

[illegible]

**SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY**

EVENT ID: 4031 EVENT NAME: Mortandad/Sandia (MDA C and GS Monitoring) Q1 Watershed Sampling\_MORTANDAD

SAMPLE ID: CAMO-13-24271 WORK ORDER:

	<u>AS PLANNED</u>	<u>AS COLLECTED</u>		<u>AS PLANNED</u>	<u>AS COLLECTED</u>
DATE COLLECTED (MM/DD/YYYY):		11/16/2012	FIELD MATRIX:	WG	ok
TIME COLLECTED (HH:MM):		1011	MEDIA:	UA	ok
PRS ID:		ok	SAMPLE TECH CODE:	UA	ESP
LOCATION ID: R-46		ok	FIELD PREP:	UF	ok
LOCATION TYPE:		ok	FIELD QC TYPE:	FD	ok
PORT: SINGLE COMPLETION		ok	SAMPLE USAGE:	QC	ok

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
2/1	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	2	HCL	Y	N/A
	WSP-8270C-SVOA	1 LITER AMBER GLASS	1	ICE	Y	N/A
	WSP-GrossA/B	1 LITER POLY	1	NONE	Y	N/A
	WSP-LL-H-3	1 LITER POLY	1	NONE	Y	N/A
	WSP-RAD	1 GAL POLY	1	HNO3	Y	N/A
	WSP-TKN+TOC	500 ML AMBER GLASS	1	H2SO4	Y	N/A

SAMPLE COMMENTS:

LOCATION COMMENTS:

FIELD PARAMETERS:

Dissolved Oxygen \_\_\_\_\_ mg/L      Oxidation-Reduction Potential \_\_\_\_\_ MV      pH \_\_\_\_\_ SU

Specific Conductance \_\_\_\_\_ uS/cm      Temperature \_\_\_\_\_ deg C      Turbidity \_\_\_\_\_ NTU

COLLECTED BY (PRINT) W. Shaw

RELINQUISHED BY (Printed Name) Andrew Stacker (Signature) [Signature]	Date/Time 11/16/12 1120	RECEIVED BY (Printed Name) S. Sheppard (Signature) [Signature]	Date/Time 11/16/12 1120
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date 10/24/2012

## Data Validation Report

Chain Of Custody No. 2013-361

**1. Distribution Of Samples In EDD.**

	Analytical	Regular	Field	Trip	Field	Equipment
SDG	Method	Samples	Duplicates	Blanks	Blanks	Blanks
ARS1-12-02340	Generic:Low_Level_Tritium	1	1			

	Analytical	Analysis	Prep	Regular	Field	Trip	Field	Equipment	Method	Matrix	Matrix
SDG	Method	Lot ID	Lot ID	Samples	Duplicates	Blanks	Blanks	Blanks	Blanks	Spikes	Spike Dups
ARS1-12-02340	Generic:Low_Level_Tritium	ARS1-B12-02782	ARS1-B12-02782	1	1				1		

**2. Distribution Of Analytes In EDD.**

Analytical Method	Method Category	Field Sample ID	Lab Sample ID	Sample Purpose	Target Analytes	Surrogates	Spikes	TICS
Generic:Low_Level_Tritium	RAD							
LCS	ARS1-B12-02782-01	LCS	0	0	1	0		
Generic:Low_Level_Tritium	RAD	CAMO-13-24271	ARS1-B12-02782-07	FD	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAMO-13-24278	ARS1-B12-02782-06	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	LCSD	ARS1-B12-02782-02	LCSD	0	0	1	0
Generic:Low_Level_Tritium	RAD	MB	ARS1-B12-02782-03	MB	1	0	0	0

**3. Are any analytes missing?**

No.

**4. Were any holding times exceeded?**

No.

**5. Any contaminants in blanks?**

No.

**Any samples affected by the presence of contaminants in blanks?**

No.

**6. Any surrogate recoveries outside the control limits?**

No.

**7. Any MS/MSD recoveries or RPDs outside the control limits?**

No.

Analytical	Post-Digestion	Lab Control	Lab Control	Blank	Blank	Lab	Storage	Preparation	Reagent
Spikes	Spikes	Samples	Sample Dups	Spikes	Spike Dups	Duplicates	Blanks	Blanks	Blanks
		1	1						

**8. Any LCS/LCSD or BS/BSD recoveries or RPDs outside the control limits?**

No.

**9. Any Field Duplicate RPDs outside the desired limits?**

No.

**10. Any Lab Duplicate RPDs outside the desired limits?**

No.

**11. Any required reporting limits exceeded?**

No.

**12. Additional Validator's Comments.**

None.

**13. Display Flagged Data.**

Location ID	Chain Of Custody No	Field Sample ID	Sample Purpose	Analysis Type Code	Analytical Suite	Analytical Method	Parameter Name	Lab Qualifier	Validation Qualifier	Validation Reason Codes	Detected
R-46	2013-361	CAMO-13-24271	FD	INIT	RAD	Generic:Low_Level_Tritium	Tritium	U	U	R5	N
R-46	2013-361	CAMO-13-24278	REG	INIT	RAD	Generic:Low_Level_Tritium	Tritium	U	U	R5	N

**Reason Code**

Description

R5 Analyte is not detected because the amount reported is less than the MDC.

**14. Useable Result Count.**

Field	Location	Sample	Analytical	No. Unuseable	Total No. Of
Sample ID	ID	Purpose	Method	Records	Records
CAMO-13-24271	R-46	FD	Generic:Low_Level_Tritium	0	1
CAMO-13-24278	R-46	REG	Generic:Low_Level_Tritium	0	1

Lab Result	Lab Units	Report Result	Report Units	Report MDA	Report Uncertainty	Lab Matrix	Sample Date	Percent Moisture	Analysis Lot ID	Validation Status Code	Use Flag
-2.252	pCi/L	-2.252	pCi/L	2.352	0.732	W	11/16/2012		ARS1-B12-02782	VAL	Y
-0.669	pCi/L	-0.669	pCi/L	2.477	0.724	W	11/16/2012		ARS1-B12-02782	VAL	Y



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# **American Radiation Services Analytical Reports**

for

## **Los Alamos National Laboratory**

# **Request Number: 2013-361**



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**American Radiation Services  
Analytical Reports**

**for**

**Los Alamos National Laboratory  
Request: 2013-361**

**Original COC**







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# **American Radiation Services Analytical Reports**

**for**

**Los Alamos National Laboratory  
Request: 2013-361**

# **Case Narrative**



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December 19, 2012

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

Request Number: **2013-361**  
LANL Sample ID: **CAMO-13-24278; CAMO-13-24271.**

Dear Mr. Greene;

On November 20, 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](mailto:LANL@amrad.com).

Sincerely,

A handwritten signature in black ink, appearing to read 'James D. Lee', is written over a horizontal line.

Laboratory Management  
**ARS International**



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## 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)
2013-361	CAMO-13-24278	ARS1-12-02340-001
2013-361	CAMO-13-24271	ARS1-12-02340-002

### 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."*

Signature

Laboratory Management, ARS International

Title

12-19-12

Date



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# **American Radiation Services Analytical Reports**

for

**Los Alamos National Laboratory**

## **Low Level Tritium by Low Level Liquid Scintillation Counting**

ARS Sample Delivery Group: ARS1-12-02340

Client Sample ID: CAMO-13-24278

Sample Collection Date: 11/16/12

Sample Matrix: Aqueous

Request or PO Number: 2013-361

ARS Sample ID: ARS1-12-02340-001

Date Received: 11/20/12

Report Date: 12/19/12

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	-0.669	0.724	2.477	1.201	U	pCi/L	ARS-040	12/13/12 12:28	RJU	NA

NOTES: Lab Agreement 63641-001-10

Project Manager Review

**Notes:** American Radiation Services, Inc. assumes no liability for the use or interpretation of any analytical results provided other than the cost of the analysis itself. Reproduction of this report in less than full requires the written consent of the American Radiation Services, Inc.

LELAP Certificate# 01949

ARS Sample Delivery Group: ARS1-12-02340

Client Sample ID: CAMO-13-24271

Sample Collection Date: 11/16/12

Sample Matrix: Aqueous

Request or PO Number: 2013-361

ARS Sample ID: ARS1-12-02340-002

Date Received: 11/20/12

Report Date: 12/19/12

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	-2.252	0.732	2.352	1.141	U	pCi/L	ARS-040	12/13/12 16:39	RJU	NA

NOTES: Lab Agreement 63641-001-10

  
Project Manager Review

**Notes:** American Radiation Services, Inc. assumes no liability for the use or interpretation of any analytical results provided other than the cost of the analysis itself. Reproduction of this report in less than full requires the written consent of the American Radiation Services, Inc.

LELAP Certificate# 01949



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## QC Results Report

Sample Delivery Group: ARS1-12-02340

Date Received: 11/20/2012

### Laboratory Control Sample Evaluation

Analysis Batch	QC Type	Analyte	Analysis Results	CSU 1 (1s)	MDC	Expected Value	Qual	Report Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Percent Recovery (%)	LCS Acceptance Range
ARS1-B12-02782	LCS	H3	22.397	3.533	2.537	25.722		pCi/L	ARS-040	12/12/12 13:33	RJU	87	80%-120%

### Blank Evaluation

Analysis Batch	QC Type	Analyte	Analysis Results	CSU 1 (1s)	MDC	Expected Value	Qual	Report Units	Analysis Test Method	Analysis Date/Time	Analysis Technician
ARS1-B12-02782	MBL	H3	-0.548	0.714	2.441	NA	U	pCi/L	ARS-040	12/12/12 13:33	RJU

### Sample RER Duplicate Evaluation

Analysis Batch	QC Type	Analysis Description	Result 1	CSU 1 (1s)	Result 2	CSU 2 (2s)	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	RER	RER Acceptance Range
ARS1-B12-02782	LCSD	H3	22.397	3.533	20.697	3.248		pCi/L	ARS-040	12/12/12 13:33	RJU	0.25	< 1

### Sample DER Duplicate Evaluation

Analysis Batch	QC Type	Analysis Description	Result 1	CSU 1 (1s)	Result 2	CSU 2 (2s)	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	DER	DER Acceptance Range
ARS1-B12-02782	LCSD	H3	22.397	3.533	20.697	3.248		pCi/L	ARS-040	12/12/12 13:33	RJU	0.71	< 3

Project Manager Review

Notes: American Radiation Services, Inc. assumes no liability for the use or interpretation of any analytical results provided other than the cost of the analysis itself. Reproduction of this report in less than full requires the written consent of ARS International.

LELAP Certificate# 01949

NELAP Certificate # E87558



# QC Evaluation

EPA Method: ARS-040

Batch ID: ARS1-B12-02782

SDG's: ARS1-12-02339; 2340; 2341

LCS	<u>22.3970</u>	CSU (2s)	<u>6.9240</u>
LCSD	<u>20.6970</u>	CSU-D (2s)	<u>6.3670</u>

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

$$DER = \frac{1.7}{4.703203} = 0.361456 < 3$$

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

$$\%RPD = \frac{1.7}{21.547} * 100 = 7.889729 < 25\%$$

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

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

$$RER = \frac{1.7}{13.2910} = 0.127906102 < 1$$

## Blank Information

	Act	CSU(2s)	MDA	Act>MDA	
AM-241					
U-234					*MDA should be below RDL
U-235					*Blank activity must be below MDA
U-238					*Blank activity must be < 1.65*CSU (DOE only)
Pu-238					
Pu-239/240					ACT = -0.548
Th-228					CSU = 1.399
Th-230					Is ACT<1.65*CSU? YES
Th-232					
H3	-0.548	1.399	2.441		
Ra-226					
Ra-228					
Total U					
Pb-210					
Po-209					
Sr-90					
TC-99					
NI-63					



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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-B12-02782									
Method		ARS-040		Analysis		LSC-A-022		Matrix	
Description		Low Level Tritium by Electrolytic Enrichment		FR		Run		Client ID	
Type	Blind Iso1	Blind Iso2	Blind Iso3	SDG	FR	Run	Client ID	Isotope Group	Lab Deadline
ARS1-B12-02782-01	B-14831								
ARS1-B12-02782-02	B-14832								
ARS1-B12-02782-03									
ARS1-B12-02782-04				ARS1-12-02339	001	1	CAMO-13-24251	STD	12/16/12
ARS1-B12-02782-05				ARS1-12-02339	002	1	CAMO-13-24252	STD	12/16/12
ARS1-B12-02782-06				ARS1-12-02340	001	1	CAMO-13-24278	STD	12/16/12
ARS1-B12-02782-07				ARS1-12-02340	002	1	CAMO-13-24271	STD	12/16/12
ARS1-B12-02782-08				ARS1-12-02341	001	1	CASA-13-24212	STD	12/16/12
ARS1-B12-02782-09				ARS1-12-02341	002	1	CASA-13-24206	STD	12/16/12

