished By/Removed From: SJGALE Date/Time 12705 1000	Received By/Stored In: FEDEX Date/Time	
Relinquished By/Removed From: FEDEX Date/Time 1/28/05	Received By/Stored In: Eberline Date/Time 1/28/05 1000	
Relinquished By/Removed From: Date/Time	Received By/Stored In: Date/Time	
Relinquished By/Removed From: Date/Time	Received By/Stored In: Date/Time	

SPECIAL INSTRUCTIONS

(1) Gamma Spectroscopy (TCL List) {Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155}

Personnel not available to relinquish samples from 3728 Ref # 1A on 1/27/05

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

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

Bechtel Hanford Inc.	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		B02-063-48	Page 2 of 2
Collector ~~NEAL~~ PTC 1/26/05 TRICE/COFFMAN	Company Contact ~~Cindy Neal~~ RTC R. COFFMAN	Telephone No. ~~528-7260~~ RTC 528-6409	Project Coordinator KESSNER, JH	Price Code Air Quality / Data Turnaround ~~21~~ 14 Days RTC 1/26/05
Project Designation 100 K Area - Full Protocol	Sampling Location 116-KE-4 H2990 (7765)		SAF No. B02-063	
Ice Chest No. AFS 04 010 ~~ERC-99-065~~ 1/26/05	Field Logbook No. EL-1572-2	COA R16KE42000	Method of Shipment FEDEX	
Shipped To EBERLINE SERVICES (Formerly TMA)	Offsite Property No. A050100		Bill of Lading/Air Bill No. SEE OSPC	

POSSIBLE SAMPLE HAZARDS/REMARKS

RAD

Special Handling and/or Storage

4 DEGREES COOL HISTORICAL DATA INDCATES THAT SAMPLES ARE LESS THAN 2000 pCi/gram.

000023

Preservation	Cool 4C	None	None	None								
Type of Container	G/P	G/P	G/P	G/P								
No. of Container(s)	1	1	1	1								
Volume	125mL	1000mL	60mL	60mL								
SAMPLE ANALYSIS	Chromium Hex - 7196	See item (1) in Special Instructions.	Isotopic Plutonium; Isotopic Uranium; Americium-241	Strontium-89,90 -- Total Sr; Nickel-63; Carbon-14								
Sample No.	Matrix *	Sample Date	Sample Time									
J026V9	SOIL	1-26-05	0805	X	X	X	X				S	D3
J026W0	SOIL		0838	X	X	X	X				S	D4
J026W1	SOIL		0825	X	X	X	X				S	D5
J026W2	SOIL	1-26-05	0814	X	X	X	X				S	D6

CHAIN OF POSSESSION — Sign/Print Names

Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
RT COFFMAN / RT Coffman 1/26/05	1520	REFER # 1-A	1520 1/26/05
REF 1A	12705 1000	SJ GALE / SJ Gale	12705 1000
SJ GALE / SJ Gale	12705 1000	FED EX	

SPECIAL INSTRUCTIONS

(1) Gamma Spectroscopy (TCL List) {Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155}

Personnel not available to Relinquish samples from 3728 Ref # A on 1/27/05

Matrix *
S=Soil
SE=Sediment
SO=Solid
SI=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

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

Appendix 5

Data Validation Supporting Documentation

APPENDIX A

RADIOCHEMICAL DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
PROJECT: 100K 116-KE-4			DATA PACKAGE: #2990		
VALIDATOR: TLI		LAB:		DATE: 3/9/05	
			SDG: #2990		
ANALYSES PERFORMED					
Gross Alpha/Beta Total Uranium	Strontium-90 Radium-22	Technetium-99 Tritium	Alpha Spectroscopy	Gamma Spectroscopy Ni-63	C-14
SAMPLES/MATRIX					
J026U5 J026U6 J026U7 J026U8 J026U9					
J026W0 J026W1 J026W2					
					Soil

