

The order of this data package is as follows:

1. Chain-of-Custody/Lab Request
2. Copies of field COCs
3. Validation Report
4. Laboratory analysis

Comments:

[illegible]

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11162

EVENT NAME: Pajarito (TA-54) MY2017 Q3

SAMPLE ID: CAPA-17-130709

WORK ORDER:

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	04/05/2017	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	1333		MEDIA:	UA	
PRS ID:	NA		SAMPLE TECH CODE:	RSP	
LOCATION ID:	R-23i S2		FIELD PREP:	UF	
LOCATION TYPE:	NA		FIELD QC TYPE:	REG	
TOP DEPTH:			SAMPLE USAGE:	INV	
BOTTOM DEPTH:			EXCAVATED:		YES / NO / <u>NA</u>

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
NA	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	2	HCL	Y	NA
	WSP-LL-H-3	1 LITER POLY	1	NONE		

SAMPLE COMMENTS: NONE

LOCATION COMMENTS: NONE

FIELD PARAMETERS:

Dissolved Oxygen	<u>6.11</u>	mg/L	Flow (in gpm)	<u>0.98</u>	GPM	Oxidation-Reduction Potential	<u>151.2</u>	mV
pH	<u>7.95</u>	SU	Specific Conductance	<u>201.9</u>	uS/cm	Temperature	<u>15.3</u>	deg C
Turbidity	<u>0.49</u>	NTU						

COLLECTED BY (PRINT): D. JARAMILLO, A. STANFIELD

RELINQUISHED BY (Printed Name) <u>A. Stanfield</u> (Signature) <u>[Signature]</u>	Date/Time <u>4/5/17</u> <u>1415</u>	RECEIVED BY (Printed Name) <u>S. Sherwood</u> (Signature) <u>[Signature]</u>	Date/Time <u>4/5/17</u> <u>1415</u>
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 03/27/2017

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11162

EVENT NAME: Pajarito (TA-54) MY2017 Q3

SAMPLE ID: CAPA-17-130723

WORK ORDER:

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	04/04/2017	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	1056	OK	MEDIA:	UA	
PRS ID:	NA		SAMPLE TECH CODE:	GSR	
LOCATION ID:	R-53 S1		FIELD PREP:	UF	
LOCATION TYPE:	NA		FIELD QC TYPE:	REG	
TOP DEPTH:	↓		SAMPLE USAGE:	INV	↓
BOTTOM DEPTH:	↓	↓	EXCAVATED:		YES / NO / NA

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
NA	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	2	HCL	Y	NA
J	WSP-LL-H-3	1 LITER POLY	1	NONE	↓	↓

SAMPLE COMMENTS: nae

LOCATION COMMENTS: Sampled 50 ft from running diesel generator

FIELD PARAMETERS:

Dissolved Oxygen	<u>6.31</u>	mg/L	Flow (in gpm)	<u>3.84</u>	GPM	Oxidation-Reduction Potential	<u>127.5</u>	mV
pH	<u>7.98</u>	SU	Specific Conductance	<u>125.1</u>	uS/cm	Temperature	<u>20.3</u>	deg C
Turbidity	<u>0.20</u>	NTU						

COLLECTED BY (PRINT): W. Pryce

RELINQUISHED BY (Printed Name) (Signature)	Date/Time 04/04/17 1335	RECEIVED BY (Printed Name) (Signature)	Date/Time 4/4/17 1335
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 03/27/2017

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11162

EVENT NAME: Pajarito (TA-54) MY2017 Q3

SAMPLE ID: CAPA-17-130724

WORK ORDER:

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	04/04/2017	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	1251	OK	MEDIA:	UA	
PRS ID:	NA		SAMPLE TECH CODE:	GSR	
LOCATION ID:	R-53 S2		FIELD PREP:	UF	
LOCATION TYPE:	NA		FIELD QC TYPE:	REG	
TOP DEPTH:			SAMPLE USAGE:	INV	
BOTTOM DEPTH:			EXCAVATED:		YES / NO / NA

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
NA	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	2	HCL	Y	NA
↓	WSP-LL-H-3	1 LITER POLY	1	NONE	↓	↓

SAMPLE COMMENTS: *nae*LOCATION COMMENTS: *Sampled SOG from running desil generator*

FIELD PARAMETERS:

Dissolved Oxygen	<u>6.40</u>	mg/L	Flow (in gpm)	<u>3.9</u>	GPM	Oxidation-Reduction Potential	<u>154.6</u>	mV
pH	<u>4.15</u>	SU	Specific Conductance	<u>122.7</u>	uS/cm	Temperature	<u>20.3</u>	deg C
Turbidity	<u>0.11</u>	NTU						

COLLECTED BY (PRINT): *T. Bankham*

RELINQUISHED BY (Printed Name) (Signature)	<i>Tanner Bankham</i>	Date/Time 4/4/17 1335	RECEIVED BY (Printed Name) (Signature)	<i>S. Sherwood</i>	Date/Time 4/4/17 1335
RELINQUISHED BY (Printed Name) (Signature)		Date/Time	RECEIVED BY (Printed Name) (Signature)		Date/Time

Report Date: 03/27/2017

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11162

EVENT NAME: Pajarito (TA-54) MY2017 Q3

SAMPLE ID: CAPA-17-130731

WORK ORDER:

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	04-04-2017	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	11:40		MEDIA:	UA	
PRS ID:	NA		SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-57 S1		FIELD PREP:	UF	
LOCATION TYPE:	NA		FIELD QC TYPE:	REG	
TOP DEPTH:			SAMPLE USAGE:	INV	
BOTTOM DEPTH:			EXCAVATED:		YES / NO / NA

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
NA	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	2	HCL	Y	NA
1	WSP-LL-H-3	1 LITER POLY	1	NONE	1	1

SAMPLE COMMENTS:

Sample 2 ≈ 50' from running diesel generator.

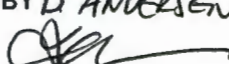
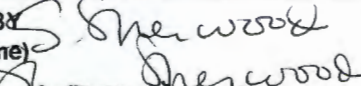
LOCATION COMMENTS:

None

FIELD PARAMETERS:

Dissolved Oxygen	5.65	mg/L	Flow (in gpm)	3.61	GPM	Oxidation-Reduction Potential	137.2	mV
pH	7.99	SU	Specific Conductance	138.7	uS/cm	Temperature	21.4	deg C
Turbidity	0.52	NTU						

COLLECTED BY (PRINT): D. Anderson, A. Vigil, A. Stanfield

RELINQUISHED BY (Printed Name) (Signature)	D. ANDERSON 	Date/Time 4-4-17 1332	RECEIVED BY (Printed Name) (Signature)	S. Sherwood 	Date/Time 4/4/17 1332
RELINQUISHED BY (Printed Name) (Signature)		Date/Time	RECEIVED BY (Printed Name) (Signature)		Date/Time

Report Date: 03/27/2017

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11162

EVENT NAME: Pajarito (TA-54) MY2017 Q3

SAMPLE ID: CAPA-17-130732

WORK ORDER:

