



9613445.503

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0GCJ9	Date Collected: 25-AUG-95
Matrix: SolidWaste	Date Received: 07-SEP-95
Percent Solids: 72.44	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Total Organic Carbon	mg/kg	9060	< 15.	100	*U	22-SEP-95	27328	L5287-7

9613445.1504

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0GCK6	Date Collected: 26-AUG-95
Matrix: Soil	Date Received: 07-SEP-95
Percent Solids: 77.65	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Total Organic Carbon	mg/kg	9060	1900	100	*	22-SEP-95	27328	L5287-10

9615445.1505

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0GCL7	Date Collected: 27-AUG-95
Matrix: Soil	Date Received: 07-SEP-95
Percent Solids: 58.39	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Total Organic Carbon	mg/kg	9060	11000	100	*	22-SEP-95	27328	L5287-13

9613445.1506

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0GCM9	Date Collected: 28-AUG-95
Matrix: SolidWaste	Date Received: 07-SEP-95
Percent Solids: 67.85	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Total Organic Carbon	mg/kg	9060	< 15.	100	*U	22-SEP-95	27328	L5287-16

**Sample Disposition Record**

Control #: B95-0062

Revision #: 0

Date Initiated: 09/13/95

**Section 1 - BACKGROUND**

SAF #: B95-083

OU: N/A

Project ID: 100 EFFL PIPE

Task ID: 1

Sampling Event: EFFLUENT PIPELINE

Laboratory: Quanterra

Project Coordinator: JA Lerch

Task Manager: DB Encke

**Section 2 - SAMPLE INFORMATION**

Number of Samples: All samples associated with SAF# B95-083 requesting C-14 analysis

ID Numbers: All samples associated with SAF# B95-083 requesting C-14 analysis

Matrix: Soil

Collection Date: Approximately 08/01/95

**Section 3 - ISSUE**

Class: Lab Direction

NCR Number: N/A

Type: Insufficient Volume

Description: Samples received by Quanterra contained insufficient volume to analyze for C-14.

N/A

NCR Validation (Print/Sign)

Date

**Section 4 - DISPOSITION**

Type: Reject

Description: The C-14 analysis will be cancelled.

JA Lerch

*Michael David (for JAL)*

9/13/95

Project Coordinator (Print/Sign)

Date

DB Encke

*DB Encke*

9/18/95

Task Manager (Print/Sign)

Date

N/A

QA (Print/Sign)

Date

**Section 5 - INSPECTION (Issue Class: Nonconformance Only)**

Inspection Number: N/A

Inspection Results: N/A

N/A

Inspector (Print/Sign)

Date

**Sample Disposition Record**

Control #: 96-0005

Revision #: 0

Date Initiated: 10/12/95

**Section 1 - BACKGROUND**

SAF #: B95-083

OU: N/A

Project ID: 100 EFFL Pipe

Task ID: 1

Sampling Event: EFFLUENT PIPELINE ERA SAMPLING

Laboratory: Lockheed

Project Coordinator: JA Lerch

Task Manager: DB Encke

**Section 2 - SAMPLE INFORMATION**

Number of Samples: 4

ID Numbers: B0GCJ9, B0GCK6, B0GCL7, and B0GCM9

Matrix: Soil/Other

Collection Date: Aproximately 08/27/95

**Section 3 - ISSUE**

Class: Lab Direction

NCR Number: N/A

Type: Revision of Direction

Description: Mercury was not originally placed on the SAF as an analyte of interest.

N/A

NCR Validation (Print/Sign)

Date

**Section 4 - DISPOSITION**

Type: REWORK

Description: Mercury will be analyzed for sample numbers B0GCJ9, B0GCK6, B0GCL7, and B0GCM9 by Lockheed on a PRIORITY turnaround time. The ERC recognizes that the holding time for the analysis will be exceeded. Data will be due to ERC-Sample Management on October 30, 1995.

JA Lerch



10/12/95

Project Coordinator (Print/Sign)

Date

DB Encke



10/16/95

Task Manager (Print/Sign)

Date

N/A

QA (Print/Sign)

Date

**Section 5 - INSPECTION (Issue Class: Nonconformance Only)**

Inspection Number: N/A

Inspection Results: N/A

N/A

Inspector (Print/Sign)

Date

9613445.1509

Lockheed Environmental Systems & Technologies Co.  
Lockheed Analytical Services  
975 Kelly Johnson Drive Las Vegas, Nevada 89119-3705  
Telephone 702-361-0220 800-582-7605 Facsimile 702-361-8146



September 29, 1995

Ms. Joan Kessner  
Bechtel Hanford, Inc.  
345 Hills  
P.O. Box 969  
Richland, WA 99352

RE:	Log-in No.:	L5287
	Quotation No.:	Q400000-B
	SAF:	B95-083
	Document File No.:	0907596
	BHI Document File No.:	271
	SDG No.:	LK5287



The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on September 7, 1995. The temperature of the cooler upon receipt was 3°C. Sample containers received agree with the chain-of-custody documentation. Sample containers were received intact. Samples were received in time to meet the analytical holding time requirements.

The case narratives included in the following attachments provide a detailed description of all events that occurred during sample preparation, analysis, and data review specific to the samples and analytical methods requested.

A list of data qualifiers, chain-of-custody forms, sample receiving checklist, and log-in report are also enclosed representing the samples received within this group.

If you have any questions concerning the analysis or the data please call Kathleen Hall at (509) 943-4423.

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**Lockheed Analytical Services**

Log-in No.: L5287  
Quotation No.: Q400000-B  
SAF: B95-083  
Document File No.: 0907596  
BHI Document File No.: 271  
SDG No.: LK5287

Release of this data report has been authorized by the Laboratory Director or the Director's designee as evidenced by the following signature.

" 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 Manger or a designee, as verified by the following signature."

Sincerely,



Kathleen M. Hall  
Client Services Representative

cc: Client Services  
Document Control

**Lockheed Analytical Services**

Log-in No.: L5287  
 Quotation No.: Q400000-B  
 SAF: B95-083  
 Document File No.: 0907596  
 BHI Document File No.: 271  
 SDG No.: LK5287

**CASE NARRATIVE  
 INORGANIC TOC ANALYSES**

The routine calibration and quality control analyses performed for this batch include as applicable: initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), matrix spike sample(s), and duplicate sample(s).

**Preparation and Analysis Requirements**

- Two soil and two solid waste samples were received for LK5287 and analyzed in batch 907 bh for selected analytes as requested on the chain of custody. Quality control analysis was performed on the following sample:

Client ID	LAL #		Method
BOGCK6	L5287-10	DUP	9060 Total Organic Carbon

**Holding Time Requirements**

- All samples were analyzed within method-specific holding times.

**Method Blanks**

- The concentration levels of all the requested analytes in the method blank were below the reporting detection limits.

**Internal Quality Control**

- All Internal Quality Control were within acceptance limits with the following exception:

For Method 9060 Total Organic Carbon for soil and solid waste (1) The TOC values are calculated by subtracting TIC values from TC values. Therefore, only a duplicate sample result and RPD are reported in the QC section. The duplicate sample precision was outside of acceptance limits. All associated samples are flagged with an "\*\*".

Kay McCann  
 Prepared By

September 25, 1995  
 Date

**Lockheed Analytical Services**

Log-in No.: L5287  
Quotation No.: Q400000-B  
SAF: B95-083  
Document File No.: 0907596  
BHI Document File No.: 271  
SDG No.: LK5287

## **CASE NARRATIVE INORGANIC METALS ANALYSES**

The routine calibration and quality control analyses performed for this batch include as applicable: instrument tune (ICP/MS only), initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), ICP interference check samples (ICP only), serial dilutions, analytical (post-digestion) spike samples, matrix spike (predigestion) sample(s), duplicate sample(s).

### **Preparation and Analysis Requirements**

All samples were received on September 7, 1995. The samples were logged in as L5287 and were prepared and analyzed in batch 907 bh.

### **Holding Time Requirements**

- All samples were analyzed within the method-specific holding times.

### **Method Blanks**

- The concentration levels of all the requested analytes in the method blank were below the reporting detection limits.

### **Internal Quality Control**

- All Internal Quality Control were within acceptance limits with the following exceptions: The matrix spike recoveries for antimony (58%), cadmium (150%), copper (126%), lead (166%), and thallium (51%) were outside of acceptance limits. The recoveries based on the LCS Solid ERA #222 (antimony 122.2%, cadmium 97.5%, copper 104.2%, lead 100.4%, and thallium 130.7%) were all within the manufacturers control limits, indicating the analytical system was operating within control limits.
- The matrix spike recoveries for aluminum, chromium, iron, manganese and zinc exceeded the 75-125% acceptance limit, however, the sample concentration is considered significant (i.e., greater than four times the spiking level) relative to the amount spiked into the sample. Therefore, the data are not qualified.
- The duplicate sample precision for aluminum (59%), chromium (30%), manganese (23%) and zinc (42%) were outside of acceptance limits indicating variability may be attributed to the inhomogeneity of soil and solid waste samples of this type.

### **Sample Results**

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961016, CA

**Lockheed Analytical Services**

Log-in No.: L5287  
Quotation No.: Q400000-B  
SAF: B95-083  
Document File No.: 0907596  
BHI Document File No.: 271  
SDG No.: LK5287

- Results are reported on a dry weight basis.

Shellee McGrath  
**Prepared By**

September 25, 1995  
**Date**

**000007**

9613446.1514

**Lockheed Analytical Services**

Log-in No.: L5287  
Quotation No.: Q400000-B  
SAF: B95-083  
Document File No.: 0907596  
BHI Document File No.: 271  
SDG No.: LK5287

## **CASE NARRATIVE INORGANIC TOTAL URANIUM ANALYSES**

The routine calibration and quality control analyses performed for this batch include as applicable: instrument calibration, initial and continuing calibration verification, quench monitoring standards, instrument background analysis, method blanks, yield tracer, laboratory control samples, matrix spike samples, and matrix spike duplicate samples.

### **Preparation and Analysis Requirements**

All samples were received on September 7, 1995. The samples were logged in as L5287.

### **Holding Time Requirements**

All holding time requirements were met.

### **Total Uranium**

The Total Uranium analysis was performed using LAL-91-SOP-0168. All samples were prepared in Workgroup U TOTAL KPA LAL-0168\_27388 with a Method Blank (MBB), Laboratory Control Sample (LCS1), Duplicate (DUP) and Matrix Spike (MS). No problems were encountered during preparation or analysis. All QC criteria were met and no reanalysis was performed.

Shellee McGrath  
Prepared By

September 25, 1995  
Date

**000008**

9613445.1515

**Lockheed Analytical Services**

Log-in No.: L5287  
Quotation No.: Q400000-B  
SAF: B95-083  
Document File No.: 0907596  
BHI Document File No.: 271  
SDG No.: LK5287

## **CASE NARRATIVE RADIOCHEMICAL ANALYSES**

The routine calibration and quality control (QC) analyses performed for this batch include as applicable: instrument calibration, initial and continuing calibration verification, quench monitoring standards, instrument background analysis, method blanks, yield tracer, laboratory control samples, matrix spike samples, duplicate samples.

### **Alpha Spectrometry**

#### *Analytical Method Isotopic Plutonium*

The isotopic plutonium analysis was performed using standard operating procedure (SOP), LAL-91-SOP-0108. The samples were analyzed in workgroups 27298 and 27305. No problems were encountered during analysis and all QC criteria were met. No re-analyses were performed.

### **Gamma Spectrometry**

#### *Analytical Method Gamma Spectrometry*

The gamma spectrometry analysis was performed using SOP, LAL-91-SOP-0064. The samples were analyzed in workgroups 27296 and 27304. No problems were encountered during the analysis and all QC criteria were met with the following exception: Elevated activity in the client samples and limited aliquot volumes caused the minimum detectable activities (MDAs) to be above the client reporting detection limit (RDL) for both workgroups. Data quality is not believed to be adversely affected. No re-analyses were performed.

### **Gas Proportional Counter**

#### *Analytical Method Gross Alpha/Beta*

The gross alpha/beta analysis was performed using SOPs, LAL-91-SOP-0060 and LAL-91-SOP-0061. The samples were analyzed in workgroups 27297 and 27307. No problems were encountered during analysis and all QC criteria were met with the following exceptions: The matrix spike (MS) recoveries were out of QC criteria in workgroup 27297 due to a problem with the MS flattening. The MS was somewhat fluffy and clumping, therefore we could not spread an even flat layer across the planchet. This caused a much higher counting efficiency (unmeasurable) than off the quench curve. Because all other QC criteria were met data quality is not believed to be adversely affected. The alpha MS recovery was out of criteria due to the effect of alpha spiking a soil matrix in workgroup 27307. Because all other QC criteria were met data quality is not believed to be adversely affected. No re-analyses were performed.

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**Lockheed Analytical Services**Log-in No.: L5287  
Quotation No.: Q400000-B  
SAF: B95-083  
Document File No.: 0907596  
BHI Document File No.: 271  
SDG No.: LK5287**Liquid Scintillation Counter***Analytical Method Carbon-14*

The carbon-14 analysis was performed using SOP, LAL-93-SOP-0209. The samples were analyzed in workgroups 27176 and 27177. No problems were encountered during analysis and all QC criteria were met with the following exceptions: The MS was out of QC criteria in workgroup 27176. Because the MS spike amount was < 10% of the sample activity data quality is not believed to be adversely affected. The MS was out of QC criteria in workgroup 27177. Because the MS spike amount was only 20% of the sample activity data quality is not believed to be adversely affected. The relative error recovery was out of QC criteria in workgroup 27177, possibly due to sample inhomogeneity. Data quality is not believed to be adversely affected. No re-analyses were performed.

*Analytical Method Nickel-63*

The nickel-63 analysis was performed using SOP, LAL-93-SOP-0224. The samples were analyzed in workgroups 27693 and 27695. No problems were encountered during the analysis and all QC criteria were met. No re-analyses were performed.

*Analytical Method Tritium*

The tritium analysis was performed using SOP, LAL-91-SOP-0067. The samples were analyzed in workgroups 27299 and 27306. No problems were encountered during analysis and all QC criteria were met. No re-analyses were performed.

Andrea Tippett  
Prepared BySeptember 27, 1995  
Date

9613445.1517

LOCKHEED ANALYTICAL SERVICES  
 LOGIN CHAIN OF CUSTODY REPORT (ln01)  
 Sep 07 1995, 05:11 pm

Login Number: L5287  
 Account: 596 Bechtel Hanford, Inc. \* Richland, WA  
 Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	Due PR Date
L5287-1 temp 3; SAF# B95-083 Location: 157 SolidWaste 8 S SCREENING	BOGCJ9	25-AUG-95	07-SEP-95	22-SEP-95
L5287-2 temp 3; SAF# B95-083 Location: 157 Soil 4 S SCREENING	BOGCK6	26-AUG-95	07-SEP-95	22-SEP-95
			Hold:22-FEB-96	
L5287-3 temp 3; SAF# B95-083 Location: 157 Soil 4 S SCREENING	BOGCL7	27-AUG-95	07-SEP-95	22-SEP-95
			Hold:23-FEB-96	
L5287-4 temp 3; SAF# B95-083 Location: 157 SolidWaste 8 S SCREENING	BOGCM9	28-AUG-95	07-SEP-95	22-SEP-95
L5287-5 temp 3; SAF# B95-083 Location: 157 SolidWaste 8 S C-14 LAL-0209 SolidWaste 8 S GAMMA SPEC LAL-0064 SolidWaste 8 S GR ALP/BETA LAL-0060 SolidWaste 8 S NI-63 LAL-0224 SolidWaste 8 S PU-ISOTOPIC LAL-0108 SolidWaste 8 S TRITIUM(H3) LAL-0067 SolidWaste 8 S U TOTAL KPA (INORG)	BOGCJ9	25-AUG-95	07-SEP-95	22-SEP-95
			Hold:21-FEB-96	
L5287-6 temp 3; SAF# B95-083 Location: RAD2(RM156) SolidWaste 8 S 6010 ICP METALS SolidWaste 8 S PERCENT SOLIDS	BOGCJ9	25-AUG-95	07-SEP-95	22-SEP-95
			Hold:21-FEB-96	
			Hold:08-SEP-95	
L5287-7 temp 3; SAF# B95-083 Location: RAD2(RM156) SolidWaste 8 S 9060 TOC	BOGCJ9	25-AUG-95	07-SEP-95	22-SEP-95
			Hold:22-SEP-95	

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LOCKHEED ANALYTICAL SERVICES  
 LOGIN CHAIN OF CUSTODY REPORT (ln01)  
 Sep 07 1995, 05:11 pm

