Wednesday, February 01, 2012

REQUEST NUMBER: 12-697

LOS ALAMOS

NATIONAL LABORATORY

ATTN: Danny Coleman
American Radiation Services - Primary
1726 Wooddale Court
Baton Rouge, LA 70806

These Samples are on:
LANL Request Number:12-697
Per Agreement Number:63641-001-10
Project Cost Code: MR1A015AGWJ0

Please analyse the enclosed samples
according to the schedule indicated:

SHIP DATE: 2/1/2012
TURNAROUND/REPORT DUE: 3/2/2012
TURNAROUND REQ'D: 30 Days

RAD SCREENING: Yes, Below Background
LAB REQUEST COMMENTS:

LANL ER SMO CONTACT:
Signature: Sheri Sherwood

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SPECIAL INSTRUCTIONS
	Generic:Low_Level_Tritium	1	CAAN-12-2031	WG	2/1/2012	
		1	CAAN-12-2199	WG	2/1/2012	

Final Page of REQUEST NUMBER 12-697

Wednesday, February 01, 2012

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 12-697C

LOS ALAMOS

NATIONAL LABORATORY

REQUEST NUMBER: 12-697

ATTN: Danny Coleman

American Radiation Services - Primary

1726 Wooddale Court

Baton Rouge, LA 70806

LAB REQUEST COMMENTS:

TURNAROUND/REPORT DUE: 3/2/2012

TURNAROUND REQ'D: 30

SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
CAAN-12-2031	1	POLY	WSP-LL-H-3	None	WG
CAAN-12-2199	1	POLY	WSP-LL-H-3	None	WG

Relinquished By: **Date** **Time** **Received By:** **Date** **Time**

Signature — Signature

Jerry Sherwood 2/1/12 3pm — Shari Sherwood

Signature — Signature

Signature — Signature

Received for DISPOSAL By: **Date** **Time** **Remarks:**

Signature

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 3734 **EVENT NAME:** Ancho, MDA AB Mon. Group Sampling Q2, January 2012, 2011 Interim Plan rev. 1

SAMPLE ID: CAAN-12-2031 **WORK ORDER:**

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
DATE COLLECTED(MM/DD/YYYY):		2/1/2012	MEDIA:	WGR	O/C
TIME COLLECTED (HH:MM)		1245	SUB-MEDIA:	UA	
PRS ID:	Ancho	O/C	SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-30		FIELD QC TYPE:	NA	
LOCATION TYPE:	MON		FIELD PREP:	UF	
PORT:	SINGLE COMPLETION		SAMPLE USAGE:	INV	
			SCREEN/PORT DESC:		
FIELD MATRIX:	WG		EXCAVATED: YES / NO / NA		

COMPOSITE TYPE: N/A COMPOSITE TIME INTERVAL: N/A WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: N/A BOREHOLE DIRECTION: N/A

#	PRIORITY	ORDER	CNTNR	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
2	N/A	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	Hydrochloric Acid (HCL)	Y	N/A
3		WSP-8270C-SVOA	1 LITER AMBER GLASS	Ice		
3		WSP-8321A-NMED HEXP	1 LITER AMBER GLASS	Ice		
1		WSP-GrossA/B	1 LITER POLY	None		
2		WSP-HEXMOD	1 LITER AMBER GLASS	Ice		
1		WSP-LL-H-3	1 LITER POLY	None		
1		WSP-RAD	1 GAL POLY	Nitric Acid (HNO3)		
1		WSP-TKN+TOC	500 ML AMBER GLASS	Sulfuric Acid (H2SO4)		
~~1~~		~~Ra226+228~~	~~1 GAL POLY~~	~~Nitric Acid (HNO3)~~	MK 1/30/12	

SAMPLE DESC: N/A

SAMPLE COMMENTS: Diesel generator running ~50 away during sampling

LOCATION DESC: N/A

FIELD SCREENING/MEASUREMENT RESULTS:

pH	T°C	SC uS/cm	DO mg/L	ORP(mV)	Q gpm	Turb (NTU)
7.97	20.25	117	7.98	176.6	~~1.25~~ 5	1.25

COLLECTED BY (PRINT) D Woody **REVIEWED BY (PRINT)** W Shaw

RELINQUISHED BY	Date/Time	RECEIVED BY	Date/Time

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 3734 **EVENT NAME:** Ancho, MDA AB Mon. Group Sampling Q2, January 2012, 2011 Interim Plan rev 1

(Printed Name) J Woody	02/01/12	(Printed Name) SHERRI SHERWOOD	02/01/12
(Signature) J Woody	1415	(Signature) Sherri Sherwood	1415
RELINQUISHED BY	**Date/Time**	**RECEIVED BY**	**Date/Time**
(Printed Name)		(Printed Name)	
(Signature)		(Signature)	

3734

CAAN-12-2031

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 3734 **EVENT NAME:** Ancho, MDA AB Mon. Group Sampling Q2, January 2012, 2011 Interim Plan rev. 1

SAMPLE ID: CAAN-12-2199 **WORK ORDER:**

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
DATE COLLECTED(MM/DD/YYYY):		2/1/2012	MEDIA:	WGR	QK
TIME COLLECTED (HH:MM)		1245	SUB-MEDIA:	UA	
PRS ID:	Ancho	OK	SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-30		FIELD QC TYPE:	FD	
LOCATION TYPE:	MON		FIELD PREP:	UF	
PORT:	SINGLE COMPLETION		SAMPLE USAGE:	QC	
			SCREEN/PORT DESC:		
FIELD MATRIX:	WG		EXCAVATED: YES / NO / (NA)		

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / (NA)

BOREHOLE: YES / NO / (NA) BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: NA

#	PRIORITY	ORDER	CNTNR	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
2	NA	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	Hydrochloric Acid (HCL)	Y	NA
1	1/31/12	WSP-8270C-SVOA	1 LITER AMBER GLASS	Ice		
1		WSP-8321A-NMED HEXP	1 LITER AMBER GLASS	Ice		
1	NA	WSP-GrossA/B	1 LITER POLY	None		
2		WSP-HEXMOD	1 LITER AMBER GLASS	Ice		
1		WSP-LL-H-3	1 LITER POLY	None		
1		WSP-RAD	1 GAL POLY	Nitric Acid (HNO3)		
1		WSP-TKN+TOC	500 ML AMBER GLASS	Sulfuric Acid (H2SO4)		

SAMPLE DESC: QC Sample of CAAN-12-2031

SAMPLE COMMENTS:

LOCATION DESC: see CAAN-12-2031

FIELD SCREENING/MEASUREMENT RESULTS:

COLLECTED BY (PRINT) J. Romero **REVIEWED BY (PRINT)** W Shan

RELINQUISHED BY (Printed Name)	Date/Time	RECEIVED BY (Printed Name)	Date/Time

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 3734 **EVENT NAME:** Ancho, MDA AB Mon. Group Sampling Q2, January 2012, 2011 Interim Plan rev. 1

(Signature)		(Signature)	
RELINQUISHED BY	**Date/Time**	**RECEIVED BY**	**Date/Time**
(Printed Name) D. Woody	02/01/12	(Printed Name) Sherri Sherwood	12/01/12
(Signature) D Woody	1415	(Signature) Sherri Sherwood	1415

3734
CAAN-12-2199

DATA VALIDATION COVER SHEET

5119-1

Data Validation Cover Sheet

Records Use only

Los Alamos NATIONAL LABORATORY EST.1943

Section I.

REQUEST NUMBER: 12-697 VALIDATION DATE: 03/02/12 LAB CODE: ARS

CONTRACT LABORATORY NAME: American Radiation Services

VALIDATOR: Kevin A. Lambert ORGANIZATION: Analytical Quality Associates, Inc.

ANALYTICAL SUITE (CHECK ALL THAT APPLY):

☐ **TPH-GRO**	☐ **HIGH EXPLOSIVES**	☐ **DIOXIN FURANS**	☐ **LCMSMS PERCHLORATES**
☐ **TPH-DRO**	☐ **METALS**	☐ **PCB CONGENERS**	☐ **ORGANOCHLORINE PESTICIDES/POLYCHLORINATED BIPHENYLS**
☐ **GENERAL CHEMISTRY**	☒ **RADIOCHEMISTRY**	☐ **LCMSMS HIGH EXPLOSIVES**	

☐ **OTHER (DESCRIBE):** tritium analysis only

Section II. Completeness Check

YES	NO	N/A	(CHECK ONE)	YES	NO	N/A	(CHECK ONE)
☒	☐	☐	1. CHAIN-OF-CUSTODY FORM(S)	☒	☐	☐	6. RAW/BSS DATA
☒	☐	☐	2. CASE NARRATIVE	☒	☐	☐	7. QUALITY CONTROL FORMS
☒	☐	☐	3. SAMPLE RESULT FORMS	☒	☐	☐	8. QUANTITATION REPORTS
☐	☐	☒	4. SAMPLE CHROMATOGRAMS	☐	☐	☒	9. TICS FORMS
☐	☐	☒	5. STANDARD CHROMATOGRAMS	☐	☐	☒	10. TICS MASS SPECTRA

Comments/problems noted (include information about requests for further information submitted to the contract laboratory and agreed-upon date of resolution and contract laboratory point of contact):

1. It should be noted that an MS was not analyzed. However, an LCS was analyzed and passed acceptance criteria. Thus, no sample data were qualified.
2. It should be noted that an LCS/LCSD pair was analyzed instead of a field sample duplicate. Acceptance criteria were met and, thus, no sample data were qualified.

Reviewed by: Larry M. Fukui Level: I Date: 3/5/12

VALIDATOR'S SIGNATURE: Kevin A Lambert DATE: 03/02/12

RAD ANALYTICAL DATA VALIDATION CHECKLIST	
5119-2 **Rad Analytical Data Validation Checklist**	Records Use only Los Alamos NATIONAL LABORATORY EST. 1943

Yes	No	N/A		Assign Qualifier Listed Below If Criterion = Yes	
(Check One)				Non-detected Analyte	Detected Analyte
☐	☒	☐	1. The holding time was >1 and ≤2 times the applicable holding time requirement.	UJ, R9	J-, R9
☐	☒	☐	2. The holding time was >2 times the applicable holding time requirement.	R, R9a	J-, R9a
☐	☐	☒	3. The results for the affected analytes are considered not detected (U) because the associated sample concentration was less than or equal to the MDC.	U, R5	N/A
☐	☐	☒	4. The analyte should be regarded as rejected because spectral interferences prevent positive identification of the analytes.	R, R5a	R, R5a
☐	☒	☐	5. The MDC and/or TPU documentation is missing. Data may not be acceptable for use. Contact the SMO or external laboratory for information.	R, R5b	J-, R5b
☐	☐	☒	6. The results for the affected analytes should be regarded as not detected (U) because the associated sample concentration was less than 3X the 1 sigma TPU.	U, R11	N/A
☐	☒	☐	7. The sample result is ≤5X the concentration of the related analyte in the method blank.	U, R4	N/A
☐	☒	☐	8. The affected analytes are considered estimated and biased high because this analyte was identified in the method blank but was >5X.	N/A	J, R4a
☐	☐	☒	9. The sample result is ≤5X the concentration of the related analyte in the trip blank, rinsate blank, or equipment blank.	U, R4d	N/A
☐	☒	☐	10. Required method blank information is missing. Data may not be acceptable for use. Contact the SMO or external laboratory for information.	R, R4e	R, R4e
☐	☐	☒	11. The tracer is <10%R. Follow the external laboratory limits located within the associated data package. Tracer%R is not applicable for Gamma Spectroscopy.	R, R3	R, R3

RAD ANALYTICAL DATA VALIDATION CHECKLIST	
5119-2 **Rad Analytical Data Validation Checklist**	Records Use only Los Alamos NATIONAL LABORATORY EST. 1943

Yes	No	N/A		Assign Qualifier Listed Below If Criterion = Yes	
(Check One)				Non-detected Analyte	Detected Analyte
☐	☐	☒	**12. The tracer is < the Lower Acceptance Level (LAL) but ≥10%R. Follow the external laboratory limits located within the associated data package. Tracer%R is not applicable for Gamma Spectroscopy.**	**UJ, R3a**	**J-, R3a**
☐	☐	☒	**13. The Tracer%R value is > the Upper Acceptance Limit (UAL). Follow the external laboratory limits located within the associated data package. Tracer%R is not applicable for Gamma Spectroscopy.**	**N/A**	**J+, R3b**
☐	☐	☒	**14. Required tracer information is missing. Data may not be acceptable for use. Contact the SMO or external laboratory for information. Tracer%R is not applicable for Gamma Spectroscopy.**	**R, R3d**	**R, R3d**
☐	☒	☐	**15. The LCS percent recovery was <10%. Follow the external laboratory limits located within the associated data package.**	**R, R12**	**R, R12**
☐	☒	☐	**16. The LCS percent recovery was < the LAL but >10%. Follow the external laboratory limits located within the associated data package.**	**UJ, R12a**	**J-, R12a**
☐	☒	☐	**17. The LCS percent recovery was > the UAL. Follow the external laboratory limits located within the associated data package.**	**N/A**	**J+, R12b**
☐	☒	☐	**18. The LCS documentation is missing. Data may not be acceptable for use. Contact the SMO or external laboratory for information.**	**R, R12c**	**R, R12c**
☐	☒	☐	**19. Associated duplicate sample has DER or RER > the analytical laboratory's acceptance limits.**	**R, R10**	**J, J10**
☒	☐	☐	**20. The duplicate sample was not prepared and/or analyzed with the samples for unspecified reasons. The duplicate information is missing. Data may not be acceptable for use. Contact the SMO or external laboratory for information.**	**R, R6**	**R, R6**

RAD ANALYTICAL DATA VALIDATION CHECKLIST	
5119-2 **Rad Analytical Data Validation Checklist**	Records Use only Los Alamos NATIONAL LABORATORY EST. 1943

Yes	No	N/A		Assign Qualifier Listed Below If Criterion = Yes	
(Check One)				Non-detected Analyte	Detected Analyte
☐	☐	☒	**21. The associated matrix spike recovery was <10%. Follow the external laboratory limits. MS/MSD is not applicable to Gamma Spectroscopy.**	**R, R6**	**R, R6**
☐	☐	☒	**22. The associated matrix spike recovery was <10%. Follow the external laboratory limits. MS/MSD is not applicable to Gamma Spectroscopy.**	**UJ, R6a**	**J-, R6a**
☐	☐	☒	**23. The associated matrix spike recovery was above the UAL. Follow the external laboratory limits. MS/MSD is not applicable to Gamma Spectroscopy.**	**UJ, R6b**	**J+, R6b**
☒	☐	☐	**24. Required matrix spike information is missing. Data may not be acceptable for use. Contact the SMO or external laboratory for information. If LCS information is present, do not Reject. Qualify data based on LCS information. MS/MSD is not applicable to Gamma Spectroscopy.**	**R, R6c**	**R, R6c**
☐	☒	☐	**25. Duplicate, dilution, or reanalysis.**	**UJ, R88**	**J, R88**
☐	☒	☐	**26. The LANL project chemist identified quality deficiencies in the reported data that require further qualification. This code can ONLY be used and/or under advisement by the LANL project chemist.**	**UJ, R, R19**	**J, R, R19**
☒	☐	☐	**27. Quantification of data via data validation did not occur based on Quality Control requirements in this procedure. Adhere to the external laboratory qualifiers found within the Form I analytical data summary sheets generated by the external laboratory.**	**U, U_LAB**	**J, J_LAB** **NQ, NQ**

ARS INTERNATIONAL
2609 North River Road, Port Allen, Louisiana 70767
1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-12-00183
Client Sample ID: CAAN-12-2031
Sample Collection Date: 02/01/12
Sample Matrix: Aqueous