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	04-04-2017	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	12:50		MEDIA:	UA	
PRS ID:	NA		SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-57 S2		FIELD PREP:	UF	
LOCATION TYPE:	NA		FIELD QC TYPE:	REG	
TOP DEPTH:			SAMPLE USAGE:	INV	
BOTTOM DEPTH:			EXCAVATED:		YES / NO / <input checked="" type="radio"/> NA

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
NA	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	2	HCL	Y	NA
1	WSP-LL-H-3	1 LITER POLY	1	NONE	1	1

SAMPLE COMMENTS:

light snow during sampling; sampled ~50' from running diesel generator

LOCATION COMMENTS:

None

FIELD PARAMETERS:

Dissolved Oxygen	5.87	mg/L	Flow (in gpm)	3.49	GPM	Oxidation-Reduction Potential	19.6	mV
pH	8.02	SU	Specific Conductance	134.6	uS/cm	Temperature	24.1	deg C
Turbidity	0.78	NTU						

COLLECTED BY (PRINT): A. Stanfield, A. Vigil, D. Anderson

RELINQUISHED BY (Printed Name) (Signature)	Date/Time 4-4-17 1332	RECEIVED BY (Printed Name) (Signature)	Date/Time 4/4/17 1332
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 03/27/2017

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11162

EVENT NAME: Pajarito (TA-54) MY2017 Q3

SAMPLE ID: CAPA-17-130759

WORK ORDER:

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	04/05/2017	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	1333		MEDIA:	UA	
PRS ID:	NA		SAMPLE TECH CODE:	RSP	
LOCATION ID:	R-23i S2		FIELD PREP:	UF	
LOCATION TYPE:	NA		FIELD QC TYPE:	FD	
TOP DEPTH:			SAMPLE USAGE:	QC	
BOTTOM DEPTH:			EXCAVATED:		YES / NO / <u>NA</u>

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
NA ↓	WSP-8260B- VOA	40 ML SEPTUM AMBER GLASS	2	HCL	Y ↓	NA ↓
	WSP-LL-H-3	1 LITER POLY	1	NONE		

SAMPLE COMMENTS:

LOCATION COMMENTS:

FIELD PARAMETERS:

NA 4-5-17

Dissolved Oxygen	_____	mg/L	Flow (in gpm)	_____	OPM	Oxidation-Reduction Potential	_____	mV
pH	_____	SI	Specific Conductance	_____	uS/cm	Temperature	_____	deg C
Turbidity	_____	NTU						

COLLECTED BY (PRINT): D. JARAMILLO, A. STANFIELD

RELINQUISHED BY (Printed Name) <i>Allyson Stanfield</i> (Signature) <i>[Signature]</i>	Date/Time 4/5/17 1415	RECEIVED BY <i>S. Greenwood</i> (Printed Name) <i>[Signature]</i> (Signature) <i>[Signature]</i>	Date/Time 4/5/17 1415
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 03/27/2017

DATA VALIDATION REPORT

Chain Of Custody No. 2017-1321

1. Distribution Of Samples In EDD.

SDG	Analytical Method	Regular Samples	Field Duplicates	Trip Blanks	Field Blanks	Equipment Blanks
ARS1-17-00921	Generic:Low_Level_Tritium	4				
ARS1-17-00921	Generic:Low_Level_Tritium	1	1			

SDG	Analytical Method	Analysis Lot ID	Prep Lot ID	Regular Samples	Field Duplicates	Trip Blanks	Field Blanks	Equipment Blanks	Method Blanks	Matrix Spikes	Matrix Spike Dups	Analytical Spikes	Post-Digestion Spikes	Lab Control Samples	Lab Control Sample Dups	Blank Spike	Blank Spike Dups	Lab Duplicates	Storage Blanks	Preparation Blanks	Reagent Blanks
ARS1-17-00921	Generic:Low_Level_Tritium	ARS1-B17-	ARS1-B17-	5	1				1					1	1						

2. Distribution Of Analytes In EDD.

Analytical Method	Analytical Method Category	Field Sample ID	Lab Sample ID	Sample Purpose	Target Analytes	Surrogates	Spiked Compounds	TICS
Generic:Low_Level_Tritium	RAD	CAPA-17-130709	ARS1-B17-00871-04	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAPA-17-130723	ARS1-B17-00871-06	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAPA-17-130724	ARS1-B17-00871-07	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAPA-17-130731	ARS1-B17-00871-08	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAPA-17-130732	ARS1-B17-00871-09	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAPA-17-130759	ARS1-B17-00871-05	FD	1	0	0	0
Generic:Low_Level_Tritium	RAD	LCS	ARS1-B17-00871-01	LCS	0	0	1	0
Generic:Low_Level_Tritium	RAD	LCSD	ARS1-B17-00871-02	LCSD	0	0	1	0
Generic:Low_Level_Tritium	RAD	MB	ARS1-B17-00871-03	MB	1	0	0	0

3. Are any analytes missing?

No.

4. Were any holding times exceeded?

No.

DATA VALIDATION REPORT

5. Any 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.

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

LCS Lab Sample	LCSD Lab	Analytical Method	Parameter Name	Lab Lot ID	Analysis	Sample Matrix	LCS Spike Recovery	LCSD Spike Recovery	Upper Limit	Lower Limit	Upper Rejection Limit	Lower Rejection Limit	RPD	RPD Limit
ARS1-B17-00871-01	ARS1-B17-00871-02	Generic:Low_Level_Tritium	Tritium	ARS1-B17-00871	05-26-2017	W	72.000	72.000	120.00	80.000		10	4.3963	

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.

13. Display Flagged Data.

Location ID	COC Number	Field Sample ID	Sample Purpose	Analysis Type Code	Analytical Suite	Analytical Method	Parameter Name	Lab Qualifier	Validation Qualifier	Validation Reason Codes	Detect Flag	Lab Result	Lab Units	Report Result	Report Units	Report MDA	Report Uncertainty	Lab Matrix	Sample Date	Percent	Analysis Lot ID	Validation Status Code	Use Flag
R-23i S2	2017-1321	CAPA-17-130709	REG	INIT	RAD	Generic:Low_Level_Tritium	Tritium		J-	R12a	Y	13.863	pCi/L	13.863	pCi/L	2.041	2.241	W	04/05/2017		ARS1-B17-00871	VAL	Y
R-53 S1	2017-1321	CAPA-17-130723	REG	INIT	RAD	Generic:Low_Level_Tritium	Tritium	U	U	R5	N	0.417	pCi/L	0.417	pCi/L	2.084	0.624	W	04/04/2017		ARS1-B17-00871	VAL	Y
R-53 S2	2017-1321	CAPA-17-130724	REG	INIT	RAD	Generic:Low_Level_Tritium	Tritium	U	U	R5	N	-0.643	pCi/L	-0.643	pCi/L	2.218	0.646	W	04/04/2017		ARS1-B17-00871	VAL	Y
R-57 S1	2017-1321	CAPA-17-130731	REG	INIT	RAD	Generic:Low_Level_Tritium	Tritium	U	U	R5	N	-0.163	pCi/L	-0.163	pCi/L	2.285	0.669	W	04/04/2017		ARS1-B17-00871	VAL	Y
R-57 S2	2017-1321	CAPA-17-130732	REG	INIT	RAD	Generic:Low_Level_Tritium	Tritium	U	U	R5	N	0.865	pCi/L	0.865	pCi/L	2.394	0.733	W	04/04/2017		ARS1-B17-00871	VAL	Y
R-23i S2	2017-1321	CAPA-17-130759	FD	INIT	RAD	Generic:Low_Level_Tritium	Tritium		J-	R12a	Y	20.743	pCi/L	20.743	pCi/L	4.098	3.485	W	04/05/2017		ARS1-B17-00871	VAL	Y

Reason Code

Description

R12a

The LCS percent recovery was <the LAL but >10%. Follow the external laboratory limits located within the associated data package.