  
**129059**  
12-02339-001-1  
**WRAD**

  
**129061**  
12-02339-002-1  
**WRAD**

  
**129063**  
12-02340-001-1  
**WRAD**

  
**129065**  
12-02340-002-1  
**WRAD**

  
**129067**  
12-02341-001-1  
**WRAD**

  
**129069**  
12-02341-002-1  
**WRAD**

LCS Report  
Analytical Batch: ARS1-B12-02782

140

PtID	ABatch	ABatchSampleID	BlindGroup	StdID	Isotope	ExpectedAddition	ExpectedValue	EmptyWt	GrossWt	NetWt	UserID	ModDate	ExpectedValue_CT	MidPointCountDate	KnownValue
B-14831	ARS1-B12-02782	ARS1-B12-02782-01	B-H3	S-0279	H-3	5	2.549416506	13.201	18.268	5.067	AMRAD\BSTEFFENS	11/21/2012	2.541182902	12/12/2012	12.87617376
B-14832	ARS1-B12-02782	ARS1-B12-02782-02	B-H3	S-0279	H-3	5	2.549416506	13.468	18.544	5.076	AMRAD\BSTEFFENS	11/21/2012	2.541182902	12/12/2012	12.89904441

15  
031001\_040

ID	ABatch	AnalysisCode	ABatchSampleID	ClientID	IC_ID	S01_1_EnrichCellNo	S01_2_TareCell	S01_3_TareResv	S02_GrossWtResv	S03_1_WtNa2O2	C_GrossSampleAdded
465	ARS1-B12-02782	LSC-A-022	ARS1-B12-02782-01		3		334.49	198.24	698.82	2.09	500.58
466	ARS1-B12-02782	LSC-A-022	ARS1-B12-02782-02		86		330.87	205.96	712.65	2.06	506.69
467	ARS1-B12-02782	LSC-A-022	ARS1-B12-02782-03		11		332.72	202.13	711.08	2	508.95
468	ARS1-B12-02782	LSC-A-022	ARS1-B12-02782-04	CAMO-13-24251	19		333.21	199.53	700.89	2	501.36
469	ARS1-B12-02782	LSC-A-022	ARS1-B12-02782-05	CAMO-13-24252	41		332.03	212.56	717.91	2.08	505.35
470	ARS1-B12-02782	LSC-A-022	ARS1-B12-02782-06	CAMO-13-24278	63		326.63	202.66	704.28	2.08	501.62
471	ARS1-B12-02782	LSC-A-022	ARS1-B12-02782-07	CAMO-13-24271	21		331.93	214.5	715.82	2.05	501.32
472	ARS1-B12-02782	LSC-A-022	ARS1-B12-02782-08	CASA-13-24212	48		336.53	212.05	715.43	2.06	503.38
473	ARS1-B12-02782	LSC-A-022	ARS1-B12-02782-09	CASA-13-24206	77		334.98	196.48	700.9	2.09	504.42

*Ban* 12-12-12

S04_1_ElectroID	S04_2_StartAmp	S04_3_StartBathC	S05_1_ElectroID	S05_2_EndBathC	S05_3_EndCellWt	C_GrossSmpIRec	C_EnrichmentF	S06_TareWt	S07_GrossWt	C_RecoveredWa
11/21/2012 13:00:00	5	2	12/04/2012 14:56:00	2.1	548.7	15.97	31.34502192	104.16	115.77	11.61
11/21/2012 13:00:00	5	2	12/10/2012 10:15:00	2	551.09	14.26	35.53225806	97.51	108.95	11.44
11/21/2012 13:00:00	5	2	12/04/2012 15:12:00	2.1	551.33	16.48	30.88288835	109.78	122.83	13.05
11/21/2012 13:00:00	5	2	12/10/2012 10:18:00	2	548.9	16.16	31.02475248	122.08	134.42	12.34
11/21/2012 13:00:00	5	2	12/10/2012 11:58:00	2	560.42	15.83	31.92356286	101.79	113.72	11.93
11/21/2012 13:00:00	5	2	12/10/2012 10:19:00	2	546.06	16.77	29.91174717	109.22	122.96	13.74
11/21/2012 13:00:00	5	2	12/04/2012 15:13:00	2.1	562.31	15.88	31.56926952	109.54	123.18	13.64
11/21/2012 13:00:00	5	2	12/04/2012 13:14:00	2.1	565.52	16.94	29.71546635	111.9	125.6	13.7
11/21/2012 13:00:00	5	2	12/10/2012 10:14:00	2	549.01	17.55	28.74188034	109.8	123.38	13.58

*[Signature]* 12-12-12

17081

S08	Year	WtLSCVial	S09_VialPlusSmpl	C_NetSample	S10_1_WtVisiSmplDrWatFill	C_NetDeadWaterAdded	C_TareWtBFCocktail	S10_2_GrossWtVSC	C_NetWtCocktailAdded	UserID	ModDate
		6.58	16.59	10.01	0	0	16.59	26.89	10.3	AMRAD\RUSEY	12/11/2012 12:05:30
		6.48	16.5	10.02	0	0	16.5	27.69	11.19	AMRAD\RUSEY	12/11/2012 12:07:46
		6.43	16.44	10.01	0	0	16.44	26.82	10.38	AMRAD\RUSEY	12/11/2012 12:10:30
		6.52	16.54	10.02	0	0	16.54	26.84	10.3	AMRAD\RUSEY	12/11/2012 12:12:41
		6.51	16.53	10.02	0	0	16.53	26.77	10.24	AMRAD\RUSEY	12/11/2012 14:42:15
		6.61	16.68	10.07	0	0	16.68	26.97	10.29	AMRAD\RUSEY	12/11/2012 14:43:56
		6.45	16.46	10.01	0	0	16.46	26.76	10.3	AMRAD\RUSEY	12/11/2012 14:46:31
		6.48	16.49	10.01	0	0	16.49	26.74	10.25	AMRAD\RUSEY	12/11/2012 14:49:17
		6.5	16.53	10.03	0	0	16.53	26.71	10.18	AMRAD\RUSEY	12/12/2012 11:20:04

*Bryan* *12-12-12*

18

00

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\20121212\_0912

Raw Results Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20121212\_0912\20121212\_0912.results

RTF File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20121212\_0912\LLH3.rtf

Comma-Delimited File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20121212\_0912\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: APS LL H3 10mL

Count Time (min): 240.00

Count Mode: Low Level

Assay Count Cycles: 1

#Vials/Sample: 1

Repeat Sample Count: 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

Colored Samples: Off

Coincidence Time (nsec): 18

Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions Half Life

Units Reference Date

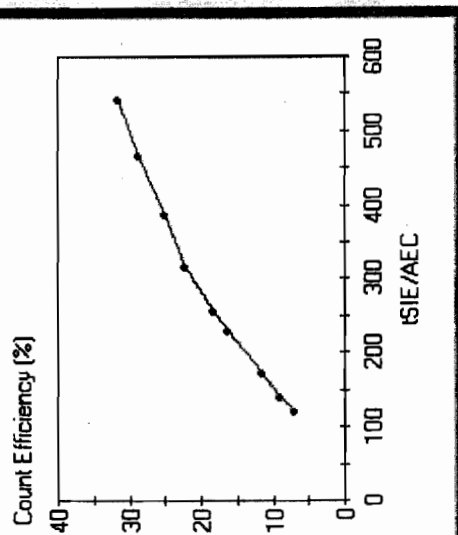
Reference Time



19 of 81  
A B C

Cycle 1 Results  
Quench Curve Block Data

ARS LL H3 10mL in A



Date Acquired:	11/20/2012
Date Modified:	
ARS LL H3 10mL in A	
tSIE/AEC	Count Efficiency (%)
543.57	31.51
466.44	28.74
387.42	24.95
316.48	22.21
257.14	18.18
229.94	16.37
172.56	11.68
142.07	9.08
121.26	7.13

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P#	S#	SMPL_ID	CPMA	DPM1	TSIE	Eff Nucl	In A	Count Time	DATE	TIME	MESSAGES
2	1	BACKGROUND	1.458	5.79	392.59		25.20	240.00	12/12/2012	9:21:06 AM	
2	2	B12-02782-01	4.759	19.99	357.88		23.81	240.00	12/12/2012	1:33:03 PM	
2	3	B12-02782-02	5.014	20.72	368.17		24.20	240.00	12/12/2012	5:44:02 PM	
2	4	B12-02782-03	1.374	5.49	388.73		25.01	240.00	12/12/2012	9:55:03 PM	*
2	5	B12-02782-04	6.276	24.82	394.49		25.29	240.00	12/13/2012	2:06:01 AM	*
2	6	B12-02782-05	1.802	7.09	397.31		25.42	240.00	12/13/2012	6:17:00 AM	*
2	7	B12-02782-06	1.357	5.37	394.54		25.29	240.00	12/13/2012	10:27:59 AM	
2	8	B12-02782-07	1.100	4.35	394.65		25.29	240.00	12/13/2012	2:38:56 PM	
2	9	B12-02782-08	3.261	13.06	387.95		24.97	240.00	12/13/2012	6:49:54 PM	
2	10	B12-02782-09	3.629	14.59	385.50		24.87	240.00	12/13/2012	11:00:52 PM	

## 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\_3\20121214\_0305

Raw Results Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\_3\20121214\_0305\20121214\_0305.results

RTF File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\_3\20121214\_0305\LLH3.rtf

Comma-Delimited File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\_3\20121214\_0305\LLH3 Results.csv

Assay File Name: C:\Packard\Tricarb\Assays\Low Level H3\_3.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): 240.00

Count Mode: Low Level

Assay Count Cycles: 1

#Vials/Sample: 1

Repeat Sample Count: 2

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

Colored Samples: Off

Coincidence Time (nsec): 18

Luminescence Correction: Off

Heterogeneity Monitor: Off

Delay Before Burst (nsec): 75

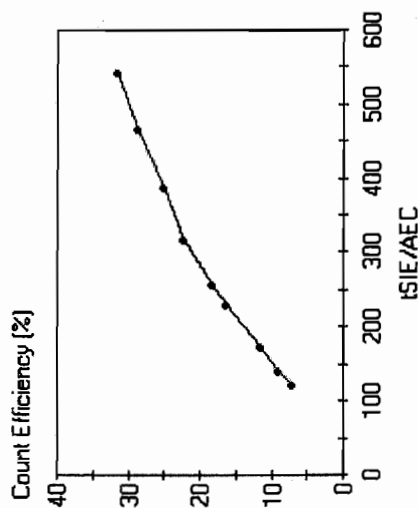
Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time
A				
B				
C				

Cycle 1 Results  
Quench Curve Block Data

ARS LL H3 10mL in A



Date Acquired: 11/20/2012

Date Modified:

ARS LL H3 10mL in A

tSIE/AEC	Count Efficiency (%)
543.57	31.51
466.44	28.74
387.42	24.95
316.48	22.21


18.18  
16.37  
11.68  
9.08  
7.13

SMPL_ID	CPMA	DPM1	tsIE	Eff Nuc1	In A	Count	Time
B12-02782-04	5.735	22.64	395.38	25.33	240.00	12/14/2012	7:25:18 AM



# LSC Instrument Data Transfer Report

\\Pickard3170\Results\H3 Low Level\Low Level H31



Batch Sample ID

ARS1-B12-02782

Non-BKG Samples Transferred

9

Samples Eligible To Save

9

LSC 1

LIMS Batch Sample ID	LSC P#	LSC PID	LSC S#	LSC SMPL_ID	LSC Count Date	LSC CPMA	LSC SITE	LSC EFF	LSC Count Dur	Analysis Batch	LIMS SDG	LIMS Run
BKG	2		1	BACKGROUND	12/12/12 09:21	1.46	392.59	25.2000	240.00	ARS1-B12-02782		
ARS1-B12-02782-01	2		2	B12-02782-01	12/12/12 13:33	4.76	357.88	23.8100	240.00	ARS1-B12-02782		
ARS1-B12-02782-02	2		3	B12-02782-02	12/12/12 17:44	5.01	368.17	24.2000	240.00	ARS1-B12-02782		
ARS1-B12-02782-03	2		4	B12-02782-03	12/12/12 21:55	1.37	388.73	25.0100	240.00	ARS1-B12-02782		
ARS1-B12-02782-04	2		5	B12-02782-04	12/13/12 02:06	6.28	394.49	25.2900	240.00	ARS1-B12-02782	ARS1-12-02339	1
ARS1-B12-02782-05	2		6	B12-02782-05	12/13/12 06:17	1.80	397.31	25.4200	240.00	ARS1-B12-02782	ARS1-12-02339	1
ARS1-B12-02782-06	2		7	B12-02782-06	12/13/12 10:27	1.36	394.54	25.2900	240.00	ARS1-B12-02782	ARS1-12-02340	1
ARS1-B12-02782-07	2		8	B12-02782-07	12/13/12 14:38	1.10	394.65	25.2900	240.00	ARS1-B12-02782	ARS1-12-02340	1
ARS1-B12-02782-08	2		9	B12-02782-08	12/13/12 18:49	3.26	387.95	24.9700	240.00	ARS1-B12-02782	ARS1-12-02341	1
ARS1-B12-02782-09	2		10	B12-02782-09	12/13/12 23:00	3.63	385.50	24.8700	240.00	ARS1-B12-02782	ARS1-12-02341	1