Login Number: L5287  
 Account: 596 Bechtel Hanford, Inc. \* Richland, WA  
 Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	Due PR Date
L5287-8 temp 3; SAF# B95-083 Location: 157	BOGCK6	26-AUG-95	07-SEP-95	22-SEP-95
Soil 4	S C-14 LAL-0209	Hold:22-FEB-96		
Soil 4	S GAMMA SPEC LAL-0064	Hold:22-FEB-96		
Soil 4	S GR ALP/BETA LAL-0061	Hold:22-FEB-96		
Soil 4	S NI-63 LAL-0224	Hold:22-FEB-96		
Soil 4	S PU-ISOTOPIC LAL-0108	Hold:22-FEB-96		
Soil 4	S TRITIUM(H3) LAL-0067	Hold:22-FEB-96		
Soil 4	S U TOTAL KPA (INORG)	Hold:22-FEB-96		
L5287-9 temp 3; SAF# B95-083 Location: RAD2(RM156)	BOGCK6	26-AUG-95	07-SEP-95	22-SEP-95
Soil 4	S 6010 ICP METALS	Hold:22-FEB-96		
Soil 4	S PERCENT SOLIDS	Hold:09-SEP-95		
L5287-10 temp 3; SAF# B95-083 Location: RAD2(RM156)	BOGCK6	26-AUG-95	07-SEP-95	22-SEP-95
Soil 4	S 9060 TOC	Hold:23-SEP-95		
L5287-11 temp 3; SAF# B95-083 Location: 157	BOGCL7	27-AUG-95	07-SEP-95	22-SEP-95
Soil 4	S C-14 LAL-0209	Hold:23-FEB-96		
Soil 4	S GAMMA SPEC LAL-0064	Hold:23-FEB-96		
Soil 4	S GR ALP/BETA LAL-0061	Hold:23-FEB-96		
Soil 4	S NI-63 LAL-0224	Hold:23-FEB-96		
Soil 4	S PU-ISOTOPIC LAL-0108	Hold:23-FEB-96		
Soil 4	S TRITIUM(H3) LAL-0067	Hold:23-FEB-96		
Soil 4	S U TOTAL KPA (INORG)	Hold:23-FEB-96		
L5287-12 temp 3; SAF# B95-083 Location: RAD2(RM156)	BOGCL7	27-AUG-95	07-SEP-95	22-SEP-95
Soil 4	S 6010 ICP METALS	Hold:23-FEB-96		
Soil 4	S PERCENT SOLIDS	Hold:10-SEP-95		
L5287-13 temp 3; SAF# B95-083 Location: RAD2(RM156)	BOGCL7	27-AUG-95	07-SEP-95	22-SEP-95
Soil 4	S 9060 TOC	Hold:24-SEP-95		

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LOCKHEED ANALYTICAL SERVICES  
LOGIN CHAIN OF CUSTODY REPORT (ln01)  
Sep 07 1995, 05:11 pm

Login Number: L5287  
Account: 596 Bechtel Hanford, Inc. \* Richland, WA  
Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	Due PR Date
L5287-14 temp 3; SAF# B95-083 Location: 157	BOGCM9	28-AUG-95	07-SEP-95	22-SEP-95
SolidWaste 8 S C-14 LAL-0209		Hold:24-FEB-96		
SolidWaste 8 S GAMMA SPEC LAL-0064		Hold:24-FEB-96		
SolidWaste 8 S GR ALP/BETA LAL-0060		Hold:24-FEB-96		
SolidWaste 8 S NI-63 LAL-0224		Hold:24-FEB-96		
SolidWaste 8 S PU-ISOTOPIIC LAL-0108		Hold:24-FEB-96		
SolidWaste 8 S TRITIUM(H3) LAL-0067				
SolidWaste 8 S U TOTAL KPA (INORG)		Hold:24-FEB-96		
L5287-15 temp 3; SAF# B95-083 Location: RAD2(RM156)	BOGCM9	28-AUG-95	07-SEP-95	22-SEP-95
SolidWaste 8 S 6010 ICP METALS		Hold:24-FEB-96		
SolidWaste 8 S PERCENT SOLIDS		Hold:11-SEP-95		
L5287-16 temp 3; SAF# B95-083 Location: RAD2(RM156)	BOGCM9	28-AUG-95	07-SEP-95	22-SEP-95
SolidWaste 8 S 9060 TOC		Hold:25-SEP-95		
L5287-17 SAF# B95-083 Location:	REPORT TYPE	07-SEP-95	07-SEP-95	22-SEP-95
Water 1 S EDD - DISK DEL.				
Water 1 S INORG TYPE 2 RPT +				
Water 1 S RAD RPT TYPE 2				

Signature: *[Handwritten Signature]*

Date: 9.7.95

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# LS287

<b>Westinghouse Hanford Company</b>	<b>CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST</b>	<b>C.O.C#</b> 009517
		Page 1 of 2

Collector <b>HULSE, KARL</b>	Contact/Requestor <b>ENCKE, DAVID B.</b>	Tel No. 373-3461 MSIN X5-53 FAX
SAF Number <b>B95-083</b>	Sample Origin <b>100 AREA</b>	Purchase Order/Charge Code
Project Title <b>100 EFFL Pipe</b>	Logbook # <b>WHC-N-205 #52</b>	Ice Chest # <b>SML-482</b> Temp.
Shipped To (Lab) <b>Lockheed</b>	Method of Shipment <b>FEDERAL EXPRESS</b>	Bill of Lading/Air Bill No.
Protocol <b>RCRA</b>	Data Turnaround <b>PRIORITY</b>	Offsite Property No.

Sample No.	Lab. ID	*	Date	Time	No/Type Container	Sample Analysis	Perservative
B0GCJ9		X	8/25/95	1300	(1) <sup>100 ml P</sup> <del>500</del>	GROSS Alpha (GADGPC) Gross Beta (GBDPC), Pu-238, 239/240, TOTAL URANIUM, Ni-63, C-14, TRITIUM, GAMMA SPEC, ACTIVITY SCAN, RAD SCREEN	None
B0GCJ9		X	8/25/95	1300	(1) <sup>125 ml P</sup> <del>60</del>	ICP METALS TAL (6010)	Keep Cool
B0GCJ9		X	8/25/95	1300	(1) 20 P	RAD Screen (Lab specific)	None
B0GCJ9		X	8/25/95	1300	(1) <sup>125 ml P</sup> <del>60</del>	TOC (9060)	Keep Cool
B0GCK6		SE	8/26/95	0815	(1) <sup>500 ml G</sup> <del>1000</del>	GROSS Alpha (GADGPC) Gross Beta (GBDPC), Pu-238, 239/240 TOTAL URANIUM, Ni-63, C-14, TRITIUM, GAMMA SPEC	None
B0GCK6		SE	8/26/95	0815	(1) 125 P	ICP METALS TAL (6010)	Keep Cool
B0GCK6		SE	8/26/95	0815	(1) 20 P	RaD Screen (Lab specific)	None
B0GCK6		SE	8/26/95	0815	(1) 125 P	TOC (9060)	Keep Cool
B0GCL7		SE	8/27/95	1530	(1) <sup>500 ml G</sup> <del>1000</del>	GROSS Alpha (GADGPC) Gross Beta (GBDPC), Pu-238, 239/240 TOTAL URANIUM, Ni-63, C-14, TRITIUM, GAMMA SPEC	None
B0GCL7		SE	8/27/95	1530	(1) 125 P	ICP METALS TAL (6010)	Keep Cool
B0GCL7		SE	8/27/95	1530	(1) 20 P	RaD Screen (Lab specific)	None
B0GCL7		SE	8/27/95	1530	(1) 125 P	TOC (9060)	Keep Cool

<b>POSSIBLE SAMPLE HAZARDS/REMARKS</b> List all known wastes. <i>Sample B08CM9 is radioactive</i>	<b>MSDS</b> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	<b>SPECIAL INSTRUCTIONS</b> <i>Some times sample volume was limited. Sample Matrix for other is scale.</i>
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Relinquished By	Print	Sign	Date/Time	Received By	Print	Sign	Date/Time	<b>Matrix *</b> S = Soil      DS = Drum Solids SE = Sediment      DL = Drum Liquids SO = Solid      T = Tissue SL = Sludge      W1 = Wipe W = Water      L = Liquid O = Oil      V = Vegetation A = Air      X = Other
Relinquished By			Date/Time	Received By			Date/Time	
Relinquished By			Date/Time	Received By			Date/Time	
Relinquished By			Date/Time	Received By			Date/Time	

<b>FINAL SAMPLE DISPOSITION</b>	Disposal Method e.g. Return to customer, per lab procedure, used in process.	Disposed By	Date/Time
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All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

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<b>Westinghouse Hanford Company</b>	<b>CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST</b>	C.O.C# <b>009517</b>
		Page <b>2</b> of <b>2</b>

Collector <b>HULSE, KARL</b>	Contact/Requestor <b>ENCKE, DAVID B.</b>	Tel No. <b>373-3461</b> MSIN <b>X5-53</b> FAX
SAF Number <b>B95-083</b>	Sample Origin <b>100 AREA</b>	Purchase Order/Charge Code
Project Title <b>100 EFFL Pipe</b>	Logbook # <b>WHC-N-205 #52</b>	Ice Chest # <b>5112-452</b> Temp.
Shipped To (Lab) <b>Lockheed</b>	Method of Shipment <b>Federal EXPRESS</b>	Bill of Lading/Air Bill No.
Protocol <b>RCRA</b>	Data Turnaround <b>PRIORITY</b>	Offsite Property No.

Sample No.	Lab. ID	*	Date	Time	No/Type Container	Sample Analysis	Perservative
BOGCM9		X	8/30/95	1325	(1) <sup>250 ml</sup> 500 ml G	GROSS Alpha (GADGPC) Gross Beta (GBDPC), Pu-238, 239/240, TOTAL URANIUM, Ni-63, C-14, TRITIUM, GAMMA SPEC, ACTIVITY SCAN, RAD SCREEN	None
BOGCM9		X	8/30/95	1325	(1) 60 G	ICP METALS TAL (6010)	Cool to 4 C
BOGCM9		X	8/30/95	1325	(1) 20 P	RAD Screen (Lab specific)	None
BOGCM9		X	8/30/95	1325	(1) 60 G	TOC (9060)	COOL TO 4 C

<b>POSSIBLE SAMPLE HAZARDS/REMARKS</b> List all known wastes.	MSDS	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	<b>SPECIAL INSTRUCTIONS</b> <i>Some times Sample volume was limited. Sample Matrix for other is scale</i>	<b>Hold Time</b>
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Relinquished By <b>Print</b> <i>KB Hulse</i>	Sign <i>KB Hulse</i>	Date/Time <i>9/6/95 1040</i>	Received By <b>Print</b> <i>Anthony M. Ilc</i>	Sign <i>Ador</i>	Date/Time <i>9-7-95 1090</i>	<b>Matrix *</b> S = Soil            DS = Drum Solids SE = Sediment    DL = Drum Liquids SO = Solid        T = Tissue SL = Sludge        WI = Wipe W = Water         L = Liquid O = Oil            V = Vegetation A = Air             X = Other
Relinquished By		Date/Time	Received By		Date/Time	
Relinquished By		Date/Time	Received By		Date/Time	
Relinquished By		Date/Time	Received By		Date/Time	

<b>FINAL SAMPLE DISPOSITION.</b>	Disposal Method e.g. Return to customer, per lab procedure, used in process.	Disposed By	Date/Time
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960946-521

9613445.1522

SAMPLE STATUS REPORT FOR N 5894. RAD SCREEN <sup>BOGCM9 X07 9/5/95</sup> TIME: 9/ 1/95 15: 9  
DISPATCHED: 8/31/95 13:28 SAMPLE HAS NOT BEEN SLURPED  
RECEIVED: 8/31/95 15:26

EXT. DETER. RESULTS OR STATUS  
\*\*\*\*\*  
4271 TOT-ACI < 5.00000E 01 pCi/G

OUT OF GOOD CHARGE  
RANGE? ANS? CODE  
\*\*\* \*\*  
N Y E61772

END OF REPORT

Field Readings were 750 cpm on the 250 ml Glass bottle

09/05/95 07:54 373 3176 222S 3B F.A.S. 002

SAMPLE STATUS REPORT FOR N 5883. RAD SCREEN <sup>BOGCJ9 X07 9/5/95</sup> TIME: 9/ 5/95 7:45  
DISPATCHED: 8/31/95 13:28 SAMPLE HAS NOT BEEN SLURPED  
RECEIVED: 8/31/95 15:24

EXT. DETER. RESULTS OR STATUS  
\*\*\*\*\*  
4271 TOT-ACT < 5.00000E 01 pCi/G

OUT OF GOOD CHARGE  
RANGE? ANS? CODE  
\*\*\* \*\*  
N Y E61772

09/01/95 13:25 373 3176 222S 3B F.A.S. 009

SAMPLE STATUS REPORT FOR N 5885. RAD SCREEN <sup>BOGCK6 X07 9/5/95</sup> TIME: 9/ 1/95 13:14  
DISPATCHED: 8/31/95 13:28 SAMPLE HAS NOT BEEN SLURPED  
RECEIVED: 8/31/95 15:25

EXT. DETER. RESULTS OR STATUS  
\*\*\*\*\*  
4271 TOT-ACT < 5.00000E 01 pCi/G

OUT OF GOOD CHARGE  
RANGE? ANS? CODE  
\*\*\* \*\*  
N Y E61772

09/01/95 13:24 373 3176 222S 3B F.A.S. 005

SAMPLE STATUS REPORT FOR N 5881. RAD SCREEN <sup>BOGCL7 X07 9/5/95</sup> TIME: 9/ 1/95 13:14  
DISPATCHED: 8/31/95 13:28 SAMPLE HAS NOT BEEN SLURPED  
RECEIVED: 8/31/95 15:24

EXT. DETER. RESULTS OR STATUS  
\*\*\*\*\*  
4271 TOT-ACT < 5.00000E 01 pCi/G

OUT OF GOOD CHARGE  
RANGE? ANS? CODE  
\*\*\* \*\*  
N Y E61772

END OF REPORT

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090759

# LOCKHEED MARTIN



## Sample Login Login Review Checklist

Lot Number L5287

The login review should be conducted by that person logging in the samples as well as a peer. Please use this checklist to ensure that such reviews occur in a uniform basis. Please sign and date below to verify that a login review has occurred. This checklist should be affixed to each login package prior to distribution.

For effective login review, at a minimum, five reports from the login process are required. These are the COC (or equivalent), the login COC report, the sample summary report, the sample receiving checklist, and the login quotation. Before beginning review, ensure that these five components are available. Jobs with single component samples, the sample summary report may be omitted.