R5

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

14. Usable Result Count.

Field Sample ID	Location ID	Sample Purpose	Analytical Method	No. Unuseable Records	Total Records
CAPA-17-130709	R-23i S2	REG	Generic:Low_Level_Tritium	0	1
CAPA-17-130723	R-53 S1	REG	Generic:Low_Level_Tritium	0	1
CAPA-17-130724	R-53 S2	REG	Generic:Low_Level_Tritium	0	1
CAPA-17-130731	R-57 S1	REG	Generic:Low_Level_Tritium	0	1
CAPA-17-130732	R-57 S2	REG	Generic:Low_Level_Tritium	0	1
CAPA-17-130759	R-23i S2	FD	Generic:Low_Level_Tritium	0	1



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: 2017-1321



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: 2017-1321**

Original COC

[illegible]



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: 2017-1321**

Case Narrative



ARS International, LLC

Laboratory Analysis Report

ARS1-17-00921

Prepared for:

Los Alamos National Laboratory

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

kgreene@lanl.gov

**Phone: 505-665-9966
Fax: 505-665-9972**

Project Manager Review

Management Review

Notes: ARS International, LLC assumes no liability for the use or the 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 client.

Contact Person: Questions regarding this analytical report should be addressed to:

**Project Manager
ProjectManagers@amrad.com**

**Phone: 225.381.2991
Fax: 225.381.2996**





2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

June 27, 2017

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

LANL Request Number: **2017-1321**
ARS SDG: **ARS1-17-00921**
Project : **ADEP**

Dear Mr. Greene;

On April 7, 2017, ARS International received six (6) water samples to be analyzed for Low Level Tritium.

Samples 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.

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

Sincerely,

Susan Leese
Project Manager
ARS International



**PROJECT SAMPLE IDENTIFICATION
CROSS-REFERENCE
TO ARS SAMPLE LABORATORY IDs
Subcontract (LANL Agreement Number) 250953**

Request Number	LANL PROJECT SAMPLE ID NUMBER	American Radiation Services SAMPLE ID NUMBER(S)
2017-1321	CAPA-17-130709	ARS1-17-00921-001
2017-1321	CAPA-17-130759	ARS1-17-00921-002
2017-1321	CAPA-17-130723	ARS1-17-00921-003
2017-1321	CAPA-17-130724	ARS1-17-00921-004
2017-1321	CAPA-17-130731	ARS1-17-00921-005
2017-1321	CAPA-17-130732	ARS1-17-00921-006

SAMPLE RECEIPT

The samples were received in good condition and was screened for radioactive contamination as per procedure ARS-062 "Sample Receiving". Samples were checked in with a 40-day turnaround, per latest contract modification.

ANALYTICAL METHODS

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

ANALYTICAL RESULTS

The LCS and LCSD percent recoveries were slightly low at 72%.

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 are 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

06-29-17
Date

Notes (Case Narrative):

Comments:

- 1.0) All MDA/MDC values are calculated on a sample specific basis.
- 2.0) Soil and Sludge analysis are reported on a wet basis or an as received basis unless otherwise indicated.
- 3.0) Data in this report are within the limits of uncertainty specified in the reference method unless otherwise specified.
- 4.0) Modified analysis procedures are procedures that are modified to meet the certain specifications. An example may be the use of a water method to analyze a solid matrix due to the lack of an officially recognized procedure for the analysis of the solid matrix. Modified analyses are indicated by the subsequent addition of "m" to the procedure number (i.e. 900.0M).
- 5.0) Total activity is actually total gamma activity and is determined utilizing the prominent gamma emitters from the naturally occurring radioactive decay chains and other prominent radioactive nuclides. Total activity may be lower than the actual total activity due to the extent of secular equilibrium achieved in the various decay chains at the time of analysis. The total activity is not representative of nuclides that emit solely alpha or beta particles.
- 6.0) Ra-228 is determined via secular equilibrium with its daughter, Actinium 228 (Gamma Spectroscopy only).
- 7.0) U-238 is determined via secular equilibrium with its daughter, Thorium 234 (Gamma Spectroscopy only).
- 8.0) All gamma spectroscopy was performed utilizing high purity germanium detectors (HPGe).
- 9.0) ARS makes every attempt to match sample density to calibrated density; however, in some cases, it is not practical or possible to do so and data results may be affected (Gamma Spectroscopy only).
- 10.0) Gamma spectroscopy results are calculated values based on the ORTEC® GammaVision ENV32 Analysis Engine.
- 11.0) ACLASS DOD and ISO 17025 certification applies only to the following analytes and methods: Gross Alpha and Gross Beta (EPA 900, SM7110B&C, SW846 9310); Radium 226 (EPA 903, EPA 903.1, SM 7500 Ra-B, SW846 9315); Radium 228 (EPA 904, SM 7500 Ra-B SW846 9320); Iodine-131(EPA 901.1); Uranium by ICPMS (EPA 200.8); Strontium 89/90 (EPA 905, Eichrom SRW01, HASL 300 Sr-03-RC); Tritium (EPA 906, EPA 906M); Gamma Emitters (EPA 901.1, SM7120B, HASL 300 Ga-01-R); Americium-241, Curium 242/244, Plutonium 239/240 and 241, Thorium 228/230/232, Uranium 234/233 and 238 (Eichrom ACW03 VBS); Lead 210 (HASL 300 Pb-01-RC, Eichrom OTW01); Polonium 210 (HASL 300 Po-01-RC, HASL 300 Po-02-RC); Technetium-99 (Eichrom TCW02, Eichrom TCS01M).

Method References:

- 1.0) EPA 600/4-80-032; Prescribed Procedures for the Measurements of Radioactivity in Drinking Water, August 1980.
- 2.0) Standard Methods for the Examination of Water and Wastewater (On-Line Edition)
- 3.0) EPA SW-846; Test Methods for Evaluating Solid Waste, (On-Line edition)
- 4.0) EPA 600/4-79-020; Methods for Chemical Analysis of Water and Waste, March 1983.
- 5.0) HASL 300; The Procedures Manual of the Environmental Measurements Laboratory, Volume I, 28th Edition February, 1997.