# NARS-040 Calculation Results

81 ARS1-B12-02782

ACF 1  
UCF 2.22  
Sys Error 0.15

AnalysisCode	ABatchSampleID	Initial_Mass_sample_g	Mass_Na2O2_added_g	Final_mass_electrolyzed_sample_g	Mass_equivalent_NaOH_g	Final_Mass_Electrolyzed_sample_g	VolumeFactor_X	Enrichment_Factor_Y
LSC-A-022	ARS1-B12-02782-01	500.580	2.090	15.970	2.144	13.826	0.028	28.270
LSC-A-022	ARS1-B12-02782-02	506.690	2.060	14.260	2.114	12.146	0.024	32.392
LSC-A-022	ARS1-B12-02782-03	508.950	2.000	16.480	2.052	14.428	0.028	27.571
LSC-A-022	ARS1-B12-02782-04	501.360	2.000	16.160	2.052	14.108	0.028	27.768
LSC-A-022	ARS1-B12-02782-05	505.350	2.080	15.830	2.134	13.696	0.027	28.789
LSC-A-022	ARS1-B12-02782-06	501.620	2.080	16.770	2.134	14.636	0.029	26.818
LSC-A-022	ARS1-B12-02782-07	501.320	2.050	15.880	2.103	13.777	0.027	28.407
LSC-A-022	ARS1-B12-02782-08	503.380	2.060	16.940	2.114	14.826	0.029	26.576
LSC-A-022	ARS1-B12-02782-09	504.420	2.090	17.550	2.144	15.406	0.031	25.666

# ARS-040 Calculation Results

ARS1-B12-02782

ACF 1  
UCF 2.22  
Sys Error 0.15

AnalysisCode	ABatchSampleID	Average_Sample_CPM	Bkg_CPM	TSIE	Detector_Eff_decimal	Aliquot	AliqUnits	Activity_reference_date	Start_Date_of_Count	Sample_Count	Duration_min
LSC-A-022	ARS1-B12-02782-01	4.759	1.458	357.880	0.238	0.01001	L	9/7/2012	12/12/2012		240.000
LSC-A-022	ARS1-B12-02782-02	5.014	1.458	368.170	0.242	0.01002	L	9/7/2012	12/12/2012		240.000
LSC-A-022	ARS1-B12-02782-03	1.374	1.458	388.730	0.250	0.01001	L	12/11/2012	12/12/2012		240.000
LSC-A-022	ARS1-B12-02782-04	6.276	1.458	394.490	0.253	0.01002	L	11/15/2012	12/13/2012		240.000
LSC-A-022	ARS1-B12-02782-05	1.802	1.458	397.310	0.254	0.01002	L	11/15/2012	12/13/2012		240.000
LSC-A-022	ARS1-B12-02782-06	1.357	1.458	394.540	0.253	0.01007	L	11/16/2012	12/13/2012		240.000
LSC-A-022	ARS1-B12-02782-07	1.100	1.458	394.650	0.253	0.01001	L	11/16/2012	12/13/2012		240.000
LSC-A-022	ARS1-B12-02782-08	3.261	1.458	387.950	0.250	0.01001	L	11/14/2012	12/13/2012		240.000
LSC-A-022	ARS1-B12-02782-09	3.629	1.458	385.500	0.249	0.01003	L	11/14/2012	12/13/2012		240.000



# ARS-040 Calculation Results

ARS1-B12-02782

01 ACF 1  
UCF 2.22  
Sys Error 0.15

AnalysisCode	ABatchSampleID	Total_Bkg_Count	Duration_min	DF	Sample_Activity_Conc	Standard_Counting_Uncertainty	CU_1	CSU_1	CU_1_96	CSU_1_96	MDC	DLC	ActivityReportUnits
LSC-A-022	ARS1-B12-02782-01	240.000	0.98532	0.98532	22.397	1.092	1.092	3.533	2.140	6.924	2.537	1.230	pCi
LSC-A-022	ARS1-B12-02782-02	240.000	0.98532	0.98532	20.697	0.956	0.956	3.248	1.873	6.367	2.176	1.055	pCi
LSC-A-022	ARS1-B12-02782-03	240.000	0.99569	0.99569	-0.548	0.709	0.709	0.714	1.390	1.399	2.441	1.184	pCi
LSC-A-022	ARS1-B12-02782-04	240.000	0.99570	0.99570	30.976	1.154	1.154	4.788	2.262	9.384	2.404	1.166	pCi
LSC-A-022	ARS1-B12-02782-05	240.000	0.99570	0.99570	2.122	0.719	0.719	0.786	1.409	1.541	2.307	1.119	pCi
LSC-A-022	ARS1-B12-02782-06	240.000	0.99585	0.99585	-0.669	0.717	0.717	0.724	1.406	1.420	2.477	1.201	pCi
LSC-A-022	ARS1-B12-02782-07	240.000	0.99585	0.99585	-2.252	0.649	0.649	0.732	1.273	1.435	2.352	1.141	pCi
LSC-A-022	ARS1-B12-02782-08	240.000	0.99554	0.99554	12.281	0.955	0.955	2.075	1.872	4.067	2.547	1.235	pCi
LSC-A-022	ARS1-B12-02782-09	240.000	0.99539	0.99539	15.346	1.029	1.029	2.521	2.017	4.942	2.643	1.282	pCi

# ARS-040 Calculation Results

## ARS1-B12-02782

ACF 1  
UCF 2.22  
Sys Error 0.15

AnalysisCode	ABatchSampleID	AliquotReportUnits	UserID	ModDate
LSC-A-022	ARS1-B12-02782-01	L	AMRAD\RUSEY	12/14/2012
LSC-A-022	ARS1-B12-02782-02	L	AMRAD\RUSEY	12/14/2012
LSC-A-022	ARS1-B12-02782-03	L	AMRAD\RUSEY	12/14/2012
LSC-A-022	ARS1-B12-02782-04	L	AMRAD\RUSEY	12/14/2012
LSC-A-022	ARS1-B12-02782-05	L	AMRAD\RUSEY	12/14/2012
LSC-A-022	ARS1-B12-02782-06	L	AMRAD\RUSEY	12/14/2012
LSC-A-022	ARS1-B12-02782-07	L	AMRAD\RUSEY	12/14/2012
LSC-A-022	ARS1-B12-02782-08	L	AMRAD\RUSEY	12/14/2012
LSC-A-022	ARS1-B12-02782-09	L	AMRAD\RUSEY	12/14/2012

# Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
12-5-12	1604	B12-02721-09	B12-02721	1649	J
L	L	B12-02721-10	L	L	J
L	L	B12-02721-11	L	L	J
12-7-12	1026	B12-02721-18	B12-02721	1755	J
L	L	B12-02721-19	L	L	J
L	L	B12-02721-20	L	L	J
L	L	B12-02721-21	L	L	J
12-12-12	0733	SNC-16	QA	QA	J
12-12-12	0855	Background	B12-02782	0912	J
L	L	B12-02782-01	L	L	J
L	L	B12-02782-02	L	L	J
L	L	B12-02782-03	L	L	J
L	L	B12-02782-04	L	L	J
L	L	B12-02782-05	L	L	J
L	L	B12-02782-06	L	L	J
L	L	B12-02782-07	L	L	J
L	L	B12-02782-08	L	L	J
L	L	B12-02782-09	L	L	J
12-12-12	0955	SNC-16	QA	QA	J
12-13-12	0950	B12-02782-04	B12-02782	0305	J

\* Set to count before SNC from 12-12-12. Page 12 of 12

ARS Batch Number:

ARS1-B12 -

02782

Enter these Values for LCS

Current ACT  
NetWt  
Aliquot

5.6414  
5.0670  
0.5006

Report Name Field Name on the Report

Standards Report ACT at Date Above (dpm/g)  
LCS Report NetWt  
Tritium Enrichment Data Gross Sample Added/1000

Enter these Values for LCS

Current ACT  
NetWt  
Aliquot

5.6414  
5.0760  
0.5067

Report Name Field Name on the Report

Standards Report ACT at Date Above (dpm/g)  
LCS Report NetWt  
Tritium Enrichment Data Gross Sample Added/1000

Expected Value Calculations

ARS Batch Number:

ARS1-B11 -

02782

LCS

CALCULATED  
EXPECTED VALUE

= 25.722

Range 20.578 - 30.867

LCSD

CALCULATED  
EXPECTED VALUE

= 25.457

Range 20.366 - 30.549



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Standards Activity as of: 12/12/12 13:33

Active	Std ID	Isotope	PSCLT	Verification Date	Exp Date	Status	Ref Date	Ref ACT (dpm)	ACT at Date Above (dpm/g)	Half-life (days)	Parent ID	Expanded Date	Comments
A	S-0279	H-3	SL	09/10/12	09/10/13	OK	09/07/12	5.7255E+00	5.6414	4.500E+03	S-0237		H3 LCS standard. Dilution performed as stated above by B Steffens. -8