### SAMPLE SUMMARY REPORT

	<u>YES</u>	<u>NO</u>	<u>N/A</u>	<u>Comment</u>
1. Are all sample ID's correct?	X	—	—	_____
2. Are all samples present?	X	—	—	_____
3. Are all matrices indicated correctly?	X	—	—	_____
4. Are all analyses on the COC logged in for the appropriate samples?	X	—	—	_____
5. Are all analyses logged in for the correct container?	X	—	—	_____
6. Are samples logged in according to LAS batching procedures?	X	—	—	_____

### LOGIN CHAIN OF CUSTODY

	<u>YES</u>	<u>NO</u>	<u>N/A</u>	<u>Comment</u>
1. Are the collect, receive, and due dates correct for every sample?	X	—	—	_____
2. Have all appropriate comments been indicated in the comment section?	—	—	X	_____

### SAMPLE RECEIVING CHECKLIST

	<u>YES</u>	<u>NO</u>	<u>N/A</u>	<u>Comment</u>
1. Are all discrepancies between the COC and the login noted (if applicable)?	—	—	X	_____

000020

[Signature]  
primary review signature

9-7-95  
date

[Signature]  
secondary review signature

9-07-95  
date

C9C759L

### SAMPLE CHECK-IN LIST

Date/Time Received: 9-7-95 / 0900 SDG#: N/A

Work Order Number: N/A SAF #: B95-083

Shipping Container ID: SML-482 Chain of Custody #: 009517

- 1. Custody Seals on shipping container intact? Yes  No
- 2. Custody Seals dated and signed? Yes  No
- 3. Sample temperature 3°C
- 4. Vermiculite/packing materials is Wet  Dry
- 5. Each sample is in a plastic bag? Yes  No
- 6. Sample holding times exceeded? Yes  No

7. Samples have:  
 tape  hazard labels  
 custody seals  appropriate sample labels

8. Samples are:  
 in good condition  leaking  
 broken  have air bubbles

9. Is the information on the COC and Sample bottles in agreement?  
 Yes  No

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Sample Custodian/Laboratory: MMQ LAS Date: 9-7-95  
 Telephoned To: Kathleen Hall On 9-7-95 By Anthony M. Her

Lockheed Analytical Services

Sample Receiving Checklist

Client Name: *Berkel - Hammond*

Job No. *LS287*

Cooler ID:

COOLER CONDITION UPON RECEIPT

Temperature of cooler upon receipt:

*3°C*

temperature of temp. blank upon receipt:

	Yes	No	* Comments/Discrepancies
custody seals intact	<input checked="" type="checkbox"/>		
chain of custody present	<input checked="" type="checkbox"/>		
blue ice (or equiv.) present/frozen	<input checked="" type="checkbox"/>		
rad survey completed	<input checked="" type="checkbox"/>		

SAMPLE CONDITION UPON RECEIPT

	Yes	No	* Comments/Discrepancies
all bottles labeled	<input checked="" type="checkbox"/>		
samples intact	<input checked="" type="checkbox"/>		
proper container used for sample type	<input checked="" type="checkbox"/>		
sample volume sufficient for analysis	<input checked="" type="checkbox"/>		
proper pres. indicated on the COC	<input checked="" type="checkbox"/>		
VOA's contain headspace			<i>NA</i>
are samples bi-phasic (if so, indicate sample ID'S):			<i>MJ</i>

MISCELLANEOUS ITEMS

	Yes	No	* Comments/Discrepancies
samples with short holding times		<input checked="" type="checkbox"/>	
samples to subcontract		<input checked="" type="checkbox"/>	

ADDITIONAL COMMENTS/DISCREPANCIES

Completed by / date: *Almond 9-7-95*

Sent to the client (date/initials):

\*\* Client's signature upon receipt:

*Note: \* = contact the appropriate CSR of any discrepancies immediately upon receipt*

*\*\* Please review this information and return via facsimile to the appropriate CSR (702) 361-8146*

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Lockheed Analytical Laboratory  
 SAMPLE SUMMARY REPORT (su02)  
 Bechtel Hanford, Inc. \* Richland, WA

Client Sample Number	LAL Sample Number	SDG Number	Matrix	Method
BOGCJ9 -	L5287-1		SolidWaste	SCREENING -
	L5287-5		SolidWaste	C-14 LAL-0209 -
	L5287-5		SolidWaste	GAMMA SPEC LAL-00
	L5287-5		SolidWaste	GR ALP/BETA LAL-0
	L5287-5		SolidWaste	NI-63 LAL-0224 -
	L5287-5		SolidWaste	PU-ISOTOPIC LAL-0
	L5287-5		SolidWaste	TRITIUM(H3) LAL-0
	L5287-5		SolidWaste	U TOTAL KPA (INOR
	L5287-6		SolidWaste	6010 ICP METALS -
	L5287-7		SolidWaste	PERCENT SOLIDS - 9060 TOC -
BOGCK6 -	L5287-2		Soil	SCREENING -
	L5287-8		Soil	C-14 LAL-0209 -
	L5287-8		Soil	GAMMA SPEC LAL-00
	L5287-8		Soil	GR ALP/BETA LAL-0
	L5287-8		Soil	NI-63 LAL-0224 -
	L5287-8		Soil	PU-ISOTOPIC LAL-0
	L5287-8		Soil	TRITIUM(H3) LAL-0
	L5287-8		Soil	U TOTAL KPA (INOR
	L5287-9		Soil	6010 ICP METALS
	L5287-10		Soil	PERCENT SOLIDS - 9060 TOC -
BOGCL7 -	L5287-3		Soil	SCREENING -
	L5287-11		Soil	C-14 LAL-0209 -
	L5287-11		Soil	GAMMA SPEC LAL-00
	L5287-11		Soil	GR ALP/BETA LAL-0
	L5287-11		Soil	NI-63 LAL-0224 -
	L5287-11		Soil	PU-ISOTOPIC LAL-0
	L5287-11		Soil	TRITIUM(H3) LAL-0
	L5287-11		Soil	U TOTAL KPA (INOR
	L5287-12		Soil	6010 ICP METALS -
	L5287-13		Soil	PERCENT SOLIDS - 9060 TOC -
BOGCM9 -	L5287-4		SolidWaste	SCREENING -
	L5287-14		SolidWaste	C-14 LAL-0209 -
	L5287-14		SolidWaste	GAMMA SPEC LAL-00
	L5287-14		SolidWaste	GR ALP/BETA LAL-0
	L5287-14		SolidWaste	NI-63 LAL-0224 -
	L5287-14		SolidWaste	PU-ISOTOPIC LAL-0
	L5287-14		SolidWaste	TRITIUM(H3) LAL-0
	L5287-14		SolidWaste	U TOTAL KPA (INOR
	L5287-15		SolidWaste	6010 ICP METALS -
	L5287-16		SolidWaste	PERCENT SOLIDS - 9060 TOC -
REPORT TYPE	L5287-17		Water	EDD - DISK DEL. -
	L5287-17		Water	INORG TYPE 2 RPT
	L5287-17		Water	RAD RPT TYPE 2 -

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9613445.1527

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0GCJ9	Date Collected: 25-AUG-95
Matrix: SolidWaste	Date Received: 07-SEP-95
Percent Solids: 72.44	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Total Organic Carbon	mg/kg	9060	< 21.	140	U	22-SEP-95	27328	L5287-7

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LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: BOGCK6	Date Collected: 26-AUG-95
Matrix: Soil	Date Received: 07-SEP-95
Percent Solids: 77.65	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Total Organic Carbon	mg/kg	9060	2400	130	*	22-SEP-95	27328	L5287-10

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9613445.1529

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: BOGCL7	Date Collected: 27-AUG-95
Matrix: Soil	Date Received: 07-SEP-95
Percent Solids: 58.39	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Total Organic Carbon	mg/kg	9060	19000	170	*	22-SEP-95	27328	L5287-13

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9613445.1530

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: BOGCM9	Date Collected: 28-AUG-95
Matrix: SolidWaste	Date Received: 07-SEP-95
Percent Solids: 67.85	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Total Organic Carbon	mg/kg	9060	< 22.	150	U	22-SEP-95	27328	L5287-16

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9613445.1531

## LOCKHEED ANALYTICAL SERVICES

## Sample Results

Client Sample ID: B0GCJ9	Date Collected: 25-AUG-95
Matrix: SolidWaste	Date Received: 07-SEP-95
Percent Solids: 72.44	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM	mg/Kg	6010	7300	39.	*	5	25-SEP-95	27389	L5287-6
ANTIMONY	mg/Kg	6010	< 16.	16.	N	1	21-SEP-95	27389	L5287-6
ARSENIC	mg/Kg	6010	< 130	130		5	25-SEP-95	27389	L5287-6
BARIUM	mg/Kg	6010	130	5.7		1	21-SEP-95	27389	L5287-6
BERYLLIUM	mg/Kg	6010	< 0.27	0.27		1	21-SEP-95	27389	L5287-6
CADMIUM	mg/Kg	6010	17.	6.8	N	5	25-SEP-95	27389	L5287-6
CALCIUM	mg/Kg	6010	15000	8.7		1	21-SEP-95	27389	L5287-6
CHROMIUM	mg/Kg	6010	4300	4.1	*	5	25-SEP-95	27389	L5287-6
COBALT	mg/Kg	6010	< 8.2	8.2		5	25-SEP-95	27389	L5287-6
COPPER	mg/Kg	6010	39.	4.1	N	5	25-SEP-95	27389	L5287-6
IRON	mg/Kg	6010	690000	16.		5	25-SEP-95	27389	L5287-6
LEAD	mg/Kg	6010	< 76.	76.	N	5	25-SEP-95	27389	L5287-6
MAGNESIUM	mg/Kg	6010	2300	14.		1	21-SEP-95	27389	L5287-6
MANGANESE	mg/Kg	6010	1400	2.7	*	5	25-SEP-95	27389	L5287-6
NICKEL	mg/Kg	6010	16.	4.1		1	21-SEP-95	27389	L5287-6
POTASSIUM	mg/Kg	6010	< 160	160		1	21-SEP-95	27389	L5287-6
SELENIUM	mg/Kg	6010	< 120	120		5	25-SEP-95	27389	L5287-6
SILVER	mg/Kg	6010	< 5.4	5.4		5	25-SEP-95	27389	L5287-6
SODIUM	mg/Kg	6010	260	19.	B	1	21-SEP-95	27389	L5287-6
THALLIUM	mg/Kg	6010	< 68.	68.	N	5	25-SEP-95	27389	L5287-6
VANADIUM	mg/Kg	6010	< 5.4	5.4		5	25-SEP-95	27389	L5287-6
ZINC	mg/Kg	6010	920	5.4	*	5	25-SEP-95	27389	L5287-6

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9613445.1532

## LOCKHEED ANALYTICAL SERVICES

## Sample Results

Client Sample ID: BOGCK6	Date Collected: 26-AUG-95
Matrix: Soil	Date Received: 07-SEP-95
Percent Solids: 77.65	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM	mg/Kg	6010	7900	7.4		1	21-SEP-95	27389	L5287-9
ANTIMONY	mg/Kg	6010	< 15.	15.	N	1	21-SEP-95	27389	L5287-9
ARSENIC	mg/Kg	6010	< 25.	25.		1	21-SEP-95	27389	L5287-9
BARIUM	mg/Kg	6010	56.	5.4		1	21-SEP-95	27389	L5287-9
BERYLLIUM	mg/Kg	6010	< 0.26	0.26		1	21-SEP-95	27389	L5287-9
CADMIUM	mg/Kg	6010	< 1.3	1.3		1	21-SEP-95	27389	L5287-9
CALCIUM	mg/Kg	6010	14000	8.2		1	21-SEP-95	27389	L5287-9
CHROMIUM	mg/Kg	6010	24.	0.77		1	21-SEP-95	27389	L5287-9
COBALT	mg/Kg	6010	6.5	1.5	B	1	21-SEP-95	27389	L5287-9
COPPER	mg/Kg	6010	29.	0.77		1	21-SEP-95	27389	L5287-9
IRON	mg/Kg	6010	28000	3.1		1	21-SEP-95	27389	L5287-9
LEAD	mg/Kg	6010	< 14.	14.		1	21-SEP-95	27389	L5287-9
MAGNESIUM	mg/Kg	6010	4700	13.		1	21-SEP-95	27389	L5287-9
MANGANESE	mg/Kg	6010	280	0.51		1	21-SEP-95	27389	L5287-9
NICKEL	mg/Kg	6010	16.	3.8		1	21-SEP-95	27389	L5287-9
POTASSIUM	mg/Kg	6010	1000	150	B	1	21-SEP-95	27389	L5287-9
SELENIUM	mg/Kg	6010	< 22.	22.		1	21-SEP-95	27389	L5287-9
SILVER	mg/Kg	6010	< 1.0	1.0		1	21-SEP-95	27389	L5287-9
SODIUM	mg/Kg	6010	580	18.	B	1	21-SEP-95	27389	L5287-9
THALLIUM	mg/Kg	6010	< 13.	13.		1	21-SEP-95	27389	L5287-9
VANADIUM	mg/Kg	6010	52.	1.0		1	21-SEP-95	27389	L5287-9
ZINC	mg/Kg	6010	210	1.0		1	21-SEP-95	27389	L5287-9

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## LOCKHEED ANALYTICAL SERVICES

## Sample Results

Client Sample ID: BOGCL7	Date Collected: 27-AUG-95
Matrix: Soil	Date Received: 07-SEP-95
Percent Solids: 58.39	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM	mg/Kg	6010	15000	9.8		1	21-SEP-95	27389	L5287-12
ANTIMONY	mg/Kg	6010	< 20.	20.	N	1	21-SEP-95	27389	L5287-12
ARSENIC	mg/Kg	6010	52.	33.	B	1	21-SEP-95	27389	L5287-12
BARIUM	mg/Kg	6010	70.	7.1		1	21-SEP-95	27389	L5287-12
BERYLLIUM	mg/Kg	6010	< 0.34	0.34		1	21-SEP-95	27389	L5287-12
CADMIUM	mg/Kg	6010	< 1.7	1.7		1	21-SEP-95	27389	L5287-12
CALCIUM	mg/Kg	6010	2100	11.		1	21-SEP-95	27389	L5287-12
CHROMIUM	mg/Kg	6010	48.	1.0		1	21-SEP-95	27389	L5287-12
COBALT	mg/Kg	6010	7.2	2.0	B	1	21-SEP-95	27389	L5287-12
COPPER	mg/Kg	6010	95.	1.0		1	21-SEP-95	27389	L5287-12
IRON	mg/Kg	6010	280000	4.0		1	21-SEP-95	27389	L5287-12
LEAD	mg/Kg	6010	400	19.		1	21-SEP-95	27389	L5287-12
MAGNESIUM	mg/Kg	6010	1400	17.	B	1	21-SEP-95	27389	L5287-12
MANGANESE	mg/Kg	6010	550	0.67		1	21-SEP-95	27389	L5287-12
NICKEL	mg/Kg	6010	23.	5.1		1	21-SEP-95	27389	L5287-12
POTASSIUM	mg/Kg	6010	340	200	B	1	21-SEP-95	27389	L5287-12
SELENIUM	mg/Kg	6010	< 29.	29.		1	21-SEP-95	27389	L5287-12
SILVER	mg/Kg	6010	< 1.3	1.3		1	21-SEP-95	27389	L5287-12
SODIUM	mg/Kg	6010	390	24.	B	1	21-SEP-95	27389	L5287-12
THALLIUM	mg/Kg	6010	20.	17.	B	1	21-SEP-95	27389	L5287-12
VANADIUM	mg/Kg	6010	19.	1.3		1	21-SEP-95	27389	L5287-12
ZINC	mg/Kg	6010	260	1.3		1	21-SEP-95	27389	L5287-12

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9613446.1534

## LOCKHEED ANALYTICAL SERVICES

## Sample Results

Client Sample ID: B0GCM9	Date Collected: 28-AUG-95
Matrix: SolidWaste	Date Received: 07-SEP-95
Percent Solids: 67.85	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM	mg/Kg	6010	6900	43.	*	5	25-SEP-95	27389	L5287-15
ANTIMONY	mg/Kg	6010	< 17.	17.	N	1	21-SEP-95	27389	L5287-15
ARSENIC	mg/Kg	6010	180	140	B	5	25-SEP-95	27389	L5287-15
BARIUM	mg/Kg	6010	54.	6.2	B	1	21-SEP-95	27389	L5287-15
BERYLLIUM	mg/Kg	6010	< 0.29	0.29		1	21-SEP-95	27389	L5287-15
CADMIUM	mg/Kg	6010	8.7	7.4	N	5	25-SEP-95	27389	L5287-15
CALCIUM	mg/Kg	6010	1100	9.4	B	1	21-SEP-95	27389	L5287-15
CHROMIUM	mg/Kg	6010	1600	4.4	*	5	25-SEP-95	27389	L5287-15
COBALT	mg/Kg	6010	< 8.8	8.8		5	25-SEP-95	27389	L5287-15
COPPER	mg/Kg	6010	25.	4.4	BN	5	25-SEP-95	27389	L5287-15
IRON	mg/Kg	6010	600000	18.		5	25-SEP-95	27389	L5287-15
LEAD	mg/Kg	6010	< 82.	82.	N	5	25-SEP-95	27389	L5287-15
MAGNESIUM	mg/Kg	6010	250	15.	B	1	21-SEP-95	27389	L5287-15
MANGANESE	mg/Kg	6010	750	2.9	*	5	25-SEP-95	27389	L5287-15
NICKEL	mg/Kg	6010	14.	4.4		1	21-SEP-95	27389	L5287-15
POTASSIUM	mg/Kg	6010	< 180	180		1	21-SEP-95	27389	L5287-15
SELENIUM	mg/Kg	6010	< 130	130		5	25-SEP-95	27389	L5287-15
SILVER	mg/Kg	6010	< 5.9	5.9		5	25-SEP-95	27389	L5287-15
SODIUM	mg/Kg	6010	270	21.	B	1	21-SEP-95	27389	L5287-15
THALLIUM	mg/Kg	6010	< 74.	74.	N	5	25-SEP-95	27389	L5287-15
VANADIUM	mg/Kg	6010	< 5.9	5.9		5	25-SEP-95	27389	L5287-15
ZINC	mg/Kg	6010	750	5.9	*	5	25-SEP-95	27389	L5287-15

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## LOCKHEED ANALYTICAL SERVICES

