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LOCKHEED MARTIN

Lockheed Analytical Services

OCT 1996
RECEIVED
Data
Log In

Ms. Joan Kessner
Bechtel Hanford, Inc.
3350 George Washington Way
MISN B1-35
Richland, WA 99352

ANALYTICAL DATA REPORT

FOR

STRONTIUM-90

FEB 1997
RECEIVED
EDM

LOG-IN NUMBER:	L7919
QUOTATION NUMBER:	Q400000-B
SAF:	B96-147
DOCUMENT FILE NUMBER:	0913596
BHI DOCUMENT FILE NO.:	405
SDG NUMBER:	LK7919

COPY

000001

Lockheed Analytical Services

BECHTEL HANFORD

Table of Contents

Sample Delivery Group. LK7919

Description	Page
Cover Page	1
Table of Contents	2
Case Narrative	3
Data Qualifiers	6
Chain-of-Custody	8
Radiochemistry	
A. Sample Result Forms and QC Summaries	15
B. Method 0196 Strontium-90 Raw Data	20
1. Run Logs	24
2. Standards Data	26

This package contains a total of 33 pages.

9713534.1631
Lockheed Environmental Systems & Technologies Co
Lockheed Analytical Services
[illegible] Johnson Drive Las Vegas, Nevada 89119-3705
Telephone 702-361-0220 800-582-[illegible] Facsimile 702-361-8146

LOCKHEED MARTIN

October 28, 1996

Ms. Joan Kessner
Bechtel Hanford, Inc.
3350 George Washington Way
MISN B1-35
Richland, WA 99352

RE:	Log-in No.:	L7919
	Quotation No.:	Q400000-B
	SAF:	B96-147
	Document File No.:	0913596
	BHI Document File No.:	405
	SDG No.:	LK7919

The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on September 13, 1996. The temperature of the cooler upon receipt was 4°C. Sample containers received agree with the chain-of-custody documentation. All 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.

Lockheed Analytical Services

Log-in No.: L7919
Quotation No.: Q400000-B
SAF: B96-147
Document File No.: 0913596
3HI Document File No.: 405
SDG No.: LK7919
Page: 2

If you have any questions concerning the analysis or the data please call Mary Wolf at (702) 361-3955, extension 311. If you are unable to contact the client services representative, please call Mary B. Ford, client services manager, at extension 326.

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

Sincerely,

Mary K. Wolf

Mary K. Wolf
Client Services Representative

cc: Client Services
Document Control

A2LA, ISO/IEC Guide 25, Section 13.2: The following results relate only to those samples tested. This report shall not be reproduced except in full, without the written approval of LAS.

CASE NARRATIVE
RADIOCHEMISTRY 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, and duplicate samples.

Holding Time Requirements

All holding time requirements were met.

Analytical Method Total Strontium

The total strontium analysis was performed using standard operating procedure, LAL-92-SOP-0196. The samples were analyzed in workgroup 42720. The instrument calibration verification met criteria. The method blank was within QC criteria. The laboratory control sample recovery was within QC criteria. The duplicate recoveries were within QC criteria. No re-analyses were performed.

Andrea Tippett
Prepared By

October 28, 1996
Date

Lockheed Analytical Services
DATA QUALIFIERS FOR RADIOCHEMICAL ANALYSES
[Revised 04/05/96]

For Use on the Analytical Data Reporting Forms	
B	Any constituent that was detected in the associated method blank at a concentration was greater than the reporting detection limit (RDL).
C	The minimum detectable activity exceeded the RDL due to the residue weight limitations forcing a volume reduction.
D	Constituent detected in the diluted sample.
E	Constituent concentration exceeded the calibration or attenuation curve range.
F	***For Alpha Spectrometry Only***-- Full width half max exceeded the acceptance limits.
H	Sample analysis performed outside of method-specified maximum holding time requirement.
Y	Chemical yield exceeded acceptance limits.
For Use on the QC Data Reporting Forms	
*	QC data (i.e., percent recovery data for laboratory control standard and matrix spike; and RPD for replicate analyses) exceeded acceptance limits.
a[1]	The spike recovery and/or RPD for matrix spike and duplicates cannot be evaluated due to insufficient spiking level compared to the elevated sample analyte concentration.
b[1]	The RPD cannot be computed because the sample and/or duplicate concentration was below the MDA.