Request or PO Number: 12-697
ARS Sample ID: ARS1-12-00183-001
Date Received: 02/02/12
Report Date: 02/29/12

Analysis Description	Analysis Results	Analysis Error +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	0.970	0.650	2.100	1.020	U	pCi/L	ARS-040	02/22/12 02:26	RU	NA

NOTES: Project Cost Code MR1A015AGWJ0

Project Manager Review

LELAP Certificate# 01949

KAL
03/02/12

ARS INTERNATIONAL
2609 North River Road, Port Allen, Louisiana 70767
1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group:	ARS1-12-00183	**Request or PO Number:**	12-697
Client Sample ID:	CAAN-12-2199	**ARS Sample ID:**	ARS1-12-00183-002
Sample Collection Date:	02/01/12	**Date Received:**	02/02/12
Sample Matrix:	Aqueous	**Report Date:**	02/29/12

Analysis Description	Analysis Results	Analysis Error +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	0.370	0.640	2.150	1.040	U	pCi/L	ARS-040	02/22/12 06:37	RU	NA

NOTES: Project Cost Code MR1A015AGWJ0

Project Manager Review

LELAP Certificate# 01949

KAL
03/02/12

Wednesday, February 01, 2012

REQUEST NUMBER: 12-697

LOS ALAMOS
NATIONAL LABORATORY

ATTN: Danny Coleman
American Radiation Services - Primary
1726 Wooddale Court
Baton Rouge, LA 70806

These Samples are on:
LANL Request Number:12-697
Per Agreement Number:63641-001-10
Project Cost Code: MR1A015AGWJ0

Please analyse the enclosed samples
according to the schedule indicated:

SHIP DATE: 2/1/2012
TURNAROUND/REPORT DUE: 3/2/2012
TURNAROUND REQ'D: 30 Days

RAD SCREENING: Yes, Below Background
LAB REQUEST COMMENTS:

LANL ER SMO CONTACT:
Signature: Sheri Sherwood

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SPECIAL INSTRUCTIONS
	Generic:Low_Level_Tritium	1	CAAN-12-2031	WG	2/1/2012	
		1	CAAN-12-2199	WG	2/1/2012	

Final Page of REQUEST NUMBER 12-697

Wednesday, February 01, 2012

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 12-697C

REQUEST NUMBER: 12-697

LOS ALAMOS
NATIONAL LABORATORY

ATTN: Danny Coleman
American Radiation Services - Primary
1726 Wooddale Court
Baton Rouge, LA 70806
LAB REQUEST COMMENTS:

TURNAROUND/REPORT DUE: 3/2/2012
TURNAROUND REQ'D: 30

SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
CAAN-12-2031	1	POLY	WSP-LL-H-3	None	WG
CAAN-12-2199	1	POLY	WSP-LL-H-3	None	WG

Relinquished By:	**Date**	**Time**	**Received By:**	**Date**	**Time**
Signature	2/1/12	3pm	Signature		
Signature			Signature	2-2-12	11:00
Signature			Signature		

Received for DISPOSAL By: **Date** **Time** **Remarks:**

Signature

ARS INTERNATIONAL

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

Request Number: 12-697

2609 North River Road • Port Allen, Louisiana 70767
1 (800) 401-4277 • Fax (225) 381-2996

American Radiation Services Analytical Reports

for

Los Alamos National Laboratory Request: 12-697

Original COC

Wednesday, February 01, 2012

REQUEST NUMBER: 12-697

LOS ALAMOS

NATIONAL LABORATORY

ATTN: Danny Coleman
American Radiation Services - Primary
1726 Wooddale Court
Baton Rouge, LA 70806

These Samples are on:
LANL Request Number:12-697
Per Agreement Number:63641-001-10
Project Cost Code: MR1A015AGWJ0

Please analyse the enclosed samples
according to the schedule indicated:

SHIP DATE: 2/1/2012
TURNAROUND/REPORT DUE: 3/2/2012
TURNAROUND REQ'D: 30 Days

RAD SCREENING: Yes, Below Background
LAB REQUEST COMMENTS:

LANL ER SMO CONTACT:
Signature: Sheri Sherwood

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SPECIAL INSTRUCTIONS
	Generic:Low_Level_Tritium	1	CAAN-12-2031	WG	2/1/2012	
		1	CAAN-12-2199	WG	2/1/2012	

Final Page of REQUEST NUMBER 12-697

Wednesday, February 01, 2012

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 12-697C

REQUEST NUMBER: 12-697

LOS ALAMOS
NATIONAL LABORATORY

ATTN: Danny Coleman
American Radiation Services - Primary
1726 Wooddale Court
Baton Rouge, LA 70806
LAB REQUEST COMMENTS:

TURNAROUND/REPORT DUE: 3/2/2012
TURNAROUND REQ'D: 30

SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
CAAN-12-2031	1	POLY	WSP-LL-H-3	None	WG
CAAN-12-2199	1	POLY	WSP-LL-H-3	None	WG

Relinquished By:	**Date**	**Time**	**Received By:**	**Date**	**Time**
Signature	2/1/12	3pm	Signature		
Joseph Sherwood Sherri Sherwood				2-2-12/11:00	
Signature			Signature		
Signature			Signature		

Received for DISPOSAL By: **Date** **Time** **Remarks:**

Signature

ARS INTERNATIONAL

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

American Radiation Services Analytical Reports

for

Los Alamos National Laboratory Request: 12-697

Case Narrative

ARS INTERNATIONAL

2609 North River Road • Port Allen, Louisiana 70767
1 (800) 401-4277 • Fax (225) 381-2996

February 29, 2012

LANL
Keith Greene
PO Box 1663 MS M992
Los Alamos, NM 87545

Request Number: **12-697**
LANL Sample ID: **CAAN-12-2031; CAAN-12-2199.**

Dear Mr. Greene;

On February 2, 2012, ARS International received two (2) water samples to be analyzed for Low Level Tritium.

The samples underwent enrichment and were counted using the appropriate counting equipment and QA/QC for this type of analysis. Results of the analysis and QA/QC are attached in the data package.

The client and QA/QC samples were counted with a count time sufficient to meet quality control parameters for counting equipment and were within acceptance criteria and statistical sound detection limits.

If you have any questions please do not hesitate to call at 225.381.2991 or email LANL@amrad.com.

Sincerely,

James D. Purvis

Laboratory Management
ARS International

ARS INTERNATIONAL
2609 North River Road • Port Allen, Louisiana 70767
1 (800) 401-4277 • Fax (225) 381-2996

COVER PAGE

PROJECT SAMPLE IDENTIFICATION CROSS-REFERENCE TO ARS SAMPLE LABORATORY IDs

Subcontract (LANL Agreement Number) 63641-001-10

Request Number	LANL PROJECT SAMPLE ID NUMBER	American Radiation Services SAMPLE ID NUMBER(S)
12-697	CAAN-12-2031	ARS1-12-00183-001
12-697	CAAN-12-2199	ARS1-12-00183-002

ANALYTICAL METHODS

Tritium analyses were performed using **ARS-040 Tritium Assay in Water Samples Using Electrolytic Enrichment.**

ANALYTICAL RESULTS

The result data that are flagged with "U" indicate that the activity is below the MDC.

American Radiation Services Project Manager/Laboratory Director's Comments:

"I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this sample data package and the computer-readable EDD, as applicable, submitted on diskette or by modem, has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature."

"I certify that this electronic image and all hardcopies produced from this image accurately represent the data and is in compliance with the LANL specific requirements, both technically and for completeness, other than the conditions detailed above or in the sample data package narrative. Release, by submission through email, the data contained in this electronic image and the computer-readable EDD (as applicable), has been authorized by the laboratory Manager/Technical Director or the Manager's designee."

James D. Purser — Signature

Laboratory Management, ARS International — Title

2-29-12 — Date

ARS INTERNATIONAL

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

Low Level Tritium by Low Level Liquid Scintillation Counting

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767
1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group:	ARS1-12-00183	**Request or PO Number:**	12-697
Client Sample ID:	CAAN-12-2031	**ARS Sample ID:**	ARS1-12-00183-001
Sample Collection Date:	02/01/12	**Date Received:**	02/02/12
Sample Matrix:	Aqueous	**Report Date:**	02/29/12

Analysis Description	Analysis Results	Analysis Error +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	0.970	0.650	2.100	1.020	U	pCi/L	ARS-040	02/22/12 02:26	RU	NA

NOTES: Project Cost Code MR1A015AGWJ0

Project Manager Review

LELAP Certificate# 01949

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group:	ARS1-12-00183	**Request or PO Number:**	12-697
Client Sample ID:	CAAN-12-2199	**ARS Sample ID:**	ARS1-12-00183-002
Sample Collection Date:	02/01/12	**Date Received:**	02/02/12
Sample Matrix:	Aqueous	**Report Date:**	02/29/12

Analysis Description	Analysis Results	Analysis Error +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	0.370	0.640	2.150	1.040	U	pCi/L	ARS-040	02/22/12 06:37	RU	NA

NOTES: Project Cost Code MR1A015AGWJ0

Project Manager Review

LELAP Certificate# 01949

2609 North River Road, Port Allen, Louisiana 70767
1 (800) 401-4277 FAX (225) 381-2996

QC Results Report

Sample Delivery Group: ARS1-12-00183
Date Received: 2/2/2012

Laboratory Control Sample Evaluation

Analysis Batch	QC Type	Analyte	Analysis Results	CSU 1 (2s)	MDC	Expected Value	Qual	Report Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Percent Recovery (%)	LCS Acceptance Range
ARS1-B12-00269	LCS	H3	20.930	3.280	2.090	23.270		pCi/L	ARS-040	2/20/12 21:08	RU	90	75%-125%

Blank Evaluation

Analysis Batch	QC Type	Analyte	Analysis Results	CSU 1 (2s)	MDC	Expected Value	Qual	Report Units	Analysis Test Method	Analysis Date/Time	Analysis Technician
ARS1-B12-00269	MBL	H3	0.930	0.610	1.970	NA	U	pCi/L	ARS-040	2/21/12 5:30	RU

Sample RER Duplicate Evaluation

Analysis Batch	QC Type	Analysis Description	Result 1	CSU 1 (2s)	Result 2	CSU 2 (2s)	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	RER	RER AcceptanceRange
ARS1-B12-00269	LCSD	H3	20.930	3.280	20.580	3.230		pCi/L	ARS-040	2/21/12 5:30	RU	0.05	< 1

Sample DER Duplicate Evaluation

Analysis Batch	QC Type	Analysis Description	Result 1	CSU 1 (2s)	Result 2	CSU 2 (2s)	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	DER	DER AcceptanceRange
ARS1-B12-00269	LCSD	H3	20.930	3.280	20.580	3.230		pCi/L	ARS-040	2/21/12 5:30	RU	0.15	< 3

Project Manager Review

LELAP Certificate# 01949 NELAP Certificate # E87558

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American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

Low Level Tritium by Low Level Liquid Scintillation Counting

Samples

ARS Tritium Enrichment Calculations

Enrichment Factor Curve coeff. - Power y = a * x^b	
a	8.978E-01
b	-9.611E-01

lambda	1.5403E-04	ACF (def. = 1)	1
Syserror (%)	15%	Reporting Units	pCi
Coverage Factor	1	UCF	2.22

Procedures ARS-040 , ARS-060
ARS File ID Number ARS1-12-00146;147;148;182;183;18
ARS Batch ID Number ARS1-B12-00269

Sample ID	Initial Mass sample (g) V_i	Mass Na2O2 added (g) mi	Final mass electrolyzed sample w/ NaOH (g) V_f	Mass equivalent NaOH (g) m_f	Final Mass Electrolyzed sample (g pure H2O) V_f	Volume factor X	Enrichment Factor Y	Average Sample CPM R_s	Bkg CPM R_b	QIP tSIE	Detector Eff (decimal) Eff	Aliquot Aliquot	Enter aliq. in final Rep. Units Units	Activity reference date T_o	Start Date of Count T_c	Total Sample Count Duration (min) t cnt (min)	Total Bkg Count Duration (min) t cnt (min)	Decay Correction to To DF	Sample Activity Conc. AC_i	Standard Counting Uncertainty CU	Counting Uncertainty 1s CU	Combined Standard Uncertainty 1s CSU	Minimum Detectable Conc. MDC	Decision Level Conc. DLC	Reporting Units Units
ARS1-B12-00269-01	543.46	2.05	17.37	2.103	15.27	0.0281	27.81	4.783	1.277	408.82	0.2784	0.01000	L	9/7/2011	2/20/2012	240	240	0.974742	20.92	0.95	0.95	3.28	2.09	1.01	pCi/L
ARS1-B12-00269-02	541.15	2.06	17.30	2.114	15.19	0.0281	27.84	4.746	1.277	411.22	0.2796	0.01001	L	9/7/2011	2/21/2012	240	240	0.974592	20.58	0.94	0.94	3.23	2.08	1.01	pCi/L
ARS1-B12-00269-03	558.55	2.02	17.46	2.073	15.39	0.0275	28.34	1.443	1.277	417.81	0.2829	0.01001	L	2/20/2012	2/21/2012	240	240	0.999833	0.93	0.60	0.60	0.61	1.97	0.95	pCi/L
ARS1-B12-00269-04	529.17	2.08	17.29	2.134	15.16	0.0286	27.30	1.348	1.277	379.59	0.2639	0.01004	L	1/18/2012	2/24/2012	240	240	0.994304	0.44	0.66	0.66	0.66	2.20	1.08	pCi/L
ARS1-B12-00269-05	523.80	2.03	17.15	2.083	15.07	0.0288	27.19	1.246	1.277	408.4	0.2782	0.01003	L	1/20/2012	2/21/2012	240	240	0.99507	-0.18	0.61	0.61	0.61	2.09	1.01	pCi/L
ARS1-B12-00269-06	526.49	2.07	17.25	2.124	15.13	0.0286	27.32	1.343	1.277	398.19	0.2732	0.01005	L	1/25/2012	2/21/2012	240	240	0.995837	0.40	0.63	0.63	0.63	2.11	1.02	pCi/L
ARS1-B12-00269-07	521.07	2.08	16.08	2.134	13.95	0.0268	29.14	1.466	1.277	413.3	0.2807	0.01004	L	1/26/2012	2/21/2012	240	240	0.99599	1.04	0.59	0.59	0.61	1.93	0.93	pCi/L
ARS1-B12-00269-08	525.95	2.07	17.42	2.124	15.30	0.0291	26.90	1.439	1.277	411.83	0.2799	0.01002	L	2/1/2012	2/22/2012	240	240	0.996758	0.97	0.64	0.64	0.65	2.10	1.02	pCi/L
ARS1-B12-00269-09	516.00	2.06	17.40	2.114	15.29	0.0296	26.43	1.337	1.277	408.64	0.2784	0.01004	L	2/1/2012	2/22/2012	240	240	0.996758	0.37	0.64	0.64	0.64	2.15	1.04	pCi/L
ARS1-B12-00269-10	527.51	2.05	16.51	2.103	14.41	0.0273	28.58	1.407	1.277	405.94	0.2770	0.01004	L	1/26/2012	2/22/2012	240	240	0.995837	0.74	0.60	0.60	0.61	2.00	0.97	pCi/L
ARS1-B12-00269-11	519.58	2.00	16.39	2.052	14.34	0.0276	28.29	1.288	1.277	414.34	0.2812	0.01003	L	1/27/2012	2/22/2012	240	240	0.99599	0.06	0.59	0.59	0.59	1.99	0.96	pCi/L
ARS1-B12-00269-12	514.49	2.07	17.32	2.124	15.20	0.0295	26.50	3.915	1.277	410.91	0.2795	0.01002	L	1/30/2012	2/22/2012	240	240	0.996451	16.07	0.90	0.90	2.57	2.14	1.03	pCi/L