## METALS RESULTS

## QC Data Summary For Reagent Blank Analysis

Constituent	Units	Reporting Detection Limit	LAS Batch ID	Date Analyzed	Reagent Blank Result	Data Qualifier
ALUMINUM	mg/Kg	5.8	27389	09/21/95	< 5.8	
ANTIMONY	mg/Kg	11.6	27389	09/21/95	< 11.6	
ARSENIC	mg/Kg	19.6	27389	09/21/95	< 19.6	
BARIUM	mg/Kg	4.2	27389	09/21/95	< 4.2	
BERYLLIUM	mg/Kg	.2	27389	09/21/95	< .2	
CADMIUM	mg/Kg	1	27389	09/21/95	< 1	
CALCIUM	mg/Kg	6.4	27389	09/21/95	< 6.4	
CHROMIUM	mg/Kg	.6	27389	09/21/95	< .6	
COBALT	mg/Kg	1.2	27389	09/21/95	< 1.2	
COPPER	mg/Kg	.6	27389	09/21/95	< .6	
IRON	mg/Kg	2.4	27389	09/21/95	3.56	B
LEAD	mg/Kg	11.2	27389	09/21/95	< 11.2	
MAGNESIUM	mg/Kg	10	27389	09/21/95	< 10	
MANGANESE	mg/Kg	.4	27389	09/21/95	< .4	
NICKEL	mg/Kg	3	27389	09/21/95	< 3	
POTASSIUM	mg/Kg	120	27389	09/21/95	< 120	
SELENIUM	mg/Kg	17.4	27389	09/21/95	< 17.4	
SILVER	mg/Kg	.8	27389	09/21/95	< .8	
SODIUM	mg/Kg	14	27389	09/21/95	< 14	
THALLIUM	mg/Kg	10	27389	09/21/95	< 10	
VANADIUM	mg/Kg	.8	27389	09/21/95	< .8	
ZINC	mg/Kg	.8	27389	09/21/95	1.04	B

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## LOCKHEED ANALYTICAL SERVICES

## METALS RESULTS

## QC Data Summary For Duplicate Sample Analysis

Client Sample ID BOGCM9 (DUP)

Constituent	Units	LAS Batch ID	LAS Sample ID	Date Analyzed	Sample Result	Duplicate Result	Relative Percent Difference	Control Limit	Data Qualifier
ALUMINUM	mg/Kg	27389	L5287-15	09/21/95	6949.	12820	59		
ANTIMONY	mg/Kg	27389	L5287-15	09/21/95	< 17.	< 17.	b		
ARSENIC	mg/Kg	27389	L5287-15	09/21/95	183.4	< 140	b		
BARIUM	mg/Kg	27389	L5287-15	09/21/95	54.02	76.82		59.	
BERYLLIUM	mg/Kg	27389	L5287-15	09/21/95	< 0.29	< 0.29	b		
CADMIUM	mg/Kg	27389	L5287-15	09/21/95	8.748	14.26		7.4	
CALCIUM	mg/Kg	27389	L5287-15	09/21/95	1114.	1364.		1500	
CHROMIUM	mg/Kg	27389	L5287-15	09/21/95	1589.	2152.	30		
COBALT	mg/Kg	27389	L5287-15	09/21/95	< 8.8	< 8.8	b		
COPPER	mg/Kg	27389	L5287-15	09/21/95	24.57	40.21		37.	
IRON	mg/Kg	27389	L5287-15	09/21/95	603500	571500	5		
LEAD	mg/Kg	27389	L5287-15	09/21/95	< 82.	< 82.	b		
MAGNESIUM	mg/Kg	27389	L5287-15	09/21/95	246.5	327.9		1500	
MANGANESE	mg/Kg	27389	L5287-15	09/21/95	749.0	939.0	23		
NICKEL	mg/Kg	27389	L5287-15	09/21/95	13.81	24.15		12.	
POTASSIUM	mg/Kg	27389	L5287-15	09/21/95	< 180	< 180	b		
SELENIUM	mg/Kg	27389	L5287-15	09/21/95	< 130	< 130	b		
SILVER	mg/Kg	27389	L5287-15	09/21/95	< 5.9	< 5.9	b		
SODIUM	mg/Kg	27389	L5287-15	09/21/95	272.6	217.9		1500	
THALLIUM	mg/Kg	27389	L5287-15	09/21/95	< 74.	< 74.	b		
VANADIUM	mg/Kg	27389	L5287-15	09/21/95	< 5.9	< 5.9	b		
ZINC	mg/Kg	27389	L5287-15	09/21/95	746.8	1142.	42		

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## LOCKHEED ANALYTICAL SERVICES

## METALS RESULTS

## QC Data Summary For Matrix Spike Sample Analysis

Client Sample ID BOGCM9 (MS)

Constituent	Units	LAS Batch ID	LAS Sample ID	Date Analyzed	Matrix Spike Result	Sample Result	Spike Added	(%) Recovery	Data Qualifier
ALUMINIUM	mg/Kg	27389	L5287-15	09/21/95	9901.	6949.	579.8	509	a
ANTIMONY	mg/Kg	27389	L5287-15	09/21/95	334.1	< 17.	579.8	58	N
ARSENIC	mg/Kg	27389	L5287-15	09/21/95	740.9	183.4	579.8	96	
BARIUM	mg/Kg	27389	L5287-15	09/21/95	624.4	54.02	579.8	98	
BERYLLIUM	mg/Kg	27389	L5287-15	09/21/95	12.15	< 0.29	14.50	84	
CADMIUM	mg/Kg	27389	L5287-15	09/21/95	30.53	8.748	14.50	150	N
CALCIUM	mg/Kg	27389	L5287-15	09/21/95					
CHROMIUM	mg/Kg	27389	L5287-15	09/21/95	2519.	1589.	57.98	1604	a
COBALT	mg/Kg	27389	L5287-15	09/21/95	152.4	< 8.8	145.0	105	
COPPER	mg/Kg	27389	L5287-15	09/21/95	116.2	24.57	72.48	126	N
IRON	mg/Kg	27389	L5287-15	09/21/95	610900	603500	289.9	2553	a
LEAD	mg/Kg	27389	L5287-15	09/21/95	240.8	< 82.	145.0	166	N
MAGNESIUM	mg/Kg	27389	L5287-15	09/21/95					
MANGANESE	mg/Kg	27389	L5287-15	09/21/95	1135.	749.0	145.0	266	a
NICKEL	mg/Kg	27389	L5287-15	09/21/95	163.8	13.81	145.0	103	
POTASSIUM	mg/Kg	27389	L5287-15	09/21/95					
SELENIUM	mg/Kg	27389	L5287-15	09/21/95	602.4	< 130	579.8	104	
SILVER	mg/Kg	27389	L5287-15	09/21/95	17.42	< 5.9	14.50	120	
SODIUM	mg/Kg	27389	L5287-15	09/21/95					
THALLIUM	mg/Kg	27389	L5287-15	09/21/95	293.1	< 74.	579.8	51	N
VANADIUM	mg/Kg	27389	L5287-15	09/21/95	130.8	< 5.9	145.0	90	
ZINC	mg/Kg	27389	L5287-15	09/21/95	1406.	746.8	145.0	455	a

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## LOCKHEED ANALYTICAL SERVICES

## METALS RESULTS

## QC Data Summary For Laboratory Control Sample Analysis

Sample: 27389LCSS

Constituent	Units	LAS Batch ID	Date Analyzed	LCS True Value	LCS Result	(%) Recovery
ALUMINUM	mg/Kg	27389	09/21/95	3740	5408.	144.6
ANTIMONY	mg/Kg	27389	09/21/95	98.9	120.9	122.2
ARSENIC	mg/Kg	27389	09/21/95	349.	367.5	105.3
BARIUM	mg/Kg	27389	09/21/95	111.	107.9	97.2
BERYLLIUM	mg/Kg	27389	09/21/95	34.7	33.84	97.5
CADMIUM	mg/Kg	27389	09/21/95	46.9	44.90	95.7
CALCIUM	mg/Kg	27389	09/21/95	2970	3323.	111.9
CHROMIUM	mg/Kg	27389	09/21/95	115.	128.9	112.1
COBALT	mg/Kg	27389	09/21/95	191.	209.2	109.5
COPPER	mg/Kg	27389	09/21/95	88.1	91.84	104.2
IRON	mg/Kg	27389	09/21/95	7890	11370	144.1
LEAD	mg/Kg	27389	09/21/95	52.4	52.62	100.4
MAGNESIUM	mg/Kg	27389	09/21/95	2850	3223.	113.1
MANGANESE	mg/Kg	27389	09/21/95	151.	178.2	118
NICKEL	mg/Kg	27389	09/21/95	89.7	102.6	114.3
POTASSIUM	mg/Kg	27389	09/21/95	2790	3240.	116.1
SELENIUM	mg/Kg	27389	09/21/95	185.	205.4	111
SILVER	mg/Kg	27389	09/21/95	154.	179.3	116.5
SODIUM	mg/Kg	27389	09/21/95	1220	1449.	118.8
THALLIUM	mg/Kg	27389	09/21/95	49.9	65.20	130.7
VANADIUM	mg/Kg	27389	09/21/95	44.4	54.12	121.9
ZINC	mg/Kg	27389	09/21/95	101.	100.3	99.3

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## LOCKHEED ANALYTICAL SERVICES

## METALS RESULTS

## QC Data Summary For Laboratory Control Sample Analysis

Sample: 27389LCSW

Constituent	Units	LAS Batch ID	Date Analyzed	LCS True Value	LCS Result	(%) Recovery
ALUMINUM	mg/L	27389	09/21/95	2.00	1.963	98.1
ANTIMONY	mg/L	27389	09/21/95	2.00	1.940	97
ARSENIC	mg/L	27389	09/21/95	2.00	1.989	99.5
BARIUM	mg/L	27389	09/21/95	2.00	2.041	102
BERYLLIUM	mg/L	27389	09/21/95	0.0500	0.04430	88.6
CADMIUM	mg/L	27389	09/21/95	0.0500	0.04100	82
CALCIUM	mg/L	27389	09/21/95	100.	99.12	99.1
CHROMIUM	mg/L	27389	09/21/95	0.200	0.2004	100.2
COBALT	mg/L	27389	09/21/95	0.500	0.4979	99.6
COPPER	mg/L	27389	09/21/95	0.250	0.2453	98.1
IRON	mg/L	27389	09/21/95	1.00	1.027	102.7
LEAD	mg/L	27389	09/21/95	0.500	0.5154	103.1
MAGNESIUM	mg/L	27389	09/21/95	50.0	49.08	98.2
MANGANESE	mg/L	27389	09/21/95	0.500	0.4991	99.8
NICKEL	mg/L	27389	09/21/95	0.500	0.5057	101.1
POTASSIUM	mg/L	27389	09/21/95	50.0	49.85	99.7
SELENIUM	mg/L	27389	09/21/95	2.00	2.028	101.4
SILVER	mg/L	27389	09/21/95	0.0500	0.04880	97.6
SODIUM	mg/L	27389	09/21/95	100.	100.7	100.7
THALLIUM	mg/L	27389	09/21/95	2.00	1.877	93.9
VANADIUM	mg/L	27389	09/21/95	0.500	0.5094	101.9
ZINC	mg/L	27389	09/21/95	0.500	0.4992	99.8

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## LOCKHEED ANALYTICAL SERVICES

## RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. \* Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0GCJ9

LAL Sample ID: L5287-5

Date Collected: 25-AUG-95

Date Received: 07-SEP-95

Matrix: SolidWaste

Login Number: L5287

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
C-14	13-SEP-95	C-14 LAL-0209_27177	42.9	2.3	0.55		pCi/g
Ac-228(Ra-228)	19-SEP-95	GAMMA SPEC LAL-0064_27296	2.7	1.9	3.7		pCi/g
Co-58	19-SEP-95	GAMMA SPEC LAL-0064_27296	0.00	0.99	1.1		pCi/g
Co-60	19-SEP-95	GAMMA SPEC LAL-0064_27296	199.	14.	0.51		pCi/g
Cs-137	19-SEP-95	GAMMA SPEC LAL-0064_27296	0.72	0.60	0.95		pCi/g
Eu-152	19-SEP-95	GAMMA SPEC LAL-0064_27296	1760	130	3.6		pCi/g
Eu-154	19-SEP-95	GAMMA SPEC LAL-0064_27296	181.	11.	4.4		pCi/g
Eu-155	19-SEP-95	GAMMA SPEC LAL-0064_27296	11.1	2.0	2.7		pCi/g
Fe-59	19-SEP-95	GAMMA SPEC LAL-0064_27296	1.17	0.86	2.1		pCi/g
Pb-212	19-SEP-95	GAMMA SPEC LAL-0064_27296	-0.07	0.67	1.1		pCi/g
Pb-214(Ra-226)	19-SEP-95	GAMMA SPEC LAL-0064_27296	0.94	0.42	1.3		pCi/g
Ra-226(GAMMA)	19-SEP-95	GAMMA SPEC LAL-0064_27296	6.4	7.7	12.		pCi/g
Ru-106	19-SEP-95	GAMMA SPEC LAL-0064_27296	-5.3	4.5	7.7		pCi/g
U-235(GAMMA)	19-SEP-95	GAMMA SPEC LAL-0064_27296	-3.5	2.1	3.9		pCi/g
Gross Alpha	19-SEP-95	GR ALP/BETA LAL-0060_27297	10.5	5.4	6.4	C	pCi/g
Gross Beta	19-SEP-95	GR ALP/BETA LAL-0060_27297	15.9	4.2	5.6		pCi/g
Ni-63	25-SEP-95	NI-63 LAL-0224_27695	79.9	7.3	3.9		pCi/g
Pu-238	18-SEP-95	PU-ISOTOPIC LAL-0108_27298	0.023	0.021	0.021		pCi/g
Pu-239/40	18-SEP-95	PU-ISOTOPIC LAL-0108_27298	1.09	0.15	0.026		pCi/g
H-3	20-SEP-95	TRITIUM(H3) LAL-0067_27299	0	10.	14.		pCi/g
Uranium	19-SEP-95	U TOTAL KPA (INORG)_27388	2.30	0.12	0.97		ug/g

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LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. \* Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0GCK6

LAL Sample ID: L5287-8

Date Collected: 26-AUG-95

Date Received: 07-SEP-95

Matrix: Soil

Login Number: L5287

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
C-14	13-SEP-95	C-14 LAL-0209_27176	76.7	4.6	1.5		pCi/g
Ac-228(Ra-228)	19-SEP-95	GAMMA SPEC LAL-0064_27304	0.96	0.33	0.44		pCi/g
Co-58	19-SEP-95	GAMMA SPEC LAL-0064_27304	-0.018	0.081	0.11		pCi/g
Co-60	19-SEP-95	GAMMA SPEC LAL-0064_27304	0.338	0.072	0.11		pCi/g
Cs-137	19-SEP-95	GAMMA SPEC LAL-0064_27304	0.070	0.085	0.11		pCi/g
Eu-152	19-SEP-95	GAMMA SPEC LAL-0064_27304	0.20	0.13	0.47		pCi/g
Eu-154	19-SEP-95	GAMMA SPEC LAL-0064_27304	0.01	0.11	0.42		pCi/g
Eu-155	19-SEP-95	GAMMA SPEC LAL-0064_27304	0.01	0.13	0.17		pCi/g
Fe-59	19-SEP-95	GAMMA SPEC LAL-0064_27304	0.03	0.13	0.23		pCi/g
Pb-212	19-SEP-95	GAMMA SPEC LAL-0064_27304	0.92	0.17	0.13		pCi/g
Pb-214(Ra-226)	19-SEP-95	GAMMA SPEC LAL-0064_27304	0.59	0.15	0.19		pCi/g
Ra-226(GAMMA)	19-SEP-95	GAMMA SPEC LAL-0064_27304	1.5	1.2	1.6		pCi/g
Ru-106	19-SEP-95	GAMMA SPEC LAL-0064_27304	-0.09	0.27	0.82		pCi/g
U-235(GAMMA)	19-SEP-95	GAMMA SPEC LAL-0064_27304	-0.04	0.27	0.40		pCi/g
Gross Alpha	19-SEP-95	GR ALP/BETA LAL-0061_27307	4.3	4.1	6.2		pCi/g
Gross Beta	19-SEP-95	GR ALP/BETA LAL-0061_27307	19.6	4.2	5.3		pCi/g
Ni-63	25-SEP-95	NI-63 LAL-0224_27693	2.1	2.4	4.0		pCi/g
Pu-238	18-SEP-95	PU-ISOTOPIC LAL-0108_27305	0.012	0.021	0.032		pCi/g
Pu-239/40	18-SEP-95	PU-ISOTOPIC LAL-0108_27305	0.256	0.078	0.016		pCi/g
H-3	19-SEP-95	TRITIUM(H3) LAL-0067_27306	0.7	2.2	2.9		pCi/L
Uranium	19-SEP-95	U TOTAL KPA (INORG)_27388	1.143	0.059	0.93		ug/g

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## LOCKHEED ANALYTICAL SERVICES

## RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. \* Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: BOGCL7