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**

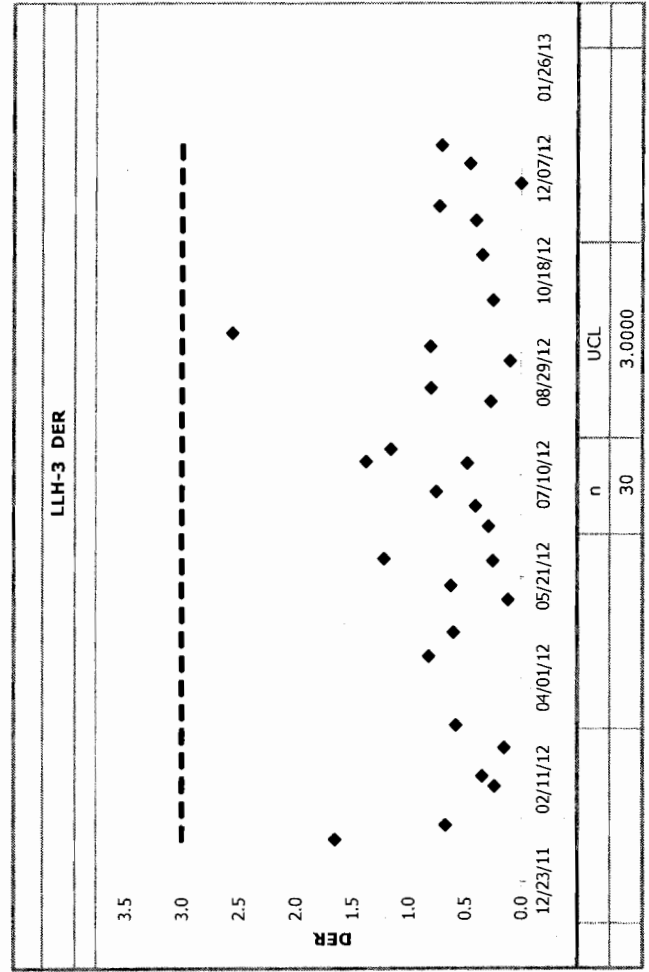
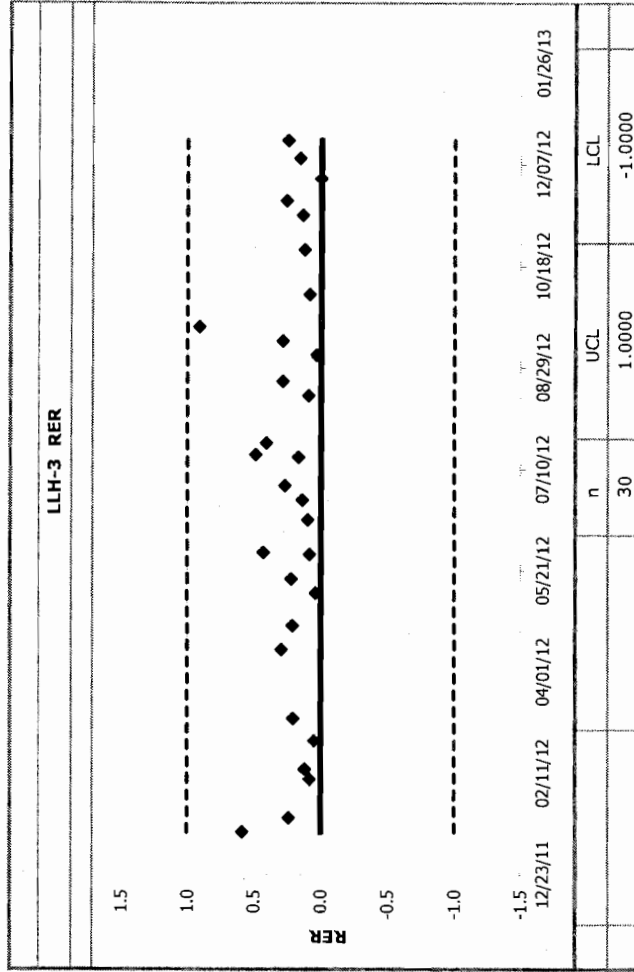
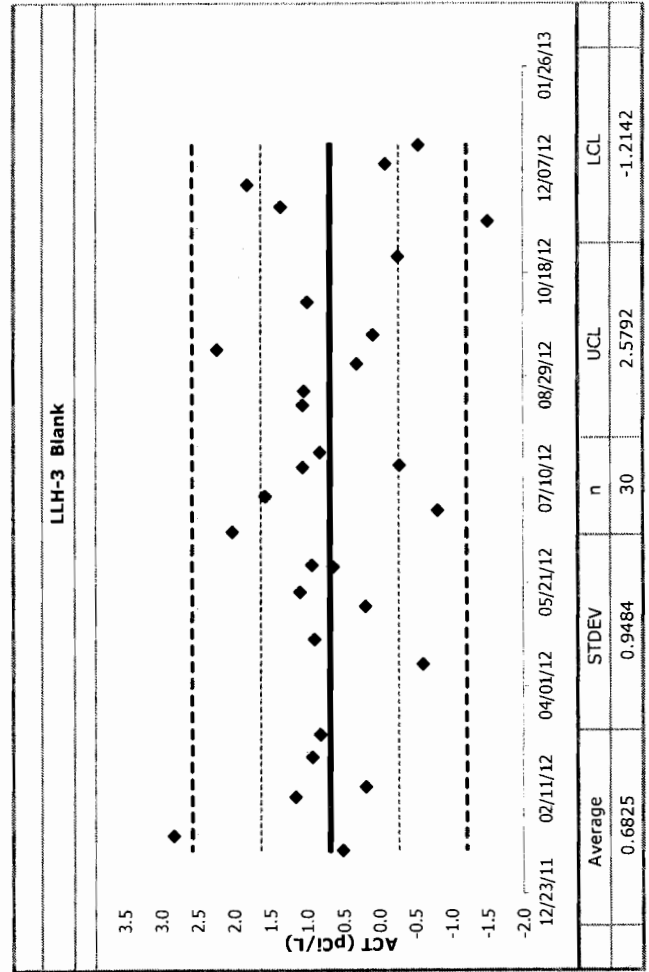
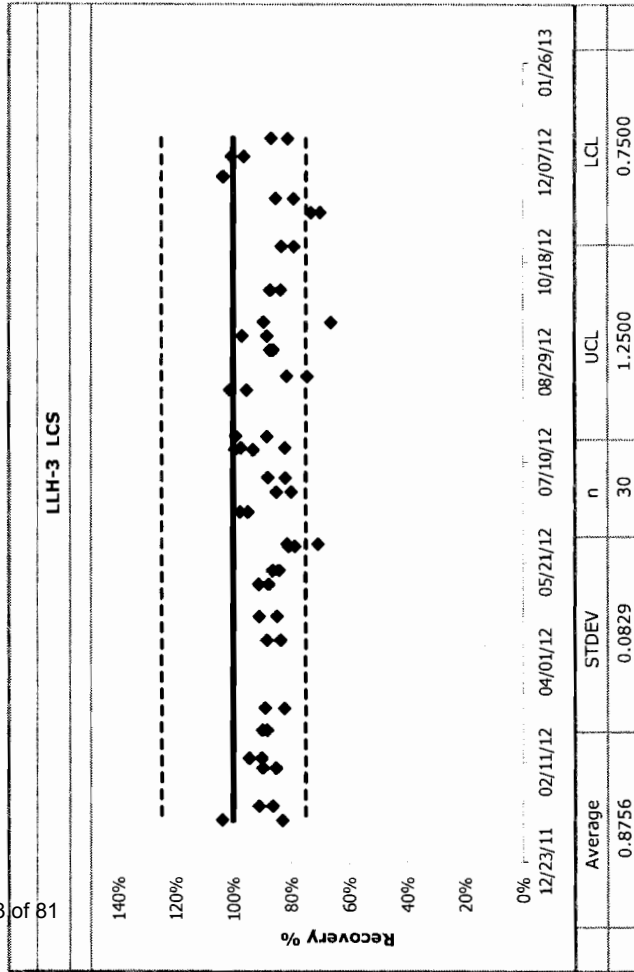
### **Low Level Tritium by**

### **Low Level Liquid Scintillation Counting**

# **Control Charts**

# QC Chart

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### 3H Efficiency

Total # pts : 5554  
Valid# # pts : 106  
Mean  $\bar{x}$  : 62.95  
SD  $\sigma$  : 0.22

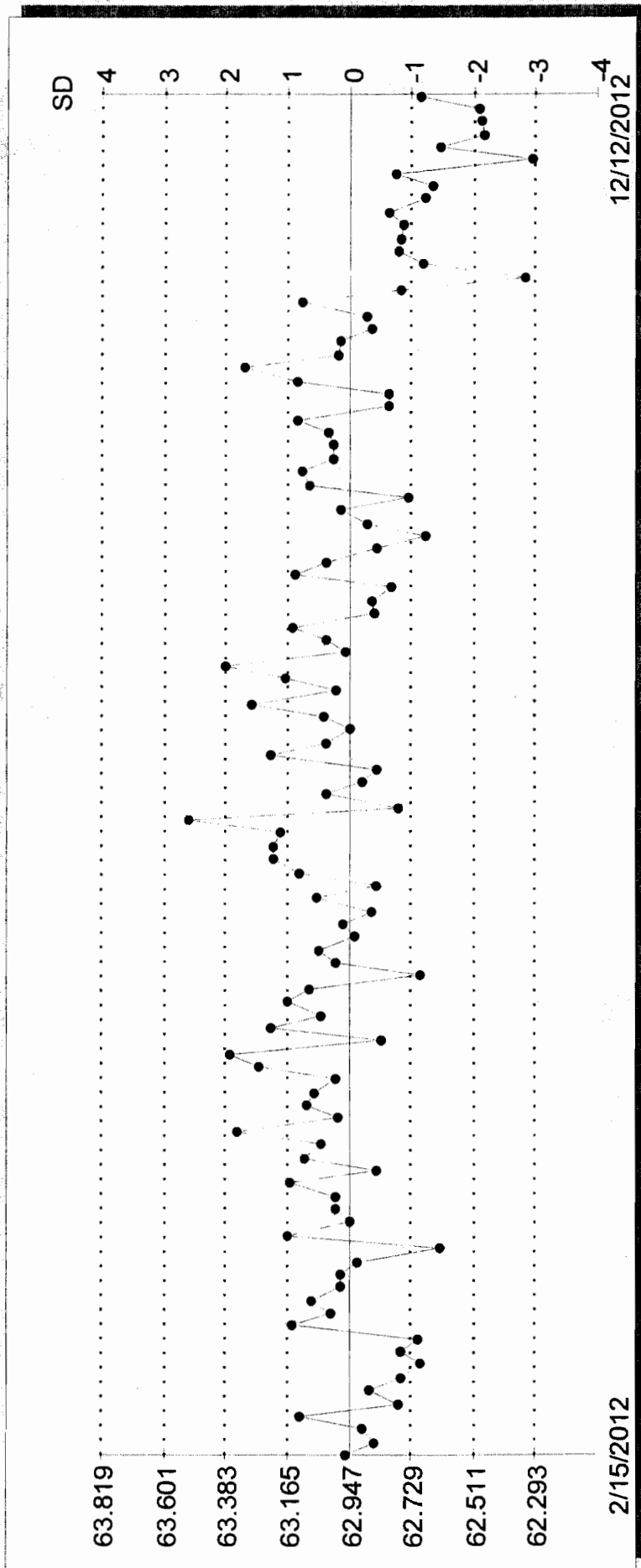
Date	Value	Valid Pt
Feb 15, 2012	62.96	X
Feb 16, 2012	62.86	X
Feb 17, 2012	62.90	X
Feb 20, 2012	63.13	X
Feb 23, 2012	62.77	X
Feb 24, 2012	62.87	X
Mar 05, 2012	62.76	X
Mar 07, 2012	62.70	X
Mar 12, 2012	62.76	X
Mar 15, 2012	62.71	X
Mar 22, 2012	63.15	X
Mar 23, 2012	63.01	X
Mar 28, 2012	63.08	X
Apr 05, 2012	62.98	X
Apr 10, 2012	62.97	X
Apr 12, 2012	62.92	X
Apr 13, 2012	62.63	X
Apr 20, 2012	63.16	X
Apr 23, 2012	62.95	X
Apr 26, 2012	62.99	X
Apr 27, 2012	62.99	X
Apr 30, 2012	63.16	X
May 01, 2012	62.85	X
May 03, 2012	63.11	X
May 07, 2012	63.05	X
May 09, 2012	63.34	X
May 14, 2012	62.99	X
May 17, 2012	63.10	X
May 17, 2012	63.07	X
May 23, 2012	62.99	X
May 30, 2012	63.26	X
May 31, 2012	63.37	X
Jun 06, 2012	62.83	X
Jun 13, 2012	63.22	X
Jun 21, 2012	63.04	X
Jun 22, 2012	63.16	X
Jun 25, 2012	63.09	X
Jun 27, 2012	62.70	X
Jun 27, 2012	62.99	X
Jun 28, 2012	63.05	X
Jun 29, 2012	62.93	X
Jun 30, 2012	62.97	X



Jul 05, 2012	62.86	X
Jul 11, 2012	63.07	X
Jul 12, 2012	62.85	X
Jul 16, 2012	63.12	X
Jul 20, 2012	63.22	X
Jul 22, 2012	63.22	X
Jul 26, 2012	63.19	X
Jul 27, 2012	63.52	X
Aug 09, 2012	62.77	X
Aug 13, 2012	63.03	X
Aug 14, 2012	62.90	X
Aug 16, 2012	62.85	X
Aug 17, 2012	63.22	X
Aug 18, 2012	63.03	X
Aug 21, 2012	62.94	X
Aug 22, 2012	63.04	X
Aug 26, 2012	63.29	X
Aug 27, 2012	62.99	X
Aug 27, 2012	63.17	X
Sep 05, 2012	63.39	X
Sep 09, 2012	62.96	X
Sep 11, 2012	63.03	X
Sep 17, 2012	63.15	X
Sep 18, 2012	62.86	X
Sep 20, 2012	62.86	X
Sep 20, 2012	62.80	X
Sep 24, 2012	63.14	X
Sep 28, 2012	63.03	X
Oct 01, 2012	62.85	X
Oct 04, 2012	62.68	X
Oct 05, 2012	62.88	X
Oct 06, 2012	62.98	X
Oct 11, 2012	62.74	X
Oct 12, 2012	63.08	X
Oct 13, 2012	63.12	X
Oct 17, 2012	63.00	X
Oct 19, 2012	63.00	X
Oct 22, 2012	63.02	X
Oct 23, 2012	63.13	X
Oct 23, 2012	62.80	X
Oct 23, 2012	62.81	X
Oct 23, 2012	63.13	X
Oct 25, 2012	63.32	X
Oct 27, 2012	62.99	X
Oct 31, 2012	62.98	X
Nov 02, 2012	62.87	X
Nov 02, 2012	62.89	X
Nov 04, 2012	63.11	X
Nov 05, 2012	62.76	X
Nov 10, 2012	62.33	X
Nov 12, 2012	62.69	X
Nov 12, 2012	62.77	X

Nov 14, 2012	62.75	X
Nov 15, 2012	62.81	X
Nov 18, 2012	62.68	X
Nov 19, 2012	62.65	X
Nov 19, 2012	62.78	X
Nov 20, 2012	62.30	X
Nov 20, 2012	62.63	X
Nov 23, 2012	62.47	X
Dec 04, 2012	62.48	X
Dec 08, 2012	62.49	X
Dec 12, 2012	62.70	X

3H Efficiency  
 Total # pts : 5554  
 Valid # pts : 106  
 Mean : 62.95  
 SD : 0.22