1. Completeness ..... ☐ N/A

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

Comments: _____

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

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

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

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

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

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

Comments: _____

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

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

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

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

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

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

Comments: _____

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

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

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

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

Comments: _____

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

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

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

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

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

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

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

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

Comments: No FB

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

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

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

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

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

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

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

Comments:

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

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

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

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

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

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

Comments: _____

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

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

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

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

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

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

Comments: _____

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

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

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

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

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

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

Comments: C-14 + Ni-63 - no MS Jall

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

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

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

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

Comments: _____

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

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

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

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

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

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

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

Comments: _____

12. Holding Times (All levels)

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

Comments: _____

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

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

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

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

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

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

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

Comments: 16 over

Appendix 6

Additional Documentation Requested by Client

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP H2990

R501230-10 Method Blank

METHOD BLANK

SDG	7765	Client/Case no	Hanford SDG H2990
Contact	Melissa C. Mannion	Contract	No. 630
Lab sample id	R501230-10	Client sample id	Method Blank
Dept sample id	7765-010	Material/Matrix	SOLID
		SAF No	B02-063

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Carbon 14	14762-75-5	0.035	2.0	3.4	50	U	C
Nickel 63	13981-37-8	0.249	1.7	2.9	30	U	NI_L
Total Strontium	SR-RAD	-0.076	0.11	0.25	1.0	U	SR
Uranium 233/234	U-233/234	0.027	0.054	0.21	1.0	U	U
Uranium 235	15117-96-1	0	0.066	0.25	1.0	U	U
Uranium 238	U-238	0	0.054	0.21	1.0	U	U
Plutonium 238	13981-16-3	0	0.38	1.5	1.0	U	PU
Plutonium 239/240	PU-239/240	0	0.38	1.5	1.0	U	PU
Americium 241	14596-10-2	0.066	0.088	0.17	1.0	U	AM
Potassium 40	13966-00-2	U		0.18		U	GAM
Cobalt 60	10198-40-0	U		0.013	0.050	U	GAM
Cesium 137	10045-97-3	U		0.014	0.10	U	GAM
Radium 226	13982-63-3	U		0.024	0.10	U	GAM
Radium 228	15262-20-1	U		0.054	0.20	U	GAM
Europium 152	14683-23-9	U		0.034	0.10	U	GAM
Europium 154	15585-10-1	U		0.039	0.10	U	GAM
Europium 155	14391-16-3	U		0.022	0.10	U	GAM
Thorium 228	14274-82-9	U		0.015		U	GAM
Thorium 232	TH-232	U		0.054		U	GAM
Uranium 235	15117-96-1	U		0.039		U	GAM
Uranium 238	U-238	U		1.8		U	GAM
Americium 241	14596-10-2	U		0.020		U	GAM

100 K Area - Full Protocol

QC-BLANK 51740

Lab id	EBRLNE
Protocol	Hanford
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	02/13/05

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP H2990

R501230-09 Lab Control Sample

LAB CONTROL SAMPLE

SDG 7765
Contact Melissa C. Mannion

Client/Case no Hanford SDG H2990
Contract No. 630

Lab sample id R501230-09
Dept sample id 7765-009

Client sample id Lab Control Sample
Material/Matrix SOLID
SAF No B02-063

ANALYTE	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST	ADDED pCi/g	2σ ERR pCi/g	REC %	3σ LMTS (TOTAL)	PROTOCOL LIMITS
Carbon 14	1620	16	3.6	50		C	1600	64	101	84-116	80-120
Nickel 63	229	7.3	3.6	30		NI_L	226	9.0	101	83-117	80-120
Total Strontium	11.1	0.38	0.14	1.0		SR	10.1	0.40	110	82-118	80-120
Uranium 233/234	18.0	2.1	0.95	1.0		U	18.6	0.74	97	81-119	80-120
Uranium 235	14.5	1.8	0.25	1.0		U	15.1	0.60	96	80-120	80-120
Uranium 238	18.6	2.1	0.92	1.0		U	20.2	0.81	92	82-118	80-120
Plutonium 238	22.3	2.0	0.17	1.0		PU	24.0	0.96	93	84-116	80-120
Plutonium 239/240	25.1	2.2	0.17	1.0		PU	26.4	1.1	95	84-116	80-120
Americium 241	21.3	2.0	0.18	1.0		AM	20.4	0.82	104	82-118	80-120
Cobalt 60	0.669	0.054	0.021	0.050		GAM	0.652	0.026	103	73-127	80-120
Cesium 137	0.653	0.048	0.031	0.10		GAM	0.636	0.025	103	74-126	80-120