Definitions:

CRDL	Contract Required Detection Limit
CSU	Combined Standard Uncertainty
DLC	Decision Level Concentration (ANSI N42.23) or critical level
DO	Duplicate Original
DUP	Method Duplicate
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
MDA	Minimum Detectable Activity
MDC	(Minimum Detectable Concentration) minimum concentration of the analyte that ARS can detect utilizing the specific analysis
MBL	Method Blank
MS/MSD	Matrix Spike/Matrix Spike Duplicate
N/A	Not Applicable
NP	Not Provided
NR	Not Referenced
LOD	Limit of Detection
LOQ	Limit of Quantitation

Data Qualifiers:

B	The analyte is found in both the associated method blank and the sample. This flag indicates probable blank contamination.
D	Sample analysis accomplished through dilution.
J	The reported result is an estimated value above the limit of detection but outside of quantitation range (e.g., matrix interference was observed).
Q	One or more quality control criteria failed (e.g., LCS recovery, surrogate spike recovery, or CCV recovery).
U	Activity is below the MDC, MDA, MDL, or LOD
N	The analyte is a tentatively identified compound using mass spectrometry or any non-customer requested compounds that are tentatively identified.
*	LCS/LCSD or MS/MSD fails RPD criteria.
S	Spike
SC	Subcontracted out to another qualified laboratory
H	Holding time exceeded

LELAP Cert# 01949

NELAP Cert# E87558

ARS-059-010

Revision: 9.1

Revision Date: 03-14-2017



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**



2609 North River Road, Port Allen, Louisiana 70767

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

ARS Sample Delivery Group: ARS1-17-00921

Client Sample ID: CAPA-17-130709

Sample Collection Date: 04/05/17

Sample Matrix: Aqueous

Percent Solids: N/A

Request or PO Number: 2017-1321

ARS Sample ID: ARS1-17-00921-001

Date Received: 04/07/17

Report Date: 06/27/17

Radiochemistry

Analysis Description	Analysis Results	CSU +/-1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	13.863	2.241	2.041	0.987	3.221		pCi/L	ARS-040	05/27/17 11:41	SWHITE	N/A

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 client.

LELAP Certificate# 01949



2609 North River Road, Port Allen, Louisiana 70767

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

ARS Sample Delivery Group: ARS1-17-00921

Client Sample ID: CAPA-17-130759

Sample Collection Date: 04/05/17

Sample Matrix: Aqueous

Percent Solids: N/A

Request or PO Number: 2017-1321

ARS Sample ID: ARS1-17-00921-002

Date Received: 04/07/17

Report Date: 06/27/17

Radiochemistry

Analysis Description	Analysis Results	CSU +/-1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	20.743	3.485	4.098	1.983	3.221		pCi/L	ARS-040	05/27/17 16:52	SWHITE	N/A

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 client.

LELAP Certificate# 01949



2609 North River Road, Port Allen, Louisiana 70767

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

ARS Sample Delivery Group: ARS1-17-00921

Client Sample ID: CAPA-17-130723

Sample Collection Date: 04/04/17

Sample Matrix: Aqueous

Percent Solids: N/A

Request or PO Number: 2017-1321

ARS Sample ID: ARS1-17-00921-003

Date Received: 04/07/17

Report Date: 06/27/17

Radiochemistry

Analysis Description	Analysis Results	CSU +/-1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	0.417	0.624	2.084	1.008	3.221	U	pCi/L	ARS-040	05/27/17 22:04	SWHITE	N/A

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 client.

LELAP Certificate# 01949



2609 North River Road, Port Allen, Louisiana 70767

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

ARS Sample Delivery Group: ARS1-17-00921

Client Sample ID: CAPA-17-130724

Sample Collection Date: 04/04/17

Sample Matrix: Aqueous

Percent Solids: N/A

Request or PO Number: 2017-1321

ARS Sample ID: ARS1-17-00921-004

Date Received: 04/07/17

Report Date: 06/27/17

Radiochemistry

Analysis Description	Analysis Results	CSU +/-1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	-0.643	0.646	2.218	1.073	3.221	U	pCi/L	ARS-040	05/28/17 3:16	SWHITE	N/A

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 client.

LELAP Certificate# 01949



2609 North River Road, Port Allen, Louisiana 70767

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

ARS Sample Delivery Group: ARS1-17-00921

Client Sample ID: CAPA-17-130731

Sample Collection Date: 04/04/17

Sample Matrix: Aqueous

Percent Solids: N/A

Request or PO Number: 2017-1321

ARS Sample ID: ARS1-17-00921-005

Date Received: 04/07/17

Report Date: 06/27/17

Radiochemistry

Analysis Description	Analysis Results	CSU +/-1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	-0.163	0.669	2.285	1.106	3.221	U	pCi/L	ARS-040	05/28/17 8:28	SWHITE	N/A

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 client.

LELAP Certificate# 01949



2609 North River Road, Port Allen, Louisiana 70767

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

ARS Sample Delivery Group: ARS1-17-00921

Client Sample ID: CAPA-17-130732

Sample Collection Date: 04/04/17

Sample Matrix: Aqueous

Percent Solids: N/A

Request or PO Number: 2017-1321

ARS Sample ID: ARS1-17-00921-006

Date Received: 04/07/17

Report Date: 06/27/17

Radiochemistry

Analysis Description	Analysis Results	CSU +/-1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	0.865	0.733	2.394	1.158	3.221	U	pCi/L	ARS-040	05/28/17 13:39	SWHITE	N/A

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 client.

LELAP Certificate# 01949



2609 North River Road, Port Allen, Louisiana 70767

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

QC Results ReportSample Delivery Group: ARS1-17-00921; 922;
923; 924**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-B17-00871	LCS	H3	24.943	3.874	2.103	34.700		pCi/L	ARS-040	5/26/17 17:35	ECAMP	72	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-B17-00871	MBL	H3	-0.460	0.514	1.762	NA	U	pCi/L	ARS-040	5/26/17 17:35	ECAMP

Sample RER Duplicate Evaluation

Analysis Batch	QC Type	Analysis Description	Result 1	CSU 1 (1s)	Result 2	CSU 2 (1s)	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	RER	RER Acceptance Range
ARS1-B17-00871	LCSD	H3	24.943	3.874	23.870	3.754		pCi/L	ARS-040	5/26/17 17:35	ECAMP	0.14	< 1

Sample DER Duplicate Evaluation

Analysis Batch	QC Type	Analysis Description	Result 1	CSU 1 (1s)	Result 2	CSU 2 (1s)	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	DER	DER Acceptance Range
ARS1-B17-00871	LCSD	H3	24.943	3.874	23.870	3.754		pCi/L	ARS-040	5/26/17 17:35	ECAMP	0.20	< 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



Duplicate Evaluation

Method: ARS-040

Uncertainty

Batch ID: ARS1-B17-00871

2 Sigma

SDG's: ARS1-17-00921; 922; 923; 924

Sample 1 ID	<div style="border: 1px solid black; padding: 2px;">24.9430</div>	CSU (2s)	<div style="border: 1px solid black; padding: 2px;">7.5930</div>	
Sample 2 ID	<div style="border: 1px solid black; padding: 2px;">23.8700</div>	CSU-D (2s)	<div style="border: 1px solid black; padding: 2px;">7.3580</div>	

DER =

$$\frac{\text{abs}(\text{LSC}-\text{LSCD})}{\text{sqr}((\text{Xs CSU})^2 + ((\text{Xs CSU}-\text{D})^2))} =$$

DER <3

DER=

$$\frac{1.073}{10.57326} =$$

0.101482 < 3

% RPD=

$$\frac{\text{ABS}(\text{LCS} - \text{LSCD})}{(\text{LCS} + \text{LSCD})/2} =$$

RPD <25%

%RPD=

$$\frac{1.073}{24.4065} =$$

4.39637 < 25%

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

RER=

$$\frac{\text{abs}((\text{LCS}-\text{LSCD}))}{(\text{Xs CSU}) + (\text{Xs CSD})} =$$

<1

RER =

$$\frac{1.073}{14.9510}$$

0.071768 <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	-0.46	1.007	1.762	
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

ACT =

-0.46

CSU =

1.007

Is ACT < 1.65*CSU?