Reviewed SDL
2-27-12

Reviewed JDT
2-28-12

ARS Tritium Enrichment Calculations

Procedures	ARS-040 , ARS-060
ARS File ID Number	ARS1-12-00146;147;148;182;163;16
ARS Batch ID Number	ARS1-B12-00269

Enrichment Factor Curve coeff. - Power y = a * x^b	
a	8.978E-01
b	-9.611E-01

lambda	1.5403E-04	ACF (def. = 1)	1
Syserror (%)	15%	Reporting Units	pCi
Coverage Factor	1.96	UCF	2.22

Sample ID	Initial Mass sample (g) V_i	Mass Na2O2 added (g) mi	Final mass electrolyzed sample w/ NaOH (g) V_f	Mass equivalent NaOH (g) m_f	Final Mass Electrolyzed sample (g pure H2O) V_f	Volume factor X	Enrichment Factor Y	Average Sample CPM R_s	Bkg CPM R_b	QIP tSIE	Detector Eff (decimal) Eff	Aliquot Aliquot	Enter aliq. in final Rep Units Units	Activity reference date T_o	Start Date of Count T_c	Total Sample Count Duration (min) t cnt (min)	Total Bkg Count Duration (min) t cnt (min)	Decay Correction to To DF	Sample Activity Conc. AC_i	Standard Counting Uncertainty CU	Counting Uncertainty 1.96s CU	Combined Standard Uncertainty 1.96s CSU	Minimum Detectable Conc. MDC	Decision Level Conc DLC	Reporting Units Units
ARS1-B12-00268-01	543.46	2.05	17.37	2.103	15.27	0.0281	27.61	4.783	1.277	408.82	0.2784	0.01000	L	9/7/2011	2/20/2012	240	240	0.974742	20.92	0.95	1.86	6.43	2.09	1.01	pCi/L
ARS1-B12-00269-02	541.15	2.06	17.30	2.114	15.19	0.0281	27.84	4.746	1.277	411.22	0.2796	0.01001	L	9/7/2011	2/21/2012	240	240	0.974592	20.58	0.94	1.84	6.32	2.08	1.01	pCi/L
ARS1-B12-00269-03	558.55	2.02	17.46	2.073	15.39	0.0275	28.34	1.443	1.277	417.81	0.2829	0.01001	L	2/20/2012	2/21/2012	240	240	0.999833	0.93	0.60	1.17	1.20	1.97	0.95	pCi/L
ARS1-B12-00269-04	529.17	2.08	17.29	2.134	15.16	0.0286	27.30	1.348	1.277	379.59	0.2639	0.01004	L	1/18/2012	2/24/2012	240	240	0.994304	0.44	0.66	1.28	1.29	2.20	1.06	pCi/L
ARS1-B12-00269-05	523.80	2.03	17.15	2.083	15.07	0.0288	27.19	1.246	1.277	408.4	0.2782	0.01003	L	1/20/2012	2/21/2012	240	240	0.99507	-0.18	0.61	1.20	1.20	2.09	1.01	pCi/L
ARS1-B12-00269-06	528.49	2.07	17.25	2.124	15.13	0.0286	27.32	1.343	1.277	398.19	0.2732	0.01005	L	1/25/2012	2/21/2012	240	240	0.995837	0.40	0.63	1.23	1.24	2.11	1.02	pCi/L
ARS1-B12-00269-07	521.07	2.08	16.08	2.134	13.95	0.0268	29.14	1.466	1.277	413.3	0.2807	0.01004	L	1/26/2012	2/21/2012	240	240	0.99599	1.04	0.59	1.15	1.19	1.93	0.93	pCi/L
ARS1-B12-00269-08	525.95	2.07	17.42	2.124	15.30	0.0291	26.90	1.439	1.277	411.83	0.2799	0.01002	L	2/1/2012	2/22/2012	240	240	0.996758	0.97	0.64	1.25	1.28	2.10	1.02	pCi/L
ARS1-B12-00269-09	516.00	2.06	17.40	2.114	15.29	0.0296	26.43	1.337	1.277	408.64	0.2784	0.01004	L	2/1/2012	2/22/2012	240	240	0.996758	0.37	0.64	1.25	1.26	2.15	1.04	pCi/L
ARS1-B12-00269-10	527.51	2.05	16.51	2.103	14.41	0.0273	28.58	1.407	1.277	405.94	0.2770	0.01004	L	1/26/2012	2/22/2012	240	240	0.995837	0.74	0.60	1.18	1.20	2.00	0.97	pCi/L
ARS1-B12-00269-11	519.58	2.00	16.39	2.052	14.34	0.0276	28.29	1.288	1.277	414.34	0.2812	0.01003	L	1/27/2012	2/22/2012	240	240	0.99599	0.06	0.59	1.15	1.15	1.99	0.96	pCi/L
ARS1-B12-00269-12	514.49	2.07	17.32	2.124	15.20	0.0295	26.50	3.915	1.277	410.91	0.2795	0.01002	L	1/30/2012	2/22/2012	240	240	0.996451	16.07	0.90	1.76	5.04	2.14	1.03	pCi/L

Reviewed SMH
2-27-12

Reviewed JDT
2-28-12

LANL
ARS Batch Number: ARS1-B12 - 00269

Enter these Values for LCS			Report Name	Field Name on the Report
	Current ACT	5.5814	Standards Report	ACT at Date Above (dpm/g)
	NetWt	5.0300	LCS Report	NetWt
	Aliquot	0.5435	Tritium Enrichment Data	Gross Sample Added/1000

Enter these Values for LCSD			Report Name	Field Name on the Report
	Current ACT	5.5814	Standards Report	ACT at Date Above (dpm/g)
	NetWt	5.0151	LCS Report	NetWt
	Aliquot	0.5412	Tritium Enrichment Data	Gross Sample Added/1000

Expected Value Calculations

LANL
ARS Batch Number: ARS1-B11 - 00269

LCS	**CALCULATED EXPECTED VALUE**	=	23.270		
			Range	18.616 -	27.924
LCSD	**CALCULATED EXPECTED VALUE**	=	23.300		
			Range	18.640 -	27.960

QC Evaluation

EPA Method: ARS-040
Batch ID: ARS1-B12-00269
SDG's: ARS1-12-00146; 147; 148; 182; 183; 184

LCS	20.9300	**CSU (2s)**	6.4300
LCSD	20.5800	**CSU-D (2s)**	6.3200

DER = $\frac{\text{abs(LSC-LSCD)}}{\text{sqr((2s CSU/2)^2)+((2s CSU-D/2)^2) } \textit{at 1 sigma}} =$ **< 3**

DER $\frac{0.35}{4.507973} =$ 0.07764 **< 3**

% RPD= $\frac{\text{ABS(LCS - LSCD)}}{\text{(LCS+LCSD)/2}} * 100 =$ **< 25%**

%RPD $\frac{0.35}{20.755} *100 =$ 1.686341 **< 25%**

The *RPD* shall be less than 25% or other client-applied criteria

RER= $\frac{\text{abs((LCS-LCSD))}}{\text{(CSU)+(CSD) } \textit{at 2 sigma}} =$ **<1** ***<--LANL Requirement***

RER = $\frac{0.35}{12.7500}$ 0.02745098 **<1**

Blank Information

	Act	CSU(2s)	MDA	Act>MDA
AM-241				
U-234				
U-235				
U-238				
Pu-238				
Pu-239/240				
Th-228				
Th-230				
Th-232				
H3	0.93	1.2	1.97	
Ra-226				
Ra-228				
Total U				
Pb-210				
Po-209				
Sr-90				
TC-99				
NI-63				

*MDA should be below RDL
*Blank activity must be below MDA
*Blank activity must be < 1.65*CSU (DOE only)

ACT = 0.93
CSU = 1.2
Is ACT<1.65*CSU? YES

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American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

Low Level Tritium by Low Level Liquid Scintillation Counting

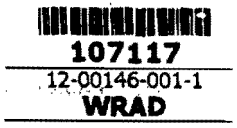
Laboratory Records

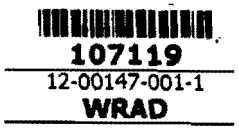
Analysis Batch Report

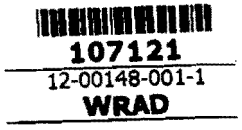
Analysis Batch ID **ARS1-B12-00269**

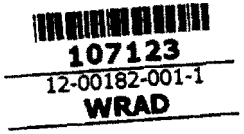
Method	ARS-040	Analysis	LSC-A-022	Matrix	AQ
Description	Low Level Tritium by Electrolytic Enrichment				

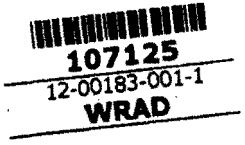
ABatch Sample ID	Type	Blind Iso1	Blind Iso2	Blind Iso3	SDG	FR	Run	Client ID	Isotope Group	Lab Deadline
ARS1-B12-00269-01	LCS	B-13301								
ARS1-B12-00269-02	LCSD	B-13302								
ARS1-B12-00269-03	MBL									
ARS1-B12-00269-04	TRG				**ARS1-12-00146**	001	1	CAWA-12-2003	STD	02/21/12
ARS1-B12-00269-05	TRG				**ARS1-12-00147**	001	1	CAWA-12-2016	STD	02/21/12
ARS1-B12-00269-06	TRG				**ARS1-12-00148**	001	1	BuckmanPZ-12-2173	STD	02/21/12
ARS1-B12-00269-07	TRG				**ARS1-12-00182**	001	1	CAWA-12-2013	STD	02/28/12
ARS1-B12-00269-08	TRG				**ARS1-12-00183**	001	1	CAAN-12-2031	STD	02/28/12
ARS1-B12-00269-09	TRG				**ARS1-12-00183**	002	1	CAAN-12-2199	STD	02/28/12
ARS1-B12-00269-10	TRG				**ARS1-12-00184**	001	1	BuckmanPZ-12-2178	STD	02/28/12
ARS1-B12-00269-11	TRG				**ARS1-12-00184**	002	1	BuckmanPZ-12-2175	STD	02/28/12
ARS1-B12-00269-12	TRG				**ARS1-12-00184**	003	1	BuckmanPZ-12-2179	STD	02/28/12

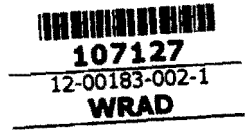


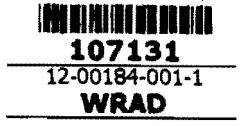


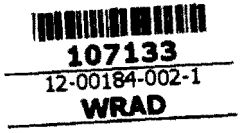


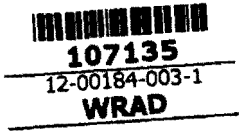












LCS Report
Analytical Batch: ARS1-B12-00269

BlindID	ABatch	ABatchSampleID	BlindGroup	StdID	Isotope	ExpectedAddition	ExpectedValue	EmptyWt	GrossWt	NetWt	UserID	ModDate	ExpectedValue_CT	MidPointCountDate	KnownValue
B-13301	ARS1-B12-00269	ARS1-B12-00269-01	B-H3	S-0262	H-3	5	2.522275449	13.4595	18.4895	5.03	BSTEFFENS	1/30/2012			
B-13302	ARS1-B12-00269	ARS1-B12-00269-02	B-H3	S-0262	H-3	5	2.522275449	13.1584	18.1735	5.0151	BSTEFFENS	1/30/2012			

Assay Definition-

Assay Description:
LLH3 Assay in DPM Mode

Assay Type: DPM (Single)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20120220_1648
Raw Results Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20120220_1648\20120220_1648.results
RTF File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20120220_1648\LLH3.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20120220_1648\LLH3 Results.csv
Assay File Name: C:\Packard\TriCarb\Assays\Low Level H3.1sa

Count Conditions-

Nuclide: Low Level H3
  Quench Indicator: tSIE/AEC
  External Std Terminator (sec): 0.5 2s%
  Pre-Count Delay (min): 0.00
Quench Set:
  Low Energy: ARS LL H3 10mL
Count Time (min): 240.00
Count Mode: Low Level
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

Background Subtract: Off
Low CPM Threshold: Off
2 Sigma % Terminator: On - Any Region

Regions	LL	UL	2Sigma % Terminator
A	2.0	18.6	0.50
B	0.0	2000.0	0.00
C	0.0	2000.0	0.00

Count Corrections-

Static Controller: On Luminescence Correction: Off
Colored Samples: Off Heterogeneity Monitor: Off
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

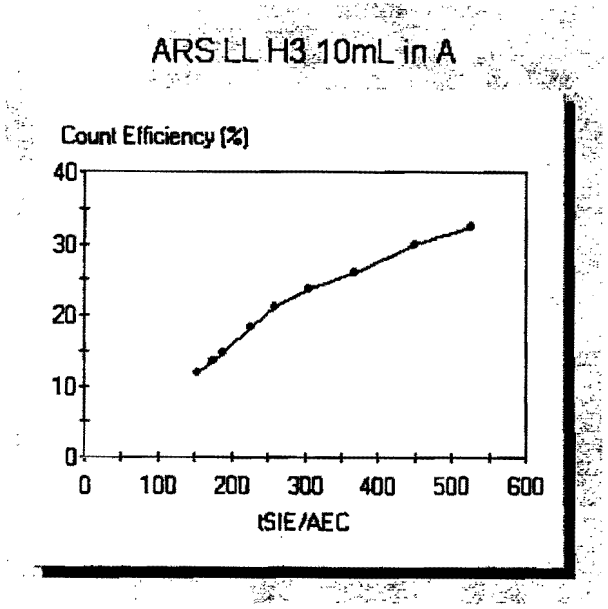
Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time

A
B
C

Cycle 1 Results
Quench Curve Block Data



Date Acquired: 11/18/2011
Date Modified:
ARS LL H3 10mL in A

tSIE/AEC	Count Efficiency (%)
526.29	32.47
450.16	29.90
370.15	25.92
306.68	23.60
260.68	20.99
228.69	18.21
189.46	14.53
177.14	13.64
155.73	11.73

P#	S#	SMPL_ID	CPMA	DPM1	tSIE	Eff Nucl In A	Count Time	DATE	TIME	MESSAGES
2	1	BACKGROUND	1.277	4.50	419.59	28.38	240.00	2/20/2012	4:57:22 PM	
2	2	B12-00269-01	4.783	17.18	408.82	27.84	240.00	2/20/2012	9:08:21 PM	
2	3	B12-00269-02	4.746	16.97	411.22	27.96	240.00	2/21/2012	1:19:29 AM	
2	4	B12-00269-03	1.443	5.10	417.81	28.29	240.00	2/21/2012	5:30:37 AM	
2	5	B12-00269-04	8.029	28.44	416.65	28.23	240.00	2/21/2012	9:41:45 AM	*
2	6	B12-00269-05	1.246	4.48	408.40	27.82	240.00	2/21/2012	1:52:50 PM	
2	7	B12-00269-06	1.343	4.92	398.19	27.32	240.00	2/21/2012	6:03:59 PM	
2	8	B12-00269-07	1.466	5.22	413.30	28.07	240.00	2/21/2012	10:15:03 PM	
2	9	B12-00269-08	1.439	5.14	411.83	27.99	240.00	2/22/2012	2:26:08 AM	
2	10	B12-00269-09	1.337	4.80	408.64	27.84	240.00	2/22/2012	6:37:12 AM	
2	11	B12-00269-10	1.407	5.08	405.94	27.70	240.00	2/22/2012	10:48:17 AM	
2	12	B12-00269-11	1.288	4.58	414.34	28.12	240.00	2/22/2012	2:59:27 PM	
2	13	B12-00269-12	3.915	14.01	410.91	27.95	240.00	2/22/2012	7:10:41 PM	

P#	S#	SMPL_ID	CPMA	DPM1	tSIE	Eff Nucl In A	Count Time	DATE	TIME	MESSAGES
10	1	B12-00269-04	1.348	5.11	379.59	26.39	240.00	2/24/2012	9:47:25 AM	