### 3H Background

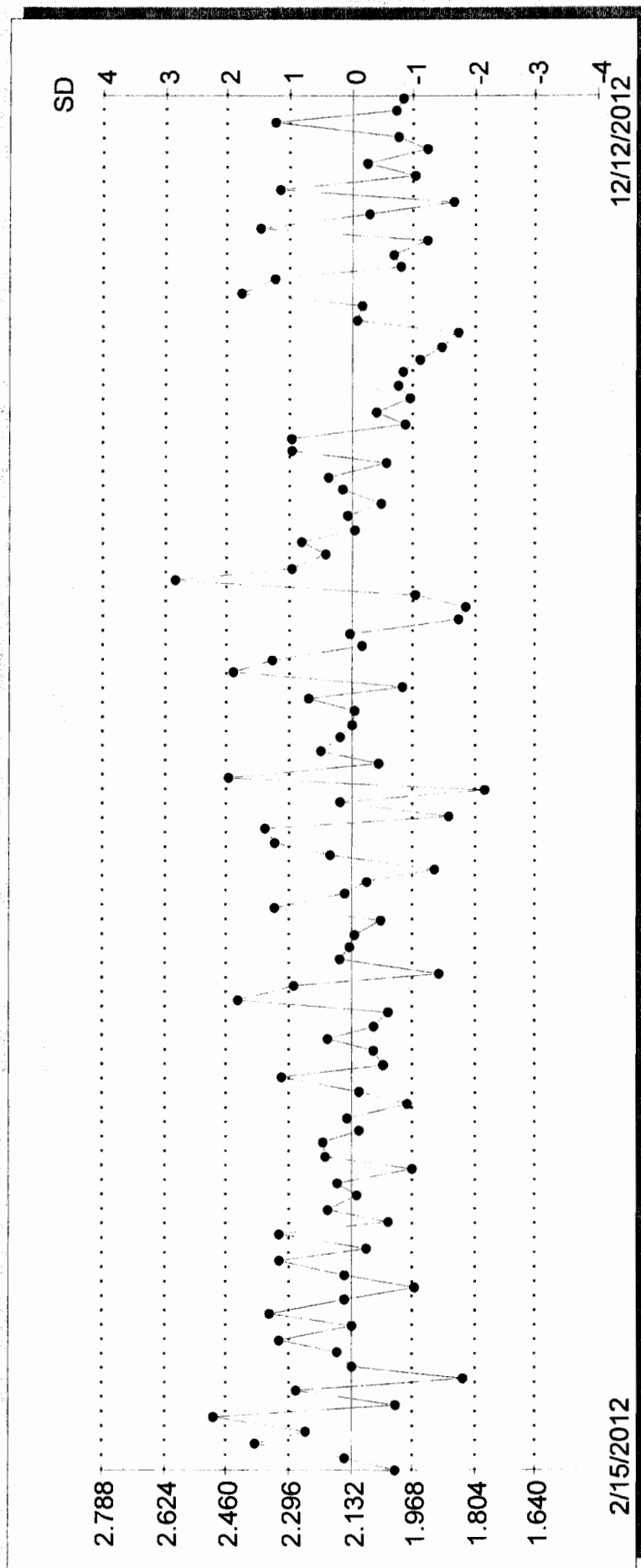
Total # pts : 5480  
Valid # pts : 106  
Mean  $\bar{Q}_1$  : 2.13  
SD  $\bar{Q}_1$  : 0.16

Date	Value	Valid Pt
Feb 15, 2012	2.01	X
Feb 16, 2012	2.15	X
Feb 17, 2012	2.39	X
Feb 20, 2012	2.25	X
Feb 23, 2012	2.50	X
Feb 24, 2012	2.01	X
Mar 05, 2012	2.28	X
Mar 07, 2012	1.84	X
Mar 12, 2012	2.13	X
Mar 15, 2012	2.17	X
Mar 22, 2012	2.32	X
Mar 23, 2012	2.13	X
Mar 28, 2012	2.35	X
Apr 05, 2012	2.15	X
Apr 10, 2012	1.96	X
Apr 12, 2012	2.15	X
Apr 13, 2012	2.32	X
Apr 20, 2012	2.09	X
Apr 23, 2012	2.32	X
Apr 26, 2012	2.03	X
Apr 27, 2012	2.20	X
Apr 30, 2012	2.12	X
May 01, 2012	2.17	X
May 03, 2012	1.97	X
May 07, 2012	2.20	X
May 09, 2012	2.20	X
May 14, 2012	2.11	X
May 17, 2012	2.14	X
May 17, 2012	1.98	X
May 23, 2012	2.11	X
May 30, 2012	2.31	X
May 31, 2012	2.04	X
Jun 06, 2012	2.07	X
Jun 13, 2012	2.19	X
Jun 21, 2012	2.08	X
Jun 22, 2012	2.04	X
Jun 25, 2012	2.43	X
Jun 27, 2012	2.28	X
Jun 27, 2012	1.90	X
Jun 28, 2012	2.16	X
Jun 29, 2012	2.13	X
Jun 30, 2012	2.12	X

Jul 05, 2012	2.05	X
Jul 11, 2012	2.33	X
Jul 12, 2012	2.15	X
Jul 16, 2012	2.09	X
Jul 20, 2012	1.91	X
Jul 24, 2012	2.19	X
Jul 28, 2012	2.33	X
Jul 27, 2012	2.36	X
Aug 09, 2012	1.88	X
Aug 13, 2012	2.16	X
Aug 14, 2012	1.78	X
Aug 16, 2012	2.46	X
Aug 17, 2012	2.06	X
Aug 18, 2012	2.21	X
Aug 21, 2012	2.16	X
Aug 22, 2012	2.13	X
Aug 26, 2012	2.12	X
Aug 27, 2012	2.25	X
Aug 27, 2012	1.99	X
Sep 05, 2012	2.44	X
Sep 09, 2012	2.34	X
Sep 11, 2012	2.11	X
Sep 17, 2012	2.14	X
Sep 18, 2012	1.85	X
Sep 20, 2012	1.83	X
Sep 20, 2012	1.96	X
Sep 24, 2012	2.60	X
Sep 28, 2012	2.29	X
Oct 01, 2012	2.20	X
Oct 04, 2012	2.26	X
Oct 05, 2012	2.13	X
Oct 06, 2012	2.14	X
Oct 11, 2012	2.05	X
Oct 12, 2012	2.15	X
Oct 13, 2012	2.19	X
Oct 17, 2012	2.04	X
Oct 19, 2012	2.29	X
Oct 22, 2012	2.29	X
Oct 23, 2012	1.99	X
Oct 23, 2012	2.06	X
Oct 23, 2012	1.98	X
Oct 23, 2012	2.01	X
Oct 25, 2012	2.00	X
Oct 27, 2012	1.95	X
Oct 31, 2012	1.89	X
Nov 02, 2012	1.85	X
Nov 02, 2012	2.11	X
Nov 04, 2012	2.11	X
Nov 05, 2012	2.42	X
Nov 10, 2012	2.33	X
Nov 12, 2012	2.00	X
Nov 12, 2012	2.02	X

Nov 14, 2012	2.37	X
Nov 15, 2012	2.09	X
Nov 18, 2012	1.86	X
Nov 19, 2012	2.32	X
Nov 18, 2012	1.96	X
Nov 20, 2012	2.09	X
Nov 21, 2012	1.93	X
Nov 23, 2012	2.01	X
Dec 04, 2012	2.34	X
Dec 08, 2012	2.02	X
Dec 12, 2012	2.00	X

3H Background  
 Total # pts : 5480  
 Valid # pts : 106  
 Mean : 2.13  
 SD : 0.16



2/15/2012



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# **American Radiation Services Analytical Reports**

for

**Los Alamos National Laboratory**

## **Tritium- Screening by Low Level Liquid Scintillation Counting**





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# **American Radiation Services Analytical Reports**

for

**Los Alamos National Laboratory**

## **Tritium-Screening by Low Level Liquid Scintillation Counting Samples**

44 of 81

num all  
LSC-A-022  
for 11-12-11



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# **American Radiation Services Analytical Reports**

for

**Los Alamos National Laboratory**

## **Tritium-Screening by Low Level Liquid Scintillation Counting Laboratory Records**

# Analysis Batch Report

46 of 46



Analysis Batch ID ARS1-B12-02779									
Method		ARS-054		Analysis		LSC-A-021		Matrix	
Description		Low Level Tritium Screening		FR		Run		Client ID	
Type	Blind Iso1	Blind Iso2	Blind Iso3	SDG	FR	Run	Isotope Group	Lab Deadline	
ARS1-B12-02779-01	LCS								
ARS1-B12-02779-02	LCSD								
ARS1-B12-02779-03	MBL								
ARS1-B12-02779-04	TRG			ARS1-12-02339	001	1	CAMO-13-24251	STD	12/16/12
ARS1-B12-02779-05	TRG			ARS1-12-02339	002	1	CAMO-13-24252	STD	12/16/12
ARS1-B12-02779-06	TRG			ARS1-12-02340	001	1	CAMO-13-24278	STD	12/16/12
ARS1-B12-02779-07	TRG			ARS1-12-02340	002	1	CAMO-13-24271	STD	12/16/12
ARS1-B12-02779-08	TRG			ARS1-12-02341	001	1	CASA-13-24212	STD	12/16/12
ARS1-B12-02779-09	TRG			ARS1-12-02341	002	1	CASA-13-24206	STD	12/16/12

127000  
12-02339-001-1  
WRAD

127001  
12-02339-002-1  
WRAD

127002  
12-02340-001-1  
WRAD

127003  
12-02340-002-1  
WRAD

127004  
12-02341-001-1  
WRAD

127005  
12-02341-002-1  
WRAD

47 of 8

ID	1001_054	ABatch	ABatchSampleID	ClientID	Aliquot1	AliquotUnits1	IC_ID1	Aliquot2	AliquotUnits2	IC_ID2	UserID	ModDate
12006	ARS1-B12-02779	ARS1-B12-02779-01			1 g						AMRAD\RUSEY	11/20/2012 14:56:20
12007	ARS1-B12-02779	ARS1-B12-02779-02			1 g						AMRAD\RUSEY	11/20/2012 14:56:20
12008	ARS1-B12-02779	ARS1-B12-02779-03			1 g						AMRAD\RUSEY	11/20/2012 14:56:20
12009	ARS1-B12-02779	ARS1-B12-02779-04	CAMO-13-24251		10 g		127000				AMRAD\RUSEY	11/20/2012 14:56:20
12010	ARS1-B12-02779	ARS1-B12-02779-05	CAMO-13-24252		10 g		127001				AMRAD\RUSEY	11/20/2012 14:56:20
12011	ARS1-B12-02779	ARS1-B12-02779-06	CAMO-13-24278		10.02 g		127002				AMRAD\RUSEY	11/20/2012 14:56:20
12012	ARS1-B12-02779	ARS1-B12-02779-07	CAMO-13-24271		10 g		127003				AMRAD\RUSEY	11/20/2012 14:56:20
12013	ARS1-B12-02779	ARS1-B12-02779-08	CASA-13-24212		10.05 g		127004				AMRAD\RUSEY	11/20/2012 14:56:21
12014	ARS1-B12-02779	ARS1-B12-02779-09	CASA-13-24206		10.04 g		127005				AMRAD\RUSEY	11/20/2012 14:56:21

48  
of 81

Assay Definition-

Assay Description:  
Low Low Level Tritium

Assay Type: DPM (Single)  
Report Name: Report1  
Output Data Path: C:\Packard\Tricarb\Results\ARS\Low Low Level Tritium\20121120\_1646  
Raw Results Path: C:\Packard\Tricarb\Results\ARS\Low Low Level Tritium\20121120\_1646\_results  
RTF File Name: C:\Packard\Tricarb\Results\ARS\Low Low Level Tritium\20121120\_1646\LLH3.rtf  
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\Low Low Level Tritium\20121120\_1646\LLH3 Results.csv  
Assay File Name: C:\Packard\Tricarb\Assays\Low Low Level Tritium.lsa

Count Conditions-

Nuclide: H-3 LL  
Quench Indicator: tSIE/AEC  
External Std Terminator (sec): 0.5 2s%  
Pre-Count Delay (min): 0.00  
Quench Set:  
Low Energy: ARS LL H3 10  
Count Time (min): 120.00  
Count Mode: Low Level  
Assay Count Cycles: 1  
#Vials/Sample: 1  
Repeat Sample Count: 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  
Colored Samples: Off  
Coincidence Time (nsec): 18  
Luminescence Correction: Off  
Heterogeneity Monitor: Off  
Delay Before Burst (nsec): 75

Half Life-

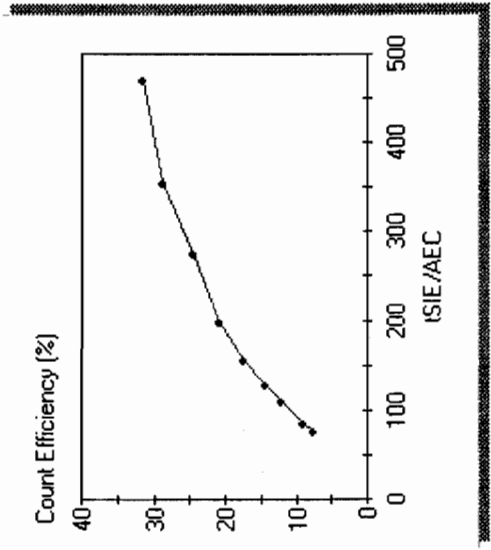
Half Life Correction: Off	Units	Reference Date	Reference Time
Regions Half Life			

Protocol# 41 - Low Level Tritium.lsa

49 of 81  
A  
B  
C

Cycle 1 Results  
Quench Curve Block Data

ARS LL H3 10 in A



Date Acquired: 07/12/2012  
Date Modified:  
ARS LL H3 10 in A

tSIE/AEC	Count Efficiency (%)
469.86	31.67
355.16	28.64
276.20	24.37
198.58	20.90
156.80	17.54
129.38	14.41
110.19	12.01
86.31	8.98
76.97	7.55