YES

ARS-014-006

R0.1

04-25-2017

Printed on 5/31/2017 11:16 AM



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
Laboratory
Records**

Analysis Batch ID ARS1-B17-00871												
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	Prep Code	Client ID	Group Name	Lab Deadline	
ARS1-B17-00871-01	LCS											
ARS1-B17-00871-02	LCSD											
ARS1-B17-00871-03	MBL											
ARS1-B17-00871-04	TRG				ARS1-17-00921	001	1			CAPA-17-130709	05/14/17	
ARS1-B17-00871-05	TRG				ARS1-17-00921	002	1			CAPA-17-130759	05/14/17	
ARS1-B17-00871-06	TRG				ARS1-17-00921	003	1			CAPA-17-130723	05/14/17	
ARS1-B17-00871-07	TRG				ARS1-17-00921	004	1			CAPA-17-130724	05/14/17	
ARS1-B17-00871-08	TRG				ARS1-17-00921	005	1			CAPA-17-130731	05/14/17	
ARS1-B17-00871-09	TRG				ARS1-17-00921	006	1			CAPA-17-130732	05/14/17	
ARS1-B17-00871-10	TRG				ARS1-17-00922	001	1			CAMO-17-131758	05/14/17	
ARS1-B17-00871-11	TRG				ARS1-17-00923	001	1			CrEx-1-17-132311	05/14/17	
ARS1-B17-00871-12	TRG				ARS1-17-00924	001	1			CAPA-17-130707	05/14/17	
ARS1-B17-00871-13	TRG				ARS1-17-00924	002	1			CAPA-17-130710	05/14/17	

LCS Report

Analytical Batch: ARS1-B17-00871

Blind ID	Batch Sample ID	Blind Group	Std ID	Isotope	Exp Addition (g)	Expected Value (pCi/g)	Empty Wt (g)	Gross Wt (g)	Net Wt (g)	Expected Value CT (pCi/g)	Mid Point Count Date	Known Value (pCi)	User ID	Mod Date
B-23515	ARS1-B17-00871-01	B-H3	S-0318	H-3	5	2.64564	17.1663	22.1648	4.9985	2.62817	05/26/2017	13.13692	ECAMP	04/13/2017
B-23516	ARS1-B17-00871-02	B-H3	S-0318	H-3	5	2.64564	17.0637	22.081	5.0173	2.62817	05/26/2017	13.18633	ECAMP	04/13/2017

5.835 dpm/g
5/26/17 @ 17:35



Standards Activity as of: 05/26/17 17:35

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	Expend Date
A	S-0318	H-3	SL	10/24/16	10/24/17	OK	10/24/16	6.0301E+00	5.8345	4.500E+03	S-0316	



Expected Value Calculations

LCS		LCS D	
ARS Batch Number:	ARS1-B17-00871		
Enter these Values	CALCULATED EXPECTED VALUE(pCi/L)	34.700	Range 26.025 - 43.375
	Current ACT(DPM)	5.8345	Standards Report generated for Analysis Date LCS Report Procedural Data Report
	NetWt(grams)	4.9985	
	Alliquot	0.3786	
LCS D		LCS D	
Enter these Values	CALCULATED EXPECTED VALUE	33.330	Range 24.997 - 41.662
	Current ACT(DPM)	5.8345	Standards Report generated for Analysis Date LCS Report Procedural Data Report
	NetWt(grams)	5.0173	
	Alliquot	0.3956	

$$\frac{24.943}{34.7} = 72\%$$

$$\frac{23.89}{33.33} = 72\%$$



LSC Instrument Data Transfer Report

\\PACKARD3170_NEW\Barrab\ARS\Low Level Tritium

Batch Sample ID: ARS1-B17-00871

Non-BKG Samples Transferred: 13

Samples Eligible To Save: 13

LIMS Batch Sample ID	LSC Pk	LSC PTD	LSC SWPL ID	LSC Count Data	LSC CPHA	LSC SFE	LSC EFF	LSC Count Dur	Analysis Batch	LIMS SDC	LIMS Run
BKG	48										
ARS1-B17-00871-01	48		1	05/26/17 12:23	1.01	192.53	23.8900	300.00	ARS1-B17-00871		
ARS1-B17-00871-02	48		2	05/26/17 17:35	4.33	201.88	24.7100	300.00	ARS1-B17-00871		
ARS1-B17-00871-03	48		3	05/26/17 22:47	3.65	151.02	19.7100	300.00	ARS1-B17-00871		
ARS1-B17-00871-04	48		4	05/27/17 03:58	0.94	226.40	26.7900	300.00	ARS1-B17-00871		
ARS1-B17-00871-05	48		5	05/27/17 09:10	2.91	194.54	24.0700	300.00	ARS1-B17-00871	ARS1-17-00921	1
ARS1-B17-00871-06	48		6	05/27/17 14:22	2.43	153.14	19.9400	300.00	ARS1-B17-00871	ARS1-17-00921	1
ARS1-B17-00871-07	48		7	05/27/17 19:34	1.07	283.08	31.4000	300.00	ARS1-B17-00871	ARS1-17-00921	1
ARS1-B17-00871-08	48		8	05/28/17 00:45	0.93	201.55	24.6800	300.00	ARS1-B17-00871	ARS1-17-00921	1
ARS1-B17-00871-09	48		9	05/28/17 05:57	0.99	191.52	23.8100	300.00	ARS1-B17-00871	ARS1-17-00921	1
ARS1-B17-00871-10	48		10	05/28/17 11:09	1.12	205.96	25.0700	300.00	ARS1-B17-00871	ARS1-17-00921	1
ARS1-B17-00871-11	48		11	05/28/17 16:21	1.04	198.81	24.5300	300.00	ARS1-B17-00871	ARS1-17-00922	1
ARS1-B17-00871-12	48		12	05/28/17 21:32	5.45	206.45	25.1100	300.00	ARS1-B17-00871	ARS1-17-00923	1
ARS1-B17-00871-13	48		13	05/29/17 02:44	1.00	187.60	23.4600	300.00	ARS1-B17-00871	ARS1-17-00924	1
ARS1-B17-00871-14	48		14	05/29/17 07:56	4.87	255.54	29.1700	300.00	ARS1-B17-00871	ARS1-17-00924	1