LAL Sample ID: L5287-11

Date Collected: 27-AUG-95

Date Received: 07-SEP-95

Matrix: Soil

Login Number: L5287

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
C-14	13-SEP-95	C-14 LAL-0209_27176	186.6	7.6	0.65		pCi/g
Ac-228(Ra-228)	19-SEP-95	GAMMA SPEC LAL-0064_27304	0.30	0.47	0.89		pCi/g
Co-58	19-SEP-95	GAMMA SPEC LAL-0064_27304	0.42	0.18	0.25		pCi/g
Co-60	19-SEP-95	GAMMA SPEC LAL-0064_27304	7.21	0.54	0.11		pCi/g
Cs-137	19-SEP-95	GAMMA SPEC LAL-0064_27304	5.82	0.62	0.22		pCi/g
Eu-152	19-SEP-95	GAMMA SPEC LAL-0064_27304	99.6	7.2	0.44		pCi/g
Eu-154	19-SEP-95	GAMMA SPEC LAL-0064_27304	11.57	0.81	1.0		pCi/g
Eu-155	19-SEP-95	GAMMA SPEC LAL-0064_27304	0.60	0.28	0.44		pCi/g
Fe-59	19-SEP-95	GAMMA SPEC LAL-0064_27304	0.17	0.18	0.48		pCi/g
Pb-212	19-SEP-95	GAMMA SPEC LAL-0064_27304	0.66	0.18	0.24		pCi/g
Pb-214(Ra-226)	19-SEP-95	GAMMA SPEC LAL-0064_27304	0.57	0.19	0.30		pCi/g
Ra-226(GAMMA)	19-SEP-95	GAMMA SPEC LAL-0064_27304	0.5	1.8	2.7		pCi/g
Ru-106	19-SEP-95	GAMMA SPEC LAL-0064_27304	-0.3	1.1	1.8		pCi/g
U-235(GAMMA)	19-SEP-95	GAMMA SPEC LAL-0064_27304	-0.58	0.48	0.80		pCi/g
Gross Alpha	19-SEP-95	GR ALP/BETA LAL-0061_27307	3.7	3.8	6.0		pCi/g
Gross Beta	19-SEP-95	GR ALP/BETA LAL-0061_27307	80.0	7.4	4.9		pCi/g
Ni-63	25-SEP-95	NI-63 LAL-0224_27693	42.0	4.6	3.2		pCi/g
Pu-238	18-SEP-95	PU-ISOTOPIC LAL-0108_27305	0.018	0.024	0.029		pCi/g
Pu-239/40	18-SEP-95	PU-ISOTOPIC LAL-0108_27305	0.276	0.087	0.019		pCi/g
H-3	19-SEP-95	TRITIUM(H3) LAL-0067_27306	-1.7	2.0	2.9		pCi/L
Uranium	19-SEP-95	U TOTAL KPA (INORG)_27388	3.03	0.16	1.6		ug/g

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## LOCKHEED ANALYTICAL SERVICES

## RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. \* Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0GCM9

LAL Sample ID: L5287-14

Date Collected: 28-AUG-95

Date Received: 07-SEP-95

Matrix: SolidWaste

Login Number: L5287

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
C-14	13-SEP-95	C-14 LAL-0209_27177	150.7	7.3	1.5		pCi/g
Ac-228(Ra-228)	19-SEP-95	GAMMA SPEC LAL-0064_27296	-0.05	0.27	0.54		pCi/g
Co-58	19-SEP-95	GAMMA SPEC LAL-0064_27296	-0.039	0.067	0.14		pCi/g
Co-60	19-SEP-95	GAMMA SPEC LAL-0064_27296	6.76	0.52	0.069		pCi/g
Cs-137	19-SEP-95	GAMMA SPEC LAL-0064_27296	1.56	0.20	0.11		pCi/g
Eu-152	19-SEP-95	GAMMA SPEC LAL-0064_27296	8.44	0.71	0.30		pCi/g
Eu-154	19-SEP-95	GAMMA SPEC LAL-0064_27296	1.12	0.20	0.57		pCi/g
Eu-155	19-SEP-95	GAMMA SPEC LAL-0064_27296	0.09	0.11	0.18		pCi/g
Fe-59	19-SEP-95	GAMMA SPEC LAL-0064_27296	0.10	0.096	0.30		pCi/g
Pb-212	19-SEP-95	GAMMA SPEC LAL-0064_27296	0.113	0.094	0.13		pCi/g
Pb-214(Ra-226)	19-SEP-95	GAMMA SPEC LAL-0064_27296	0.26	0.11	0.16		pCi/g
Ra-226(GAMMA)	19-SEP-95	GAMMA SPEC LAL-0064_27296	1.9	1.0	1.4		pCi/g
Ru-106	19-SEP-95	GAMMA SPEC LAL-0064_27296	-0.34	0.54	0.94		pCi/g
U-235(GAMMA)	19-SEP-95	GAMMA SPEC LAL-0064_27296	-0.15	0.23	0.38		pCi/g
Gross Alpha	19-SEP-95	GR ALP/BETA LAL-0060_27297	15.7	6.3	6.2	C	pCi/g
Gross Beta	19-SEP-95	GR ALP/BETA LAL-0060_27297	1308.	70.	5.7		pCi/g
Ni-63	25-SEP-95	NI-63 LAL-0224_27695	463.	34.	12.		pCi/g
Pu-238	18-SEP-95	PU-ISOTOPIC LAL-0108_27298	0.049	0.043	0.026		pCi/g
Pu-239/40	18-SEP-95	PU-ISOTOPIC LAL-0108_27298	2.01	0.29	0.026		pCi/g
H-3	20-SEP-95	TRITIUM(H3) LAL-0067_27299	-5.4	9.5	14.		pCi/g
Uranium	19-SEP-95	U TOTAL KPA (INORG)_27388	3.85	0.20	1.1		ug/g

9613445.1544

RECEIVED  
10/3/94

AC5293

RLS



National Institute of Standards &amp; Technology

## Certificate

THIS IS A PHOTOCOPY OF THE CERTIFICATE  
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SEPARATE COVER.

## Standard Reference Material 4334E

### Radioactivity Standard

Radionuclide	Plutonium-242
Source identification	4334E (A)
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule <sup>(1)*</sup>
Solution mass	Approximately 5.8 grams
Solution composition	Plutonium-242 in 5 mol·L <sup>-1</sup> nitric acid <sup>(2)</sup>
Reference time (Purification time)	1200 EST, 18 December 1989
Radioactivity concentration	26.37 Bq·g <sup>-1</sup> = $\frac{152.946 \text{ Bq (g)}}{1.46 \text{ eB Bq}} = 1.0476 \text{ e}^{-6} \text{ g}$
Overall uncertainty	1.12 percent <sup>(3)</sup>
Radionuclidic impurities	See Table 1 <sup>(4)</sup> = 4.1337 e <sup>-3</sup> uCi
Half life	(3.733 ± 0.012) x 10 <sup>5</sup> years <sup>(5)</sup>
Measuring instrument	Two 4π $\alpha$ liquid-scintillation counters, a calibrated germanium detector system, and a silicon surface-barrier detector

This standard reference material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M. Robin Hutchinson, Acting Group Leader.

Gaithersburg, MD  
January 1993

William P. Reed, Chief  
Standard Reference Materials Program

\*Notes on back

000088

TABLE 1

RELATIVE ACTIVITY OF RADIONUCLIDIC IMPURITIES AT REFERENCE TIME 1200 EST, 18 DECEMBER 1989 <sup>(a)</sup>			
RADIONUCLIDE	HALF LIFE (YEARS)	RELATIVE ACTIVITY AS DETERMINED BY	
		LLNL	NIST
<sup>238</sup> Pu	87.74 ± 0.04 <sup>(b)</sup>	<sup>238</sup> Pu + <sup>241</sup> Am <0.000 025 <sup>(c)</sup>	-----
<sup>239</sup> Pu	24119 ± 26 <sup>(b)</sup>		
<sup>240</sup> Pu	6570 ± 6 <sup>(b)</sup>	<sup>239</sup> Pu + <sup>240</sup> Pu <0.000 005 <sup>(c)</sup>	<sup>239</sup> Pu + <sup>240</sup> Pu <0.000 043 <sup>(c)</sup>
<sup>241</sup> Pu	14.35 ± 0.10 <sup>(b)</sup>	-----	0.162 ± 0.002(1σ) <sup>(d)</sup>
<sup>242</sup> Pu	373300 ± 1200 <sup>(b)</sup>	1.000 000	1.000 000
<sup>241</sup> Am	432.2 ± 0.5 <sup>(b)</sup>	<sup>238</sup> Pu + <sup>241</sup> Am <0.000 025 <sup>(c)</sup>	0.000 000 assumed

- (a) Reference time is the time of purification of the plutonium-242.
- (b) Evaluated Nuclear Structure Data File (ENSDF), February 1990.
- (c) Using alpha-particle spectrometry, no alpha-particle emission was detected that could reliably be ascribed to these radionuclides. The value shown is an estimated upper limit based upon background and counting statistics.
- (d) The plutonium-241 relative activity at reference time was calculated from a gamma-ray measurement of the americium-241 ingrowth as of 18 August 1990.

# INITIAL STANDARD DILUTION RECORD

## Standard Information:

Isotope:	<u>Pu-242</u>	Vendor:	<u>NIST</u>
Activity of Standard Received:	<u>4.13 e<sup>-3</sup> uCi</u>	Vendor I.D. #:	<u>—</u>
Weight of Standard Received (g):	<u>5.8 g</u>	LAL I.D. #:	<u>AC 5293</u>
Standard Activity (pCi/g):	<u>712.7 pCi/g</u>	NIST Traceable?	<u>Yes</u>
Half-life in Years or Days:	<u>3.73 x 10<sup>5</sup> yrs</u>	Certificate #:	<u>4334E (B)</u>
Reference Date:	<u>12/18/89</u>	Preparer's Name:	<u>J. Morales</u>
		Receiver's Name:	<u>J. Morales</u>
		Date Received:	<u>10/3/94</u>

## Primary Dilution

Balance Verification?:	<u>Yes</u>
Diluent Used:	<u>5 M HNO<sub>3</sub></u>
a: <del>Decay Corrected</del> Standard Activity (pCi/g):	<u>712.7 pCi/g @ 12/18/89</u> <u>(4.893 ml)</u>
b: Weight of the Source Transferred (g):	<u>5.6612 g (10.1484 - 4.4872)</u>
c: Total diluted weight (g):	<u>578.50 g</u>
d: Total Diluted Volume (mL):	<u>500.00 mL</u>
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	<u>6.9745 pCi/g</u>
f: Calculated Density of Solution (g/ml) [c / d]:	<u>1.157 g/mL</u>
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	<u>8.07 pCi/mL</u>
h. Dilution Logbook I.D. #:	<u>94-0677-68</u>
Prepared By: <u>J. C. Morales</u>	Preparation Date: <u>6/14/97</u> <u>6/14/95</u>
Reviewed By: <u>AW</u>	Review Date: <u>6-14-95</u>
Purity/Cross Check Performed By: _____	Check Date: _____

000090

Signed

Date

Signed

Date

*J. Morales*  
*6/14/95*

Agnie Wong  
4-9-93

### ISOTOPES DILUTION RECORD

#### Secondary/Working Level Dilution

Date: 4/8/93 Preparer's Name: A. Wong

Pipet Check / Balance Wt. Check Done (✓)

Diluent used: 0.1 M HCl

16 oz PLASTIC JAR  
100 uis AQUEOUS  
GAMMA LCS

$\approx 984.5 \text{ pCi/lcs}$   
4-2-91

I. Isotope #1: CS-137  $\Rightarrow$  197.0 pCi 4-2-91

Diluted Source ID (log#): 91-225-24-3

A: Source activity:  ~~$\frac{940.831 \text{ pCi/ml}}{965.84}$~~  decay corrected from  $\downarrow$

B: Amount of source transferred: 0.2 ml

C: Total amount of dilution: 100 ml

D: Isotope activity (A\*B/C): 1.8817 pCi/ml \* 100ml

$\approx 975.1348 \text{ pCi/ml}$

$\approx 197.0 \text{ pCi}$  4-2-91

$= 188.17 \text{ pCi}$  137  
total

II. Isotope #2: Co-60  $\Rightarrow$  259.1 pCi 4-2-91

Diluted Source ID (log#): 91-225-80-1

E: Source activity:  ~~$\frac{998.1087 \text{ pCi/ml}}{838.8 \text{ pCi/ml}}$~~  decay corrected from  $\downarrow$

F: Amount of source transferred: 0.2 ml

G: Total amount of dilution: 100 ml

H: Isotope activity (E\*F/G):  ~~$\frac{199.62 \text{ pCi/ml}}{199.62 \text{ pCi/ml}}$~~  \* 100ml

$\rightarrow 1091.1 \text{ pCi/ml}$

$\approx 259.1 \text{ pCi}$  4-2-91

$= 199.62 \text{ pCi}$  60

Dilution Log Book ID: 92-353-78

Reviewed by: [Signature] Date: 4/9/93

Geometry I

Read and Understood E.

Agnie Wong  
Signed

4-9-93  
Date

[Signature]  
Signed

4/7/93  
Date

9613446, 1548

# CERTIFICATE OF CALIBRATION GAMMA STANDARD SOLUTION

Radionuclide: Cs-137      Customer: LOCKHEED ENGINEERING & SCIENCES Co.  
Half Life: 30.0 ± 0.2 years      P.O.No.: 06LAB1036  
Catalog No.: 7137      Reference Date: September 1 1991      12:00 PST.  
Source No.: 389-21-2      Contained Radioactivity: 1.002      µCi.

Description of Solution  
a. Mass of solution: 4.9523      grams.  
b. Chemical form: CsCl in 0.1N HCl  
c. Carrier content: None added  
d. Density: 0.9996      grams/ml @ 20°C.

Radioimpurities: None detected

Radioactive Daughters: None

Radionuclide Concentration: 0.202      µCi/gram.

### Method of Calibration

Weighed aliquots of the solution were assayed using gamma spectrometry:

Energy peak(s) integrated under: 662      KeV.

Branching ratio(s) used: 0.8521      gamma rays per decay.

### Uncertainty of Measurement

- a. Systematic uncertainty in instrument calibration: ±1.0%
- b. Random uncertainty in assay: ±1.1%
- c. Random uncertainty in weighing(s): ±0.4%
- d. Total uncertainty at the 99% confidence level: ±2.5%

### NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

### Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)



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QUALITY CONTROL

9613445, 1549

Diluted to 100x

U.S. Environmental Protection Agency  
Environmental Monitoring Systems Laboratory-Las Vegas  
Nuclear Radiation Assessment Division

Calibration Certificate

Description

Principal radionuclide  Half-life   
Nominal activity   curies  
Nominal volume  ml in ampoule/bottle number

Measurement Activity of principal radionuclide

Activity per gram of this solution

curies of   
at 0400 hours PST on

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

Per gram  
of the daughter nuclide

Total mass of this solution

grams

Method of measurement

The activity of the primary solution was measured using an ionization chamber.

The activity of the dilution was measured using gamma spectroscopy.

Useful Life

This radionuclide has decayed through  half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after

000166

Purity

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated/known to be

- (1) none stated less than equal to        % of the principal activity
- (2)        less than equal to        % of the principal activity
- (3)        less than equal to        % of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity.

Random Errors

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than  $\pm$  0.42 %  
 (The 99.7% confidence limits are given by  $t(sm)$  where  $t$  is obtained from the student  $t$  factor for the degree of freedom ( $n-1$ )).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ( $+\delta - \delta'$ ). These have been estimated not to exceed -2.1 % or -2.1 %

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error  $[t(sm)]$  at the 99.7% confidence limits and the worst case estimate of the systematic errors ( $+\delta, -\delta'$ )  
 The overall uncertainty is therefore calculated on the basis of  $+[t(sm) + \delta], -[t(sm) + \delta]$  and is +3.5 %, -3.5 % of the quoted radioactive concentration.

Decay Schemes

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Cobalt-60 decays 100 percent by beta emission followed by prompt gamma transition.

Chemical Composition of Solution

Carrier content per gram of solution:

Other components:

30 micrograms cobalt

0.1 M HCl

Preservative:

Remarks

Date Certificate Prepared May 31, 1991

Approval Signature

Paul B. Fahn

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide	Am-241	Customer:	LOCKHEED ENGINEERING & SCIENCES Co
Half Life:	432.7 ± 0.5 years	P.O.No.:	06LAB1245
Catalog No.:	7241	Reference Date:	November 1 1991 12:00 PST.
Source No.:	388-100-1	Contained Radioactivity:	0.997 $\mu$ Cl
<b>Description of Solution</b>			
a. Mass of solution:	5.0007		
b. Chemical form:	AmCl3 in 0.5N HCl		grams
c. Carrier content:	None added		
d. Density:	1.0077		gram/ml @ 20°C.
<b>Radioimpurities</b>			
	None detected		
<b>Radioactive Daughters</b>			
	None detected		
<b>Radionuclide Concentration</b>			
	0.1994		$\mu$ Cl/gram.