[1] Used as foot note designations on the QC summary form.

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SAMPLE RECEIPT LOG-IN AND CHAIN-OF-CUSTODY

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LOCKHEED ANALYTICAL SERVICES
LOGIN CHAIN OF CUSTODY REPORT (ln01)
Oct 01 1996, 09:17 am

Login Number: L7919
Account: 596 Bechtel Hanford, Inc. * Richland, WA
Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	PR	Due Date
L7919-1	B0J0K5	10-SEP-96	13-SEP-96		28-OCT-96
temp 4					
Location: 156-018					
Water 1 S SCREENING		Hold: 09-MAR-97			
L7919-2	B0J0K5	10-SEP-96	13-SEP-96		28-OCT-96
temp 4					
Location: 156V-A031					
Water 1 S SR-90 LAL-0196		Hold: 09-MAR-97			
L7919-3	B0J0K5	10-SEP-96	13-SEP-96		28-OCT-96
temp 4					
Location: 156V-A031					
L7919-4	B0J0K5	10-SEP-96	13-SEP-96		28-OCT-96
temp 4					
Location: 156V-A031					
L7919-5	B0J0K5	10-SEP-96	13-SEP-96		28-OCT-96
temp 4					
Location: 156V-A031					
L7919-6	REPORT TYPE	13-SEP-96	13-SEP-96		28-OCT-96
Location:					
Water 1 S EDD - DISK DEL.					
Water 1 S RAD RPT TYPE 2					
Water 1 S WOLF					

analysis changed to reflect COC 9-30-96 MW

Signature: Mary E Wolf

Date: 9-30-96 000008

913596

Bechtel Hanford Inc.	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST L7919	B96-147-45	Page 1 of 1

Collector A. Arzac	**Company Contact** Borghese, JV	**Telephone No.** (509) 373-4790	**Data Turnaround** 15 Days
Project Designation 100-NR-2 Pump and Treat Treatability Study	**Sampling Location** 100 N	**SAF No.** B96-147	
Ice Chest No. PNL-EM-040	**Field Logbook No.** EFL-1248	**Method of Shipment** Federal Express	
Shipped To Lockheed	**Offsite Property No.** W96-0-0314-8	**Bill of Lading/Air Bill No.** 2771631922	

POSSIBLE SAMPLE HAZARDS/REMARKS

Special Handling and/or Storage
Maintain samples between 2 degrees C and 6 degrees C

Preservation	None	HNO3 to pH <2									
Type of Container	P	P									
No. of Container(s)	1	4									
Volume	20ml	1000ml									
SAMPLE ANALYSIS	Activity Scan	Strontium-89,90 -- Total Sr									
Sample No. / **Matrix *** / **Sample Date** / **Sample Time**											
B0J0K5 / Water / 9/10/96 / 0950	X	X									

CHAIN OF POSSESSION — **Sign/Print Names**

Relinquished By	Date/Time	Received By	Date/Time
A.G. Arzac (EFL)	9-12-96 1130	EFL B.W. Hutton	9-12-96 1130
EFL B.W. Hutton	9-12-96 1140		

SPECIAL INSTRUCTIONS
Data turnaround is 72 hours

Matrix *

S	=	Soil
SE	=	Sediment
SO	=	Solid
SL	=	Sludge
W	=	Water
O	=	Oil
A	=	Air
DS	=	Drum Solids
DL	=	Drum Liquids
T	=	Tissue
WI	=	Wipe
L	=	Liquid
V	=	Vegetation
X	=	Other

LABORATORY SECTION	Received By: A.M. Alb	Title: Sample Custodian	Date/Time: 9-13-96/0920
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

