

# START

9615447.0644

LK 5543<sup>97</sup>  
0044407

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 17, 1995

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

RE:	Log-in No.:	L5543
	Quotation No.:	Q400000-B
	SAF:	B95-080
	Document File No.:	1003596
	BHI Document File No.:	280
	SDG No.:	LK5543



The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on 6 October 1995.

The temperature of the cooler upon receipt was 2°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.

**Lockheed Analytical Services**

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SDG No.: LK5543  
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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.: L5543  
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 SDG No.: LK5543  
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**CASE NARRATIVE  
 INORGANIC NON METALS 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 (predigestion) sample(s), duplicate sample(s).

**Preparation and Analysis Requirements**

- One water sample was received for LK5543 and analyzed in batch 1006 bh for selected analytes as requested on the chain of custody. Quality control analysis was performed on the following sample:

Client ID	LAL #		Method
BOGP15	L5543-3	MS, DUP	375.4 Sulfate

**Holding Time Requirements**

- The sample was analyzed within the method-specified holding time.

**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.

Kay McCann  
 Prepared By

October 12, 1995  
 Date

**Lockheed Analytical Services**

Log-in No.: L5543  
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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**

All samples were received on October 6, 1995. The samples were logged in as L5543 and were prepared and analyzed in batch 1006 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.

Shellee McGrath  
**Prepared By**

October 17, 1995  
**Date**

**Lockheed Analytical Services**

Log-in No.: L5543  
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## CASE NARRATIVE RADIOCHEMICAL 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, duplicate samples.

**Note:** Chemical recoveries and minimum detectable activities can be found on the preparation and calculation sheets of the attached raw data.

### Holding Time Requirements

All holding time requirements were met.

### Analytical Method Strontium-90

The strontium-90 analysis was performed using standard operating procedure, LAL-91-SOP-0196. The samples were analyzed in workgroup 28363. No problems were encountered during analysis and all QC criteria were met, with the following exception: The method blank (MBB) was greater than the reporting detection limit; however, since the MBB activity was less than 5% of the sample activity, the data is considered acceptable and no re-analyses were performed.

Yvonne M. Jacoby  
Prepared By

October 16, 1995  
Date

9613447.0649

LOCKHEED ANALYTICAL SERVICES  
 LOGIN CHAIN OF CUSTODY REPORT (ln01)  
 Oct 06 1995, 04:03 pm

Login Number: L5543  
 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
L5543-1 temp 2; SAF# B95-080 Location: RFG01-ON FLOOR Water 1 S SCREENING	BOGP15	04-OCT-95	06-OCT-95	21-OCT-95
				Hold:01-APR-96
L5543-2 temp 2; SAF# B95-080, ICP=Ca + Mg ONLY Location: RFG01-ON FLOOR Water 1 S 6010 ICP METALS	BOGP15	04-OCT-95	06-OCT-95	21-OCT-95
				Hold:01-APR-96
L5543-3 temp 2; SAF# B95-080 Location: RFG01-ON FLOOR Water 1 S 375.4 SULFATE	BOGP15	04-OCT-95	06-OCT-95	21-OCT-95
				Hold:01-NOV-95
L5543-4 temp 2; SAF# B95-080 Location: RFG01-ON FLOOR Water 1 S SR-90 LAL-0196	BOGP15	04-OCT-95	06-OCT-95	21-OCT-95
				Hold:01-APR-96
L5543-5 temp 2; SAF# B95-080 Location: RFG01-ON FLOOR	BOGP15	04-OCT-95	06-OCT-95	21-OCT-95
L5543-6 temp 2; SAF# B95-080 Location: RFG01-ON FLOOR	BOGP15	04-OCT-95	06-OCT-95	21-OCT-95
L5543-7 temp 2; SAF# B95-080 Location: RFG01-ON FLOOR	BOGP15	04-OCT-95	06-OCT-95	21-OCT-95
L5543-8 SAF# B95-080 Location: Water 1 S EDD - DISK DEL. Water 1 S INORG TYPE 2 RPT + Water 1 S RAD RPT TYPE 2	REPORT TYPE	06-OCT-95	06-OCT-95	21-OCT-95