ID_31001_040	ABatch	AnalysisCode	ABatchSampleID	ClientID	IC_ID	S01_1_EnrichCellNo	S01_2_TareCell	S01_3_TareResv	S02_GrossWtResv	S03_1_WtNa2O2	C_GrossSampleAdded
109	ARS1-B12-00269	LSC-A-022	ARS1-B12-00269-01			23	332.7	202.17	745.63	2.05	543.46
110	ARS1-B12-00269	LSC-A-022	ARS1-B12-00269-02			59	324.33	196.67	737.82	2.06	541.15
111	ARS1-B12-00269	LSC-A-022	ARS1-B12-00269-03			98	333.68	203.16	761.71	2.02	558.55
112	ARS1-B12-00269	LSC-A-022	ARS1-B12-00269-04	CAWA-12-2003		21	332.91	218.24	747.41	2.08	529.17
113	ARS1-B12-00269	LSC-A-022	ARS1-B12-00269-05	CAWA-12-2016		58	336.41	201.63	725.43	2.03	523.8
114	ARS1-B12-00269	LSC-A-022	ARS1-B12-00269-06	BuckmanPZ-12-2173		87	331.91	214.3	742.79	2.07	528.49
115	ARS1-B12-00269	LSC-A-022	ARS1-B12-00269-07	CAWA-12-2013		89	336.91	216.38	737.45	2.08	521.07
116	ARS1-B12-00269	LSC-A-022	ARS1-B12-00269-08	CAAN-12-2031		25	324.18	213.94	739.89	2.07	525.95
117	ARS1-B12-00269	LSC-A-022	ARS1-B12-00269-09	CAAN-12-2199		43	326.12	208.56	724.56	2.06	516
118	ARS1-B12-00269	LSC-A-022	ARS1-B12-00269-10	BuckmanPZ-12-2178		47	338.06	228.27	755.78	2.05	527.51
119	ARS1-B12-00269	LSC-A-022	ARS1-B12-00269-11	BuckmanPZ-12-2175		24	331.14	193.7	713.28	2	519.58
120	ARS1-B12-00269	LSC-A-022	ARS1-B12-00269-12	BuckmanPZ-12-2179		4	324.82	205.04	719.53	2.07	514.49

2-21-12

S04_1_ElectrolSD	S04_2_StartAmp	S04_3_StartBathC	S05_1_ElectrolED	S05_2_EndBathC	S05_3_EndCellWt	C_GrossSmplRec	C_EnrichmentF	S06_TareWt	S07_GrossWt	C_RecoveredWa	S08_TearWtLSCVial
02/03/2012 15:00:00	5	2	02/17/2012 07:43:00	2	552.24	17.37	31.28727691	104.38	117.73	13.35	6.48
02/03/2012 15:00:00	5	2	02/17/2012 10:13:00	2	538.3	17.3	31.28034682	109.75	122.25	12.5	6.49
02/03/2012 15:00:00	5	2	02/17/2012 10:51:00	2	554.3	17.46	31.99026346	110.22	124.4	14.18	6.38
02/03/2012 15:00:00	5	2	02/17/2012 10:17:00	2	568.44	17.29	30.60555234	116.4	129.86	13.46	6.55
02/03/2012 15:00:00	5	2	02/16/2012 14:29:00	2	555.19	17.15	30.54227405	96.12	109.33	13.21	6.54
02/03/2012 15:00:00	5	2	02/16/2012 14:31:00	2	563.46	17.25	30.63710145	103.77	117.01	13.24	6.6
02/03/2012 15:00:00	5	2	02/16/2012 12:26:00	2	569.37	16.08	32.40485075	114.4	126.64	12.24	6.57
02/03/2012 15:00:00	5	2	02/16/2012 12:30:00	2	555.54	17.42	30.19230769	114.97	127.25	12.28	6.44
02/03/2012 15:00:00	5	2	02/16/2012 10:16:00	2	552.08	17.4	29.65517241	111.76	124.16	12.4	6.47
02/03/2012 15:00:00	5	2	02/17/2012 10:53:00	2	582.84	16.51	31.95093882	115.54	126.3	10.76	6.47
02/03/2012 15:00:00	5	2	02/16/2012 12:32:00	2	541.23	16.39	31.70103722	104.38	116.26	11.88	6.54
02/03/2012 15:00:00	5	2	02/16/2012 11:45:00	2	547.18	17.32	29.70496536	109.08	122.47	13.39	6.52

2-21-12

S09_VialPlusSmpl	C_NetSample	S10_1_WtVialSmplDrWatFill	C_NetDeadWaterAdded	C_TareWtBFCocktail	S10_2_GrossWtVSC	C_NetWtCocktailAdded	UserID	ModDate
16.48	10	0	0	16.48	27.14	10.66	AMRAD\RUSEY	02/20/2012 11:41:51
16.5	10.01	0	0	16.5	27.17	10.67	AMRAD\RUSEY	02/20/2012 11:44:06
16.39	10.01	0	0	16.39	27.05	10.66	AMRAD\RUSEY	02/20/2012 11:47:00
16.59	10.04	0	0	16.59	27.27	10.68	AMRAD\RUSEY	02/20/2012 11:49:13
16.57	10.03	0	0	16.57	27.19	10.62	AMRAD\RUSEY	02/20/2012 14:58:15
16.65	10.05	0	0	16.65	27.31	10.66	AMRAD\RUSEY	02/20/2012 15:00:32
16.61	10.04	0	0	16.61	27.27	10.66	AMRAD\RUSEY	02/20/2012 15:03:10
16.46	10.02	0	0	16.46	27.12	10.66	AMRAD\RUSEY	02/20/2012 15:05:14
16.51	10.04	0	0	16.51	27.18	10.67	AMRAD\RUSEY	02/21/2012 12:25:19
16.51	10.04	0	0	16.51	27.13	10.62	AMRAD\RUSEY	02/21/2012 12:27:50
16.57	10.03	0	0	16.57	27.25	10.68	AMRAD\RUSEY	02/21/2012 12:30:02
16.54	10.02	0	0	16.54	27.22	10.68	AMRAD\RUSEY	02/21/2012 12:32:08

2-21-12

Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
2-10-12	1410	B12-00202-01 ~~B12-00202~~ 2-10-12	B12-00202	2228	
↓	↓	B12-00202-02	↓	↓	
↓	↓	B12-00202-03	↓	↓	
↓	↓	B12-00202-04	↓	↓	
↓	↓	B12-00202-05	↓	↓	2-15-12
2-15-12	1120	SNC-16	QA	QA	
2-15-12	1228	Background	B12-00346	1259	
↓	↓	B12-00346-04	↓	↓	
↓	↓	B12-00346-04-RS	↓	↓	
2-16-12	0901	SNC-16	QA	QA	
2-17-12	0800	SNC-16	QA	QA	
2-20-12	1512	SNC-16	QA	QA	
2-20-12	1514	Background	B12-00269	1648	
↓	↓	B12-00269-01	↓	↓	
↓	↓	B12-00269-02	↓	↓	
↓	↓	B12-00269-03	↓	↓	
↓	↓	B12-00269-04	↓	↓	
↓	↓	B12-00269-05	↓	↓	
↓	↓	B12-00269-06	↓	↓	
↓	↓	B12-00269-07	↓	↓	

Reviewed By: SDL Initials Date: 2-23-12

Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample ID No. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
2-20-12	1514	[illegible]	[illegible]	1648	RJH
↓	↓	[illegible]	↓	↓	RJH
↓	↓	[illegible]	↓	↓	RJH
↓	↓	[illegible]	↓	↓	RJH
RJH 2-21-12 ↓	↓	[illegible]	↓	↓	RJH
2-23-12	0804	SNC-16	QA	QA	RJH
2-23-12	0938	B12-00269-04	B12-00269	0947	RJH
↓	↓	B12-00269-12	↓	0947	RJH
~~2-23-12~~	~~1415~~	~~B12-00269-04~~	~~B12-00269~~		RJH
↓	↓	B12-00269-12	↓ RJH 12-24-12		RJH
RJH 2-24-12 ~~2-24-12~~	0801	SNC-16	QA	QA	RJH
2-24-12	0802	B12-00269-04	B12-00269	0938	RJH
↓	↓	B12-00269-12	↓		RJH

Did not count RJH 12-24-12

RJH 2-24-12

Reviewed By: SDL Initials Date: 2-27-12

Standards Activity as of: 02/20/12 21:08

Active	Std ID	Isotope	PSCLT	Verification Date	Exp Date	Status	Ref Date	Ref ACT (dpm)	ACT at Date Above (dpm/g)	Halflife (days)	Parent ID	Expended Date	Comments
[redacted]													

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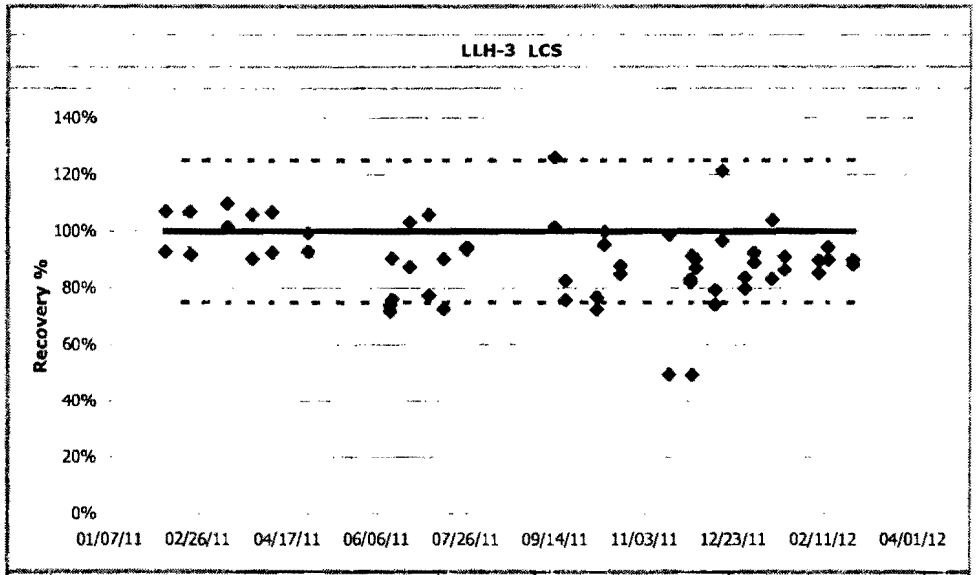
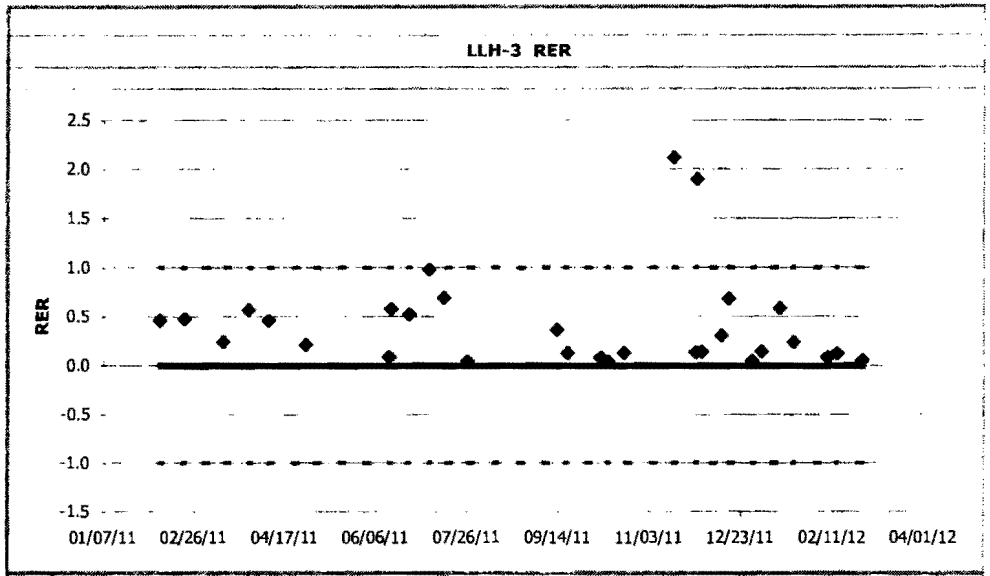
Low Level Tritium by Low Level Liquid Scintillation Counting

Control Charts

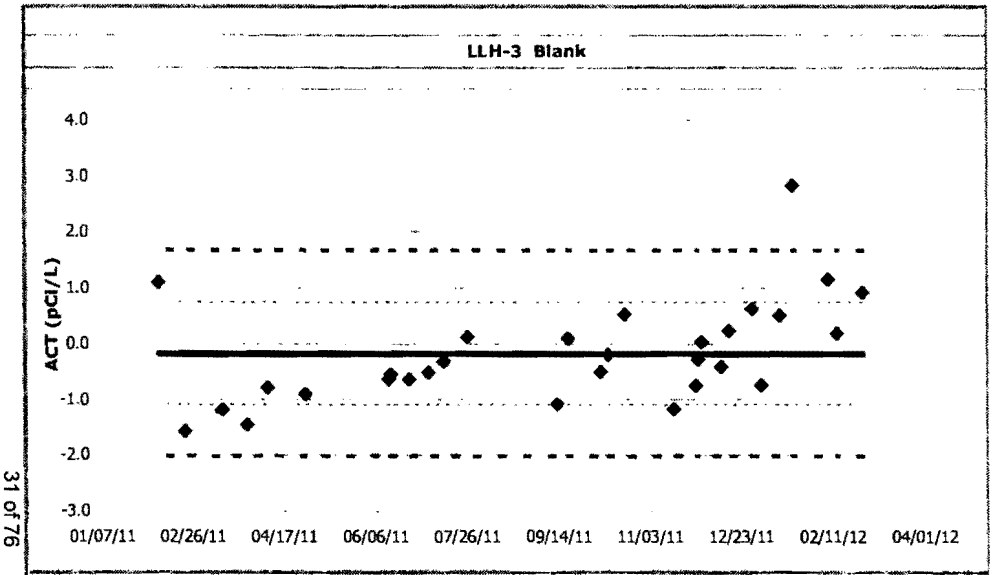
QC Chart



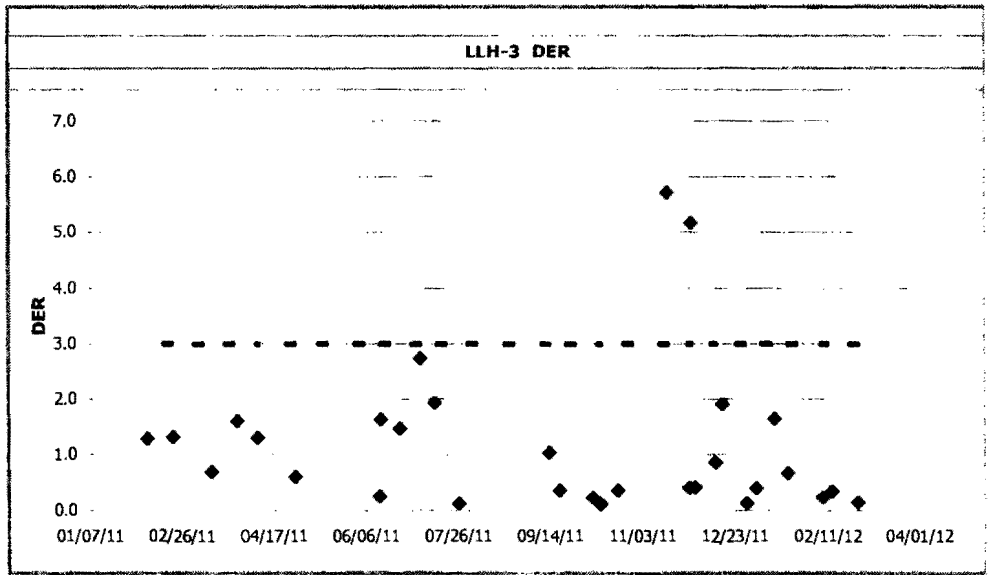
Average	STDEV	n	UCL	LCL
0.8983	0.1373	30	1.2500	0.7500