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SAMPLE CHECK-IN LIST

Date/Time Received: 9-13-96/0700 SDG#: N/A

Work Order Number: N/A SAF #: 896-147

Shipping Container ID: PNL-EM-040 Chain of Custody # N/A

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

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

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

9. Is the information on the COC and Sample bottles in agreement?

   Yes [X] No [ ]

Notes: _____

Sample Custodian/Laboratory: [signature] Date: 9-13-96

Telephoned To: N/A On _____ By _____

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LOCKHEED MARTIN

Sample Login
Login Review Checklist

Lot Number 67919

The login review should be conducted by that person logging in the samples as well as a peer. Please use this checklist to ensu that such reviews occur in a uniform basis. Please sign and date below to verify that a login review has occurred. This checkli 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	YES	NO	N/A	Comment
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	YES	NO	N/A	Comment
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	YES	NO	N/A	Comment
1. Are all discrepancies between the COC and the login noted (if applicable)?			X	

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[illegible] 9-13-96
primary review signature date

Kamala Trojer 9-13-96
secondary review signature date

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Lockheed Analytical Services
Sample Receiving Checklist

Page of

Client Name: Westinghouse Job No. L7919 Cooler ID: PNL-EM-040

COOLER CONDITION UPON RECEIPT			
Temperature of cooler upon receipt: 4°C			
temperature of temp. blank upon receipt:			
	Yes	No	• Comments/Discrepancies
custody seals intact	X		
chain of custody present	X		
blue ice (or equiv.) present/frozen			
rad survey completed	X		

SAMPLE CONDITION UPON RECEIPT			
	Yes	No	• Comments/Discrepancies
all bottles labeled	X		
samples intact	X		
proper container used for sample type	X		
sample volume sufficient for analysis	X		
proper pres. indicated on the COC	X		
VOA's contain headspace			Mt
are samples bi-phasic (if so, indicate sample ID'S):			Mt

MISCELLANEOUS ITEMS			
	Yes	No	• Comments/Discrepancies
samples with short holding times		X	
samples to subcontract		X	

ADDITIONAL COMMENTS/DISCREPANCIES

Completed by / date: [illegible] 9-13-96

Sent to the client (date/initials): •• Client's signature upon receipt:

Noted • = 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

version 2.0 (11/11/94)

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RADIOCHEMISTRY

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SAMPLE RESULT FORMS AND QC SUMMARIES

LOCKHEED ANALYTICAL SERVICES

RADIOCHEMISTRY DATA REPORT
Account Name: Bechtel Hanford, Inc. * Richland, WA
Project Name: BECHTEL-HANFORD
Project Desc: Bechtel Hanford Project

Client Sample ID: BOJOK5
Date Collected: 10-SEP-96
Matrix: Water

Login Number: L7919
Date Received: 13-SEP-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab ID
Sr-89,90	LAL-0196	42720	670.	34.	0.74		pCi/L	25-OCT-96	L7919-2

LOCKHEED ANALYTICAL SERVICES

METHOD BLANK DATA SUMMARY

Login/SDG Number: L7919

Analyte	Batch ID	Date Analyzed	Prep ID	Ana ID	Inst ID	LAL ID	Acceptance Criteria	MBS Result	UNCTY 2 Sigma	MDA	Units	Data Qual
Sr-89,90	42720	25-OCT-96	JS	CS	LB1-B3	42720MBB1	2.0	0.234	0.472	0.806	pCi/L	

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LOCKHEED ANALYTICAL SERVICES

LCS DATA SUMMARY

Login/SDG Number: L7919

Analyte	Batch ID	Date Analyzed	Prep ID	Ana ID	Inst ID	LAL ID	LCS Result	UNCTY 2 Sigma	Known Value	UNCTY 2 Sigma	Units	% Rec	Data Qual	QC Limits
Sr-89,90	42720	25-OCT-96	JS	CS	LB1-B2	42720LCS1	51.2	3.05	50.5	2.52	pCi/L	101		75-125

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LOCKHEED ANALYTICAL SERVICES

DUPLICATE DATA SUMMARY

Login/SDG Number: L7919

Analyte	Batch ID	Date Analyzed	Prep ID	Ana ID	Inst ID	Client ID	LAL ID	SMP Result	UNCTY 2 Sigma	DUP Result	UNCTY 2 Sigma	Units	RER	RPD	Data Qual	RPD Limit
Sr-89,90	42720	25-OCT-96	JS	CS	LB1-B1	B0J0K5	L7919-2	670.	34.0	683.	34.6	pCi/L	0.185	2		25

NOTE: Data qualified as out of limits if RPD > 20% and RER > 1.