ARS-040 Calculation Results

ARS1-B17-00871

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-B17-00871-01	300.000	0.96757	24.943	1.004	1.004	3.874	1.968	7.593	2.103	1.017	PCI
LSC-A-022	ARS1-B17-00871-02	300.000	0.96743	23.870	1.128	1.128	3.754	2.211	7.358	2.528	1.223	PCI
LSC-A-022	ARS1-B17-00871-03	300.000	0.99708	-0.460	0.509	0.509	0.514	0.998	1.007	1.762	0.853	PCI
LSC-A-022	ARS1-B17-00871-04	300.000	0.99202	13.863	0.835	0.835	2.241	1.637	4.392	2.041	0.987	PCI
LSC-A-022	ARS1-B17-00871-05	300.000	0.99202	20.743	1.570	1.570	3.485	3.078	6.831	4.098	1.983	PCI
LSC-A-022	ARS1-B17-00871-06	300.000	0.99172	0.417	0.621	0.621	0.624	1.218	1.224	2.084	1.008	PCI
LSC-A-022	ARS1-B17-00871-07	300.000	0.99172	-0.643	0.639	0.639	0.646	1.253	1.267	2.218	1.073	PCI
LSC-A-022	ARS1-B17-00871-08	300.000	0.99172	-0.163	0.669	0.669	0.669	1.311	1.312	2.285	1.106	PCI
LSC-A-022	ARS1-B17-00871-09	300.000	0.99172	0.865	0.721	0.721	0.733	1.414	1.437	2.394	1.158	PCI
LSC-A-022	ARS1-B17-00871-10	300.000	0.99095	0.315	0.869	0.869	0.870	1.703	1.706	2.933	1.419	PCI
LSC-A-022	ARS1-B17-00871-11	300.000	0.99172	43.227	1.430	1.430	6.640	2.804	13.014	2.724	1.318	PCI
LSC-A-022	ARS1-B17-00871-12	300.000	0.99187	-0.101	0.688	0.688	0.688	1.348	1.348	2.345	1.135	PCI
LSC-A-022	ARS1-B17-00871-13	300.000	0.99187	27.850	1.012	1.012	4.298	1.984	8.425	2.022	0.978	PCI

ARS-040 Calculation Results			
ARS1-B17-00871			
ACF	1		
UCF	2.22		
Sys Error	0.15		

AnalysisCode	ABatchSampleID	Initial_Mass_sample_g	Mass_Na2O2_added_g	Final_mass_electrolyzed_sample_NaOH_g	Mass_equivalent_NaOH_g	Final_Mass_Electrolyzed_sample_g	VolumeFactor_X	Enrichment_Factor_Y
LSC-A-022	ARS1-B17-00871-01	378.580	1.500	14.920	1.539	13.381	0.035	22.304
LSC-A-022	ARS1-B17-00871-02	395.630	1.500	19.130	1.539	17.591	0.044	17.889
LSC-A-022	ARS1-B17-00871-03	372.250	1.500	11.480	1.539	9.941	0.027	29.200
LSC-A-022	ARS1-B17-00871-04	385.710	1.500	15.360	1.539	13.821	0.036	22.012
LSC-A-022	ARS1-B17-00871-05	388.890	1.500	28.420	1.539	26.881	0.069	11.706
LSC-A-022	ARS1-B17-00871-06	354.000	1.500	9.730	1.539	8.191	0.023	33.513
LSC-A-022	ARS1-B17-00871-07	375.820	1.500	15.580	1.539	14.041	0.037	21.146
LSC-A-022	ARS1-B17-00871-08	374.670	1.500	15.860	1.539	14.321	0.038	20.687
LSC-A-022	ARS1-B17-00871-09	377.930	1.500	16.490	1.539	14.951	0.040	20.015
LSC-A-022	ARS1-B17-00871-10	388.240	1.500	20.160	1.539	18.621	0.048	16.633
LSC-A-022	ARS1-B17-00871-11	395.600	1.500	19.240	1.539	17.701	0.045	17.781
LSC-A-022	ARS1-B17-00871-12	387.800	1.500	17.630	1.539	16.091	0.041	19.118
LSC-A-022	ARS1-B17-00871-13	367.660	1.500	10.980	1.539	9.441	0.026	30.321

ARS-040 Calculation Results

ARS1-B17-00871

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-B17-00871-01	4.330	1.014	201.880	0.247	0.01123	L	10/24/2016	5/26/2017		300.000
LSC-A-022	ARS1-B17-00871-02	3.653	1.014	151.020	0.197	0.01460	L	10/24/2016	5/26/2017		300.000
LSC-A-022	ARS1-B17-00871-03	0.941	1.014	226.400	0.268	0.00916	L	5/8/2017	5/27/2017		300.000
LSC-A-022	ARS1-B17-00871-04	2.913	1.014	194.540	0.241	0.01174	L	4/5/2017	5/27/2017		300.000
LSC-A-022	ARS1-B17-00871-05	2.429	1.014	153.140	0.199	0.01327	L	4/5/2017	5/27/2017		300.000
LSC-A-022	ARS1-B17-00871-06	1.070	1.014	283.080	0.314	0.00579	L	4/4/2017	5/27/2017		300.000
LSC-A-022	ARS1-B17-00871-07	0.933	1.014	201.550	0.247	0.01097	L	4/4/2017	5/28/2017		300.000
LSC-A-022	ARS1-B17-00871-08	0.994	1.014	191.520	0.238	0.01128	L	4/4/2017	5/28/2017		300.000
LSC-A-022	ARS1-B17-00871-09	1.115	1.014	205.960	0.251	0.01057	L	4/4/2017	5/28/2017		300.000
LSC-A-022	ARS1-B17-00871-10	1.044	1.014	199.810	0.245	0.01062	L	3/30/2017	5/28/2017		300.000
LSC-A-022	ARS1-B17-00871-11	5.450	1.014	206.450	0.251	0.01044	L	4/5/2017	5/28/2017		300.000
LSC-A-022	ARS1-B17-00871-12	1.002	1.014	187.600	0.235	0.01207	L	4/6/2017	5/29/2017		300.000
LSC-A-022	ARS1-B17-00871-13	4.865	1.014	255.540	0.292	0.00710	L	4/6/2017	5/29/2017		300.000