Protocol# 41 - Low Low Level Tritium.lsa

50 of 81

P#	S#	SMPL ID	CPMA	DPM1	tSIE	Eff Nucl	In A	Count	Time	DATE	TIME	MESSAGES
41	1	BACKGROUN	1.524	6.400	263.84	23.82	23.82	120.00	11/20/2012	4:55:36 PM		
41	2	B12-02779-04	2.477	10.090	279.54	24.55	24.55	120.00	11/20/2012	7:07:37 PM		
41	3	B12-02779-05	1.728	7.097	275.87	24.35	24.35	120.00	11/20/2012	9:19:37 PM		
41	4	B12-02779-06	1.607	6.481	284.04	24.79	24.79	120.00	11/20/2012	11:31:39 PM		
41	5	B12-02779-07	2.166	8.780	281.71	24.67	24.67	120.00	11/21/2012	1:43:42 AM		
41	6	B12-02779-08	1.852	7.507	281.84	24.67	24.67	120.00	11/21/2012	3:55:45 AM		
41	7	B12-02779-09	1.662	6.770	279.72	24.56	24.56	120.00	11/21/2012	6:07:47 AM		



51  
 56  
 81

# Assay Definition-

Assay Description:  
 Low Level H3

Assay Type: DPM (Single)

Report Name: Report1

Output Data Path: C:\Packard\Tricarb\Results\ARS\Low Low Level Tritium 2\20121121\_0813

Raw Results Path: C:\Packard\Tricarb\Results\ARS\Low Low Level Tritium 2\20121121\_0813\20121121\_0813.results

RTF File Name: C:\Packard\Tricarb\Results\ARS\Low Low Level Tritium 2\20121121\_0813\Report1.rtf

Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\Low Low Level Tritium 2\20121121\_0813\Report1.txt

Assay File Name: C:\Packard\Tricarb\Assays\Low Low Level Tritium 2.lsa

## Count Conditions-

Nuclide: H-3 LL

Quench Indicator: tSIE/AEC

External Std Terminator (sec): 0.5 2s%

Pre-Count Delay (min): 0.00

Quench Set:

Low Energy: ARS LL H3 10

Count Time (min): 120.00

Count Mode: Low Level

Assay Count Cycles: 1

#Vials/Sample: 1

Repeat Sample Count: 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

Colored Samples: Off

Coincidence Time (nsec): 18

Luminescence Correction: Off

Heterogeneity Monitor: Off

Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions Half Life

Units

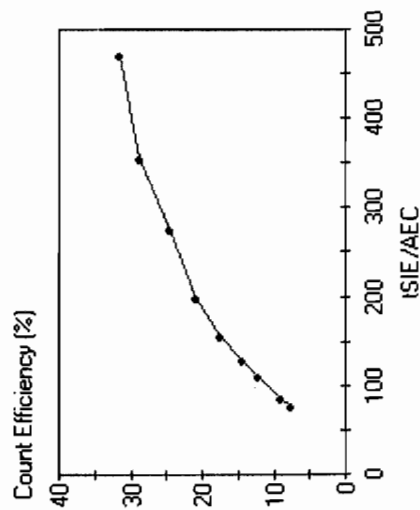
Reference Date

Reference Time

52 of 81  
 A  
 B  
 C

Cycle 1 Results  
 Quench Curve Block Data

ARS LL H3 10 in A



Date Acquired: 07/12/2012  
 Date Modified:  
 ARS LL H3 10 in A

tSIE/AEC	Count Efficiency (%)
469.86	31.67
355.16	28.64
276.20	24.37
198.58	20.90
156.80	17.54
129.38	14.41
110.19	12.01
86.31	8.98
76.97	7.55

Protocol# 49 - Low Low Level Tritium 2.lsa

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P#	S#	SMPL_ID	CPMA	DPML	tsIE	Eff Nucl	In A	Count Time	DATE	TIME	MESSAGES
49	1	B12-02779-04	1.347	5.575	271.65		24.16	120.00	11/21/2012	8:22:43 AM	
49	2	B12-02779-07	1.736	7.041	281.62		24.66	120.00	11/21/2012	10:34:45 AM	

# Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
11-15-12	1203	B12-02687-06	B12-02687	1354	<del>JS</del>
↓	↓	B12-02687-07	↓	↓	<del>JS</del>
↓	↓	B12-02687-08	↓	↓	<del>JS</del>
↓	↓	B12-02687-09	↓	↓	<del>JS</del>
↓	↓	B12-02687-10	↓	↓	<del>JS</del>
↓	↓	B12-02687-11	↓	↓	<del>JS</del>
↓	↓	B12-02687-12	↓	↓	<del>JS</del>
↓	↓	B12-02687-13	↓	↓	<del>JS</del>
↓	↓	B12-02687-14	↓	↓	<del>JS</del>
11-20-12	1501	SNC FS	QA	QA	JS
11-20-12	1502	Background	B12-02779	1646	JS
↓	↓	B12-02779-04	↓	↓	JS
↓	↓	B12-02779-05	↓	↓	JS
↓	↓	B12-02779-06	↓	↓	JS
↓	↓	B12-02779-07	↓	↓	JS
↓	↓	B12-02779-08	↓	↓	JS
↓	↓	B12-02779-09	↓	↓	JS
11-21-12	0720	B12-02779-04	B12-02779	0813	JS
↓	↓	B12-02779-07	↓	↓	JS
<del>JS 11-21-12</del>					



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# **American Radiation Services Analytical Reports**

**for**

**Los Alamos National Laboratory**

**Tritium-Screening  
by**

**Low Level Liquid  
Scintillation Counting**

**Control Charts**

3H Efficiency

Total # pts : 1872  
Valid # pts : 123  
Mean % : 63.48  
SD % : 0.39

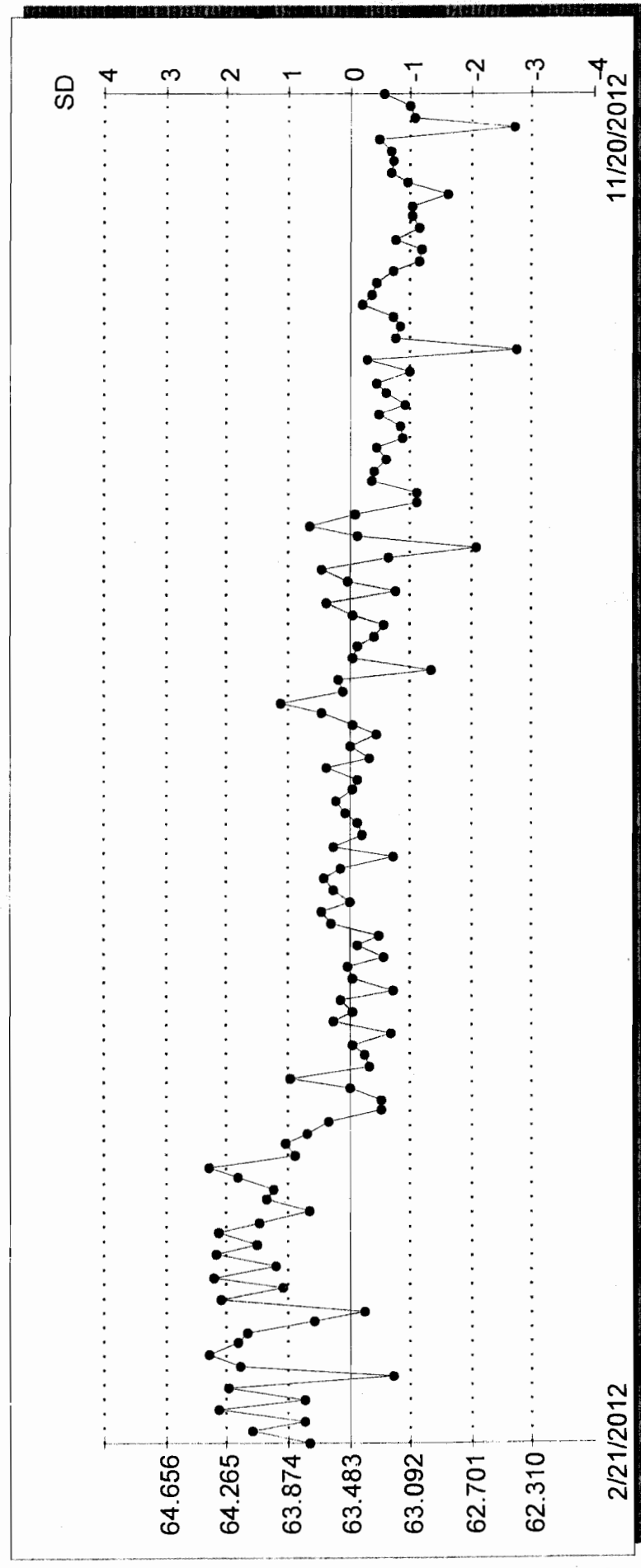
Date	Value	Valid Pt
Feb 21, 2012	63.73	X
Feb 23, 2012	64.10	X
Feb 28, 2012	63.77	X
Mar 02, 2012	64.32	X
Mar 05, 2012	63.77	X
Mar 08, 2012	64.25	X
Mar 13, 2012	63.20	X
Mar 13, 2012	64.18	X
Mar 15, 2012	64.37	X
Mar 20, 2012	64.19	X
Mar 23, 2012	64.13	X
Mar 27, 2012	63.71	X
Mar 27, 2012	63.39	X
Mar 30, 2012	64.29	X
Apr 03, 2012	63.89	X
Apr 10, 2012	64.34	X
Apr 13, 2012	63.95	X
Apr 16, 2012	64.32	X
Apr 20, 2012	64.07	X
Apr 23, 2012	64.31	X
Apr 27, 2012	64.05	X
Apr 30, 2012	63.74	X
Apr 30, 2012	64.01	X
May 04, 2012	63.97	X
May 07, 2012	64.20	X
May 14, 2012	64.37	X
May 16, 2012	63.83	X
May 17, 2012	63.89	X
Jun 01, 2012	63.75	X
Jun 01, 2012	63.62	X
Jun 01, 2012	63.27	X
Jun 01, 2012	63.28	X
Jun 01, 2012	63.47	X
Jun 02, 2012	63.86	X
Jun 02, 2012	63.35	X
Jun 02, 2012	63.39	X
Jun 02, 2012	63.46	X
Jun 02, 2012	63.21	X
Jun 02, 2012	63.59	X
Jun 02, 2012	63.46	X
Jun 02, 2012	63.54	X
Jun 02, 2012	63.20	X
Jun 02, 2012	63.46	X
Jun 02, 2012	63.50	X
Jun 02, 2012	63.27	X
Jun 02, 2012	63.43	X
Jun 02, 2012	63.20	X

Jun 02, 2012	63.60	X
Jun 03, 2012	63.65	X
Jun 03, 2012	63.47	X
Jun 03, 2012	63.57	X
Jun 03, 2012	63.65	X
Jun 03, 2012	63.53	X
Jun 03, 2012	63.21	X
Jun 03, 2012	63.58	X
Jun 03, 2012	63.39	X
Jun 03, 2012	63.43	X
Jun 03, 2012	63.50	X
Jun 03, 2012	63.56	X
Jun 03, 2012	63.46	X
Jun 03, 2012	63.43	X
Jun 03, 2012	63.63	X
Jun 03, 2012	63.36	X
Jun 04, 2012	63.47	X
Jun 04, 2012	63.31	X
Jun 04, 2012	63.46	X
Jun 04, 2012	63.66	X
Jun 04, 2012	63.91	X
Jun 13, 2012	63.52	X
Jun 14, 2012	63.56	X
Jun 21, 2012	62.96	X
Jun 22, 2012	63.46	X
Jun 26, 2012	63.43	X
Jun 27, 2012	63.32	X
Jun 28, 2012	63.27	X
Jul 03, 2012	63.45	X
Jul 09, 2012	63.63	X
Jul 12, 2012	63.19	X
Jul 13, 2012	63.49	X
Jul 13, 2012	63.66	X
Jul 16, 2012	63.24	X
Jul 18, 2012	62.67	X
Jul 18, 2012	63.42	X
Jul 19, 2012	63.73	X
Jul 20, 2012	63.44	X
Jul 23, 2012	63.05	X
Jul 26, 2012	63.04	X
Jul 28, 2012	63.34	X
Jul 30, 2012	63.33	X
Jul 30, 2012	63.25	X
Jul 31, 2012	63.31	X
Aug 03, 2012	63.15	X
Aug 06, 2012	63.16	X
Aug 08, 2012	63.30	X
Aug 08, 2012	63.13	X
Aug 24, 2012	63.24	X
Sep 05, 2012	63.31	X
Sep 07, 2012	63.10	X
Sep 10, 2012	63.36	X
Sep 12, 2012	62.40	X
Sep 14, 2012	63.19	X
Sep 14, 2012	63.16	X
Sep 17, 2012	63.19	X
Sep 19, 2012	63.39	X