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STRONTIUM-90
LAL-91-SOP-0196

LOCKHEED ANALYTICAL LABORATORY

SAMPLE PREPARATION LOG FOR STRONTIUM ANALYSIS
TOTAL RADIOSTRONTIUM - LAL-91-SOP-0196

Date Prep Started : 10-23-96 Matrix : Water

WorkGroup : SR-90 LAL-0196 42720 Prep Due Date : 10/24/96

CUSTOMER ID	PARENT LAL ID	NO	QC	CHILD LAL ID	ALIQUOT VOLUME (g or L)	SR CARRIER (mL)	YTTRIUM SEP DATE	YTTRIUM SEP TIME	PLANCHET TARE WT (grams)	PLANCHET GROSS WT (grams)	* * *	RESIDUE WEIGHT (grams)	COMMENTS
L7919-2	42720DUP1	1	DUP1	42720-01	500ml	0.5ml	10/24/96	21:00	6.65231	6.66306			
Lab Ctrl Sample	42720LCS1	2	LCS1	42720-02				20:59	6.61827	6.62921			
Method Blank	42720MBB	3	MBB1	42720-03				21:00	6.56366	6.57440			
B0J0K5	L7919-2	4	SMP1	42720-04				21:01	6.56910	6.58040			
B0J1P1	L8049-27	5		42720-05				21:02	6.56675	6.57826			
B0J1P0	L8049-31	6		42720-06				21:02	6.84930	6.86061			
		7											
		8											
		9											
		10											
		11											
		12											
		13											
		14											
		15											
		16											
		17											
		18											
		19											
		20											
		21											
		22											
		23											
		24											

Conc&Vol of Carrier	SR-90 0.01223g per 5ml 0.5ml	Act & Vol of LCS	SR-90 25.72 pCi/ml 1.0ml	Prep Anlst	S. Rutherford JS
Carrier Exp Date	9-30-96	LCS Ref Date	8-14-96	Start Date	10-23-96
Carrier ID#	94-658-20	LCS ID#	95-0721-39-1	Count Anlst	CS

Balance Number : 400-200-21 (✓) Pipette Number : 139746 (✓) Carrier and LCS added by: SR 10-23-96

( ) 134488 (✓) Witnessed by: [illegible] 10-23-96

Comments :

V96024

Analyst : SR JS Checked by : [illegible] Cnt Rm Custody\Date : [illegible]