n	UCL	LCL
30	1.0000	-1.0000



Average	STDEV	n	UCL	LCL
-0.1737	0.9219	30	1.6701	-2.0174

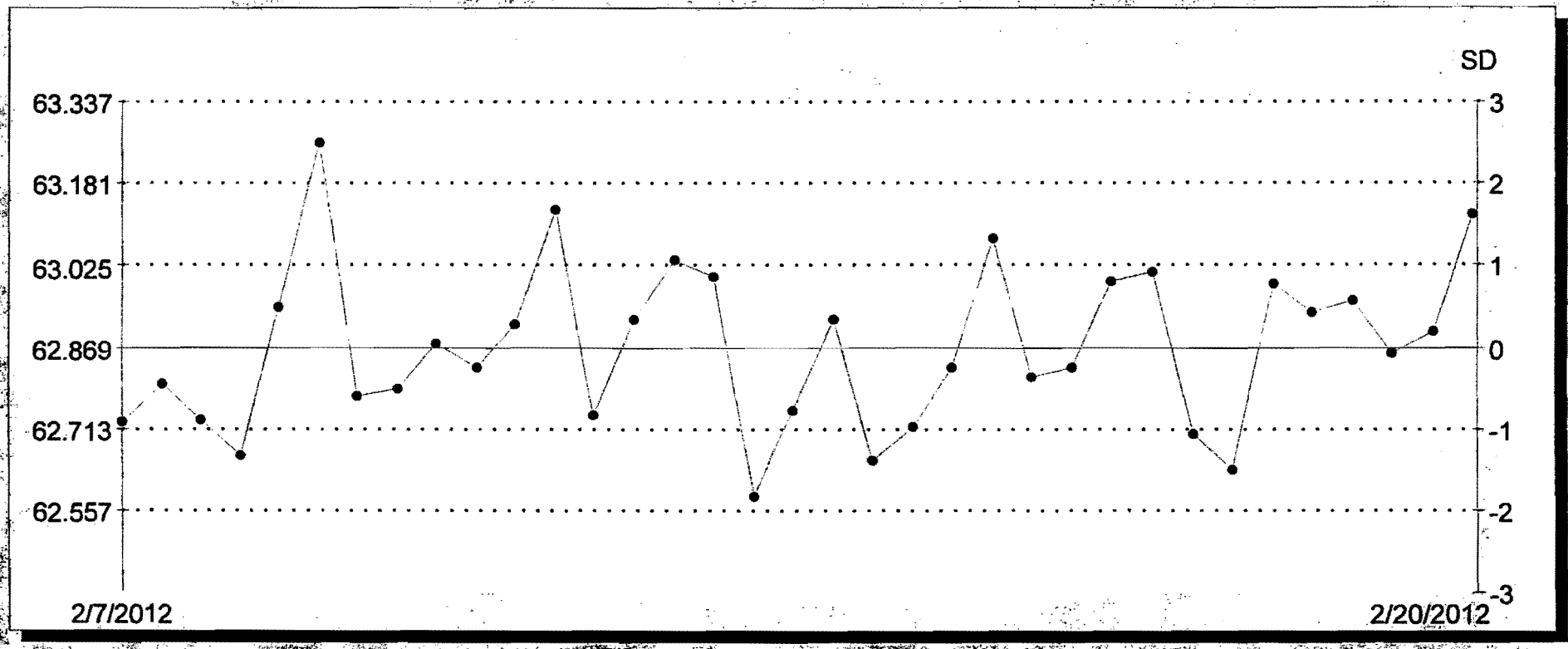


n	UCL
30	3.0000

3H Efficiency
Total # pts : 5452
Valid # pts : 35
Mean : 62.87
SD : 0.16

Date	Value	Valid Pt
Feb 07, 2012	62.72	X
Feb 07, 2012	62.80	X
Feb 07, 2012	62.73	X
Feb 07, 2012	62.66	X
Feb 07, 2012	62.95	X
Feb 08, 2012	63.26	X
Feb 08, 2012	62.78	X
Feb 08, 2012	62.79	X
Feb 08, 2012	62.88	X
Feb 08, 2012	62.83	X
Feb 08, 2012	62.91	X
Feb 08, 2012	63.13	X
Feb 08, 2012	62.74	X
Feb 08, 2012	62.92	X
Feb 08, 2012	63.04	X
Feb 08, 2012	63.00	X
Feb 08, 2012	62.59	X
Feb 08, 2012	62.75	X
Feb 08, 2012	62.92	X
Feb 08, 2012	62.65	X
Feb 09, 2012	62.72	X
Feb 09, 2012	62.83	X
Feb 09, 2012	63.08	X
Feb 09, 2012	62.81	X
Feb 09, 2012	62.83	X
Feb 09, 2012	62.99	X
Feb 09, 2012	63.02	X
Feb 09, 2012	62.70	X
Feb 09, 2012	62.64	X
Feb 09, 2012	62.99	X
Feb 10, 2012	62.94	X
Feb 15, 2012	62.96	X
Feb 16, 2012	62.86	X
Feb 17, 2012	62.90	X
Feb 20, 2012	63.13	X

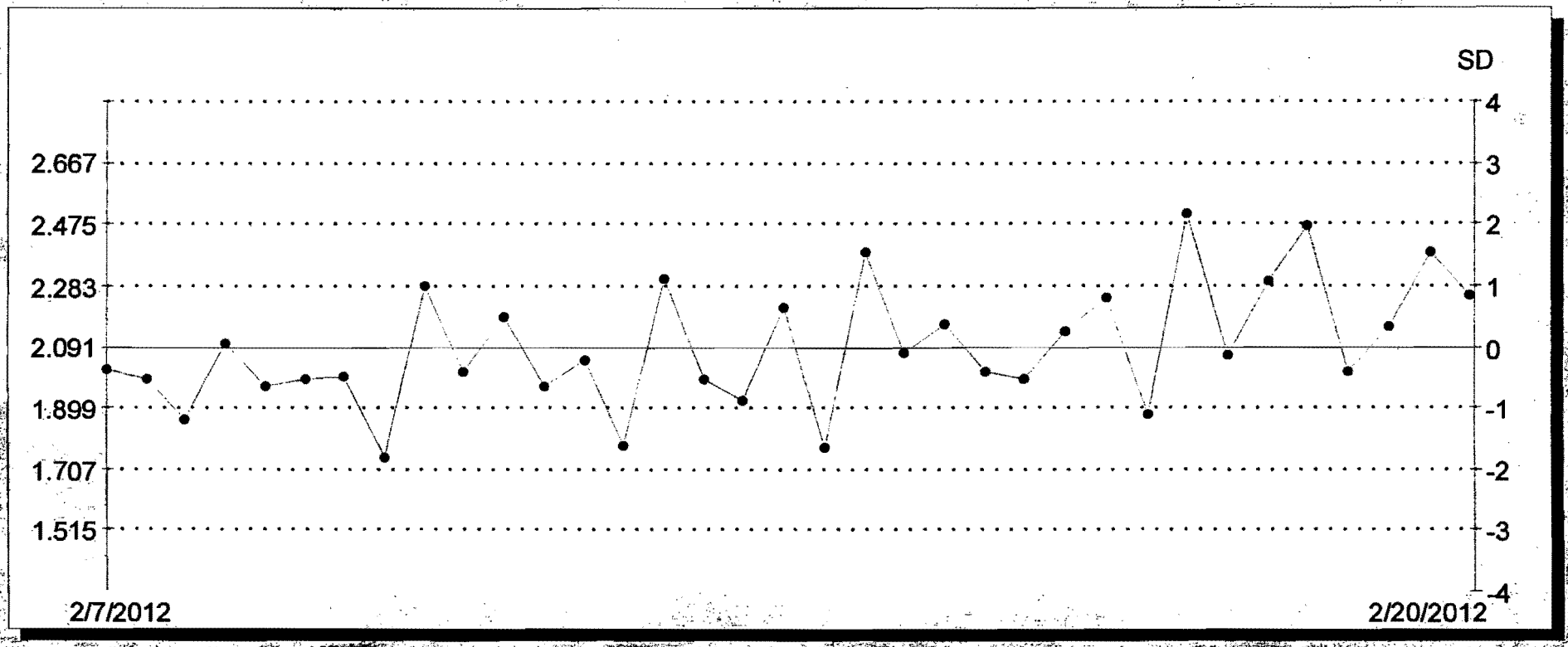
3H Efficiency
Total # pts : 5452
Valid # pts : 35
Mean : 62.87
SD : 0.16



3H Background
Total # pts : 5378
Valid # pts : 35
Mean : 2.09
SD : 0.19

Date	Value	Valid Pt
Feb 07, 2012	2.02	X
Feb 07, 2012	1.99	X
Feb 07, 2012	1.86	X
Feb 07, 2012	2.10	X
Feb 07, 2012	1.97	X
Feb 08, 2012	1.99	X
Feb 08, 2012	2.00	X
Feb 08, 2012	1.74	X
Feb 08, 2012	2.28	X
Feb 08, 2012	2.01	X
Feb 08, 2012	2.19	X
Feb 08, 2012	1.97	X
Feb 08, 2012	2.05	X
Feb 08, 2012	1.78	X
Feb 08, 2012	2.30	X
Feb 08, 2012	1.99	X
Feb 08, 2012	1.92	X
Feb 08, 2012	2.21	X
Feb 08, 2012	1.77	X
Feb 08, 2012	2.39	X
Feb 09, 2012	2.07	X
Feb 09, 2012	2.16	X
Feb 09, 2012	2.01	X
Feb 09, 2012	1.99	X
Feb 09, 2012	2.14	X
Feb 09, 2012	2.24	X
Feb 09, 2012	1.88	X
Feb 09, 2012	2.50	X
Feb 09, 2012	2.06	X
Feb 09, 2012	2.29	X
Feb 10, 2012	2.47	X
Feb 15, 2012	2.01	X
Feb 16, 2012	2.15	X
Feb 17, 2012	2.39	X
Feb 20, 2012	2.25	X

3H Background
Total # pts : 5378
Valid # pts : 35
Mean : 2.09
SD : 0.19



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Tritium- Screening
by
Low Level Liquid
Scintillation Counting

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Los Alamos National Laboratory

Tritium-Screening by Low Level Liquid Scintillation Counting

Samples

Procedures: **ARS-060** **ARS-040** *Section 14.1 Tritium Screen in Clean Water without Distillation*

ARS File ID Numbers: ARS1-12-00182; 183; 184
ARS Batch ID: ARS1-B12-00268

	Sample ID:	COUNT TIME	CPMA	Background CPMA	Eff Nucl In A	Aliquot (grams)	ACTIVITY	units	MDA	Sample Must be analyzed as LSC-A-001
1	B12-00268-04	120	1.566	1.221	26.82	10.02	57.828	pCi/L	100.2836	NO
2	B12-00268-05	120	1.451	1.221	26.8	10.05	38.466	pCi/L	100.0588	NO
3	B12-00268-06	120	1.275	1.221	27.08	10.06	8.929	pCi/L	98.92583	NO
4	B12-00268-07	120	1.255	1.221	26.49	10.01	5.776	pCi/L	101.6343	NO
5	B12-00268-08	120	1.332	1.221	26.71	10.09	18.553	pCi/L	99.998	NO
6	B12-00268-09	120	1.917	1.221	26.77	10.07	116.300	pCi/L	99.97203	YES, analyze by LSC-A-001.
7							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
8	B12-00268-09 rescreen1	120	1.406	1.221	26.72	10.07	30.971	pCi/L	100.1591	NO
9	B12-00268-09 rescreen2	120	1.436	1.221	26.61	10.07	36.142	pCi/L	100.5731	NO
10							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
11							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
12							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
13							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
14							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
15							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
16							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
17							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
18							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
19							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
20							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
21							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
22							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
23							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!

Analyze by LL H3
2.23.11
YHM

Procedures: **ARS-060** **ARS-040** *Section 14.1 Tritium Screen in Clean Water without Distillation*

ARS File ID Numbers: ARS1-12-00182; 183; 184
ARS Batch ID: ARS1-B12-00268

	Sample ID:	COUNT TIME	CPMA	Background CPMA	Eff Nucl In A	Aliquot (grams)	ACTIVITY	units	MDA	Sample Must be analyzed as LSC-A-001
1	B12-00268-04	120	1.566	1.221	26.82	10.02	57.828	pCi/L	100.2836	NO
2	B12-00268-05	120	1.451	1.221	26.8	10.05	38.466	pCi/L	100.0588	NO
3	B12-00268-06	120	1.275	1.221	27.08	10.06	8.929	pCi/L	98.92583	NO
4	B12-00268-07	120	1.255	1.221	26.49	10.01	5.776	pCi/L	101.6343	NO
5	B12-00268-08	120	1.332	1.221	26.71	10.09	18.553	pCi/L	99.998	NO
6	B12-00268-09	120	1.917	1.221	26.77	10.07	116.300	pCi/L	99.97203	YES, analyze by LSC-A-001.
7							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
8							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
9							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
10							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
11							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
12							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
13							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
14							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
15							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
16							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
17							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
18							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
19							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
20							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
21							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
22							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
23							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!