Sep 26, 2012	63.33	X
Sep 27, 2012	63.31	X
Sep 29, 2012	63.20	X
Oct 10, 2012	63.04	X
Oct 16, 2012	63.02	X
Oct 18, 2012	63.19	X
Oct 24, 2012	63.03	X
Oct 26, 2012	63.07	X
Oct 29, 2012	63.07	X
Oct 30, 2012	62.84	X
Oct 30, 2012	63.11	X
Nov 01, 2012	63.22	X
Nov 04, 2012	63.20	X
Nov 06, 2012	63.21	X
Nov 09, 2012	63.29	X
Nov 10, 2012	62.43	X
Nov 14, 2012	63.07	X
Nov 15, 2012	63.09	X
Nov 20, 2012	63.26	X



3H Efficiency : 1872  
Total # pts : 123  
Valid # pts : 63.48  
Mean : 0.39  
SD : 0.39

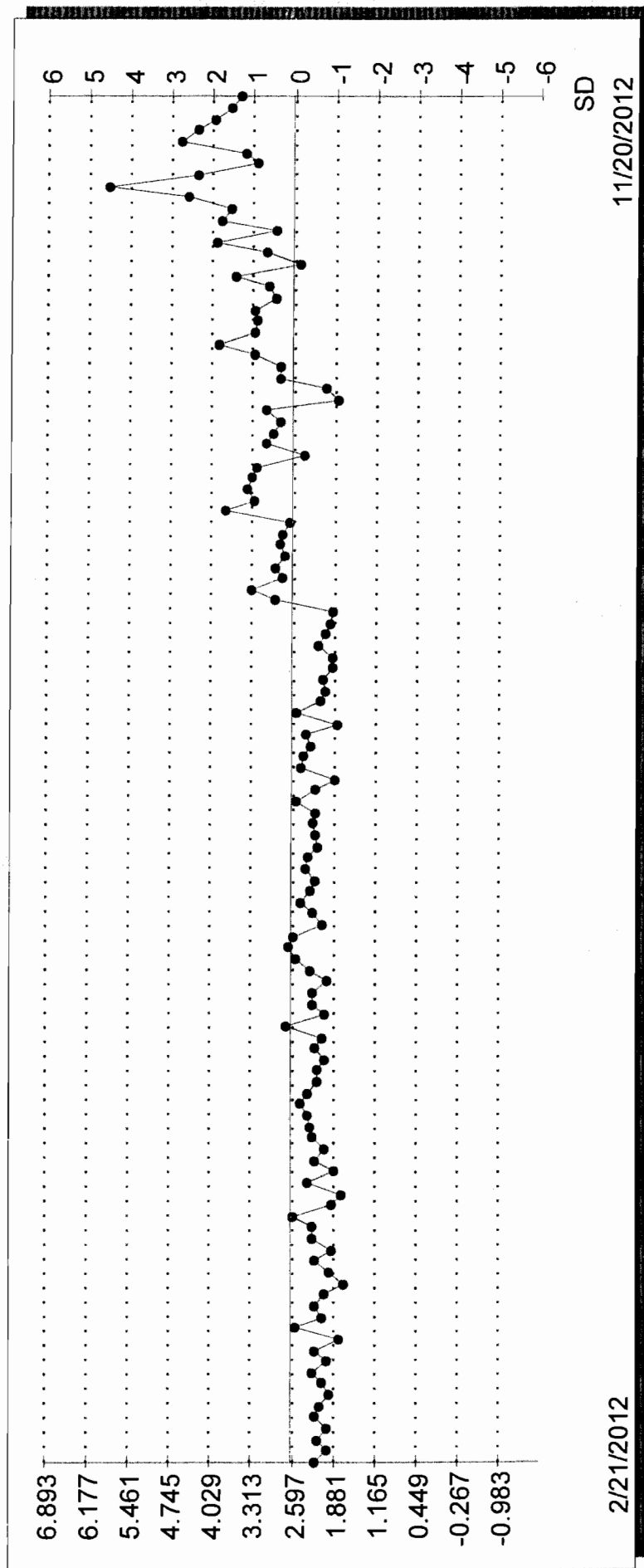




Jun 02, 2012	2.56	X
Jun 03, 2012	2.06	X
Jun 03, 2012	2.23	X
Jun 03, 2012	2.45	X
Jun 03, 2012	2.28	X
Jun 03, 2012	2.19	X
Jun 03, 2012	2.36	X
Jun 03, 2012	2.33	X
Jun 03, 2012	2.14	X
Jun 03, 2012	2.21	X
Jun 03, 2012	2.23	X
Jun 03, 2012	2.20	X
Jun 03, 2012	2.55	X
Jun 03, 2012	2.19	X
Jun 03, 2012	1.88	X
Jun 03, 2012	2.43	X
Jun 04, 2012	2.42	X
Jun 04, 2012	2.29	X
Jun 04, 2012	2.37	X
Jun 04, 2012	1.84	X
Jun 04, 2012	2.52	X
Jun 13, 2012	2.14	X
Jun 14, 2012	2.01	X
Jun 21, 2012	2.09	X
Jun 22, 2012	1.91	X
Jun 26, 2012	1.90	X
Jun 27, 2012	2.18	X
Jun 28, 2012	2.04	X
Jul 03, 2012	1.96	X
Jul 09, 2012	1.90	X
Jul 12, 2012	2.91	X
Jul 13, 2012	3.33	X
Jul 13, 2012	2.78	X
Jul 16, 2012	2.93	X
Jul 18, 2012	2.76	X
Jul 18, 2012	2.85	X
Jul 19, 2012	2.79	X
Jul 20, 2012	2.65	X
Jul 23, 2012	3.78	X
Jul 26, 2012	3.28	X
Jul 28, 2012	3.41	X
Jul 30, 2012	3.33	X
Jul 30, 2012	3.24	X
Jul 31, 2012	2.42	X
Aug 03, 2012	3.09	X
Aug 06, 2012	2.96	X
Aug 08, 2012	2.82	X
Aug 08, 2012	3.09	X
Aug 24, 2012	1.84	X
Sep 05, 2012	2.04	X
Sep 07, 2012	2.81	X
Sep 10, 2012	2.84	X
Sep 12, 2012	3.31	X
Sep 14, 2012	3.90	X
Sep 14, 2012	3.28	X
Sep 17, 2012	3.26	X
Sep 19, 2012	3.27	X

Sep 26, 2012	2.90	X
Sep 27, 2012	3.03	X
Sep 29, 2012	3.61	X
Oct 10, 2012	2.51	X
Oct 18, 2012	3.08	X
Oct 18, 2012	3.94	X
Oct 24, 2012	2.93	X
Oct 26, 2012	3.87	X
Oct 29, 2012	3.71	X
Oct 30, 2012	4.48	X
Oct 30, 2012	5.86	X
Nov 01, 2012	4.30	X
Nov 04, 2012	3.23	X
Nov 06, 2012	3.47	X
Nov 09, 2012	4.61	X
Nov 10, 2012	4.31	X
Nov 14, 2012	3.99	X
Nov 15, 2012	3.72	X
Nov 20, 2012	3.56	X

3H Background  
 Total # pts : 1828  
 Valid # pts : 123  
 Mean : 2.60  
 SD : 0.72



2/21/2012



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# **American Radiation Services Analytical Reports**

**for**

## **Los Alamos National Laboratory**

### **Low Level Liquid Scintillation Counting**

# **Calibration Information**



**QUALITY CONTROL PROGRAM**  
**AMERICAN RADIATION SERVICES**  
**RADIOACTIVE REFERENCE SOLUTIONS**  
**ANNUAL ACTIVITY VERIFICATION**

VERIFICATION DATE **9/10/2012 20:16** *date counted*  
 STANDARD REFERENCE # **S-0279**

Principal Radionuclide

**H-3**

ENTER --&gt;

Half Life, Years

**1.232E+01**

OR --&gt;

Half Life, Days

**4.4998E+03**  
**4.4998E+03**Radionuclide **H-3**Dilution Reference Date **9/7/2012 10:40**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-0279-V1	15.91	1	LSC	0.3302	6.49	5.019	5.68	2.56
S-0279-V2	16.21	1	LSC	0.3291	6.49	5.018	5.89	2.65
S-0279-V3	15.76	1	LSC	0.3290	6.49	5.018	5.62	2.53
S-0279-V4	15.62	1	LSC	0.3293	6.49	5.008	5.54	2.49
S-0279-V5	15.76	1	LSC	0.3280	6.49	5.018	5.63	2.54

**10% Max****PASS**

Standard Deviation percent of known concentration

**5% Max****PASS**

Average	<b>5.67</b>	<b>2.55</b>
Two Sigma Uncertainty	<b>0.26</b>	<b>0.12</b>
Target Activity	<b>5.72</b>	<b>2.58</b>
% Diff	<b>-0.91%</b>	<b>-0.91%</b>

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

Prepared &amp; Counted By

Date: **9/10/2012 20:16**

Verified &amp; Approved By

Date: **9-11-12 0817**

QC Approval

Date: **9-11-12 0817****S-0279****H-3**Verified **9/10/12****SL****Expires 9/10/13**

Manufacturer

**NIST SRM 4927F**

Sol Matrix

**H2O**

Ref No

**NIST SRM 4927F**

Tech

**Unknown**

Parent ID

**S-0237****RADIOACTIVE STANDARDS -- BATON ROUGE LABORATORY**

3

**Date:** 9/7/2012

Pipettor ID: Auto-pipettor

Pipettor ID: na

**Standard ID:** S-0279

**Standard ID:** N/A

Standards made in glass vials.

S-0279-V1	5.019 g
S-0279-V2	5.018 g
S-0279-V3	5.018 g
S-0279-V4	5.008 g
S-0279-V5	5.018 g

**Balance ID:** H1331122173560P



Assay Definition-

Assay Description:  
H3 Normal Lvl

Assay Type: DPM (Single)

Report Name: Report1  
Output Data Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20120910\_0931  
Raw Results Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20120910\_0931\H3 Results.results  
RTF File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20120910\_0931\H3 Results.rtf  
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20120910\_0931\H3 Results.csv  
Assay File Name: C:\Packard\Tricarb\Assays\H-3 Normal 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

#Vials/Sample: 1

Repeat Sample Count: 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  
Colored Samples: Off  
Coincidence Time (nsec): 18  
Luminescence Correction: Off  
Heterogeneity Monitor: Off  
Delay Before Burst (nsec): 75

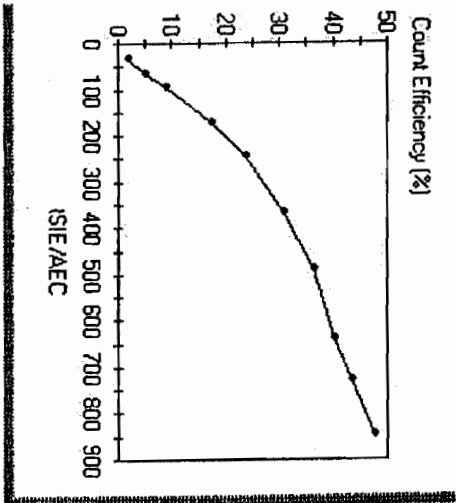
Half Life-

Half Life Correction: Off  
Regions Half Life  
Units  
Reference Date  
Reference Time

A  
 B  
 C

Cycle 1 Results  
 Quench Curve Block Data

UG STD H-3 in A



Date Acquired: 06/27/2012  
 Date Modified:  
 UG STD H-3 in A

tSIE/AEC	Count Efficiency (%)
846.90	47.58
730.85	43.21
639.47	40.08
487.78	36.36
365.41	30.73
244.81	23.69
169.28	17.31
95.01	8.79
64.60	4.97
34.32	1.64

P#	S#	SMPL_ID	CPMA	DPM1	tSIE	Eff Nucl	In A	Count Time	DATE	TIME	MESSAGES
54	1	BACKGROUND	6.49	19.81	409.74		32.77	120.00	9/10/2012	9:36:46 AM	
54	2	S-0279-V1	15.91	48.18	415.20		33.02	120.00	9/10/2012	11:44:40 AM	
54	3	S-0279-V2	16.21	49.25	412.72		32.91	120.00	9/10/2012	1:52:36 PM	
54	4	S-0279-V3	15.76	47.89	412.56		32.90	120.00	9/10/2012	4:00:32 PM	
54	5	S-0279-V4	15.62	47.44	413.22		32.93	120.00	9/10/2012	6:08:27 PM	
54	6	S-0279-V5	15.76	48.04	410.40		32.80	120.00	9/10/2012	8:16:20 PM	