00:00:20

97159341648

LOCKHEED ANALYTICAL LABORATORY

SAMPLE PREPARATION LOG FOR STRONTIUM ANALYSIS
TOTAL RADIOSTRONTIUM - LAL-91-SOP-0196

Date Prep Started : 10/23/96 Matrix : Water

WorkGroup : SR-90 LAL-0196 42720 Prep Due Date : 10/24/96

CUSTOMER ID	PARENT LAL ID	NO	QC	CHILD LAL ID	ALIQUOT VOLUME (L)	SR CARRIER (mL)	YTTRIUM SEP DATE	YTTRIUM SEP TIME	PLANCHET TARE WT (grams)	PLANCHET GROSS WT (grams)	* * *	RESIDUE WEIGHT (grams)	COMMENTS
L7919-2	42720DUP1	1	DUP1	42720-01	0.5	0.5	10/24/96	21:00	6.65231	6.66306		0.01075	
Lab Ctrl Sample	42720LCS1	2	LCS1	42720-02	0.5	0.5	10/24/96	20:59	6.61827	6.62921		0.01094	
Method Blank	42720MBB	3	MBB1	42720-03	0.5	0.5	10/24/96	21:00	6.56366	6.5744		0.01074	
B0J0K5	L7919-2	4	SMP1	42720-04	0.5	0.5	10/24/96	21:01	6.5691	6.5804		0.0113	
B0J1P1	L8049-27	5		42720-05	0.5	0.5	10/24/96	21:02	6.56675	6.57826		0.01151	
B0J1P0	L8049-31	6		42720-06	0.5	0.5	10/24/96	21:02	6.8493	6.86061		0.01131	
		7											
		8											
		9											
		10											
		11											
		12											
		13											
		14											
		15											
		16											
		17											
		18											
		19											
		20											
		21											
		22											
		23											
		24											

Conc&Vol of Carrier	24.50 mg/mL; 0.5 mL	Act & Vol of LCS	25.72 pCi/mL; 1.0 mL	Prep Anlst	JS
Carrier Exp Date	30-Sep-96	LCS Ref Date	05-Jan-96	Start Date	10/23/96
Carrier ID#	94-658-20	LCS ID#	95-721-39	Count Anlst	CS

Balance Number : 40020021 ( ) Pipette Number : 139746 ( ) Carrier and LCS added by: SR 10/23/96

( ) 134488 ( ) Witnessed by : DM 10/23/96

Comments :

V96024

Analyst : SV for JS Checked by : Cnt Rm Custody\Date :

000031

LOCKHEED ANALYTICAL LABORATORY

COUNT DATA AND CALCULATIONS FOR STRONTIUM ANALYSIS
TOTAL RADIOSTRONTIUM - LAL-91-SOP-0196

WorkGroup : SR-90 LAL-0196_42720

Det	Planchet LAL ID Sr	QC	Chem Recov	Count Time (min)	Beta Counts	Bkg Counts	EFF Sr-90	Count Start Date	Count Start Time	Yttrium Ingrow To Count	Bkg Corr Activity pCi/L	Count Error 2 Sigma	Total Error 2 Sigma	LLD pCi/L	MDA pCi/L
LB1-B1	42720-01	DUP1	0.878	150	50723	156	0.439	10/25/96	11:43	1.159	682.51	5.97	34.64	0.78	0.82
LB1-B2	42720-02	LCS1	0.893	150	4079	149	0.445	10/25/96	11:43	1.159	51.21	1.66	3.05	0.74	0.77
LB1-B3	42720-03	MBB1	0.877	150	180	162	0.454	10/25/96	11:43	1.159	0.23	0.47	0.47	0.77	0.81
LB1-B4	42720-04	SMP1	0.922	150	53728	147	0.450	10/25/96	11:43	1.159	669.79	5.70	33.97	0.71	0.74
LB1-A3	42720-05		0.940	150	191	151	0.454	10/25/96	11:43	1.158	0.49	0.44	0.44	0.70	0.73
LB1-A4	42720-06		0.923	150	33800	161	0.450	10/25/96	11:43	1.158	420.19	4.52	21.49	0.74	0.77

COMMENTS : 42720LCS1 LCS Recovery = 51.21/50.46 = 101.5 %.
L7919-2, 42720DUP1 RPD = 1.9 %, RER = 0.19

MBB = 0.234 pCi/L = > less than RDL(HAMDC).

V96024

Date Completed : 10-25-96

Analyst's Signature : SV

Checked by :