ARS-040 Calculation Results

ARS1-B17-00871

ACF	1
UCF	2.22
Sys Error	0.15

AnalysisCode	ABatchSampleID	AliquotReportUnits	UserID	ModDate
LSC-A-022	ARS1-B17-00871-01	L	AMRAD\SWHITE	5/30/2017
LSC-A-022	ARS1-B17-00871-02	L	AMRAD\SWHITE	5/30/2017
LSC-A-022	ARS1-B17-00871-03	L	AMRAD\SWHITE	5/30/2017
LSC-A-022	ARS1-B17-00871-04	L	AMRAD\SWHITE	5/30/2017
LSC-A-022	ARS1-B17-00871-05	L	AMRAD\SWHITE	5/30/2017
LSC-A-022	ARS1-B17-00871-06	L	AMRAD\SWHITE	5/30/2017
LSC-A-022	ARS1-B17-00871-07	L	AMRAD\SWHITE	5/30/2017
LSC-A-022	ARS1-B17-00871-08	L	AMRAD\SWHITE	5/30/2017
LSC-A-022	ARS1-B17-00871-09	L	AMRAD\SWHITE	5/30/2017
LSC-A-022	ARS1-B17-00871-10	L	AMRAD\SWHITE	5/30/2017
LSC-A-022	ARS1-B17-00871-11	L	AMRAD\SWHITE	5/30/2017
LSC-A-022	ARS1-B17-00871-12	L	AMRAD\SWHITE	5/30/2017
LSC-A-022	ARS1-B17-00871-13	L	AMRAD\SWHITE	5/30/2017

Procedure Data

ABatch Sample ID	Client ID	Parent	Tare Wt of Electrolysis Cell & Electrodes	Tare Wt Reservoir	Gross Weight of Sample Reservoir	Wt Sodium Peroxide	Gross Sample Added	Electrolysis Start Date & Time	Start AMP	Start Bath (C)	Electrolysis End Date/Time
ARS1-B17-00871-01			318.1600	210.6400	589.2200	1.5000	378.5800	5/10/2017 11:05:00 AM	5.0000	2.0000	5/24/2017 1:35:00 PM
ARS1-B17-00871-02			312.7600	216.6900	612.3200	1.5000	395.6300	5/10/2017 11:15:00 AM	5.0000	2.0000	5/23/2017 2:10:00 PM
ARS1-B17-00871-03			315.8100	217.4700	589.7200	1.5000	372.2500	5/10/2017 11:20:00 AM	5.0000	2.0000	5/24/2017 4:20:00 PM
ARS1-B17-00871-04	CAPA-17-130709		325.8300	261.8900	647.6000	1.5000	385.7100	5/8/2017 4:00:00 PM	5.0000	2.0000	5/19/2017 12:10:00 PM
ARS1-B17-00871-05	CAPA-17-130759		326.7500	225.5400	614.4300	1.5000	388.8900	5/8/2017 4:05:00 PM	5.0000	2.0000	5/26/2017 11:30:00 AM
ARS1-B17-00871-06	CAPA-17-130723		321.5900	201.5800	555.5800	1.5000	354.0000	5/8/2017 4:10:00 PM	5.0000	2.0000	5/22/2017 2:45:00 PM
ARS1-B17-00871-07	CAPA-17-130724		318.2700	210.1000	585.9200	1.5000	375.8200	5/8/2017 4:15:00 PM	5.0000	2.0000	5/22/2017 2:55:00 PM
ARS1-B17-00871-08	CAPA-17-130731		315.4700	196.2700	570.9400	1.5000	374.6700	5/8/2017 4:20:00 PM	5.0000	2.0000	5/22/2017 1:25:00 PM
ARS1-B17-00871-09	CAPA-17-130732		312.5100	208.5700	586.5000	1.5000	377.9300	5/8/2017 4:25:00 PM	5.0000	2.0000	5/23/2017 8:05:00 AM
ARS1-B17-00871-10	CAMO-17-131758		314.8500	221.1900	609.4300	1.5000	388.2400	5/8/2017 4:45:00 PM	5.0000	2.0000	5/24/2017 11:25:00 AM
ARS1-B17-00871-11	CrEx-1-17-132311		318.3400	222.8800	618.4800	1.5000	395.6000	5/8/2017 4:50:00 PM	5.0000	2.0000	5/24/2017 1:00:00 PM
ARS1-B17-00871-12	CAPA-17-130707		315.7400	255.0900	642.8900	1.5000	387.8000	5/8/2017 4:55:00 PM	5.0000	2.0000	5/24/2017 1:50:00 PM
ARS1-B17-00871-13	CAPA-17-130710		313.6200	222.7800	590.4400	1.5000	367.6600	5/8/2017 5:00:00 PM	5.0000	2.0000	5/25/2017 1:20:00 PM

Procedure Data

ABatch Sample ID	Client ID	End Bath (C)	End Wt of Cell + Resv + Sample	Gross Sample Recovered	Enrichment Factor	Tare Wt Cryo- distill flask	Gross Wt flask + Sample	Recovered Water	Tare Weight of LSC Vial	Vial + Sample	Net Sample
ARS1-B17-00871-01		2.0000	543.7200	14.9200	25.3740	116.2100	130.8600	14.6500	6.5100	17.7400	11.2300
ARS1-B17-00871-02		2.0000	548.5800	19.1300	20.6811	118.4100	133.2800	14.8700	6.6100	21.2100	14.6000
ARS1-B17-00871-03		2.0000	544.7600	11.4800	32.4260	111.6900	121.0200	9.3300	6.6000	15.7600	9.1600
ARS1-B17-00871-04	CAPA-17-130709	2.0000	603.0800	15.3600	25.1113	92.6700	104.5200	11.8500	6.6000	18.3400	11.7400
ARS1-B17-00871-05	CAPA-17-130759	2.0000	580.7100	28.4200	13.6837	123.9500	137.3300	13.3800	6.5700	19.8400	13.2700
ARS1-B17-00871-06	CAPA-17-130723	2.0000	532.9000	9.7300	36.3823	118.4200	124.6000	6.1800	6.5100	12.3000	5.7900
ARS1-B17-00871-07	CAPA-17-130724	2.0000	543.9500	15.5800	24.1220	109.3900	120.5300	11.1400	6.6600	17.6300	10.9700
ARS1-B17-00871-08	CAPA-17-130731	2.0000	527.6000	15.8600	23.6236	123.1400	134.6100	11.4700	6.4900	17.7700	11.2800
ARS1-B17-00871-09	CAPA-17-130732	2.0000	537.5700	16.4900	22.9187	103.3200	113.9700	10.6500	6.5500	17.1200	10.5700
ARS1-B17-00871-10	CAMO-17-131758	2.0000	556.2000	20.1600	19.2579	111.6900	125.7000	14.0100	6.6200	17.2400	10.6200
ARS1-B17-00871-11	CFEX-1-17-132311	2.0000	560.4600	19.2400	20.5613	123.1500	137.2500	14.1000	6.6300	17.0700	10.4400
ARS1-B17-00871-12	CAPA-17-130707	2.0000	588.4600	17.6300	21.9966	96.0500	108.4300	12.3800	6.4800	18.5500	12.0700
ARS1-B17-00871-13	CAPA-17-130710	2.0000	547.3800	10.9800	33.4845	120.5600	127.9200	7.3600	6.5000	13.6000	7.1000

