

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

LK5543  
0044407

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**

Log-in No.: L5543  
Quotation No.: Q400000-B  
SAF: B95-080  
Document File No.: 1006596  
BHI Document File No.:280  
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

**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

**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.

Sheilee McGrath  
Prepared By

October 17, 1995  
Date

## **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

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

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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	500mL	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	Y	Y		Y	X			

CHAIN OF POSSESSION		Sign/Print Names		SPECIAL INSTRUCTIONS				Matrix*
Relinquished By <b>A.R. Rizzo</b>	Date/Time <b>10-5-95</b>	Received By <b>ERL</b>	Date/Time <b>0740</b>					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
Relinquished By <b>ERL</b>	Date/Time <b>0800</b>	Received By <b>Bechtel</b>	Date/Time <b>10-5-95</b>					
Relinquished By <b>Bechtel</b>	Date/Time <b>10-5-95</b>	Received By	Date/Time					
Relinquished By	Date/Time	Received By	Date/Time					
LABORATORY SECTION	Received By <b>Monte</b>	Title <b>Sample Custodian</b>	Date/Time <b>10-6-95 0900</b>					
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time					

10000596 011

10:00 00 00:00 0070 0170 0113 00  
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*

010

*1000596*

# SAMPLE CHECK-IN LIST

Date/Time Received: 10-6-95 / 0900

SDG#: MY

Work Order Number: MY

SAF #: B95-080

Shipping Container ID: SML-294

Chain of Custody #: MY

- 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:

<u>      </u> tape	<u>      </u> hazard labels
<u>  x  </u> custody seals	<u>  x  </u> appropriate sample labels

8. Samples are:

<u>  x  </u> in good condition	<u>      </u> leaking
<u>      </u> broken	<u>      </u> 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: Karshen Hall 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

	<u>YES</u>	<u>NO</u>	<u>N/A</u>	<u>Comment</u>
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

	<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?	<u>X</u>	___	___	_____
2. Have all appropriate comments been indicated in the comment section?	___	___	<u>Y</u>	_____

### 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)?	___	___	<u>X</u>	_____

[Signature]  
primary review signature

10-6-95  
date

[Signature]  
secondary review signature

10-06-95 015  
date

1000596

Lockheed Analytical Services  
Sample Receiving Checklist

Client Name: *Bedwell*

Job No. *25543*

Cooler ID:

COOLER CONDITION UPON RECEIPT

Temperature of cooler upon receipt:

*2°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>Mh</i>
are samples bi-phasic (if so, indicate sample ID'S):			<i>Mh</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: *[Signature]* *10-6-95*

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

Notes: \* = 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

1006596

013

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 ✓

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: BOGP15	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

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: BOGP15	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

330

Date Prep Started : 10/10/95  
WorkGroup : SR-90 LAL-0196 28363

Matrix : Water  
Prep Due Date : 10/12/95

CUSTOMER ID	PARENT LAL ID	NO	QC	CHILD LAL ID	ALIQOT 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
L5543-4	28363DUP1	1	DUP1	28363-01	4.95ml	0.5ml	10-11-95	21:12	6.53637	6.54559		
Lab Ctrl Sample	28363LCS1	2	LCS1	28363-02		↓		21:12	6.57588	6.58332		
Method Blank	28363MBB	3	MBB1	28363-03		↓		21:12	6.62928	6.63787		
B0GP15	L5543-4	4	SMP1	28363-04	4.95ml	0.5ml	↓	21:17	6.53903	6.54689		
		5										
		6										
		7										
		8										
		9										
		10										
		11										
		12										
		13										
		14										
		15										
		16										
		17										
		18										
		19										
		20										
		21										
		22										
		23										
		24										
Conc & Vol of Carrier	0.01231g / 0.5ml 0.5ml				Act & Vol of LCS				SR-90 2678 (cpm/ml) 1.0ml			
Carrier Exp Date	1-5-96				LCS Ref Date				4-1-94			
Carrier ID#	94-658-4-1				LCS ID#				94-677-44-1			

Balance Number : 400-200-21 ( + )  
( )

Pipette Number : 134488 ( + )  
139746 ( + )

Carrier and LCS added by : [Signature] 10/10/95  
Witnessed by : SR 10/10/95

Prep Anlist : W. Leitch  
Start Date : 10-10-95  
Count Anlist : [Signature]

Comments :

Analyst : [Signature] 10/12/95

Checked by : [Signature]

Cnt Rm Custody/Date : SR 10-11-95

# LOCKHEED ANALYTICAL LABORATORY

SAMPLE PREPARATION LOG FOR STRONTIUM ANALYSIS

TOTAL RADIOSTRONTIUM - LAL-91-SOP-0196

630

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	ALIQVOT 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	
B0GP15	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											
		14											
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		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 USL Checked by : [Signature] 10/13/95

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



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
28363M8B1	Total radio-strontium	45.4547	2.58156	0.553389
L5543-4	Total radio-strontium	4066.21	200.168	1.25227

AC 5851  
R.S

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.

042  
CST 30

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 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  $\pm 0.1\%$  (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

Sr-90

## 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>93-474-82-1</sup> 94/1/95</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: _____

*[Handwritten signature]*

1045

### 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. 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.

Signed \_\_\_\_\_ Date \_\_\_\_\_ Signed Dynes Wong 3-3-95 Date 046

**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<sub>3</sub>)<sub>2</sub> 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 Sr(NO<sub>3</sub>)<sub>2</sub> ± STD DEV. = 0.01231 g

Expected mg of Sr(NO<sub>3</sub>)<sub>2</sub> = cert. value (=10mg of Sr/mL) \* 0.5 mL \* 2.41

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

Initial and Date: AW 1-10-95

Read and Understood By

*Agnes Wong  
1-10-95*

Signed

Date

Signed

Date 047

*D. Jones Wony*  
*3-15-94*

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

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: DW 3-6-94

Continued on Page \_\_\_\_\_

Read and Understood By DA Review 048

D. Jones Wony  
Signed

3-15-94  
Date

Yves M. L...  
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



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  
February, 1991

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

\*Notes on back