Please rescreen Buckman PZ-12-2179
ARS1-12-00184-003
SQL
2-3-12

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Tritium-Screening by Low Level Liquid Scintillation Counting

Laboratory Records

Analysis Batch Report

Analysis Batch ID **ARS1-B12-00268**

Method	ARS-054	Analysis	LSC-A-021	Matrix	AQ
Description	Low Level Tritium Screening				

ABatch Sample ID	Type	Blind Iso1	Blind Iso2	Blind Iso3	SDG	FR	Run	Client ID	Isotope Group	Lab Deadline
ARS1-B12-00268-01	LCS									
ARS1-B12-00268-02	LCSD									
ARS1-B12-00268-03	MBL									
ARS1-B12-00268-04	TRG				**ARS1-12-00182**	001	1	CAWA-12-2013	STD	02/28/12
ARS1-B12-00268-05	TRG				**ARS1-12-00183**	001	1	CAAN-12-2031	STD	02/28/12
ARS1-B12-00268-06	TRG				**ARS1-12-00183**	002	1	CAAN-12-2199	STD	02/28/12
ARS1-B12-00268-07	TRG				**ARS1-12-00184**	001	1	BuckmanPZ-12-2178	STD	02/28/12
ARS1-B12-00268-08	TRG				**ARS1-12-00184**	002	1	BuckmanPZ-12-2175	STD	02/28/12
ARS1-B12-00268-09	TRG				**ARS1-12-00184**	003	1	BuckmanPZ-12-2179	STD	02/28/12

105781
12-00182-001-1
WRAD

105782
12-00183-001-1
WRAD

105783
12-00183-002-1
WRAD

105784
12-00184-001-1
WRAD

105785
12-00184-002-1
WRAD

105786
12-00184-003-1
WRAD

ID_31001_054	ABatch	ABatchSampleID	ClientID	Aliquot1	AliquotUnits1	IC_ID1	Aliquot2	AliquotUnits2	IC_ID2	UserID	ModDate
10965	ARS1-B12-00268	ARS1-B12-00268-01		1	g					RUSEY	02/02/2012 15:21:16
10966	ARS1-B12-00268	ARS1-B12-00268-02		1	g					RUSEY	02/02/2012 15:21:16
10967	ARS1-B12-00268	ARS1-B12-00268-03		1	g					RUSEY	02/02/2012 15:21:16
10968	ARS1-B12-00268	ARS1-B12-00268-04	CAWA-12-2013	10.02	g	105781				RUSEY	02/02/2012 15:21:16
10969	ARS1-B12-00268	ARS1-B12-00268-05	CAAN-12-2031	10.05	g	105782				RUSEY	02/02/2012 15:21:16
10970	ARS1-B12-00268	ARS1-B12-00268-06	CAAN-12-2199	10.06	g	105783				RUSEY	02/02/2012 15:21:16
10971	ARS1-B12-00268	ARS1-B12-00268-07	BuckmanPZ-12-2178	10.01	g	105784				RUSEY	02/02/2012 15:21:17
10972	ARS1-B12-00268	ARS1-B12-00268-08	BuckmanPZ-12-2175	10.09	g	105785				RUSEY	02/02/2012 15:21:17
10973	ARS1-B12-00268	ARS1-B12-00268-09	BuckmanPZ-12-2179	10.07	g	105786				RUSEY	02/02/2012 15:21:17

Assay Definition-

Assay Description:
LLH3 Assay in DPM Mode

Assay Type: DPM (Single)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20120203_0911
Raw Results Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20120203_0911\20120203_0911.results
RTF File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20120203_0911\LLH3.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20120203_0911\LLH3 Results.csv
Assay File Name: C:\Packard\TriCarb\Assays\Low Level H3.lsa

Count Conditions-

Nuclide: Low Level H3
  Quench Indicator: tSIE/AEC
  External Std Terminator (sec): 0.5 2s%
  Pre-Count Delay (min): 0.00
Quench Set:
  Low Energy: ARS LL H3 10mL
Count Time (min): 120.00
Count Mode: Low Level
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

Background Subtract: Off
Low CPM Threshold: Off
2 Sigma % Terminator: On - Any Region

Regions	LL	UL	2Sigma % Terminator
A	2.0	18.6	0.50
B	0.0	2000.0	0.00
C	0.0	2000.0	0.00

Count Corrections-

Static Controller: On Luminescence Correction: Off
Colored Samples: Off Heterogeneity Monitor: Off
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

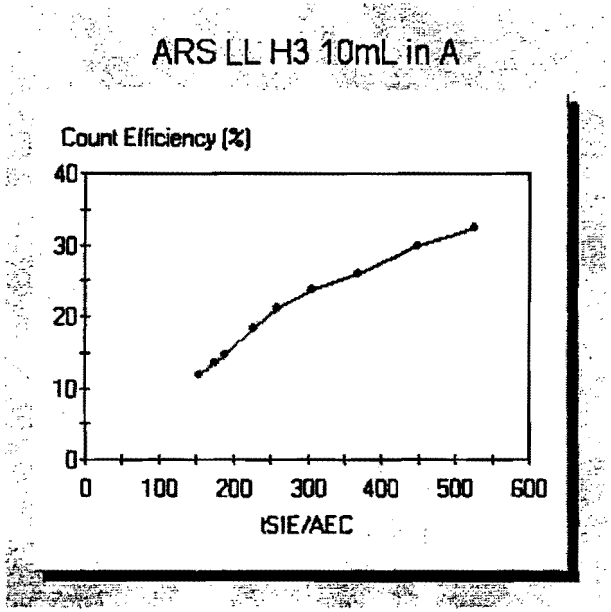
Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time

A
B
C

Cycle 1 Results
Quench Curve Block Data



Date Acquired: 11/18/2011
Date Modified:
ARS LL H3 10mL in A

tSIE/AEC	Count Efficiency (%)
526.29	32.47
450.16	29.90
370.15	25.92
306.68	23.60
260.68	20.99
228.69	18.21
189.46	14.53
177.14	13.64
155.73	11.73

P#	S#	SMPL_ID	CPMA	DPM1	tSIE	Eff Nucl In A	Count Time	DATE	TIME	MESSAGES
11	1	BACKGROUND	1.221	4.62	380.64	26.45	120.00	2/2/2012	3:44:20 PM	
11	2	B12-00268-04	1.566	5.84	388.17	26.82	120.00	2/2/2012	5:54:24 PM	
11	3	B12-00268-05	1.451	5.41	387.85	26.80	120.00	2/2/2012	8:04:30 PM	
11	4	B12-00268-06	1.275	4.71	393.45	27.08	120.00	2/2/2012	10:14:33 PM	
11	5	B12-00268-07	1.255	4.74	381.56	26.49	120.00	2/3/2012	12:24:35 AM	
11	6	B12-00268-08	1.332	4.99	385.88	26.71	120.00	2/3/2012	2:34:39 AM	
11	7	B12-00268-09	1.917	7.16	387.09	26.77	120.00	2/3/2012	4:44:41 AM	

Protocol# 2 - Low Level H3.lsa **User: H3 Low Level**

P#	S#	SMPL_ID	CPMA	DPM1	tSIE	Eff Nucl In A	Count Time	DATE	TIME	MESSAGES
2	1	B12-00268-09-RS	1.406	5.26	386.14	26.72	120.00	2/3/2012	9:20:23 AM	
2	2	B12-00268-09	1.436	5.40	383.90	26.61	120.00	2/3/2012	11:30:26 AM	

Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
1-31-12	1457	B12-00123-05	B12-00123	1638	
2-2-12	0902	SNC-51	QA	QA	
2-2-12	1532	Background	B12-00268	1535	
↓	↓	B12-00268-04	↓	↓	
↓	↓	B12-00268-05	↓	↓	
↓	↓	B12-00268-06	↓	↓	
↓	↓	B12-00268-07	↓	↓	
↓	↓	B12-00268-08	↓	↓	
↓	↓	B12-00268-09	↓	↓	
2-3-12	0736	SNC-51	QA	QA	
2-3-12	0737	B12-00268-09-LCS	B12-00268	0911	
↓	↓	B12-00268-09	↓	↓	

2-3-12

Reviewed By: _____ Date: 2-27-12
Initials

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American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

Tritium-Screening by Low Level Liquid Scintillation Counting

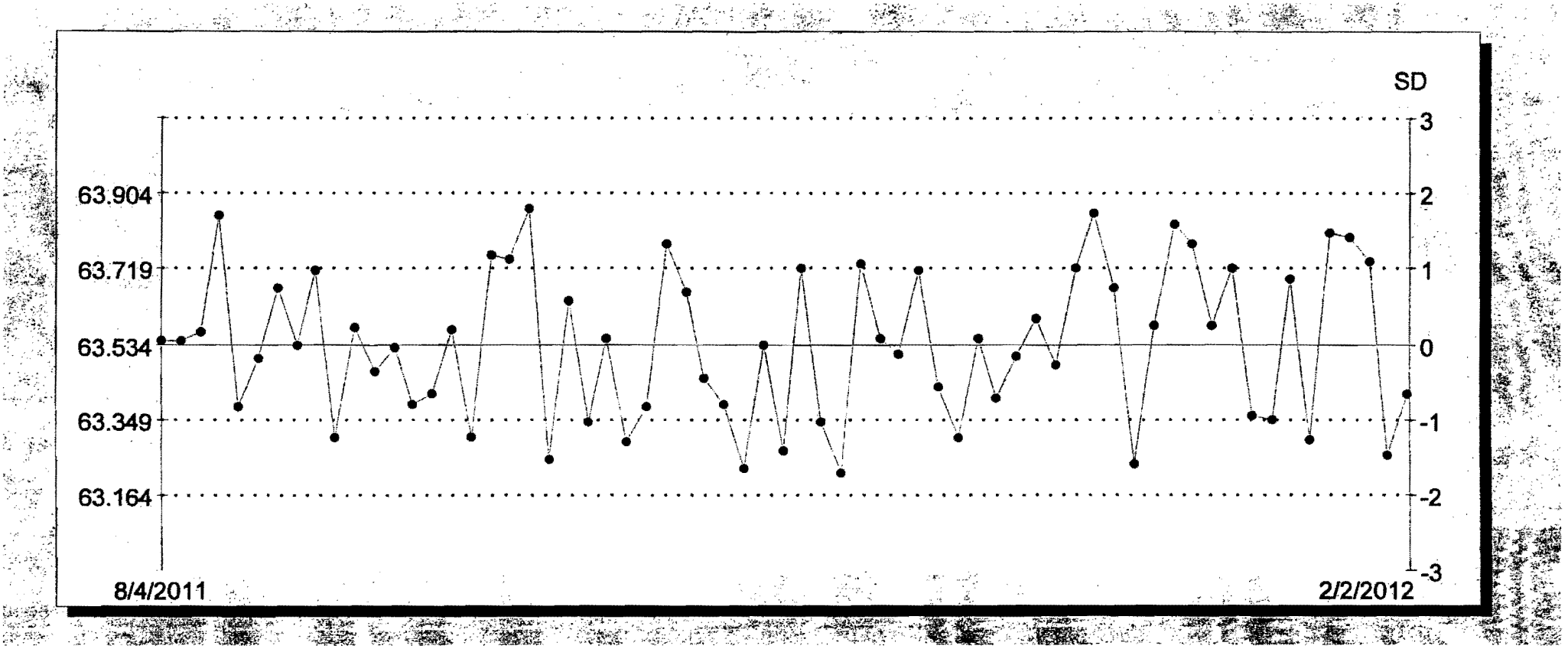
Control Charts

H Efficiency
'otal # pts : 5416
'alid # pts : 65
ean : 63.53
D : 0.18

ate	Value	Valid Pt
ug 04, 2011	63.54	X
ug 11, 2011	63.54	X
ug 15, 2011	63.56	X
ug 16, 2011	63.85	X
ug 21, 2011	63.38	X
ug 25, 2011	63.50	X
ug 29, 2011	63.67	X
ep 02, 2011	63.53	X
ep 04, 2011	63.71	X
ep 04, 2011	63.30	X
ep 04, 2011	63.58	X
ep 04, 2011	63.47	X
ep 04, 2011	63.53	X
ep 04, 2011	63.39	X
ep 04, 2011	63.41	X
ep 04, 2011	63.57	X
ep 06, 2011	63.31	X
ep 06, 2011	63.75	X
ep 11, 2011	63.74	X
ep 14, 2011	63.87	X
ep 17, 2011	63.25	X
ep 21, 2011	63.64	X
ep 26, 2011	63.34	X
ep 29, 2011	63.55	X
ct 03, 2011	63.29	X
ct 05, 2011	63.38	X
ct 08, 2011	63.78	X
ct 09, 2011	63.66	X
ct 09, 2011	63.45	X
ct 09, 2011	63.39	X
ct 09, 2011	63.23	X
ct 09, 2011	63.53	X
ct 09, 2011	63.27	X
ct 10, 2011	63.72	X
ct 10, 2011	63.34	X
ct 10, 2011	63.22	X
ct 10, 2011	63.73	X
ct 10, 2011	63.55	X
ct 12, 2011	63.51	X
ct 19, 2011	63.71	X
ct 24, 2011	63.43	X
ct 26, 2011	63.31	X

Nov 07, 2011	63.55	X
Nov 15, 2011	63.40	X
Nov 18, 2011	63.50	X
Nov 19, 2011	63.60	X
Nov 25, 2011	63.48	X
Nov 28, 2011	63.72	X
Nov 29, 2011	63.86	X
Nov 30, 2011	63.67	X
Dec 02, 2011	63.24	X
Dec 06, 2011	63.58	X
Dec 12, 2011	63.83	X
Dec 20, 2011	63.78	X
Dec 28, 2011	63.58	X
Dec 29, 2011	63.72	X
Jan 03, 2012	63.36	X
Jan 10, 2012	63.35	X
Jan 18, 2012	63.69	X
Jan 23, 2012	63.30	X
Jan 25, 2012	63.81	X
Jan 26, 2012	63.80	X
Jan 27, 2012	63.74	X
Jan 31, 2012	63.26	X
Feb 02, 2012	63.41	X

H Efficiency
otal # pts : 5416
alid # pts : 65
ean : 63.53
D : 0.18

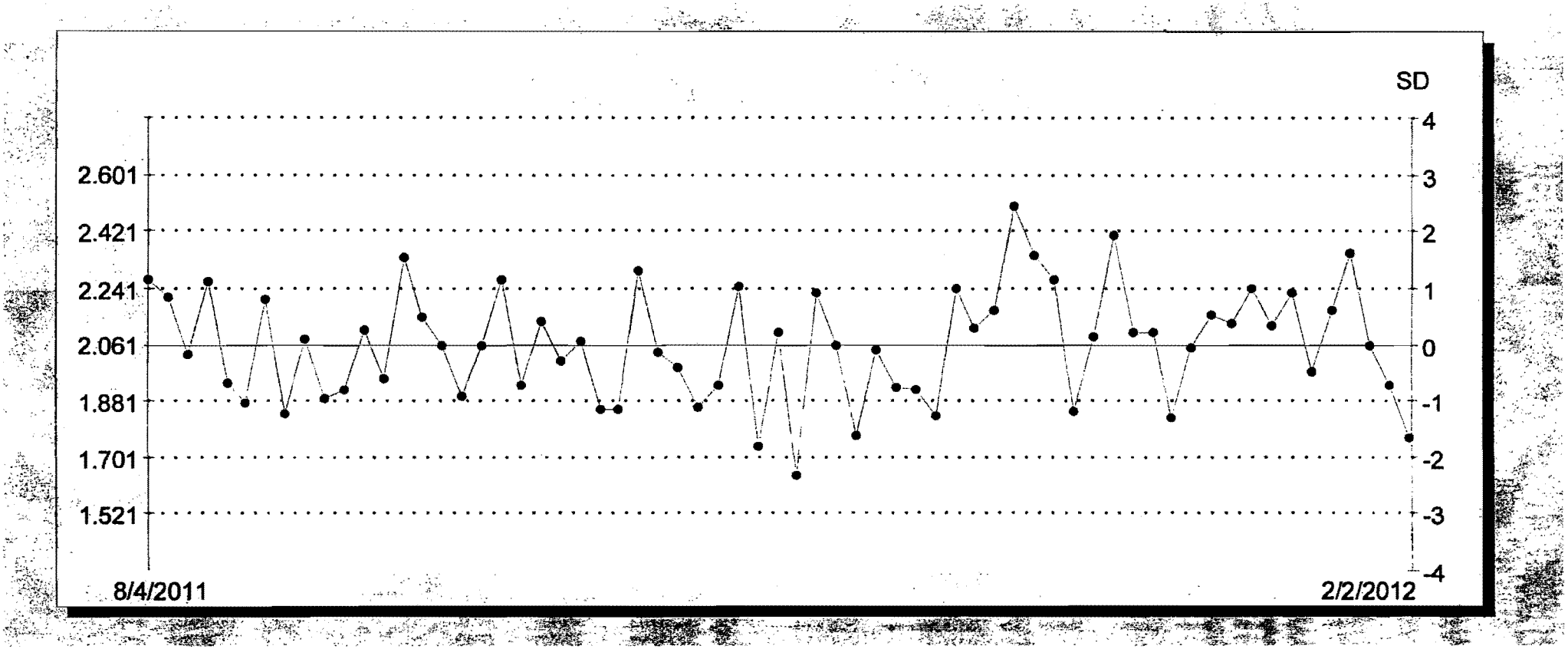


3H Background
Total # pts : 5342
Valid # pts : 65
Mean : 2.06
SD : 0.18

Date	Value	Valid Pt
Aug 04, 2011	2.27	X
Aug 11, 2011	2.21	X
Aug 15, 2011	2.03	X
Aug 16, 2011	2.26	X
Aug 21, 2011	1.94	X
Aug 25, 2011	1.88	X
Aug 29, 2011	2.21	X
Sep 02, 2011	1.84	X
Sep 04, 2011	2.08	X
Sep 04, 2011	1.89	X
Sep 04, 2011	1.91	X
Sep 04, 2011	2.11	X
Sep 04, 2011	1.95	X
Sep 04, 2011	2.34	X
Sep 04, 2011	2.15	X
Sep 04, 2011	2.05	X
Sep 06, 2011	1.89	X
Sep 06, 2011	2.05	X
Sep 11, 2011	2.27	X
Sep 14, 2011	1.93	X
Sep 17, 2011	2.14	X
Sep 21, 2011	2.01	X
Sep 26, 2011	2.07	X
Sep 29, 2011	1.85	X
Oct 03, 2011	1.85	X
Oct 05, 2011	2.30	X
Oct 08, 2011	2.03	X
Oct 09, 2011	1.99	X
Oct 09, 2011	1.86	X
Oct 09, 2011	1.93	X
Oct 09, 2011	2.24	X
Oct 09, 2011	1.73	X
Oct 09, 2011	2.10	X
Oct 10, 2011	1.64	X
Oct 10, 2011	2.22	X
Oct 10, 2011	2.05	X
Oct 10, 2011	1.77	X
Oct 10, 2011	2.04	X
Oct 12, 2011	1.92	X
Oct 19, 2011	1.92	X
Oct 24, 2011	1.83	X
Oct 26, 2011	2.24	X

lov 07, 2011	2.11	X
lov 15, 2011	2.17	X
lov 18, 2011	2.50	X
lov 19, 2011	2.35	X
lov 25, 2011	2.27	X
lov 28, 2011	1.85	X
lov 29, 2011	2.09	X
lov 30, 2011	2.40	X
)ec 02, 2011	2.10	X
)ec 06, 2011	2.10	X
)ec 12, 2011	1.83	X
)ec 20, 2011	2.05	X
)ec 28, 2011	2.15	X
)ec 29, 2011	2.13	X
'an 03, 2012	2.24	X
'an 10, 2012	2.12	X
'an 18, 2012	2.23	X
'an 23, 2012	1.97	X
'an 25, 2012	2.17	X
'an 26, 2012	2.35	X
'an 27, 2012	2.05	X
'an 31, 2012	1.93	X
'eb 02, 2012	1.76	X