Signature: *Harrell*  
 Date: 10-6-95

01  
 1000596

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

**L5543**

Collector <b>A Rizzo</b>	Company Contact J.V. Borghese	Telephone (509) 372-9584	<input checked="" type="checkbox"/> Priority <input type="checkbox"/> Normal
Project Designation 100-NR-2 Performance Monitoring - Oct.	Sampling Location 100 N	SAF No. B95-080	
Ice Chest No. <b>SML-294</b>	Field Logbook No. <b>ERL 1058</b>	Method of Shipment Federal Express	
Shipped To Lockheed	Offsite Property No. <b>W96-0-0640-1</b>	Bill of Lading/Air Bill No. <b>2904643095</b>	

Possible Sample Hazards/Remarks	Preservation	HNO <sub>3</sub>	Cool 4°C	H <sub>2</sub> SO <sub>4</sub>	HNO <sub>3</sub>	Cool 4°C					
	Type of Container	P/G	G	G	P/G	P/G					
	No. of Container(s)	1	1	2	4	1					
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	500mL	500-1 250mL	1045 1L	1L	20mL					
SAMPLE ANALYSIS	ICP Metals - Ca, Mg (Only)	Anions (IC) - SO <sub>4</sub> (Only)	TPH - Total	Sr-90	Activity Scan						

Sample No.	Matrix*	Date Sampled	Time Sampled									
BOGP15	W	10-4-95	1325	✓	✓	✓	✓					

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS	Matrix*
Relinquished By <i>AG Rizzo</i> Date/Time <i>0740</i>	Received By <i>ER</i> Date/Time <i>0740</i>		S = Soil
Relinquished By <i>AG Rizzo (ERL)</i> Date/Time <i>10-5-95</i>	Received By <i>Eric Rizzo</i> Date/Time <i>10-5-95</i>		SE = Sediment
Relinquished By <i>Eric Rizzo</i> Date/Time <i>0800</i>	Received By <i>Eric Rizzo</i> Date/Time		SO = Solid
Relinquished By <i>Eric Rizzo</i> Date/Time <i>10-5-95</i>	Received By <i>Eric Rizzo</i> Date/Time		SL = Sludge
Relinquished By _____ Date/Time _____	Received By _____ Date/Time _____		W = Water
Relinquished By _____ Date/Time _____	Received By _____ Date/Time _____		O = Oil
Relinquished By _____ Date/Time _____	Received By _____ Date/Time _____		A = Air
Relinquished By _____ Date/Time _____	Received By _____ Date/Time _____		DS = Drum Solids
LABORATORY SECTION	Received By <i>h. m. rille</i> Title <i>Sample Custodian</i> Date/Time <i>10-6-95 0900</i>		DL = Drum Liquids
FINAL SAMPLE DISPOSITION	Disposal Method _____ Disposed By _____ Date/Time _____		T = Tissue

100-0596-011

9613417-1650

9613447.0651

SAMPLE STATUS REPORT FOR N 5984. RAD SCREEN 199N106A TIME: 10/ 5/95 7:57  
DISPATCHED: 9/29/95 10:56 SAMPLE HAS NOT BEEN SLURPED  
RECEIVED: 10/ 4/95 16: 0

EXT.	DETER.	RESULTS OR STATUS	OUT OF RANGE?	GOOD ANS?	CHARGE CODE
****	*****	*****	***	***	*****
4271	TOT-ACT	< 5.00000E 01 pCi/G	N	Y	XR5807

END OF REPORT

*BOGB15  
BW  
10-5-95*

### SAMPLE CHECK-IN LIST

Date/Time Received: 10-6-95/0900 SDG#: MT

Work Order Number: MT SAF #: B95-080

Shipping Container ID: SML-294 Chain of Custody #: MT

- 1. Custody Seals on shipping container intact? Yes  No
- 2. Custody Seals dated and signed? Yes  No
- 3. Sample temperature 2°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:

<input type="checkbox"/> tape	<input type="checkbox"/> hazard labels
<input checked="" type="checkbox"/> custody seals	<input checked="" type="checkbox"/> appropriate sample labels