100 K Area - Full Protocol

QC-LCS 51739

Lab id EBRLNE
Protocol Hanford
Version Ver 1.0
Form DVD-LCS
Version 3.06
Report date 02/13/05

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP H2990

R501230-11 J026V6

DUPLICATE

SDG	7765			Client/Case no	Hanford SDG H2990
Contact	Melissa C. Mannion			Contract	No. 630
DUPLICATE		ORIGINAL			
Lab sample id	R501230-11	Lab sample id	R501230-02	Client sample id	J026V6
Dept sample id	7765-011	Dept sample id	7765-002	Location/Matrix	100-KE-4 SOLID
		Received	01/28/05	Collected/Weight	01/26/05 08:20 1778 g
% solids	92.2	% solids	92.2	Custody/SAF No	B02-063-48 B02-063

ANALYTE	DUPLICATE pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST	ORIGINAL pCi/g	2σ ERR (COUNT)	MDA pCi/g	QUALI-FIERS	RPD %	3σ TOT	PROT LIMIT
Carbon 14	-0.326	1.5	2.6	50	U	C	-0.237	1.5	2.5	U	-		
Nickel 63	6.91	2.2	3.2	30		NI_L	6.56	2.1	3.2		5	71	
Total Strontium	0.121	0.11	0.16	1.0	U	SR	0.259	0.12	0.18		73	130	
Uranium 233/234	0.501	0.24	0.18	1.0		U	0.755	0.28	0.21		40	89	
Uranium 235	0	0.058	0.22	1.0	U	U	0.033	0.065	0.25	U	-		
Uranium 238	0.620	0.24	0.18	1.0		U	0.324	0.16	0.21		63	92	
Plutonium 238	0.044	0.044	0.17	1.0	U	PU	0.028	0.056	0.21	U	-		
Plutonium 239/240	0.022	0.044	0.17	1.0	U	PU	0.056	0.056	0.21	U	-		
Americium 241	0.119	0.14	0.18	1.0	U	AM	-0.021	0.042	0.16	U	-		
Potassium 40	8.79	0.80	0.50			GAM	9.44	0.66	0.33		7	36	
Cobalt 60	0.110	0.045	0.041	0.050		GAM	0.086	0.034	0.032		24	92	
Cesium 137	0.866	0.076	0.067	0.10		GAM	0.869	0.060	0.051		0	36	
Radium 226	0.470	0.088	0.091	0.10		GAM	0.430	0.084	0.088		9	52	
Radium 228	0.586	0.20	0.25	0.20		GAM	0.678	0.16	0.17		15	69	
Europium 152	2.00	0.13	0.12	0.10		GAM	2.08	0.11	0.091		4	34	
Europium 154	0.314	0.16	0.17	0.10		GAM	0.281	0.11	0.12		11	103	
Europium 155	U		0.14	0.10	U	GAM	U		0.15	U	-		
Thorium 228	0.500	0.048	0.058			GAM	0.490	0.040	0.048		2	37	
Thorium 232	0.586	0.20	0.25			GAM	0.678	0.16	0.17		15	69	
Uranium 235	U		0.19		U	GAM	U		0.18	U	-		
Uranium 238	U		6.6		U	GAM	U		5.3	U	-		
Americium 241	U		0.18		U	GAM	U		0.33	U	-		

100 K Area - Full Protocol

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Protocol Hanford
Version Ver 1.0
Form DVD-DUP
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