H Background
otal # pts : 5342
alid # pts : 65
ean : 2.06
D : 0.18



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American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

Low Level Liquid Scintillation Counting

Calibration Information

STD ID: S-0262

ARS INTERNATIONAL

Add/Edit *Secondary Stds*

Planning	
Planning Comments	Create an H3 LCS stock solution.
Target dpm/g (on dil. date)	5.5
Target Final volume ml	2000
Appx mass g of Parent Sol'n	3.408759506
Appx vol ml of Parent Sol'n	3.414995335
Expected Addition for Analysis g	5
Standards Preparation / Dilution	
Secondary Solution #	S-0262
Dilution Date (New Ref Date)	09/07/2011 11:47
Ampoule, Empty (g)	
Ampoule /Solution Gross (g)	
Net Wt Removed (g)	
Transfer Container, empty (g)	13.352
Container Plus Solution (g)	16.889
Net Wt Transferred (g)	3.537
DPM Xferred on 09/07/2011 11:47	11413.83291
Diluent/matrix	Dead H2O
Diluent Density Cont, empty (g)	
Test Mass of 5 ml of Diluent (g)	
Diluent Density Test - (g/mL)	
Dilution Empty Container Mass (g)	473.97
Dilution Full Cont g (if measured)	2467.33
Dilution Final Volume ml (if measured)	2000
Final Dilution Density (g/mL)	0.99668
Final Dilution Measured Mass g	1993.36
Comments	H3 LCS stock solution dilution performed as stated above by B Steffens. -BJS 9/7/11
Final Dilution dpm/g	5.725926829
Final Dil New Ref Date/Time	09/07/2011 11:47

Parent Standard Data

Parent Solution Reference #	NIST SRM 4927F			
Parent Solution #	S-0237			
Parent Principal Radionuclide	H-3	Half Life (Days)	4499.8000000	
Parent Reference Date	03/22/2010 10:10			
Parent Certified Act	3583.682716	Certi Act/Vol Units	dpm	g
Parent Certi Act Uncert 1 Sigma	0.0036			
Parent Sp. Gravity G/Ml	0.9982			
Parent Supplier	NIST SRM 4927F			
Parent Date Recvd	01/02/00			
Parent Received By	Unknown			
Parent Cert Exp Date				
Parent Matrix	H2O			
Certified dpm/g At Ref Date	3583.682716			
Certified dpm/g on 09/07/2011 11:47	3226.981313			
Parent Comments	Intermediate level H-3 standard for creating LCS solutions and matrix spikes. Dilution performed as stated above by B Steffens. -BJS 3/22/10			
Parent Tech	Unknown			
Is_Primary	FALSE			
Is_LCS	TRUE			
Is_Tracer	FALSE			
Is_Calib	FALSE			

S-0262	
H-3	Verified 9/7/11
SL	Expires 9/7/12
Manufactuer	NIST SRM 4927F
Sol Matrix	H2O
Ref No	NIST SRM 4927F
Tech	Unknown
Parent ID	S-0237

ARS INTERNATIONAL

RADIOACTIVE STANDARDS -- BATON ROUGE LABORATORY

ARS INTERNATIONAL

QUALITY CONTROL PROGRAM

AMERICAN RADIATION SERVICES
RADIOACTIVE REFERENCE SOLUTIONS

ANNUAL ACTIVITY VERIFICATION

VERIFICATION DATE: 9/13/2011 7:43 *date counted*
STANDARD REFERENCE #: S-0262

Principal Radionuclide		Half Life, Years		Half Life, Days
H-3	*ENTER -->*		*OR -->*	4.4998E+03
		1.232E+01		4.4998E+03

Radionuclide: H-3 Dilution Reference Date: 9/7/2011 11:47

Dilution Activity: 2.58 pCi per gram ===> dpm/g: 5.73
Verif. Date Decay Corrected: 2.58 pCi per gram ===> dpm/g: 5.72

Minimum of 3 Required

Trial ID	Sample Counts	Count Time (min)	Detector	Efficiency	Bkg. (cpm)	Net Weight	Decay Corrected Activity Result (dpm/g)	Decay Corrected Activity Result (pCi/g)
S-0262-V1	16.07	1	LSC	0.3754	5.40	5.050	5.63	2.54
S-0262-V2	16.39	1	LSC	0.3770	5.40	5.037	5.79	2.61
S-0262-V3	15.70	1	LSC	0.3763	5.40	5.035	5.44	2.45
S-0262-V4	15.00	1	LSC	0.3768	5.40	5.022	5.07	2.29
S-0262-V5	15.85	1	LSC	0.3774	5.40	5.019	5.52	2.49

Average	5.49	2.47
Two Sigma Uncertainty	0.52	0.24
Standard Deviation percent of known concentration	4.66%	4.66%
Target Activity	5.72	2.58
% Diff	-4.13%	-4.13%

10% Max *PASS*

5% Max *PASS*

Verification Expiration Date: ###############

Prepared & Counted By: [signature] Date: 9/13/2011 7:43

Verified & Approved By: [signature] Date: 9-13-11

QC Approval: [signature] Date: 9-13-11

S-0262	
H-3	Verified 9/7/11
SL	Expires 9/7/12
Manufactuer	NIST SRM 4927F
Sol Matrix	H2O
Ref No	NIST SRM 4927F
Tech	Unknown
Parent ID	S-0237

ARS INTERNATIONAL
RADIOACTIVE STANDARDS -- BATON ROUGE LABORATORY

H-3 Standard Verification

Verifier's Name: Brian Steffens **Date:** 9/7/2011

Pipettor ID: FJ40469

Pipettor ID: Auto-pipettor

Pipettor ID: na

Standard ID: S-0262

Standard ID: N/A

Standards brought up to ~5g with distilled dead water.
Standards made in glass vials.

15mL of Ultima Gold added to standard

	Weight of Standard
S-0262-V1	5.050 g
S-0262-V2	5.037 g
S-0262-V3	5.035 g
S-0262-V4	5.022 g
S-0262-V5	5.019 g

Balance ID: H1331122173560P

Assay Definition-

Assay Description:
H-3 Normal Level Assay

Assay Type: DPM (Single)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110912_2059
Raw Results Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110912_2059\20110912_2059.results
RTF File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110912_2059\H-3 Results.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110912_2059\H-3 Results.csv
Assay File Name: C:\Packard\TriCarb\Assays\H-3 Normal Lvl 3.lsa

Count Conditions-

Nuclide: H-3 Normal
  Quench Indicator: tSIE/AEC
  External Std Terminator (sec): 0.5 2s%
  Pre-Count Delay (min): 0.00
Quench Set:
  Low Energy: UG STD H-3
Count Time (min): 120.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

Background Subtract: Off
Low CPM Threshold: Off
2 Sigma % Terminator: On - Any Region

Regions	LL	UL	2Sigma % Terminator
A	2.0	18.6	0.50
B	0.0	2000.0	0.00
C	0.0	2000.0	0.00

Count Corrections-

Static Controller: On Luminescence Correction: Off
Colored Samples: Off Heterogeneity Monitor: Off
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

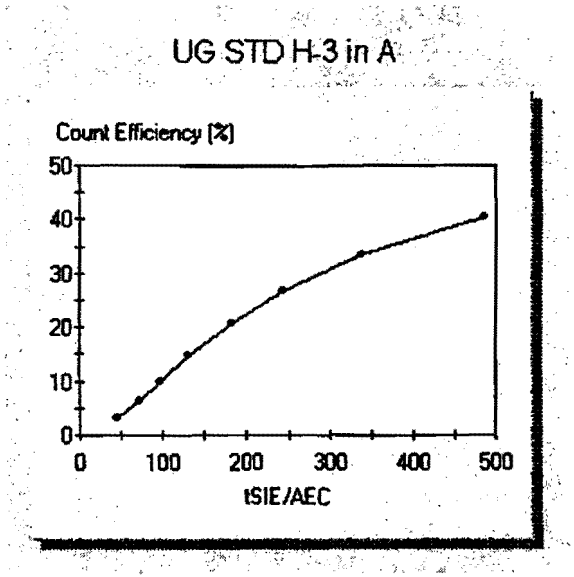
Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time

A
B
C

Cycle 1 Results
Quench Curve Block Data



Date Acquired: 06/15/2011
Date Modified:
UG STD H-3 in A

tSIE/AEC	Count Efficiency (%)
487.53	40.41
339.12	33.51
243.83	26.83
182.60	20.93
130.85	14.63
96.86	9.97
71.30	6.34
46.31	3.09

P#	S#	SMPL_ID	CPMA	DPM1	tSIE	Eff Nuc1 In A	Count Time	DATE	TIME	MESSAGES
50	1	BACKGROUND	5.40	14.31	429.68	37.72	120.00	9/12/2011	9:04:58 PM	
50	2	S-0262-V1	16.07	42.82	425.91	37.54	120.00	9/12/2011	11:12:00 PM	
50	3	S-0262-V2	16.39	43.48	429.27	37.70	120.00	9/13/2011	1:19:59 AM	
50	4	S-0262-V3	15.70	41.73	427.79	37.63	120.00	9/13/2011	3:27:57 AM	
50	5	S-0262-V4	15.00	39.81	428.81	37.68	120.00	9/13/2011	5:35:55 AM	
50	6	S-0262-V5	15.85	42.00	430.24	37.74	120.00	9/13/2011	7:43:52 AM	

National Institute of Standards & Technology

Certificate

Standard Reference Material 4927F

Hydrogen-3 Radioactivity Standard

This Standard Reference Material (SRM) consists of tritiated water, having a standardized and certified quantity of radioactive hydrogen-3. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. The solution, whose composition is specified in Table 1, is contained in a flame-sealed, 5 mL, NIST, borosilicate-glass ampoule (see Note 1)*.

The certified **hydrogen-3** massic activity value, at a **Reference Time of 1200 EST, 3 September 1998**, is:

$$(634.7 \pm 4.6)\ \mathbf{kBq \cdot g^{-1}}$$

Additional physical, chemical, and radiological properties for the SRM, as well as details on the standardization method, are given in Table 1. Uncertainty intervals for certified quantities are expanded ($k = 2$) uncertainties calculated according to the ISO and NIST Guidelines (see Note 2). Table 2 contains a specification of the components that comprise the uncertainty analyses.

The certification of this SRM, within the measurement uncertainties specified, is valid for at least five (5) years after receipt. The solution matrix, in an unopened ampoule, is believed to be indefinitely homogeneous and stable, within its half-life-dependent, useful lifetime. NIST will monitor this material and will report any substantive changes in certification to the purchaser. Should any of the certified values change, purchasers of this SRM will be notified of the change by NIST.

This SRM may represent a radiological hazard. Hydrogen-3 decays by beta particle emission. None of the beta particles escape from the SRM vial. During the decay process no photons are emitted. The SRM should be stored and used at a temperature between 5 and 35 °C. See Note 1

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, Dr. M.P Unterweger, Acting Group Leader. The overall technical direction and physical measurements leading to certification were provided by Drs. L.L. Lucas and M.P Unterweger of the Radioactivity Group. The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program.

Lisa R. Karam, Deputy Chief
Ionizing Radiation Division

Gaithersburg, Maryland 20899
May 2008
See Certificate Revision History on Last Page

Robert L. Watters, Jr., Chief
Measurement Services Division

*Notes and references are on page 4

Table 1. Properties of SRM 4927F

Certified values

Radionuclide	**Hydrogen-3**
Reference time	**1200 EST, 3 September 1998**
Massic activity of the solution	**634.7 kBq•g^{-1}**
Relative expanded uncertainty ($k = 2$)	**0.72 %** (see Note 2)*

Uncertified information

Source description	Liquid in flame-sealed, 5 mL NIST borosilicate ampoule (see Note 1)
Solution composition	Distilled water
Solution density	(0.998 ± 0.002) g•mL^{-1} at 20 °C (see Note 3)
Solution mass	Approximately 5.0 g
Radionuclidic impurities	None detected (see Note 4)
Half-lifes used	^{3}H: (4500 ± 8) d (see Note 5)
Calibration method (and instruments)	The certified massic activity for ^{3}H was obtained by 4πβ gas counting of SRM 4927E using the NIST length-compensated internal gas proportional counters and intercomparison of SRMs 4927E/4927F using two 4πβ liquid-scintillation (LS) counting systems (see Note 6)

*Notes and references are on page 4

Table 2. Uncertainty evaluation for the massic activity for SRM 4927F

	Uncertainty component	Assessment Type †	Relative standard uncertainty contribution on massic activity of ^{3}H (%)
1	Massic count rate of SRM 4927E, corrected for background and decay; standard deviation of the mean for 23 sets of gas counting measurements (see Note 6)	A	0.18
2	LS intercomparison of SRM 4927F and SRM 4927E; standard deviation of the mean for 7 sets of LS measurements	A	0.06
3	Decay corrections for ^{3}H; (for half-life uncertainty of 0.18%)	A	0.002
4	Gram-mole determinations based on pressure, volume and temperature measurements	B	0.20
5	Livetime determinations	B	0.10
6	Extrapolation of count-rate-versus-energy to zero energy	B	0.20
7	Limit for radionuclidic impurities	B	0.05
Relative combined standard uncertainty			**0.36**
Relative expanded uncertainty ($k = 2$)			**0.72**

† = (A) denotes evaluation by statistical methods; (B) denotes evaluation by other methods.

NOTES

Note 1. Refer to http://physics.nist.gov/Divisions/Div846/srm.html for the standardized ampoule dimensions and for assistance and instructions on how to properly open an ampoule. Information on additional storage and handling requirements is also included in the website.

Note 2. The uncertainties on certified values are expanded uncertainties, $U = ku_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO and NIST Guides (see references [1] and [2]). The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

Note 3. The stated uncertainty is two times the standard uncertainty. See reference [2]

Note 4. The estimated lower limit of detection for radionuclidic impurities is 300 $Bq \cdot g^{-1}$

Note 5. The stated uncertainty is the standard uncertainty. See reference [2] and [3].