9713534.1651

RUN LOGS

PROJECT L3 9713534.1652 OPS

Notebook No. 0971

Continued From Page 0039

DATE	TIME	CHILD-ID	PARENT-ID	MATRIX	DET	PRESET	FILENAME	AI
10-25-96	0800	AC5257-AC5264	Cal Ver	STD	A1-B4	7m	DCAL299.1	C
	0811				B1-C4			C
	0820				C1-D4			C
	0829				D1-A4			C
	0912	AC5258			A2		DCAL299A.1	C
		AC5263			B3			C
10-25-96	0913	42249-04	42249 MS1	Planchet	D1	100m	A6142249.1	C
	0935	BKG	BKG	None	A1-C4	100m	DBKG299.1	C
	1139				D1-D4			C
10-25-96	1142	42720-01	42720 DUP1	Planchet	B1	150m	19642720.1	C
		-02	LCS1		B2			
		-03	MBB1		B3			
		-04	L7919-2		B4			
		-05	L8049-27		A3			
		-06	-31		A4			
		42786-01	42786 DUP1		C4	100m	06042786.1	
		-02	LCS1		C3			
		-03	MBB1		C2			
		-04	L8110-2		C1			C
10-25-96	1404	42618-01	42618 DUP1	Planchet	C1	100m	06142618.1	BV
		-02	LCS1		C2			
		-03	MBB		C3			
		-04	L8109-1		C4			
		-05	-10		D1			
		-06	-13		D3			
		-07	-16		D4			BV
10-25-96	1503	42618-08	L8109-19	Planchet	A1	100m	06142618.1	BV
		-09	-22		A2			
		-10	-25		A3			
		-11	-4		A4			
		-12	-7		B1			BV

BV 10-25-96

Reviewed and Understood By

BV 10-25-96

Signed Date Signed Date

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9713534.1653

STANDARDS

Strontium Carrier Standardization

Strontium Carrier (10 mg/mL):

Use commercially available 10,000 μg Sr/mL ICP Standard or equivalent. Alternately, Dissolve 24.16 g of $Sr(NO_3)_2$ in water and dilute to 1 L in a volumetric flask with water.

Perform calibration check on a 0.5 mL pipet and then carefully pipet 3 - 0.5 mL portions of the strontium carrier solution into separate cleaned dried and tared planchets. Dry the planchet under a drying lamp. Cool the planchets in a desiccator and weigh.

	Calib # 1	Calib # 2	Calib # 3
Carrier plus planchet wt. (mg)	6865.84	6562.93	6540.56
Tare wt. of planchet (mg)	6853.57	~~68~~ 6550.76	6528.26 ~~6520~~
Net wt. of carrier added (mg)	12.27	12.17	12.30

AVERAGE $Sr(NO_3)_2$ ± STD DEV. = 12.25 ± 0.0681 (0.01225g ± 0.0001g per 0.5mL)

Expected mg of $Sr(NO_3)_2$ = *cert.value(=10mgofSr/mL)* * 0.5 *mL* * 2.41

Within 3% of expected (12.08 mg/0.5 mL) value (yes/no) yes

Initial and Date: WL 10-5-95

44-651 2c

Walter Lutt 10-11-95

Continued on Page

Read and Understood By

WL	10-11-95	Thomas Wong	1-16-96
Signed	Date	Signed	Date

9713534.165

SPEX

ISO 9001

CERTIFICATE OF ANALYSIS

Catalog Number: PLSR2-3X Lot No. G3-153SR
Element and Matrix: $Sr/HNO_3/H_2O$
Starting Material: Strontium Carbonate $SrCO_3$
Starting Material Lot Number: 05941D

Trace Metallic Impurities in the actual solution via ICP of the concentrate.

Element	PPM	Element	PPM	Element	PPM
Ag	<.05	Cu	<.05	P	<.05
Al	<.05	Fe	<.05	Pb	.06
As	<.05	Ga	<.05	Sb	<.10
B	<.05	In	<.05	Si	<.05
Ba	<.05	K	<.05	Sn	<.10
Be	<.05	Li	<.05	Ti	<.05
Bi	<.05	Mg	<.05	Tl	<.05
Ca	<.05	Mn	<.05	V	<.05
Cd	<.05	Mo	<.10	Zn	<.05
Co	<.05	Na	<.05	Zr	<.10
Cr	<.05	Ni	<.05		

Traceability Documentation For Solution Standard:

1. Classical Wet Assay: 10,050 ppm.

   Titrimetry: EDTA titration using Methyl Thymol Blue as indicator. EDTA standardized against NIST $Pb(NO_3)_2$ SRM 928.