8. Samples are:

<input checked="" type="checkbox"/> in good condition	<input type="checkbox"/> leaking
<input type="checkbox"/> broken	<input type="checkbox"/> have air bubbles

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

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

Sample Custodian/Laboratory: Lemuel Date: 10-6-95

Telephoned To: Karsten Hill On 10-6-95 By Anthony Miller

**LOCKHEED MARTIN**

**Sample Login  
Login Review Checklist**

Lot Number L5543

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**

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

**LOGIN CHAIN OF CUSTODY**

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

**SAMPLE RECEIVING CHECKLIST**

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

[Signature]  
primary review signature

10-6-95  
date

[Signature]  
secondary review signature

10-06-95 015  
date

1000596



9613447.0655

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

Client Sample Number	LAL Sample Number	SDG Number	Matrix	Method
BOGP15 ~	L5543-1		Water	- SCREENING -
	L5543-2		Water	- 6010 ICP METALS -
	L5543-3		Water	- 375.4 SULFATE -
	L5543-4		Water	- SR-90 LAL-0196 -
REPORT TYPE ✓	L5543-8		Water	EDD - DISK DEL ✓
	L5543-8		Water	INORG TYPE 2 RPT
	L5543-8		Water	RAD RPT TYPE 2 ✓

017

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LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0GP15	Date Collected: 04-OCT-95
Matrix: Water	Date Received: 06-OCT-95
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
SULFATE	mg/L	375.4	19.	5.0		10-OCT-95	28386	L5543-3

9613447.0657

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0GP15	Date Collected: 04-OCT-95
Matrix: Water	Date Received: 06-OCT-95
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
CALCIUM, TOTAL	mg/L	6010	28.	0.032		1	11-OCT-95	28387	L5543-2
MAGNESIUM, TOTAL	mg/L	6010	5.0	0.050		1	11-OCT-95	28387	L5543-2

## LOCKHEED ANALYTICAL SERVICES

## RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. \* Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0GP15

LAL Sample ID: L5543-4

Date Collected: 04-OCT-95

Date Received: 06-OCT-95

Matrix: Water

Login Number: L5543

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
Total radio-strontium	11-OCT-95	SR-90 LAL-0196_28363	4070	200	1.3		pCi/L



# LOCKHEED ANALYTICAL LABORATORY

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

039

Date Prep Started : 10/10/95

Matrix : Water

WorkGroup : SR-90 LAL-0196 28363

Prep Due Date : 10/12/95

CUSTOMER ID	PARENT LAL ID	NO	QC	CHILD LAL ID	ALIQOT VOLUME (L)	SR CARRIER (mL)	YTTRIUM SEP DATE	YTTRIUM SEP TIME	PLANCHET TARE WT (grams)	PLANCHET GROSS WT (grams)	RESIDUE WEIGHT (grams)	COMMENTS
L5543-4	28363DUP1	1	DUP1	28363-01	0.495	0.05	10/11/95	21:12	6.53637	6.54559	0.00922	
Lab Ctrl Sample	28363LCS1	2	LCS1	28363-02	1	0.05	10/11/95	21:12	6.57588	6.58332	0.00744	
Method Blank	28363MBB	3	MBB1	28363-03	1	0.05	10/11/95	21:12	6.62928	6.63787	0.00859	
BOGP15	L5543-4	4	SMP1	28363-04	0.495	0.05	10/11/95	21:17	6.53903	6.54689	0.00786	
		5										
		6										
		7										
		8										
		9										
		10										
		11										
		12										
		13										
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		15										
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		17										
		18										
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		20										
		21										
		22										
		23										
		24										
Conc&Vol of Carrier	24.62 mg/mL; 0.5 mL		Act & Vol of LCS		26.78 pCi/mL; 1.0 mL		Prep Anlst		WL			
Carrier Exp Date	05-Jan-96		LCS Ref Date		01-Apr-94		Start Date		10/10/95			
Carrier ID#	94-658-4-1		LCS ID#		94-677-44-1		Count Anlst		LV			

Balance Number : 40020021 ( )

Pipette Number : 134488 ( )