### Method of Calibration

Weighted aliquots of the solution were assayed using a liquid scintillation counter.

### Uncertainty of Measurement

- |  |       |
|--|-------|
| a. Systematic uncertainty in instrument calibration: | ±2.0% |
| b. Random uncertainty in assay:                      | ±0.7% |
| c. Random uncertainty in weighing(s):                | ±0.0% |
| d. Total uncertainty at the 99% confidence level:    | ±2.7% |

### NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

### Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)



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*Stan A. Milmore*  
 \_\_\_\_\_  
 QUALITY CONTROL

PROJECT Am-241 / 1.6" dia. filter & LCS

Continued From Page \_\_\_\_\_

### ISOTOPE DILUTION RECORD

Isotope: Am-241

*Agnes Wong  
4-9-93*

Secondary/Working Level Dilution

Date: 4-9-93 Preparer's Name: A. Wong

Pipet Check / Balance Wt. Check Done (✓)

Diluted Source ID (log#): 91-225-60-1

Diluent used: 0.5N HCl

A: Source activity: 21700 dpm/g (9774.8 pCi/g)

B: Amount of source transferred: 10.3235 g

C: Total amount of dilution: 100.1029 g

D: Activity of dilution (A\*B/C): 2237.90 dpm/g

E: Density of Diluent: 1.0010 g/ml

\* F: Activity by volume (D\*E): 2240.14 dpm/ml

Dilution Log Book ID: ~~92-335~~<sup>rw</sup> 92-353-81-1

Reviewed by: [Signature] Date: 4/9/93

1.6" diameter filter LCS in Gamma Spec. (in petri dish and sealed) JSS 5/18/93

Prepared by Nels VanNuyen 5/10/93 - Cut Whatman Glass Micro-fiber Cellulose paper (originally 3" dia) to 1.6" dia - P. petted on filter:

<sup>137</sup>Cs LAL-0199- 0.200 ml \* 975.18 pCi/ml = 195.0 pCi (≅ 197.8 pCi 4-2-91)

<sup>60</sup>Co LAL-0225-80-1 0.200 ml \* <sup>(99.11 pCi/ml)</sup> 970.36 pCi/ml = 194.07 pCi (≅ 259.1 pCi 4-2-91)

(same precise amounts as p. 80K)

Read and Understood By

Agnes Wong  
Signed

4-9-93  
Date

Jarrell S. Schwab  
Signed

5-18-93  
Date

U.S. Environmental Protection Agency  
Environmental Monitoring Systems Laboratory-Las Vegas  
Nuclear Radiation Assessment Division

Calibration Certificate

## Description

Principal radionuclide

Strontium-90

Half-life

28.6 years

Nominal activity

27

nano curies

Nominal volume

5

ml in ampoule/bottle number

94003-1

## Measurement Activity of principal radionuclide

Activity per gram of this solution

5.40

nano curies

of

Strontium-90

at 0400 hours PST on

April 1, 1994

## Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

5.40

nano curies

Per gram

of the daughter nuclide

Yttrium-90

Total mass of this solution

Approximately 5.0 grams

## Method of measurement

The activity of the primary solution was measured by liquid scintillation counting.

The activity of the dilution was measured by liquid scintillation counting.

## Useful Life

This radionuclide has decayed through

0.0

half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after

August 1994

This dilution was prepared for the 1994 ASTM Collaborative Study of a test method for the determination of Sr-90 in water.

**Purity**

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated/known to be:

- (1)  less than  % of the principal activity
- (2)  less than  % of the principal activity
- (3)  less than  % of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity.

**Random Errors**

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than  $\pm 0.1\%$  (The 99.7% confidence limits are given by  $t(sm)$  where  $t$  is obtained from the student  $t$  factor for the degree of freedom  $(n-1)$ ).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error  $(+\delta - \delta')$ . These have been estimated not to exceed  $+3.8\%$  or  $-3.8\%$

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error  $[t(sm)]$  at the 99.7% confidence limits and the worst case estimate of the systematic errors  $(+\delta, -\delta')$ . The overall uncertainty is therefore calculated on the basis of  $+ [t(sm) + \delta], - [t(sm) + \delta']$  and is  $+4.0\%$ ,  $-4.0\%$  of the quoted radioactive concentration.

**Decay Schemes**

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Strontium-90 decays 100 percent by beta emission to yttrium-90. Yttrium-90 also decays 100 percent by beta emission.

**Chemical Composition of Solution**

Carrier content per gram of solution:  
30 micrograms strontium

Other components:  
0.1 M HCl

Preservative:

**Remarks**

Date Certificate Prepared April 26, 1994

Approval Signature

*Paul B. Fisher* 000137

Sr-90

INITIAL STANDARD DILUTION RECORD

Standard Information:	
Isotope:	Sr-90
Activity of Standard Received:	$2.7 \times 10^4$ uCi
Weight of Standard Received (g):	5.0 g
Standard Activity (pCi/g):	$5.4 \times 10^3$ pCi/g
Half-life in Years or Days:	28.6 yrs
Reference Date:	4-1-1994
Vendor:	EPA
Vendor I.D. #:	94003-1
LAL I.D. #:	AC5281
NIST Traceable?	yes
Certificate #:	94003-1
Receiver's Name:	K. Free
Date Received:	5-3-94

Primary Dilution	
Balance Verification?:	yes
Diluent Used:	0.1M HCl
a: Decay Corrected Standard Activity (pCi/g):	$5.4 \times 10^3$ pCi/g
b: Weight of the Source Transferred (g):	4.9670 g
c: Total diluted weight (g):	49.91 g
d: Total Diluted Volume (mL):	50 mL
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	537.4 pCi/g
f: Calculated Density of Solution (g/ml) [c / d]:	0.9982 g/mL
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	536.44 pCi/mL
h. Dilution Logbook I.D. #:	93-474-81-1 CP 4/7/95
Prepared By: <u>Ignes Wong</u>	Preparation Date: <u>6-15-94</u>
Reviewed By: <u>Joe Hutchinson</u>	Review Date: <u>6/30/94</u>
Purity/Cross Check Performed By: _____	Check Date: _____

*[Handwritten signature]*

000188

# CERTIFICATE OF CALIBRATION

## BETA STANDARD SOLUTION

AA0114

Radionuclide	C-14	Customer:	LOCKHEED ENVIRONMENTAL
Half Life:	5730 ± 40 years	P.O.No.:	06LAB2959
Catalog No.:	7014	Reference Date:	November 15 1992 12:00 PST.
Source No.:	407-124-2	Contained Radioactivity:	1.093 $\mu$ Ci.
		Contained Radioactivity:	40.4 kBq

**Description of Solution**

a. Mass of solution:	5.0242	grams.
b. Chemical form:	Benzoic Acid Carboxy-C-14 in 0.1N NaOH	
c. Carrier content:	None added	
d. Density:	1.002	g/ml @ 20°C.

**Radioimpurities** None detected

**Radioactive Daughters** None

**Radionuclide Concentration** 0.218  $\mu$ Ci/g

**Method of Calibration**

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

**Uncertainty of Measurement**

a. Systematic uncertainty in instrument calibration:	± 1.8%
b. Random uncertainty in assay:	± 0.5%
c. Random uncertainty in weighing(s):	± 1.0%
d. Total uncertainty at the 99% confidence level:	± 2.2%

**NIST Traceability**

This calibration is implicitly traceable to the National Institute of Standards and Technology.

**Notes**

1. Nuclear data were taken from "Table of Radioactive Isotopes", edited by Virginia S. Shirley, 1986.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).



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 1800 North Keystone Street  
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 (818) 843 - 7000

*Anna U. Uman*  
 \_\_\_\_\_  
**QUALITY CONTROL**

*Nov. 17, 1992*  
 \_\_\_\_\_

**Date Signed**

000204

AA0114

ISOTOPE WEIGHT DILUTION RECORD

Isotope: C-14 Vendor: IPL  
 Total Received Activity: 1.093  $\mu$ ci Vendor ID: 407-124-2  
 Wt. Received: 5.024 g NIST Traceable (Y/N) Cert. # Implicitly  
 Activity in Units/g: .2175  $\mu$ ci/g Reference Date: 11-15-92  
 Activity converted (dpm/g): 482,954 dpm/g Receive Date: 11/18/92  
 Half-life (Yrs or days)  $t_{1/2}$  = 5730  $\pm$  40 years Receiver's Name: Jimmy Morales

PRIMARY DILUTION:

Balance wt. check done

a: Source activity: 482,954 dpm/g \* (if  $t_{1/2}$  = < 100yr decay to prep. date)  
 b: Wt. of Source transferred: 4.90951 g  
 Diluent used: 0.1 N<sub>2</sub>O<sub>4</sub>  
 c: Total diluted weight: 116.53 g  
 d: Activity of dilution (a\*b/c): 20,347 dpm/g  $\pm$  2.2%  
 e: Calculated density of solution: 1.002 g/mL (4M HNO<sub>3</sub> = 1.1294  $\pm$  .0007 g/mL)  
 f: Activity by volume = (d\*e): 20,388 dpm/mL  
 Dilution Log Book ID: LAL-93-474-23-1 ✓  
 Preparation Date: 10/27/93 Preparer's Name: M.

SECONDARY OR WORKING LEVEL DILUTION

Balance wt. check done

Log Book ID of source being diluted: \_\_\_\_\_  
 a: Source activity: \_\_\_\_\_ dpm/g \* (if  $t_{1/2}$  = < 100yr decay to prep. date)  
 b: Wt. of Source transferred: \_\_\_\_\_ g  
 Diluent used: \_\_\_\_\_  
 c: Total diluted weight: N/A g  
 d: Activity of dilution (a\*b/c): \_\_\_\_\_ dpm/g  
 e: Calculated density of solution: \_\_\_\_\_ g/mL (4M HNO<sub>3</sub> = 1.1294  $\pm$  .0007 g/mL)  
 f: Activity by volume = (d\*e): \_\_\_\_\_ dpm/mL  
 Dilution Log Book ID: \_\_\_\_\_

MS  
Signed

10/27/93  
Date

Revised  
Signed

000205  
Date

## INITIAL STANDARD DILUTION RECORD

Standard Information:			
Isotope:	<u>C-14</u>	Vendor:	<u>Isotope Product</u>
Activity of Standard Received:	<u>1.09 <math>\mu</math>Ci</u>	Vendor I.D. #	<u></u>
Weight of Standard Received (g):	<u>5.0242 g</u>	LAL I.D. #:	<u>AA0114</u>
Standard Activity (pCi/g):	<u>2.17E+05 pCi/g</u>	NIST Traceable ?	<u>Yes</u>
Halflife in Years or Days:	<u>5730 yrs</u>	Certificate #:	<u>407-124-2</u>
Reference Date:	<u>11/15/92</u>	Preparer's Name:	<u>Mark Young</u>
		Date Received:	<u>11/18/92</u>

Primary Dilution	
Balance Verification?:	<u>Yes</u>
Diluent Used:	<u>0.1 N NaOH</u>
a: Decay Corrected Standard Activity (pCi/g):	<u>2.17E+05 pCi/g</u>
b: Weight of the Source Transferred (g):	<u>4.90951 g</u>
c: Total diluted weight (g):	<u>116.53 g</u>
d: Total Diluted Volume (mL)	<u>116.3 mL</u>
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	<u>9.139E+03 pCi/g</u>
f: Calculated Density of Solution (g/ml) [c / d]:	<u>1.0020 g/mL</u>
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	<u>9.157E+03 pCi/mL</u>
h. Dilution Logbook I.D. #:	<u>LAL-93-0474-23-1</u>
Prepared By: _____	Preparation Date: <u>10/27/93</u>
Reviewed By: _____	Review Date: _____
Purity/Cross Check Performed By: _____	Check Date: _____

## SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information	
Isotope:	<u>C-14</u>
Parent Barcode Number	<u>AA0114</u>
Vendor or Certificate I.D. # of Parent Standard:	<u>407-124-2</u>
Diluted Source Logbook I.D. #:	<u>LAL-93-0474-23-1</u>
Balance Verification?:	<u>Yes</u>
Diluent Used:	<u>0.1 N NaOH</u>

Dilution	
*Diluent:	<u>Nanopure w/ 1 mg/ml formaldehyde</u>
*Density of diluent (g/ml):	<u>1.0006</u> g/ml
a: Parent Specific Activity:	<u>9.14E+03</u> pCi/g
b: Amount of Source Transferred:	<u>0.70</u> g
c: Total amount of Dilution:	<u>250.14</u> g
d: Total Volume of Dilution:	<u>250</u> ml
e: Activity of Dilution [a * b / c]:	<u>2.57E+01</u> pCi/g
f: Activity of Dilution (a * b / d):	<u>2.58E+01</u> pCi/ml
Dilution Logbook I.D. #:	<u>LAL-94-0677-18-1</u>
Prepared By: <u>Agnes Wong</u>	Preparation Date: <u>11/19/94</u>
Preparer Signature: _____	
Reviewed By: _____	Review Date: _____
Reviewer Signature: _____	
<small>*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.</small>	

## SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information	
Isotope:	<u>C-14</u>
Parent Barcode Number	<u>AA0114</u>
Vendor or Certificate I.D. # of Parent Standard:	_____
Diluted Source Logbook I.D. #:	<u>93-474-23-1</u>
Balance Verification?:	<u>yes</u>
Diluent Used:	<u>DDI water in 1mg/ml formaldehyde</u>

Dilution	
*Diluent:	<u>Nanopure water with 1mg/ml formaldehyde</u>
*Density of diluent (g/ml):	<u>N/A</u> g/ml
a: Parent Specific Activity:	<u>9267.27</u> <del>20,388</del> <sup>11-19-94</sup> pCi/g <u>pCi/ml</u>
b: Amount of Source Transferred:	<u>0.7046</u> g
c: Total amount of Dilution:	<u>250.14</u> g
d: Total Volume of Dilution:	<u>N/A</u> ml
e: Activity of Dilution (a * b / c):	<u>N/A</u> pCi/g
f: Activity of Dilution (a * b / d):	<u>26.10</u> pCi/ml
Dilution Logbook I.D. #:	<u>94-677-18-1</u> ✓
Prepared By: <u>Agnes Wong</u>	Preparation Date: <u>11-19-94</u>
Reviewed By: <u>Joe Hultman</u>	Review Date: <u>12/16/94</u>
<small>*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.</small>	

**SECONDARY/WORKING LEVEL  
STANDARD DILUTION RECORD**

**Dilution Source Information**

Isotope: Am-241 and Sr-90

Parent Barcode Number: AA0030 AA0046  
Am-241 IPI 388-100-1

Vendor or Certificate I.D. # of Parent Standard: Sr-90 NIST SRM 4219G  
Am-241 91-0225-60-1  
Sr-90 91-0225-30-2

Diluted Source Logbook I.D. #: \_\_\_\_\_

Balance Verification?: Yes

Diluent Used: 0.1N HNO<sub>3</sub>

**Dilution**

\*Diluent: 0.1N HNO<sub>3</sub> + 42mg Sr(NO<sub>3</sub>)<sub>2</sub>/mL

\*Density of diluent (g/ml): NA

a: Parent Specific Activity: Am-241 9810 pCi/mL  
Sr-90 6000 pCi/mL m 8/1/90

b: Amount of Source Transferred: Am-241 0.5 mL  
Sr-90 0.5 mL

c: Total amount of Dilution: 500 mL

d: Total Volume of Dilution: 500 mL

e: Activity of Dilution (a \* b / c): NA

f: Activity of Dilution (a \* b / d): Am-241 9.81 pCi/mL  
Sr-90 12 pCi/mL m 8/1/90

Dilution Logbook I.D. #: 95-721-13-1

Prepared By: Joe Hutchinson Preparation Date: 8/23/95

Reviewed By: Joe Marshall Review Date: 8/24/95

\*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.

Read and Understood By

**000209**

Signed \_\_\_\_\_ Date \_\_\_\_\_ Signed \_\_\_\_\_ Date \_\_\_\_\_

S 12. 0613416-1562 and to make 91-0225-60-1 AA0030

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide	Am-241	Customer:	LOCKHEED ENGINEERING & SCIENCES Co.
Half Life:	432.7 ± 0.5 years	P.O.No.:	06LAB1245
Catalog No.:	7241	Reference Date:	November 1 1991 12:00 PST.
Source No.:	388-100-1	Contained Radioactivity:	0.997 $\mu$ Ci.
<b>Description of Solution</b>			
a. Mass of solution:	5.0007		grams.
b. Chemical form:	AmCl <sub>3</sub> in 0.5N HCl		
c. Carrier content:	None added		
d. Density:	1.0077		gram/ml @ 20°C.
<b>Radioimpurities</b>			
	None detected		
<b>Radioactive Daughters</b>			
	None detected		
<b>Radionuclide Concentration</b>			
	0.1994		$\mu$ Ci/gram.