Note 6. Extensive gas-counting measurements were made on the SRM 4927E solution during 1998 and 1999. The SRM 4927F solution was intercompared with the SRM 4927E using LS counting.

REFERENCES

[1] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993 (corrected and reprinted, 1995). Available from Global Engineering Documents, 12 Inverness Way East, Englewood, CO 80112, U.S.A. Telephone 1-800-854-7179.

[2] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.

[3] L.L Lucas and M.P. Unterweger, *Comprehensive Review and Critical Evaluation of the Half-Life of Tritium*, J. Res. Natl. Inst. Stand. Technol. **105**, 541-549 (2000)

Certificate Revision History: May 2008 (Text revised); February 2007 (Text revised and expiration date extended); October 2000 (Half-life and text revised); June 1999 (Original certificate date).

ARS INTERNATIONAL

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American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

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ARS INTERNATIONAL

Report Compilation Checklist

ARS SDG: 12-00183 **Client Name:** LANL **Sample Matrix:** AQ

LEVEL 1 COMPONENTS	1st Reviewer	
1) Cover Page Complete and Accurate (see ARS-059)?	~~Yes~~ No N/A	
2) Technical Review Checklist(s) Complete and Accurate?	~~Yes~~ No N/A	
3) Case Narrative Complete and Accurate (see ARS-059)?	~~Yes~~ No N/A	
4) Form 1s Present for all Samples and Tests?	~~Yes~~ No N/A	
5) Client Specific Components are Present and Complete?	~~Yes~~ No N/A	

LEVEL 2 COMPONENTS	1st Reviewer	
6) Batch Quality Control Report is Present and Accurate?	~~Yes~~ No N/A	
7) DQO Report is Present and Accurate?	~~Yes~~ No N/A	
8) Client Specific Batch QC Components are Present and Complete?	~~Yes~~ No N/A	

LEVEL 3 COMPONENTS	1st Reviewer	
9) Efficiencies are Present?	~~Yes~~ No N/A	
10) Calibrations are Present?	~~Yes~~ No N/A	
11) Backgrounds are Present?	~~Yes~~ No N/A	
12) Spectrum Analysis is Present?	~~Yes~~ No N/A	
13) Spectral Plots are Present?	~~Yes~~ No N/A	
14) Plateaus are Present?	~~Yes~~ No N/A	
15) Control Charts are Present?	~~Yes~~ No N/A	
16) Other:	Yes No ~~N/A~~	

LEVEL 4 COMPONENTS	1st Reviewer	
17) Preparation Raw Data Present, Signed and Complete?	~~Yes~~ No N/A	
18) Instrument Raw Data Present and Complete?	~~Yes~~ No N/A	
19) Calibration Certificates Present?	~~Yes~~ No N/A	
20) Copies of Log Book Pages Present?	~~Yes~~ No N/A	
21) Sample Receiving Documentation Present?	~~Yes~~ No N/A	
22) LIMS Reports Present?	~~Yes~~ No N/A	
23) Applicable Correspondence Present?	~~Yes~~ No N/A	
24) Other:	Yes No ~~N/A~~	

Report Generator Signature — Date: 2-29-12

Management Review Signature — Date: 2-29-12

ARS INTERNATIONAL

LSC
Technical Review Checklist

ARS SDG ARS1-12-00183

Sample Matrix: AQ **Aliquot** (Circle One) : Dry As Received Filtered Other: _____

Required QC Samples (Mark all that apply): Blank LCS LCSD Sample Dup MS MSD

ARS A. Batch ID(s): **Batch A:** ARS1-B12-00269 **Batch B:** N/A **Batch C:** N/A

Test Method(s): LSC-A-022 N/A N/A

A. RADIOCHEMICAL PREPARATION REVIEW

	Chemist Review	Verifier Review
1) 100% of Manual Transcriptions Verified?	Yes No N/A	Yes No N/A
2) 100% of Manual Calculations Verified?	Yes No N/A	Yes No N/A
3) Blank Composition/Configuration Matches Calibration?	Yes No N/A	Yes No N/A
4) Deviations from procedure are documented and verified?	Yes No N/A	Yes No N/A
5) Appropriate Cocktail Selected?	Yes No N/A	Yes No N/A

6) Sample Prep Anomaly? ☑ No ☐ Yes (See Tech Notes) NCR # (If initiated): _____

Chemist Signature 2-20-12 Date

Verifier Review Signature 2-21-12 Date

B. ANALYSIS REVIEW

	Analyst Review	QA Officer Review
1) Calibrations Valid and Current?	Yes No N/A	Yes No N/A
2) Backgrounds Valid and Current?	Yes No N/A	Yes No N/A
3) Source Checks Completed and Acceptable?	Yes No N/A	Yes No N/A

QA Officer Signature for V. Mueller 2-21-12 Date

	Analyst Review	Technicial Review
4) Background Checks Complete and Acceptable?	Yes No N/A	Yes No N/A
5) 100% of Manually Entered Parameters Verified Accurate?	Yes No N/A	Yes No N/A
6) Appropriate QC samples initiated at required frequency?	Yes No N/A	Yes No N/A
6) Test/Sample Specific Parameters (See ARS-059 for details)		
a) Analysis Parameters Checked and Correct and Peak Shapes are Acceptable?	Yes No N/A	Yes No N/A
b) Spectra show no Evidence of Interferences?	Yes No N/A	Yes No N/A
c) Sample Quench for All Samples within Range of Quench Curve?	Yes No N/A	Yes No N/A

7) Analysis Anomaly? ☑ No ☐ Yes (See Comments) NCR # (If initiated): _____

Analyst Signature 2-22-12 Date

Technicial Reviewer Signature 2-23-12 Date

ARS INTERNATIONAL

Batch A: ARS1-B12-00269

LSC
Technical Review Checklist

C. BATCH QC VALIDATION

	Proj. Mgr. Review	QA Officer Review
1) Activity + 3xCSU a Negative Number?	Yes ~~No~~ N/A	Yes (No) N/A
2) RDL Criteria are Met?	~~Yes~~ No N/A	(Yes) No N/A
3) Method Blank Criterion Met?	~~Yes~~ No N/A	(Yes) No N/A
4) LCS/LCD Criteria Met?	~~Yes~~ No N/A	(Yes) No N/A
5) Duplicate (Sample Duplicate, LCSD, MSD) Criteria Met?	~~Yes~~ No N/A	(Yes) No N/A
6) MS/MSD Criteria Met?	Yes No ~~N/A~~	Yes No (N/A)
7) Batch QC Anomaly? ☑ No ☐ Yes (See Tech Notes) NCR # (If initiated):		

Susan Reese 2-29-12
Project Manager Signature Date

James D. Penn 2-29-12
QA Officer Signature for V. Mulligan Date

GENERAL COMMENTS

LSC
Technical Review Checklist

ARS SDG ARS1-12-00183

Sample Matrix: AQ **Aliquot** (Circle One): Dry As Received Filtered Other: _____

Required QC Samples (Mark all that apply): Blank LCS LCSD Sample Dup MS MSD

ARS A. Batch ID(s): **Batch A:** ARS1-B12-00268 **Batch B:** N/A **Batch C:** N/A

Test Method(s): LSC-A-021 N/A N/A

A. RADIOCHEMICAL PREPARATION REVIEW

	Chemist Review	Verifier Review
1) 100% of Manual Transcriptions Verified?	Yes No N/A	Yes No N/A
2) 100% of Manual Calculations Verified?	Yes No N/A	Yes No N/A
3) Blank Composition/Configuration Matches Calibration?	Yes No N/A	Yes No N/A
4) Deviations from procedure are documented and verified?	Yes No N/A	Yes No N/A
5) Appropriate Cocktail Selected?	Yes No N/A	Yes No N/A

6) Sample Prep Anomaly? ☑ No ☐ Yes (See Tech Notes) NCR # (If initiated): _____

Chemist Signature 2-2-12 Date

Verifier Review Signature 2-2-12 Date

B. ANALYSIS REVIEW

	Analyst Review	QA Officer Review
1) Calibrations Valid and Current?	Yes No N/A	Yes No N/A
2) Backgrounds Valid and Current?	Yes No N/A	Yes No N/A
3) Source Checks Completed and Acceptable?	Yes No N/A	Yes No N/A

James D. Penn 2-29-12
QA Officer Signature for U. Mueller Date

	Analyst Review	Technicial Review
4) Background Checks Complete and Acceptable?	Yes No N/A	Yes No N/A
5) 100% of Manually Entered Parameters Verified Accurate?	Yes No N/A	Yes No N/A
6) Appropriate QC samples initiated at required frequency?	Yes No N/A	Yes No N/A
6) Test/Sample Specific Parameters (See ARS-059 for details)		
a) Analysis Parameters Checked and Correct and Peak Shapes are Acceptable?	Yes No N/A	Yes No N/A
b) Spectra show no Evidence of Interferences?	Yes No N/A	Yes No N/A 2-2-12
c) Sample Quench for All Samples within Range of Quench Curve?	Yes No N/A	Yes No N/A

7) Analysis Anomaly? ☑ No ☐ Yes (See Comments) NCR # (If initiated): _____

Analyst Signature 2-3-12 Date

N/A
Technicial Reviewer Signature Date

ARS INTERNATIONAL

Batch A: ARS1-B12-00268

LSC
Technical Review Checklist

C. BATCH QC VALIDATION

	Proj. Mgr. Review	QA Officer Review
1) Activity + 3xCSU a Negative Number?	Yes No N/A	Yes No (N/A)
2) RDL Criteria are Met?	Yes No N/A	Yes No (N/A)
3) Method Blank Criterion Met?	Yes No N/A	Yes No (N/A)
4) LCS/LCD Criteria Met?	Yes No N/A	Yes No (N/A)
5) Duplicate (Sample Duplicate, LCSD, MSD) Criteria Met?	Yes No N/A	Yes No (N/A)
6) MS/MSD Criteria Met?	Yes No N/A	Yes No (N/A)
7) Batch QC Anomaly? ☒ No ☐ Yes (See Tech Notes) NCR # (If initiated):		
Susan Leese 2-29-12 Project Manager Signature / Date	James D. Rue 2-29-12 for V. Mubiayi QA Officer Signature / Date	

GENERAL COMMENTS

SDG Report - Samples and Containers

SDG Specific Data

SDG	ARS1-12-00183		TAT Days	30	Project Type	Environmental
Sample Count	Rpt Level	4	Date Received	2/2/2012	COC Number	12-697
Client	Los Alamos National Laboratory		Client Deadline	3/2/2012	PO Number	63641-001-10
Client Code	114		Internal Deadline	3/1/2012	Job Number	MR1A015AGWJ0
Profile Number	PN-00094		Lab Deadline	2/28/2012	Job Location	
Comments						

Samples and Containers (→) Checked In Thus Far

FR	ClientID	Matrix	SampleStartDate	SampleEndDate	Disp	Hold	Arch	Storage	X	Units	Y	Units	Z	Units	Comments
001	CAAN-12-2031	AQ	02/01/12 12:00 PM	02/01/12 12:00 PM	H	90	5	LL3H							
→															
	105768	1	1000.00				60	22		N	N/A				
002	CAAN-12-2199	AQ	02/01/12 12:00 PM	02/01/12 12:00 PM	H	90	5	LL3H							
→															
	105769	1	1000.00				60	24		N	N/A				

SDG Report - Analysis Assignments

Temp SDG	ARS1-12-00183	Sample Count	
Client	Los Alamos National Laboratory	Analysis Count	2-4

Samples Count Totals per Analysis

Analysis Code	Analysis Description	Samples Count
LSC-A-021	Low Level Tritium Screen in (Aqueous)	2
LSC-A-022	Low Level Tritium by Enrichment Process in (Aqueous [AQ])	2

Analyses Assigned Per Fraction

Fraction	Analysis Code	X = Assigned
001	LSC-A-021	X
001	LSC-A-022	X
002	LSC-A-021	X
002	LSC-A-022	X

DQO Report for SDG

ARS1-12-00183

Analysis Code	Group	Isotope	Activity Units	Aliquot Units	ProcedureNo	RDL	LCS_LL	LCS_UL	MS_LL	MS_UL	RadY_LL	RadY_UL	GravY_LL	GravY_LL	RER	RPD	DilutionReq	RoughPrepReq	BlankCorrectionMDA	BlankCorrectionAll	CountTimeReq	AliquotRequired
LSC-A-021	STD	H-3	pCi	L	ARS-054	0.00E+00	75	125	60	140	30	110	40	110	1.00	25	FALSE	FALSE	FALSE	FALSE		
LSC-A-022	STD	Enriched H-3	pCi	L	ARS-040	0.00E+00	75	125	60	140	30	110	40	110	1.00	25	FALSE	FALSE	FALSE	FALSE		

ARS FILE TRACKING SHEET

SDG: ARS1-12-00183

Task	Date / Time	Initials
Date & Time Samples Received	02-02-12/11:00	
ICOC Initiated / Storage Location: LL3H	02-02-12/13:55	
Technical Checks Performed	Lee Batzla	—
Report Written / EDD Generated: 2-29-12/940 (Date/Time) SDL (Initials)	2-29-12/936	SDL
Quality Assurance Checks Performed on Report	2-24-12 0955	JDT
Management Check Performed on Report		
Preliminary Report Sent		
Report E-mailed		
Report Faxed		
Report Reviewed		
Report Mailed		
Invoice Completed Invoice #:_____		
Report Imaged		

SPECIAL REQUIREMENTS

Requirement	Yes	No
3 Hour Rush		✓
24 Hour Rush		✓
48 Hour Rush		✓
Special Invoicing *see notes* Mgmt. Approval:_____		✓

NOTES:

ARS-062
04/23/2010

COMPANY NAME: Los Alamos National Lab SDG: ARSI-12-00183

SHIPPING CONTAINER

Good Condition	☑ Yes	☐ No
Radioactive	☐ Yes	☑ No
UN2910	☐ Yes	☑ No
Sec. Seals	☑ Yes	☐ No
Seals Intact	☑ Yes ☐ No	☐ N/A
Air Bill	☐ Yes	☑ No

COC PRESENT WITH SAMPLES

COC	☑ Yes	☐ No

SAMPLE CONTAINER(S)

Good Condition	☑ Yes	☐ No
Sec. Seals	☑ Yes	☐ No
Seal Intact	☑ Yes ☐ No	☐ N/A
Marked Radioactive	☐ Yes	☑ No

Samples Rcv: 2

Matrix: [AF , (AQ) , BI , FE , LT , SI , SO , UR , VG]

External and Internal Surveys

Exposure Rate Meter:	M3 24280	Serial No.:	44-2 PR2604266	Calibration Due Date:	4-2012
Count Rate Meter:	M2 154851	Serial No.:	44-9 PR1841351	Calibration Due Date:	4-2012

Background Exposure Rate (µR/hr)	24	Max. Exposure Rate on Shipping Containers Externals (Plus Bkgd)	20 µR/hr
Background Count Rate (cpm)	60	Max. Removable Count Rate on Shipping Containers Externals (Plus Bkgd)	50 cpm
		Max. Removable Count Rate on Shipping Containers Internals (Plus Bkgd)	45 cpm

Sample Label/Comments/Notes	pH Orig (pH ≤ 2 is Acceptable)	pH Final (pH ≤ 2 is Acceptable)	Mark if Preserve	Acid Lot #	Weight(g) / (Volume(mL))	Acceptance Limits <500 µR/hr: µR/hr	Acceptance Limits <100 cpm/cm²: cpm
CAAN-12-2031			LB 2-27-12		100mL	22	60
↓ 2199					↓	24	60

Surveyors' Name: [signature]

Date/Time Surveyed: 2-27-12 11:18