Carrier and LCS added by: WL

( )

139746 ( )

Witnessed by : SR

Comments :

Analyst : DATA entered by: LV FOR WL Checked by : [Signature] 10/13/95

Cnt Rm Custody\Date : \_\_\_\_\_

26131117-0660



9613447.0662  
RADIATION RESULTS CHECK REPORT

Workgroup Number: SR-90 LAL-0196\_28363

Sample	Parameter	Value	Error	MDA
28363DUP1	Total radio-strontium	4102.53	201.701	1.02402
28363LCS1	Total radio-strontium	26.8919	1.72008	0.636147
28363MBB1	Total radio-strontium	45.4547	2.58156	0.553389
L5543-4	Total radio-strontium	4066.21	200.168	1.25227

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. Fahn* 046

# INITIAL STANDARD DILUTION RECORD

## Standard Information:

Isotope:	<u>Sr-90</u>	Vendor:	<u>EPA</u>
Activity of Standard Received:	<u><math>2.7 \times 10^4</math> uCi</u>	Vendor I.D. #	<u>94003-1</u>
Weight of Standard Received (g):	<u>50 g</u>	LAL I.D. #:	<u>AC5281</u>
Standard Activity (pCi/g):	<u><math>5.4 \times 10^3</math> pCi/g</u>	NIST Traceable ?	<u>yes</u>
Half-life in Years or Days:	<u>28.6 yrs</u>	Certificate #:	<u>94003-1</u>
Reference Date:	<u>4-1-1994</u>	Receiver's Name:	<u>K. Free</u>
		Date Received:	<u>5-3-94</u>

## Primary Dilution

Balance Verification?:	<u>yes</u>
Diluent Used:	<u>0.1 M HCl</u>
a: Decay Corrected Standard Activity (pCi/g):	<u><math>5.4 \times 10^3</math> pCi/g</u>
b: Weight of the Source Transferred (g):	<u>4.9670 g</u>
c: Total diluted weight (g):	<u>49.91 g</u>
d: Total Diluted Volume (mL)	<u>50 mL</u>
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	<u>537.4 pCi/g</u>
f: Calculated Density of Solution (g/ml) [c / d]:	<u>0.9982 g/mL</u>
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	<u>536.44 pCi/mL</u>
h. Dilution Logbook I.D. #:	<u><del>93-474-81-1</del> <sup>73-474-82-1</sup> CP4/7/95</u>
Prepared By: <u>Dyane 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: _____

*Upper stated*

### SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information	
Isotope:	<u>Sr-90</u>
Ref. <u>4-1-94</u> Parent Barcode Number	<u>AC5281</u>
Vendor or Certificate I.D. # of Parent Standard:	<u>EPA 94003 - 1</u>
Diluted Source Logbook I.D. #:	<u>93-474 - 82 - 1</u>
Balance Verification?:	<u>Yes</u>
Diluent Used:	<u>0.1 M HCl</u>

Dilution	
* Diluent:	<u>0.1 M HCl</u>
* Density of diluent (g/ml):	<u>N/A</u>
a: Parent Specific Activity:	<u>536.44 pCi/ml</u>
b: Amount of Source Transferred:	<u>5.0018 g</u>
c: Total amount of Dilution:	<u>100.20 g</u>
d: Total Volume of Dilution:	<u>N/A</u>
e: Activity of Dilution (a * b / c):	<u>N/A</u>
f: Activity of Dilution (a * b / d):	<u>26.78 pCi/ml</u>
Dilution Logbook I.D. #:	<u>94-677-44-1</u>
Prepared By: <u>Dynes Wong</u>	Preparation Date: <u>3-2-95</u>
Reviewed By: <u>Joe H...</u>	Review Date: <u>3/3/95</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.

**Strontium Carrier Standardization**

Strontium Carrier (10 mg/mL):

Use commercially available 10,000  $\mu\text{g Sr/mL}$  ICP Standard or equivalent. Alternately, Dissolve 24.16 g of  $\text{Sr}(\text{NO}_3)_2$  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.