### Method of Calibration

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

### Uncertainty of Measurement

- a. Systematic uncertainty in instrument calibration: ±2.0%
- b. Random uncertainty in assay: ±0.7%
- c. Random uncertainty in weighing(s): ±0.0%
- d. Total uncertainty at the 99% confidence level: ±2.7%

### NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

### Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)



**ISOTOPE PRODUCTS LABORATORIES**  
 1800 No. Keystone Street,  
 Burbank, California 91504  
 (818) 843 - 7000

*Ray A. Gilmore*  
 QUALITY CONTROL

000210

9613445.1563

AA004



THIS IS A PHOTOCOPY OF THE CERTIFICATE  
WHICH IS BEING MAILED TO YOU UNDER  
SEPARATE COVER.

## National Institute of Standards & Technology

# Certificate

## Standard Reference Material 4919-G Radioactivity Standard

Radionuclide	Strontium-90
Source identification	4919-G
Source description	Solution in NIST borosilicate-glass ampoule <sup>(1)</sup>
Solution composition	Strontium-90 plus yttrium-90 plus approximately 95 $\mu\text{g}$ each of non-radioactive strontium and yttrium per gram of 1-molar hydrochloric acid <sup>(2)</sup>
Mass	Approximately 5.0 grams
Radioactivity concentration	$4.514 \times 10^3 \text{ Bq g}^{-1}$
Reference time	1200 EST August 1, 1990
Overall uncertainty	1.05 percent <sup>(3)</sup>
Photon-emitting impurities	None observed <sup>(4)</sup>
Alpha-particle-emitting impurities	None observed <sup>(5)</sup>
Half life	$28.5 \pm 0.2 \text{ years}$ <sup>(6)</sup>
Measuring instrument	$4\pi\beta$ liquid-scintillation counter

This standard reference material was prepared in the Center for Radiation Research, Ionizing Radiation Division, Radioactivity Group, Dale D. Hoppes, Group Leader.

Gaithersburg, MD 20899  
January, 1991

William P. Reed, Acting Chief  
Office of Standard Reference Materials

\*Notes on back

000212

PROJECT Ni-63

Continued From Page \_\_\_\_\_

*Agnes Wong*  
*3-30-93*

ISOTOPE VOLUME DILUTION RECORD

Secondary / Working Level Dilution:

*AW* Isotope: Ni-63

Date: 3-30-93 Preparer's Name: A. Wong

Pipet check done (✓)

Diluted Source ID (log #): LAL-92-353-52-2

A: Source activity: 829.6 dpm/mL \* (if  $t_{1/2} < 100\text{yr}$ , decay to prep date)

B: Vol. of source transferred: 4 mL )

C: Total Vol. of Dilution: 100 mL

Diluent used: 0.1M HCl

D: Activity by volume A\*B/C: 33.18 dpm/mL

Dilution Log Book ID: LAL-92-353-74-1

Reviewed by: *rgs* Date: 3/30/93

*rgs 4/1/93*

Read and Understood By

000229

Agnes Wong  
Signed

3-30-93  
Date

*rgs*  
Signed

4-1-93  
Date

2013115-1505

52

PROJECT Ni-63 Std Prep

Notebook No. 353

Continued From Page \_\_\_\_\_

ISOTOPE WEIGHT DILUTION RECORD

Isotope: Ni-63 Vendor: Isotope Products Inc. Reference Date: 9-15-92 *Agnes Way 3-1-93*

Total Activity: 181 kBq <sup>5.06  $\mu$ Ci</sup> Vendor ID: 407-74 Receive Date: 9-17-1992

Total wt. (g) 5.10g NIST traceable Y/N Cert. # implicit  $\pm$  100.1 yr. AA0111

Activity UNITS/g .993  $\mu$ Ci/g --- converted to dpm/g 2.2032  $\times 10^6$  Receiver's Name: Jimmy M.

Uncertainty  $\pm 3.4\%$

PRIMARY DILUTION:

Date: 2/23/93 Preparer's Name: Agnes/Bob

a: Decay corrected activity: 2.2032  $\times 10^6$  dpm/g (\* if <100yr decay correct to prep. date)

b: Wt. of Volumetric: NA g

c: Wt. Volumetric + source: NA g

d: Wt of source transferred (c-b): 5.0640 g Diluent: 0.1M HCl

e: Total wt. @ 100 mL mark : 99.85 g

f: Activity of dilution (a\*d/e-b): 1.11738  $\times 10^5$  dpm/g  $\pm 3.4\%$

g: Density (g/mL) = (e-b/100 mL): .9985  $\leftarrow$  from Certificate Actual found .9985 g/mL

h: Activity by volume = (f\*g) 1.116  $\times 10^5$  dpm/mL  $\pm 3.4\%$

Dilution Log Book ID: LAL-92-353-52-1



Working Level Dilution:

Date: 2/23/93 Preparer's Name: Agnes/Bob *(rgs)*

A: Decay corrected activity: 1.11738  $\times 10^5$  dpm/g (from f: above)

B: Wt of source transferred: 1.1976 g Diluent: 0.1M HCl

C: Total weight of Dilution : 119.76 ~~161.07~~ g

D: Activity of dilution A\*B/C: 830.8  $\pm 3.4\%$  dpm/g

E: Density of Diluent: .9985 g/mL  $\leftarrow$  From e. above 4 M HNO<sup>3</sup> = 1.1294  $\pm$  .0007 g/mL

F: Activity by Volume = D\*E 829.6 dpm/mL  $\pm 3.4\%$

Dilution Log Book ID: LAL-92-353-52-2

Agnes Way 2/23/93 [Signature] 000230

Signed Date Signed Date

# CERTIFICATE OF CALIBRATION BETA STANDARD SOLUTION

Radionuclide	Ni-63	Customer:	LOCKHEED ENVIRON.
Half Life:	100.1 ± 2.0 years	P.O.No.:	06LAB2694
Catalog No.:	7063	Reference Date:	September 15 1992 12:00 PST.
Source No.:	407-74	Contained Radioactivity:	5.06 μCi
		Contained Radioactivity:	187.3 kBq

### Description of Solution

a. Mass of solution:	5.1008	grams.
b. Chemical form:	NiCl <sub>2</sub> in 0.1N HCl	
c. Carrier content:	None added	
d. Density:	0.9996	g/ml @ 20°C.

**Radioimpurities** None detected

**Radioactive Daughters** None

**Radionuclide Concentration** 0.993 μCi/g

### Method of Calibration

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

### Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration:	± 1.1%
b. Random uncertainty in assay:	± 2.3%
c. Random uncertainty in weighing(s):	± 0.0%
d. Total uncertainty at the 99% confidence level:	± 3.4%

### NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

### Notes

1. Nuclear data were taken from "Table of Radioactive Isotopes", edited by Virginia S. Shirley, 1986.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).



**ISOTOPE PRODUCTS LABORATORIES**  
1800 No. Keystone Street,  
Burbank, California 91504  
(818) 843 - 7000

*Anna V. Khan*

QUALITY CONTROL

*Sept. 9, 1992*

Date Signed

9613H45.1567

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U.S. Environmental Protection Agency  
Environmental Monitoring Systems Laboratory-Las Vegas  
Nuclear Radiation Assessment Division

Calibration Certificate

Description

Principal radionuclide  Half-life   
Nominal activity   curies  
Nominal volume  ml in ampoule/bottle number

Measurement Activity of principal radionuclide

Activity per gram of this solution  
  curies of   
at 0400 hours PST on

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

Per gram  
of the daughter nuclide

Total mass of this solution

grams

Method of measurement

The activity of the primary solution and this dilution were measured by liquid scintillation counting.

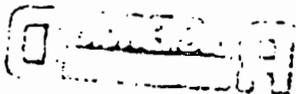
Counting efficiencies for both standardizations were determined by counting solutions directly traceable to the National Institute of Standards & Technology (NIST).

Useful Life

This radionuclide has decayed through  half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after

000247



## Purity

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated/known to be:

- (1) none less than equal to  % of the principal activity
- (2)  less than equal to  % of the principal activity
- (3)  less than equal to  % of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity.

## Random Errors

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than  $\pm$   % (The 99.7% confidence limits are given by  $t(sm)$  where  $t$  is obtained from the student  $t$  factor for the degree of freedom ( $n-1$ )).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ( $+\delta - \delta'$ ). These have been estimated not to exceed

% or  %

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error  $[t(sm)]$  at the 99.7% confidence limits and the worst case estimate of the systematic errors ( $+\delta, -\delta'$ )

The overall uncertainty is therefore calculated on the basis of  $+[t(sm) + \delta], -[t(sm) + \delta']$  and is  % .  % of the quoted radioactive concentration.

## Decay Schemes

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Tritium decays 100 percent by beta emission. The maximum energy is 18.6 Kev, the average is 5.68 Kev.

## Chemical Composition of Solution

Carrier content per gram of solution:

100 percent H<sub>2</sub>O

Other components:

Barium less than 0.004 perc  
Lead less than  $3 \times 10^{-5}$  perce

Preservative:

## Remarks

Date Certificate Prepared

June 17, 1992

000248

Approval Signature

*George Dulbeck*

9613445.1569



U.S. DEPARTMENT OF COMMERCE  
National Institute of Standards & Technology  
Gaithersburg, MD 20899

### REPORT OF TRACEABILITY

U.S. Environmental Protection Agency  
Environmental Monitoring Systems Laboratory  
Las Vegas, Nevada

Radionuclide	Hydrogen-3
Source identification	2606-1, prepared by EMSL
Source description	Liquid in 5-mL flame-sealed glass ampoule
Source mass	Approximately 5.0 grams
Source composition	Hydrogen-3 in water
Reference time	0700 EST June 3, 1992

	<u>NIST DATA</u>	<u>EMSL DATA</u>
Radioactivity concentration	810.5 Bq g <sup>-1</sup>	810.3 Bq g <sup>-1</sup>
Expanded uncertainty	0.64 percent <sup>(12)*</sup>	4.3 percent <sup>(3)</sup>
Photon-emitting impurities	None observed <sup>(9)</sup>	None observed
Measuring instrument	4πβ liquid-scintillation counters calibrated with SRM 4926D	Liquid-scintillation counting
Half life	12.43 ± 0.05 years <sup>(9)</sup>	
Difference from NIST		-0.05 percent <sup>(9)</sup>

For the Director,

J.M. Robin Hutchinson, Acting Group Leader  
Radioactivity Group  
Physics Laboratory

Gaithersburg, MD 20899  
January 1994

\*Notes on next page

000249

NOTES

- (1) The uncertainty analysis methodology and nomenclature used for the reported uncertainties are based on uniform NIST guidelines and are compatible with those adopted by the principal international metrology standardization bodies [cf., B.N. Taylor and C.E. Kuyatt, *NIST Technical Note 1129* (1993)].
- (2) The combined standard uncertainty,  $u_c = 0.32$  percent, is the quadratic combination of the standard deviation (or standard deviation of the mean where appropriate), or approximations thereof, for the following component uncertainties:
- |    |   |              |
|----|---|--------------|
| a) | 11 liquid-scintillation measurements on each of 4 vials | 0.11 percent |
| b) | gravimetric   | 0.05 percent |
| c) | calibration of SRM 4926D                                | 0.29 percent |
| d) | background  | 0.00 percent |
| e) | half life   | 0.03 percent |
- The expanded uncertainty,  $U = 0.64$  percent, is obtained by multiplying  $u_c$  by a coverage factor of  $k = 2$  and is assumed to provide an uncertainty interval of at least 95% confidence.
- (3) Overall uncertainty reported by EMSL.
- (4) The limit of detection for photon-emitting impurities is:
- $0.08 \text{ } \mu\text{s}^{-1}\text{g}^{-1}$  for energies between 90 and 2700 keV.
- (5) Unterwiesing, M.P., Coursey, B.M., Schima, F.J., and Mann, W.B., *Int. J. Appl. Radiat. Isot.*, **31**, 611 (1980).
- (6) This result demonstrates the traceability of EMSL to NIST, for this measurement, to within five percent as specified in the appendix, Traceability Studies, of the EPA-NIST interagency agreement of April 1976, as amended.

For further information call Larry Lucas at 301-975-5546 or Jeffrey Cessna at 301-975-5539.

# INITIAL STANDARD DILUTION RECORD

Standard Information:			
Isotope:	H-3	Vendor:	EPA
Activity of Standard Received:	.11 uCi	Vendor I.D. #	2/7/95
Weight of Standard Received (g):	5 g	LAL I.D. #:	AC 5299
Standard Activity (pCi/g):	21.9 nCi/g pCi/g	NIST Traceable?	Yes
Half-life in Years or Days:	12.43 yrs	Certificate #:	2606-1
Reference Date:	0400, 6/3/92	Receiver's Name:	Kevin Free
		Date Received:	1/25/95

Primary Dilution			
Balance Verification?:	Yes		
Diluent Used:	EPA	Distilled ASTM Type II Water (Deion Water)	
a: Decay Corrected Standard Activity (pCi/g):	21.9 nCi/g	4.939 pCi/g	on 6/3/92
b: Weight of the Source Transferred (g):		4.939 g	
c: Total diluted weight (g):		49.377 g	
d: Total Diluted Volume (mL):		50 49.5 mL	
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:		2190 pCi/g	
f: Calculated Density of Solution (g/mL) [c / d]:		0.99777 g/mL	
g: Activity of Dilution by Volume (pCi/mL) [e * f]:		2190 pCi/mL	on 6/3/92
h. Dilution Logbook I.D. #:	C. Ponienez	950.102	CAL-95-0721-1
Prepared By:	Joe Hutchison / J. Morales	C. Ponienez	Preparation Date: 2/7/95
Reviewed By:	Joe Hutchison		Review Date: 2/7/95
Purity/Cross Check Performed By:			Check Date:

Carry  
P. M. M. M.

Signed

Date

CP 5/8/95

Signed

000251  
Date

## SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information	
Isotope:	<u>H-3 LES<sup>5</sup> MS</u>
Parent Barcode Number	<u>AC5299</u>
Vendor or Certificate I.D. # of Parent Standard:	_____
Diluted Source Logbook I.D. #:	<u>95-0721-1</u>
Balance Verification?:	<u>Yes</u>
Diluent Used:	<u>Deion Water</u>

Dilution	
*Diluent:	<u>Low Bkg Water</u>
*Density of diluent (g/ml):	<u>1</u> g/ml
a: Parent Specific Activity:	<u>2190</u> pCi/g
b: Amount of Source Transferred:	<u>10.0</u> g
c: Total amount of Dilution:	<u>100</u> g
d: Total Volume of Dilution:	<u>100</u> ml
e: Activity of Dilution (a * b / c):	_____ pCi/g
f: Activity of Dilution (a * b / d):	<u>219</u> pCi/ml on <u>6/23/92</u>
Dilution Logbook I.D. #:	<u>94-0677-70</u>
Prepared By: <u>Joe Hatcher</u>	Preparation Date: <u>6/23/95</u>
Reviewed By: <u>J. C. Marshall</u>	Review Date: <u>6/23/95</u>

\*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.

read and understood by

Signed

Date

Signed

Date

9613446.1573

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U.S. Environmental Protection Agency  
Environmental Monitoring Systems Laboratory-Las Vegas  
Nuclear Radiation Assessment Division

Calibration Certificate

Description

Principal radionuclide  Half-life

Nominal activity   curies

Nominal volume  ml in ampoule/bottle number

Measurement Activity of principal radionuclide

Activity per gram of this solution

curies of

at 0400 hours PST on

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

Per gram

of the daughter nuclide

Total mass of this solution

grams

Method of measurement

The activity of the primary solution and this dilution were measured by liquid scintillation counting.

Counting efficiencies for both standardizations were determined by counting solutions directly traceable to the National Institute of Standards & Technology (NIST).