2. Instrumentation Analysis By Inductively Coupled Plasma Spectrometer[ICP]: 10,009 ppm via NIST SRM 3153a.

3. Balances are calibrated with NIST weight sets N.J. #92589 and #92550, according to NIST circular 547 3.4.3.

SPEX plasma solution standards are guaranteed stable and accurate to ± 0.5% of labeled concentration for one year from date of shipment. This value is the sum of cumulative errors associated with analytical determinations, pipetting and diluting to final volume. For these solutions we use high purity acids, 18 megohm double deionzed water and triple rinsed bottles. All glassware used is class A.

Signed by: N. Kocherlakota, Chemical Production Manager, Date: SEP 95

SPEX

Printed on Recycled Paper

SPEX INDUSTRIES, INC. 3880 PARK AVE. EDISON, N.J. 08820 908-549-7144 FAX: 908-603-9647

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CERTIFICATE OF CALIBRATION
BETA STANDARD SOLUTION

Radionuclide	Sr-90	Customer:	LOCKHEED ENGINEERING & SCIENCES Co.
Half Life:	28.5 ± 0.2 years	P.O.No.:	06LAB1245
Catalog No.:	7090	Reference Date:	November 1 1991 12:00 PST.
Source No.:	388-99-2	Contained Radioactivity:	1.018 µCi.

Description of Solution

a. Mass of solution: 5.0012 grams.

b. Chemical form: SrCl2 in 0.1N HCl

c. Carrier content: None added

d. Density: 0.9996 gram/ml @ 20°C.

Radioimpurities

None (Y-90 daughter in equilibrium)

Radioactive Daughters

Y-90 daughter in equilibrium

Radionuclide Concentration

0.203 µCi/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: ±1.5%

b. Random uncertainty in assay: ±0.5%

c. Random uncertainty in weighing(s): ±0.0%

d. Total uncertainty at the 99% confidence level: ±2.0%

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)

Gary A Gilmore
QUALITY CONTROL

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

RADIONUCLIDE REQUEST FORM

To: U.S. EPA EMSL-LV
Nuclear Radiation Assessment Division
NRA - RADQA
P.O. Box 93478
Las Vegas, NV 89193-3478

FAX: 702 798-2236

Please ship the calibrated standards listed below to:

Contact Person: _____

Title: _____

Alternate Person: _____

Title: _____

Laboratory: _____

Address: _____

_____

Telephone: _____

NRC License and/or State License Type: _____

Number: _____ Exp.Date _____

Note: When requesting radionuclides, a copy of the current NRC license and/or State license must be on file with us.

RADIONUCLIDE STANDARD DESIRED:

_____ _____ _____

_____ _____ _____

I certify that the calibrated standard(s) requested are to be used only in this laboratory by qualified personnel for the purpose of developing or checking analytical procedures and/or for calibrating instrumentation. I further certify that I am authorized to receive the radionuclides listed above under the license number(s) listed above.

Signature _____ Date _____

Title _____ _____

Lab Code _____

AVAILABLE RADIONUCLIDES FROM EPA

H-3	I-131 (1/95)	Ra-228
Co-60	Ba-133	Th-230
Zn-65	Cs-134	U-238
Sr-89	Cs-137	Pu-239 (2/95)
Sr-90	Ra-226	Pu-240 *
		Am-241

SPECIAL REFERENCE MATERIAL *

(DP2) DILUTED PITCHBLENDE

(SM1) STANDARD MONAZITE ORE

(DM2) DILUTED MONAZITE ORE

(MT1) CLIMAX SAND TAILINGS

(MX1) MIXED NUCLIDE STANDARD
(H-3, Sr-90, Cs-134, Ra-226, Ra-228, U-Nat)

(MX2) DILUTED MIXED NUCLIDE STANDARD
(H-3, Sr-90, Cs-134, Ra-226, Ra-228, U-Nat)

U-CHAIN---SPIKED AIR FILTER; U-238 CHAIN
U-238 through Ra-226; 10 to 20 pCi/filter
Pb-210; -440 pCi/filter

* DISCONTINUED WHEN SUPPLY RUNS OUT

(Approximate activities can be found in the Radioactive Standards Distribution Program brochure.)