*Sr Carrier #91-208-100-1 was recalibrated to give a new calibrated value. Prepped on 1-5-95*

	Calib # 1	Calib # 2	Calib # 3
Carrier plus planchet wt.	6.60823	6.65050	6.818936 <sup>AW</sup>
Tare wt. of planchet	6.59582	6.63805	6.80698
Net wt. of carrier added (mg)	0.01241	0.01245	0.012068

AVERAGE  $\text{Sr}(\text{NO}_3)_2 \pm \text{STD DEV.} = \underline{0.01231 \text{ g}}$

*Expected mg of  $\text{Sr}(\text{NO}_3)_2 = \text{cert. value} (=10 \text{ mg of Sr/mL}) * 0.5 \text{ mL} * 2.41$*

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

Initial and Date: JW 1-10-95

Read and Understood By

*Raymond Wong  
1-10-95*

Signed

Date

Signed

Date 047

## Strontium Carrier Standardization

Strontium Carrier (10 mg/mL):

Use commercially available 10,000  $\mu\text{g}$  Sr/mL ICP Standard or equivalent. Alternately, Dissolve 24.16 g of  $\text{Sr}(\text{NO}_3)_2$  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.	6.58185 g	6.49626 g	6.56816 g
Tare wt. of planchet	6.56968 g	6.48464 g	6.55620 g
Net wt. of carrier added (mg)	0.01217 g	0.01162	0.01196 g

AVERAGE  $\text{Sr}(\text{NO}_3)_2 \pm \text{STD DEV.} = 0.01192 \text{ g} \pm 0.000277$

Expected mg of  $\text{Sr}(\text{NO}_3)_2 = \text{cert. value} (=10 \text{ mg of Sr/mL}) * 0.5 \text{ mL} * 2.41$

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

Initial and Date: AW 3-6-94

Continued on Page

Read and Understood By QA Review:

048

Dagmar Wong  
Signed

3-15-94  
Date

Yue-Mei-Lin  
Signed

8/14/94  
Date

INTERDEPARTMENTAL COMMUNICATION

DATE September 29, 1994

TO Document Control DEPT./ ORGN. BLDG./ BLDG 9 ZONE PLANT/ FAC.

FROM Carl Schloesslin <sup>CS</sup> DEPT./ 5014 ORGN. BLDG./ LAS ZONE PLANT/ FAC. EXT. 242

SUBJECT: Tennelec LB4000.1 (LB1) Total Strontium Calibration (Method 196)

Attached is calibration data of Strontium-90 for total strontium analysis by gas proportional counting. This calibration was performed during September 21-29, 1994 on the LB4000.1 GPC. The results of this calibration is to be put in use beginning September 29, 1994 and continue until a new calibration is performed and approved.

Three Sr-90 calibration standards were made and counted on 9/21/94 with 2% ingrow of Y-90. The standards were counted again on 9/28/94 with 84% ingrow of Y-90. The three standards were counted long enough to achieve over 10,000 counts on detectors A1, A2 & A3. Using the normalization factors determined from the gross beta calibration which uses Sr-Y-90 as the standard, the counting efficiencies of A2 & A3 can be related to that of A1. The counting efficiency of Sr-90 on A1 is determined to be 44.05%. The counting efficiency of Y-90 on A1 is determined to be 51.99%. Multiplying the efficiency of A1 by the normalization factor for the detector in use gives the counting efficiency for that detector. The normalization factors for Sr-Y-90 on the LB4000.1 detectors are as follows:

A1	1.0000	B1	1.0089	C1	1.0064	D1	1.0070
A2	1.0300	B2	1.0245	C2	0.9913	D2	0.9275
A3	1.0345	B3	1.0352	C3	1.0053	D3	1.0105
A4	1.0317	B4	1.0275	C4	0.9958	D4	0.9343

This calibration is valid for strontium carrier calibration values of approximately 0.0119 grams.

A copy of this data package should be kept on file in document control with previous radiochemistry calibrations of the Tennelec LB4000 gas proportional counter for strontium analysis.

Approved by:

Terry Romanko 9/30/94  
Terry Romanko, Counting Room Lead



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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  
February, 1991

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

\*Notes on back