STD ID: S-0279

ARS INTERNATIONAL		Add/Edit Secondary Stds	Parent Standard Data			
<b>Planning</b>		Parent Solution Reference #	<b>NIST SRM 4927F</b>			
Planning Comments	Create a H3 LCS standard.	Parent Solution #	<b>S-0237</b>			
Target dpm/g (on dil. date)	<b>5.5</b>	Parent Principal Radionuclide	<b>H-3</b>	Half Life (Days)	<b>4499.8000000</b>	
Target Final volume mL	<b>2000</b>	Parent Reference Date	<b>03/22/2010 10:10</b>			
Appx mass g of Parent Sol'n	<b>3.606433954</b>	Parent Certified Act	<b>3503.682716</b>	Cert Act/Vol Units	<b>dpm</b>	<b>g</b>
Appx vol ml of Parent Sol'n	<b>3.612937241</b>	Parent Cert Act Uncert 1 Sigma	<b>0.0036</b>			
Expected Addition for Analysis g	<b>5</b>	Parent Sp. Gravity G/Ml	<b>0.9982</b>			
<b>Standards Preparation / Dilution</b>		Parent Supplier	<b>NIST SRM 4927F</b>			
Secondary Solution #	<b>S-0279</b>	Parent Date Recvd	<b>01/02/00</b>			
Dilution Date (New Ref Date)	<b>09/07/2012 10:40</b>	Parent Received By	<b>Unknown</b>			
Ampoule, Empty (g)		Parent Cert Exp Date				
Ampoule /Solution Gross (g)		Parent Matrix	<b>H2O</b>			
Net Wt Removed (g)		Certified dpm/g At Ref Date	<b>3503.682716</b>			
Transfer Container, empty (g)	<b>13.144</b>	Certified dpm/g on 09/07/2012 10:40	<b>3050.10438</b>			
Container Plus Solution (g)	<b>16.89</b>	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			
Net Wt Transferred (g)	<b>3.746</b>					
DPM Xferred on 09/07/2012 10:40	<b>11425.69101</b>					
Diluent/matrix	<b>DI H2O</b>	Parent Tech	<b>Unknown</b>			
Diluent Density Cont, empty (g)		Is_Primary	<b>FALSE</b>			
Test Mass of 5 ml of Diluent (g)		Is_LCS	<b>TRUE</b>			
Diluent Density Test - (g/mL)		Is_Tracer	<b>FALSE</b>			
Dilution Empty Container Mass (g)	<b>473.93</b>	Is_Calib	<b>FALSE</b>			
Dilution Full Cont g (if measured)	<b>2469.52</b>					
Dilution Final Volume ml (if measured)	<b>2000</b>					
Final Dilution Density (g/mL)	<b>0.997795</b>					
Final Dilution Measured Mass g	<b>1995.59</b>					
Comments	<b>H3 LCS standard. Dilution performed as stated above by B Steffens. -BJS 9/7/12</b>					
Final Dilution dpm/g	<b>5.725470166</b>					
Final Dil New Ref Date/Time	<b>09/07/2012 10:40</b>					



2609 North River Road • Port Allen, Louisiana 70767

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# **American Radiation Services Analytical Reports**

**for**

**Los Alamos National Laboratory**

# **Folder Duplicate**



## Report Compilation Checklist

ARS SDG: 12-02340 Client Name: LANL Sample Matrix: AQ

### LEVEL 1 COMPONENTS

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

### LEVEL 2 COMPONENTS

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

### LEVEL 3 COMPONENTS

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

### LEVEL 4 COMPONENTS

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

SOL  
Report Generator Signature

12-19-12  
Date

James D. R.  
Management Review Signature

12-19-12  
Date



## LSC Technical Review Checklist

ARS SDG ARS1-12-02340

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-B12-02779 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? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Tech Notes) NCR # (If initiated): _____						
Chemist Signature <u>[Signature]</u>		Date <u>11-20-12</u>		Verifier Review Signature <u>N/A</u>		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 <u>James D. Far</u>		Date <u>12-19-12</u>				
	Analyst Review			Technical 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? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Comments) NCR # (If initiated): _____						
Analyst Signature <u>[Signature]</u>		Date <u>11-21-12</u>		Technical Reviewer Signature <u>NA</u>		Date _____

Batch A: ARS1-B12-02779

## LSC Technical Review Checklist

**C. BATCH QC VALIDATION**

	Proj. Mgr. Review	QA Officer Review
1) Activity + 3xCSU a Negative Number?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
2) RDL Criteria are Met?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
3) Method Blank Criterion Met?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
4) LCS/LCD Criteria Met?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
5) Duplicate (Sample Duplicate, LCSD, MSD) Criteria Met?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
6) MS/MSD Criteria Met?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
7) Batch QC Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Tech Notes)   NCR # (If initiated): _____		
<u><i>Soe</i></u> Project Manager Signature	<u>12-19-12</u> Date	<u><i>James D. Fan</i></u> <u>12-19-12</u> QA Officer Signature                      Date

**GENERAL COMMENTS**





# LSC Technical Review Checklist

ARS SDG ARS1-12-02340

Sample Matrix: AQ Aliquot (Circle One) : Dry As ☒ Received Filtered Other: \_\_\_\_\_

Required QC Samples (Mark all that apply): Blank ☒ LOS ☒ LOSD ☒ Sample Dup MS MSD

ARS A. Batch ID(s): Batch A: ARS1-B12-02782 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?	<input checked="" type="checkbox"/> Yes	No	N/A	<input checked="" type="checkbox"/> Yes	No	N/A
2) 100% of Manual Calculations Verified?	Yes	No	<input checked="" type="checkbox"/> N/A	Yes	No	<input checked="" type="checkbox"/> N/A
3) Blank Composition/Configuration Matches Calibration?	<input checked="" type="checkbox"/> Yes	No	N/A	<input checked="" type="checkbox"/> Yes	No	N/A
4) Deviations from procedure are documented and verified?	Yes	No	<input checked="" type="checkbox"/> N/A	Yes	No	<input checked="" type="checkbox"/> N/A
5) Appropriate Cocktail Selected?	<input checked="" type="checkbox"/> Yes	No	N/A	<input checked="" type="checkbox"/> Yes	No	N/A
6) Sample Prep Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Tech Notes) NCR # (If initiated): _____						
Chemist Signature <u>[Signature]</u>			Date <u>12-12-12</u>	Verifier Review Signature <u>[Signature]</u> Date <u>12-12-12</u>		

## B. ANALYSIS REVIEW

	Analyst Review			QA Officer Review		
1) Calibrations Valid and Current?	<input checked="" type="checkbox"/> Yes	No	N/A	<input checked="" type="checkbox"/> Yes	No	N/A
2) Backgrounds Valid and Current?	<input checked="" type="checkbox"/> Yes	No	N/A	<input checked="" type="checkbox"/> Yes	No	N/A
3) Source Checks Completed and Acceptable?	<input checked="" type="checkbox"/> Yes	No	N/A	<input checked="" type="checkbox"/> Yes	No	N/A
			QA Officer Signature <u>[Signature]</u> Date <u>12-19-12</u>			
	Analyst Review			Technical Review		
4) Background Checks Complete and Acceptable?	<input checked="" type="checkbox"/> Yes	No	N/A	<input checked="" type="checkbox"/> Yes	No	N/A
5) 100% of Manually Entered Parameters Verified Accurate?	<input checked="" type="checkbox"/> Yes	No	N/A	<input checked="" type="checkbox"/> Yes	No	N/A
6) Appropriate QC samples initiated at required frequency?	<input checked="" type="checkbox"/> Yes	No	N/A	<input checked="" type="checkbox"/> 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?	<input checked="" type="checkbox"/> Yes	No	N/A	<input checked="" type="checkbox"/> Yes	No	N/A
b) Spectra show no Evidence of Interferences?	<input checked="" type="checkbox"/> Yes	No	N/A	<input checked="" type="checkbox"/> Yes	No	N/A
c) Sample Quench for All Samples within Range of Quench Curve?	<input checked="" type="checkbox"/> Yes	No	N/A	<input checked="" type="checkbox"/> Yes	No	N/A
7) Analysis Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Comments) NCR # (If initiated): _____						
Analyst Signature <u>[Signature]</u>			Date <u>12-14-12</u>	Technical Reviewer Signature <u>[Signature]</u> Date <u>12-14-12</u>		



**DQO Report for SDG**  
ARS1-12-02340

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Analysis Code	Group	Isotope	Activity Units	Aliquot Units	ProcedureNo	RDL	LCS_LL	LCS_UL	MS_LL	MS_UL	Rdy_LL	Rdy_UL	Grav_LL	Grav_UL	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		

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## 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 ➔	CAMO-13-24278	AQ	11/16/12 10:11 AM	11/16/12 10:11 AM	H	90	5	A4							
	IC_ID	Cnt	Volume_mL	Wt_g	pH_Orig	pH_Final	CPM	uR_Hr	Storage	VOA	Head Sp	AF Units	AF Rate	AF Mins	AF Total Vol
	126983	1	1000.00					80	24		N	N/A			
002 ➔	CAMO-13-24271	AQ	11/16/12 10:11 AM	11/16/12 10:11 AM	H	90	5	A4							
	IC_ID	Cnt	Volume_mL	Wt_g	pH_Orig	pH_Final	CPM	uR_Hr	Storage	VOA	Head Sp	AF Units	AF Rate	AF Mins	AF Total Vol
	126984	1	1000.00					80	24		N	N/A			

### SDG Report - Analysis Assignments

Temp SDG	ARS1-12-02340	Sample Count	2
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

# ARS FILE TRACKING SHEET

SDG: ARS1-12-02340

Task	Date / Time	Initials
Date & Time Samples Received	11/20/12 10:50	cad
ICOC Initiated / Storage Location: <u>A4</u>	11/20/12 11:31	cad
Technical Checks Performed	<i>See Batch</i>	
Report Written / EDD Generated: _____ / _____ <span style="display: block; text-align: center; font-size: small;">Date/Time                      Initials</span>	12-19-12 1409	SPR
Quality Assurance Checks Performed on Report	12-19-12 1505	JST
Management Check Performed on Report		
<i>Preliminary Report Sent</i>		
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		✓
3 Day TAT		✓
5 Day TAT		✓

**NOTES:**

COMPANY NAME: LANCSDG: ARS1-12-02340

## 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

Matrix

[ AF AQ BI FE LT SL SO UR VG ]

## External and Internal Surveys

Exposure Rate Meter: <u>M3 242861</u>	Serial No.: <u>PR 264266</u>	Calibration Due Date: <u>4-18-13</u>
Count Rate Meter: <u>M2 184559</u>	Serial No.: <u>PR 184559</u>	Calibration Due Date: <u>4-18-13</u>
Background Exposure Rate ( $\mu\text{R/hr}$ ) <u>24</u>	Max. Exposure Rate on Shipping Containers Externals (Plus Bkgd) <u>30</u>	$\mu\text{R/hr}$
Background Count Rate (cpm) <u>80</u>	Max. Removable Count Rate on Shipping Containers Externals (Plus Bkgd) <u>80</u>	cpm
	Max. Removable Count Rate on Shipping Containers Internals (Plus Bkgd) _____	cpm

pH  $\leq 2$  is Acceptable

## Acceptance Limits

<500  $\mu\text{R/hr}$  <100 cpm/cm<sup>2</sup>

Sample Label/Comments/Notes	pH Orig	pH Final	Mark if Preserve	Acid Lot #	Weight(g) / Volume(mL)	$\mu\text{R/hr}$	cpm
<u>IND 90-13-24153</u>			<input type="checkbox"/>			<u>24</u>	<u>80</u>
<u>-24154</u>			<input type="checkbox"/>			<u>24</u>	<u>80</u>
<u>-24155</u>			<input type="checkbox"/>			<u>24</u>	<u>80</u>
<u>-24156</u>			<input type="checkbox"/>			<u>24</u>	<u>80</u>
<u>-24157</u>			<input type="checkbox"/>			<u>24</u>	<u>80</u>
<u>CAMO-13-24251</u>			<input type="checkbox"/>		<u>1000 mL</u>	<u>24</u>	<u>80</u>
<u>-24252</u>			<input type="checkbox"/>		<u>↓</u>	<u>24</u>	<u>80</u>
<u>CAMO-13-24278</u>			<input type="checkbox"/>		<u>1000 mL</u>	<u>24</u>	<u>80</u>
<u>-24271</u>			<input type="checkbox"/>		<u>↓</u>	<u>24</u>	<u>80</u>
<u>CHSA-13-24212</u>			<input type="checkbox"/>		<u>1000 mL</u>	<u>26</u>	<u>90</u>
<u>-24206</u>			<input type="checkbox"/>		<u>↓</u>	<u>26</u>	<u>90</u>
			<input type="checkbox"/>				
			<input type="checkbox"/>				
			<input type="checkbox"/>				
			<input type="checkbox"/>				
			<input type="checkbox"/>				
			<input type="checkbox"/>				
			<input type="checkbox"/>				
			<input type="checkbox"/>				

Surveyors'

Name: [Signature]Date/Time Surveyed: 11/20/12 1150