Revised 19-Jan-1995

9713534 1659

INITIAL STANDARD DILUTION RECORD

Standard Information:			
Isotope:	Sr. 90	Vendor:	IPL
Activity of Standard Received:	~~5.001~~ 1.018 uCi	Vendor I.D. #	—
Weight of Standard Received (g):	5.0012 g	LAL I.D. #:	AA 00 49
Standard Activity (pCi/g):	2.036E 5 pCi/g	NIST Traceable ?	Yes
Halflife in Years or Days:	29.1 yrs	Certificate #:	388-99-2
Reference Date:	11/1/91	Receiver's Name:	FREE
		Date Received:	12/91

Primary Dilution		
Balance Verification?:	Yes	
Diluent Used:	1 M HNO_3 (1.0290 g/ml)	
Decay Corrected Standard Activity (pCi/g):	1.844 E5	pCi/g @ 1/5/96
Weight of the Source Transferred (g):	4.949	g
Total diluted weight (g):	100.01	g
Total Diluted Volume (mL)	97.19	mL
Activity of Dilution by Weight (pCi/g) [a * b / c]:	9125.0	pCi/g @ 1/5/96
Calculated Density of Solution (g/ml) [c / d]:	~~9389.8~~ 1.0290	g/mL
Activity of Dilution by Volume (pCi/mL) [e * f]:	9389.8	pCi/mL
Dilution Logbook I.D. #:	94-0677-91-1	

Prepared By: [signature] Preparation Date: 1/5/96

Reviewed By: [signature] Review Date: 1/[illegible]/[illegible]

Peer/Cross Check Performed By: _____ Check Date: _____

Signed Date Signed Date

PROJECT Sr-90 LW 9713534.1660

Continued From Page N/A

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information

Isotope:	Sr-90
Parent Barcode Number	94-0677-92-1
Vendor or Certificate I.D. # of Parent Standard:	—
Diluted Source Logbook I.D. #:	94-0677-92-1
Balance Verification?:	Yes
Diluent Used:	1 M HNO_3

8/14/96

Dilution

*Diluent:	1 M HNO_3	
*Density of diluent (g/ml):	1.029	g/ml
a: Parent Specific Activity:	500.09	pCi/g @ 1/5/96
b: Amount of Source Transferred:	5.00	g
c: Total amount of Dilution:	100.05	g
d: Total Volume of Dilution:	102.95	ml
e: Activity of Dilution (a * b / c):	24.99	pCi/g @ 1/5/96
f: Activity of Dilution (a * b / d):	25.72	pCi/ml
Dilution Logbook I.D. #:	95-0721-39-1	

Prepared By: [signature] Preparation Date: 8/14/96

Reviewed By: [signature] Review Date: 8/14/96

*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.

Signed Date Signed Date

000032

9213534.1661

Notebook No. 0677

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information	
Isotope:	Sr-90
Parent Barcode Number	AA0049
Vendor or Certificate I.D. # of Parent Standard:	~~94-0677-91-1~~ 388-99-2
Diluted Source Logbook I.D. #:	94-0677-91-1
Balance Verification?:	Yes
Diluent Used:	1.0 M HNO_3

Dilution		
*Diluent:	1.0 M HNO_3	
*Density of diluent (g/ml):	1.0290	g/ml
a: Parent Specific Activity:	9125.0	pCi/g @ 1/5/96
b: Amount of Source Transferred:	6.012	g
c: Total amount of Dilution:	109.70	g
d: Total Volume of Dilution:	106.61	ml
e: Activity of Dilution (a * b / c):	500.09	pCi/g 1/5/96
f: Activity of Dilution (a * b / d):	514.6	pCi/ml
Dilution Logbook I.D. #:	94-0677-92-1	

Prepared By: [signature] Preparation Date: 1/5/96

Reviewed By: [signature] Review Date: 1/5/96

*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

000033