Useful Life

This radionuclide has decayed through  half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after

000253



U.S. DEPARTMENT OF COMMERCE  
National Institute of Standards & Technology  
Gaithersburg, MD 20899

## REPORT OF TRACEABILITY

U.S. Environmental Protection Agency  
Environmental Monitoring Systems Laboratory  
Las Vegas, Nevada

Radioisotope	Hydrogen-3
Source identification	2606-1, prepared by EMSL
Source description	Liquid in 5-mL flame-sealed glass ampoule
Source mass	Approximately 5.0 grams
Source composition	Hydrogen-3 in water
Reference time	0700 EST June 3, 1992

	<u>NIST DATA</u>	<u>EMSL DATA</u>
Radioactivity concentration	810.5 Bq g <sup>-1</sup>	810.3 Bq g <sup>-1</sup>
Expanded uncertainty	0.64 percent <sup>(1,2)*</sup>	4.3 percent <sup>(3)</sup>
Photon-emitting impurities	None observed <sup>(4)</sup>	None observed
Measuring instrument	4 $\pi$ $\beta$ liquid-scintillation counters calibrated with SRM 4926D	Liquid-scintillation counting
Half life	12.43 $\pm$ 0.05 years <sup>(5)</sup>	
Difference from NIST		-0.05 percent <sup>(6)</sup>

For the Director,

J.M. Robin Hutchinson, Acting Group Leader  
Radioactivity Group  
Physics Laboratory

Gaithersburg, MD 20899  
January 1994

\*Notes on next page

# INITIAL STANDARD DILUTION RECORD

Standard Information:			
Isotope:	H-3	Vendor:	EPA
Activity of Standard Received:	.11 uCi	Vendor I.D. #	2/7/95
Weight of Standard Received (g):	5 g	LAL I.D. #:	AC 5299
Standard Activity (pCi/g):	21.9 nCi/g pCi/g	NIST Traceable?	Yes
Half-life in Years or Days:	12.43 yrs	Certificate #:	2606-1
Reference Date:	CAO, 6/3/92	Receiver's Name:	Kevin Free
		Date Received:	1/25/95

Primary Dilution			
Balance Verification?:	Yes		
Diluent Used:	EPA Distilled ASTM Type II Water (Deion Water)		
a: Decay Corrected Standard Activity (pCi/g):	21.9 nCi/g 4.939 pCi/g on 6/3/92		
b: Weight of the Source Transferred (g):	4.939 g		
c: Total diluted weight (g):	49.377 g		
d: Total Diluted Volume (mL)	50 mL 49.5 mL		
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	2190 pCi/g		
f: Calculated Density of Solution (g/ml) [c / d]:	0.99777 g/mL		
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	2190 pCi/mL on 6/3/92		
h. Dilution Logbook I.D. #:	C. Porewicz 9. J. A. M. J.	LAL-95-0721-1	
Prepared By:	Joe Hutchinson / J. Morales	Preparation Date:	2/7/95
Reviewed By:	Joe Hutchinson	Review Date:	2/7/95
Purity/Cross Check Performed By:		Check Date:	

CAO  
P. M. J.

Signed

Date

CP 5/8/95

Signed

000255

### SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

#### Dilution Source Information

Isotope: H-3 LCS

Parent Barcode Number: AC5299

Vendor or Certificate I.D. # of Parent Standard: 2606-1

Diluted Source Logbook I.D. #: LAL-95-721-1

Balance Verification?: Yes

Diluent Used: Deionized Water

#### Dilution

\*Diluent: Deionized Water

\*Density of diluent (g/ml): 0.99

a: Parent Specific Activity: 2190 pCi/ml

b: Amount of Source Transferred: 5.0 ml *8/24/95*

c: Total amount of Dilution: 4000 ml *8/24/95*

d: Total Volume of Dilution:           

e: Activity of Dilution (a \* b / c): 2.71 pCi/ml *8/24/95*

f: Activity of Dilution (a \* b / d):           

Dilution Logbook I.D. #: 95-721-1A-1

*9/27/95  
G.M.J.*

Prepared By: *J. Campbell*

Preparation Date: 8/24/95

Reviewed By: *Joe Hutchins*

Review Date: 8/24/95

\*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.

Read and Understood By

Signed

Date

Signed

Date

000256



# Certificate of Analysis

## Standard Reference Material 3164

### Spectrometric Standard Solution

#### Uranium

Batch Code 390709

This Standard Reference Material (SRM) is intended for use in atomic absorption spectrometry, optical emission (plasma) spectrometry, spectrophotometry, or any other analytical technique that requires aqueous standard solutions for calibrating instruments. SRM 3164 is a single element solution prepared gravimetrically to contain 10 mg/mL of uranium with a nitric acid concentration (V/V) of 10 percent. The certified value is based on a gravimetric procedure, i.e., weight per volume composition of the high-purity uranium oxide dissolved in NIST high-purity reagents. The uncertainty listed is based on gravimetric and volumetric uncertainties of the preparation and the effect of solvent transpiration through the container walls for one year after the bottle is removed from the plastic sleeve.

Metal	Concentration (mg/mL)	Source Purity, %	Acid Conc. (V/V) Approximate
U	10.00 ± 0.03	NBL-CRM 129 (99.968%) (formerly SRM 950b)	HNO <sub>3</sub> , 10%

#### Procedures for Use

**Stability:** This certification is valid for one year from the date of shipment from NIST provided the solutions are kept tightly capped and stored under normal laboratory conditions. NIST will monitor the stability of representative solutions from this SRM lot and if changes occur that invalidate this certification, NIST will notify purchasers.

**Preparation of Working Standard Solutions:** All solutions should be brought to 22 ± 1 °C and all glass or plastic surfaces coming into contact with the standard must have been previously cleaned. A working standard solution can be prepared from the SRM solution by serial dilution. Dilutions should be made with certified volumetric class A flasks and 5 or 10 mL class A pipets. All volumetric transfers of solutions should be performed using a proven analytical technique. Each dilution should be acidified with an appropriate high-purity acid and diluted to calibrated volume using high-purity water. The stability of the working standard solution will depend on the final acid concentration; therefore, care should be exercised to ensure that the final acid concentration of the dilution closely approximates that of the SRM. To achieve the highest accuracy, the analyst should prepare daily working solutions from 100 µg/mL dilutions of the original SRM solution.

SRM 3164 was prepared by T.A. Butler of the NIST Inorganic Analytical Research Division. Inductively coupled plasma emission spectrometric analyses were made by T.A. Butler and L.J. Wood.

The technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by J.S. Kane.

Gaithersburg, MD 20899  
October 5, 1993

Thomas E. Gills, Acting Chief  
Standard Reference Materials Program

000253

9613445.1570

Lockheed Environmental Systems & Technologies Co.  
Lockheed Analytical Services  
975 Kelly Johnson Drive Las Vegas, Nevada 89119-3705  
Telephone 702-361-0220 800-582-7605 Facsimile 702-361-8146

**LOCKHEED MARTIN** 

October 30, 1995

Ms. Joan Kessner  
Bechtel Hanford, Inc.  
P.O. Box 969  
1022 Lee Boulevard  
Richland, WA 99352

RE:	Log-in No.:	L5599
	Quotation No.:	Q400000-B
	SAF:	B95-083
	Document File No.:	1013596
	BHI Document File No.:	284
	SDG No.:	LK5599

The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on 13 October 1995.

The temperature of the samples were 4°C. Sample containers agree with the chain-of-custody documentation. Sample containers were intact.

The case narratives included in the following attachments provide a detailed description of all events that occurred during sample preparation, analysis, and data review specific to the samples and analytical methods requested.

A list of data qualifiers, chain-of-custody forms, sample receiving checklist, and log-in report are also enclosed representing the samples received within this group.

If you have any questions concerning the analysis or the data please call Kathleen Hall at (509) 375-4741.

0003

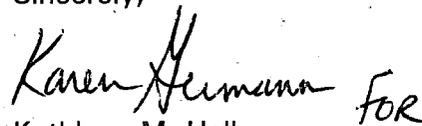
**Lockheed Analytical Services**

Log-in No.: L5599  
Quotation No.: Q400000-B  
SAF: B95-083  
Document File No.: 1013596  
BHI Document File No.:284  
SDG No.: LK5599  
Page1

Release of this data report has been authorized by the Laboratory Director or the Director's designee as evidenced by the following signature.

" 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 Manger or a designee, as verified by the following signature."

Sincerely,

Handwritten signature of Karen Heumann in cursive script, followed by the word "FOR" in all caps.

Kathleen M. Hall  
Client Services Representative

cc: Client Services  
Document Control

**Lockheed Analytical Services**

Log-in No.: L5599  
Quotation No.: Q400000-B  
SAF: B95-083  
Document File No.: 1013596  
BHI Document File No.:284  
SDG No.: LK5599  
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## **CASE NARRATIVE INORGANIC METALS ANALYSES**

The routine calibration and quality control analyses performed for this batch include as applicable: instrument tune (ICP/MS only), initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), ICP interference check samples (ICP only), serial dilutions, analytical (post-digestion) spike samples, matrix spike (predigestion) sample(s), duplicate sample(s).

### **Preparation and Analysis Requirements**

- Four solid samples for mercury metals analysis. The samples were prepared as LAS Batch 1013BH and analyzed for mercury analytes as requested on the chain of custody. Sample BOGCJ9 (L5599-1) was used for matrix spike and duplicate analyses. All data flags due to the performance of the above-mentioned QC sample are also associated with every sample digested with this batch.

### **Holding Time Requirements**

- All samples were analyzed within the method-specific holding times.

### **Method Blanks**

- The level of analytes in the method blanks were less than the reporting detection limits.

### **Internal Quality Control**

All internal quality control were within acceptance limits with the following exceptions:

- A duplicate precision is not reported for mercury, as the procedure does not adequately address how to report the triplicate results. At the customers request, the samples were analyzed in triplicate, all solid samples submitted for this method are reported as the mean of the three values with a +/- 2sigma error.

### **Sample Results**

- The following samples were reanalyzed at 10X dilutions because the concentration in the samples exceeded the linear range of the instrument:

BOGCL7 (L5599-3), (L5599-3D1), (L5599-3D2)

BOGCM9 (L5599-4), (L5599-4D1), (L5599-4D2)

**Lockheed Analytical Services**

Log-in No.: L5599  
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SDG No.: LK5599  
Page3

The preparation log (form XIII) indicates one digestion for each sample. However, as per the customers, the samples were digested and analyzed in triplicates. Due to software field size the duplicate and triplicate sample do not show on this form. Please refer to the bench sheets for additional information.

- The following qualifiers are reported on the basis of the techniques employed to perform the analyses:

"AV"Cold Vapor AA

Nalini Prabhakar

10\30\95

Prepared By

Date

9613445.1582

LOCKHEED ANALYTICAL SERVICES  
 LOGIN CHAIN OF CUSTODY REPORT (ln01)  
 Oct 13 1995, 03:26 pm

Login Number: L5599  
 Account: 596 Bechtel Hanford, Inc. \* Richland, WA  
 Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	Due PR Date
L5599-1 temp 4; OLD ID# L5287-7 Location: RFG01-16C SolidWaste 8 S 7471 MERCURY	BOGCJ9	25-AUG-95	13-OCT-95	27-OCT-95
		Hold:22-SEP-95		
L5599-2 temp 4; OLD ID# L5287-10 Location: RFG01-16C Soil 4 S 7471 MERCURY	BOGCK6	26-AUG-95	13-OCT-95	27-OCT-95
		Hold:23-SEP-95		
L5599-3 temp 4; OLD ID# L5287-12 Location: 157 Soil 4 S 7471 MERCURY	BOGCL7	27-AUG-95	13-OCT-95	27-OCT-95
		Hold:24-SEP-95		
L5599-4 temp 4; OLD ID# L5287-16 Location: RFG01-16C SolidWaste 8 S 7471 MERCURY	BOGCM9	28-AUG-95	13-OCT-95	27-OCT-95
		Hold:25-SEP-95		
L5599-5 Location: Water 1 S EDD - DISK DEL. Water 1 S INORG TYPE 2 RPT +	REPORT TYPE	13-OCT-95	13-OCT-95	27-OCT-95

Page 1

Signature: *McNeill*Date: 10-13-95 0000

1013596



**FIELD CHAIN-OF-CUSTODY FORM**

<b>Client Name and Address</b> Bechtel Hanford SAF # B95-083			<b>PWO/Contract No.</b>				<b>Analysis Required</b>				<b>Laboratory Use Only</b>	
<b>Sampling Site</b> Re-Log for additional analysis												
<b>Client Sample ID</b>	<b>Collection</b>		<b>Matrix Code*</b>	<b>Sample Type**</b>	<b>Field Preserved (Y or N)</b>	<b>No. and Volume of Containers</b>					<b>Comments</b>	<b>LAL Sample ID - Aliquot No.</b>
B0GCT9	8.25.95		Solid Waste				X					RFG19-52B (L5287-7) 15287-5
B0GCK6	8.26.95		Soil				X					RFG19-52B (L5287-10) 15287-8
B0GCL7	8.27.95		Soil				X					156RAD1-02 (L5287-13) 15287-11
B0GCM9	8.28.95		Solid Waste				X					RFG19-52B (L5287-16) 15287-14
<b>Date Data Required:</b>	<b>Cooler No.</b>	<b>Seal No.</b>		<b>Received for Laboratory By: (Signature)</b>				<b>Date</b>	<b>Time (am pm)</b>			
				Karin Herman				10.13.95	1100			
<b>Relinquished by: (Signature)</b>	<b>Date</b>	<b>Time (am pm)</b>		<b>Method of Shipment:</b>				<b>Airbill No.</b>				
<b>Received By: (Signature)</b>	<b>Date</b>	<b>Time (am pm)</b>		<b>Cooler Survey (pass/fail)</b>				<b>Surveyed by: (Signature)</b>				
				→ If FAIL, do not open cooler; contact the Program Development Department and the Radiation Safety Officer IMMEDIATELY.								
<b>Relinquished by: (Signature)</b>	<b>Date</b>	<b>Time (am pm)</b>		<b>Cooler Condition Upon Receipt at Laboratory:</b>				<b>Date</b>	<b>Time (am pm)</b>			
				Beats Intact: (Y/N) Blue Ice Adequate: (Y/N) Blue Ice Solid: (Y/N)								
<b>Received By: (Signature)</b>	<b>Date</b>	<b>Time (am pm)</b>		<b>Internal Cooler Temp. °C; Samples in good condition: (Y/N)</b>				<b>Samples surveyed (pass/fail)</b>				
<b>*Sample Matrix Codes</b>			<b>**Sample Type Codes</b>			<b>Comments:</b>						
SW - Surface Water	AR - Air	WW - Waste Water	G - Grab									
GW - Ground Water	SL - Soil	FI - Filter	C - Composite									
DW - Drinking Water	SG - Sludge	BI - Biota	O - Other									
	SD - Sediment	O - Other										

10135916

613445-1584

# LOCKHEED MARTIN



## Sample Login Login Review Checklist

Lot Number L5594

The login review should be conducted by that person logging in the samples as well as a peer. Please use this checklist to ensure that such reviews occur in a uniform basis. Please sign and date below to verify that a login review has occurred. This checklist should be affixed to each login package prior to distribution.

For effective login review, at a minimum, five reports form the login process are required. These are the COC (or equivalent), the login COC report, the sample summary report, the sample receiving checklist, and the login quotation. Before beginning review, ensure that these five components are available. Jobs with single component samples, the sample summary report may be omitted.

### SAMPLE SUMMARY REPORT

	<u>YES</u>	<u>NO</u>	<u>N/A</u>	<u>Comment</u>
1. Are all sample ID's correct?	X	—	—	_____
2. Are all samples present?	X	—	—	_____
3. Are all matrices indicated correctly?	X	—	—	_____
4. Are all analyses on the COC logged in for the appropriate samples?	X	—	—	_____
5. Are all analyses logged in for the correct container?	X	—	—	_____
6. Are samples logged in according to LAS batching procedures?	X	—	—	_____

### LOGIN CHAIN OF CUSTODY

	<u>YES</u>	<u>NO</u>	<u>N/A</u>	<u>Comment</u>
1. Are the collect, receive, and due dates correct for every sample?	X	—	—	_____
2. Have all appropriate comments been indicated in the comment section?	—	—	X	_____

### SAMPLE RECEIVING CHECKLIST

	<u>YES</u>	<u>NO</u>	<u>N/A</u>	<u>Comment</u>
1. Are all discrepancies between the COC and the login noted (if applicable)?	—	—	X	_____

[Signature]  
primary review signature

10-13-95  
date

[Signature]  
secondary review signature

10-13-95  
date

001:

1013596



9613446.1587

Lockheed Analytical Laboratory  
SAMPLE SUMMARY REPORT (su02)  
Bechtel Hanford, Inc. \* Richland, WA

Client Sample Number	LAL Sample Number	SDG Number	Matrix	Method
BOGCJ9 -	L5599-1		SolidWaste	7471 MERCURY -
BOGCK6 -	L5599-2		Soil	7471 MERCURY -
BOGCL7 -	L5599-3		Soil	7471 MERCURY -
BOGCM9 -	L5599-4		SolidWaste	7471 MERCURY -
REPORT TYPE -	L5599-5 L5599-5		Water Water	EDD - DISK DEL. INORG TYPE 2 RPT

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