Procedure Data							
ABatch Sample ID	Client ID	Gross Wt Vial + Dead Water If used	Net Dead Water Added	Tare Wt b/f Cocktail	Gross Wt Vial + Cocktail	Net Wt of Cocktail Added	User ID
ARS1-B17-00871-01		17.7400	0.0000	17.7400	27.7600	10.0200	SWHITE
ARS1-B17-00871-02		21.2100	0.0000	21.2100	31.2400	10.0300	SWHITE
ARS1-B17-00871-03		15.7600	0.0000	15.7600	25.7500	9.9900	SWHITE
ARS1-B17-00871-04	CAPA-17-130709	18.3400	0.0000	18.3400	28.3100	9.9700	SWHITE
ARS1-B17-00871-05	CAPA-17-130759	19.8400	0.0000	19.8400	29.7900	9.9500	SWHITE
ARS1-B17-00871-06	CAPA-17-130723	12.3000	0.0000	12.3000	22.1200	9.8200	SWHITE
ARS1-B17-00871-07	CAPA-17-130724	17.6300	0.0000	17.6300	27.6900	10.0600	SWHITE
ARS1-B17-00871-08	CAPA-17-130731	17.7700	0.0000	17.7700	27.7800	10.0100	SWHITE
ARS1-B17-00871-09	CAPA-17-130732	17.1200	0.0000	17.1200	27.1500	10.0300	SWHITE
ARS1-B17-00871-10	CAMO-17-131758	17.2400	0.0000	17.2400	27.3000	10.0600	SWHITE
ARS1-B17-00871-11	CrEx-1-17-132311	17.0700	0.0000	17.0700	27.1200	10.0500	SWHITE
ARS1-B17-00871-12	CAPA-17-130707	18.5500	0.0000	18.5500	28.5700	10.0200	SWHITE
ARS1-B17-00871-13	CAPA-17-130710	13.6000	0.0000	13.6000	23.7400	10.1400	SWHITE

ARS-040

ARS International
Baton Rouge Laboratory

Reagent Amounts				
Batch Sample ID	Client ID	14.2.12 DISTILLAT - Ionize & add O to electrolysis - Sodium Peroxide (granular) Reagent Grade (g)	14.3.22 DISTILLATION - Add scint cocktail - Ultima Gold LIT Reagent Grade (mL)	User ID
ARS1-B17-00871-01		1.50	10.00	SWHITE
ARS1-B17-00871-02		1.50	10.00	SWHITE
ARS1-B17-00871-03		1.50	10.00	SWHITE
ARS1-B17-00871-04	CAPA-17-130709	1.50	10.00	SWHITE
ARS1-B17-00871-05	CAPA-17-130759	1.50	10.00	SWHITE
ARS1-B17-00871-06	CAPA-17-130723	1.50	10.00	SWHITE
ARS1-B17-00871-07	CAPA-17-130724	1.50	10.00	SWHITE
ARS1-B17-00871-08	CAPA-17-130731	1.50	10.00	SWHITE
ARS1-B17-00871-09	CAPA-17-130732	1.50	10.00	SWHITE
ARS1-B17-00871-10	CAMO-17-131758	1.50	10.00	SWHITE
ARS1-B17-00871-11	CREX-17-132311	1.50	10.00	SWHITE
ARS1-B17-00871-12	CAPA-17-130707	1.50	10.00	SWHITE
ARS1-B17-00871-13	CAPA-17-130710	1.50	10.00	SWHITE

Reagent Tracking	
Procedure Section	Reagent ID
14.2.12 DISTILLAT - Ionize & add O to electrolysis	R16-00810
14.3.22 DISTILLATION - Add scint cocktail	R17-00037

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 3\20170526_1214

Raw Results Path: C:\Packard\Tricarb\Results\ARS\Low Low Level Tritium 3\20170526_1214\20170526_1214.results

RTF File Name: C:\Packard\Tricarb\Results\ARS\Low Low Level Tritium 3\20170526_1214\Report1.rtf

Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\Low Low Level Tritium 3\20170526_1214\LLH3 Results.csv

Assay File Name: C:\Packard\Tricarb\Assays\Low Low Level Tritium 3.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): 300.00

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

Luminescence Correction: Off

Colored Samples: Off

Heterogeneity Monitor: Off

Coincidence Time (nsec): 18

Delay Before Burst (nsec): 200

Half Life-

Half Life Correction: Off

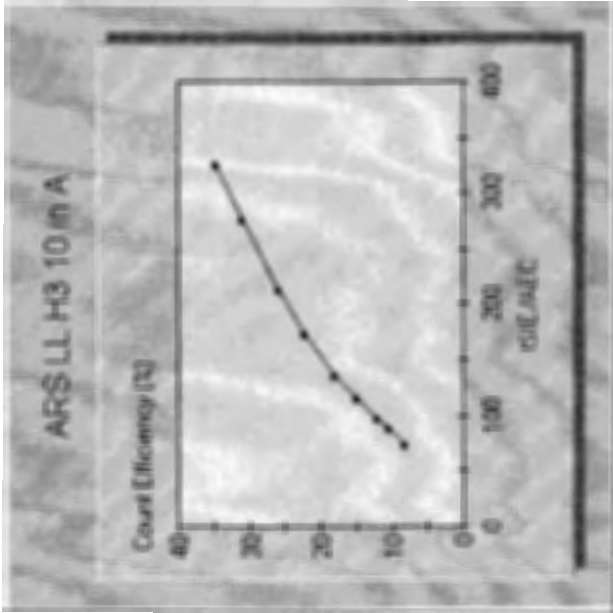
Regions Half Life

Units Reference Date

Reference Time

A
B
C

Cycle 1 Results
Quench Curve Block Data



Date Acquired: 10/29/2014
Date Modified:
ARS LL H3 10 in A

tSIE/AEC	Count Efficiency (%)
326.10	34.75
276.09	30.85
214.12	25.79
173.96	22.27
135.91	18.02
115.60	15.00
98.47	12.21
88.00	10.55
74.82	8.24

Protocol# 48 - Low Low Level Tritium 3.lsa

User: ARS

P#	S#	SMPL_ID	CPMA	DPM1	tSIE	Eff	Nucl	In A	Count	Time	DATE	TIME	MESSAGES
48	1	BACKGROUN	1.014	4.242	192.53			23.89	300.00		5/26/2017	12:23:42 PM	
48	2	B17-00871-01	4.330	17.519	201.88			24.71	300.00		5/26/2017	5:35:29 PM	
48	3	B17-00871-02	3.653	18.537	151.02			19.71	300.00		5/26/2017	10:47:13 PM	
48	4	B17-00871-03	0.941	3.511	226.40			26.79	300.00		5/27/2017	3:58:56 AM	
48	5	B17-00871-04	2.913	12.104	194.54			24.07	300.00		5/27/2017	9:10:39 AM	
48	6	B17-00871-05	2.429	12.180	153.14			19.94	300.00		5/27/2017	2:22:23 PM	
48	7	B17-00871-06	1.070	3.409	283.08			31.40	300.00		5/27/2017	7:34:06 PM	
48	8	B17-00871-07	0.933	3.781	201.55			24.68	300.00		5/28/2017	12:45:51 AM	
48	9	B17-00871-08	0.994	4.177	191.52			23.81	300.00		5/28/2017	5:57:35 AM	
48	10	B17-00871-09	1.115	4.448	205.96			25.07	300.00		5/28/2017	11:09:17 AM	
48	11	B17-00871-10	1.044	4.256	199.81			24.53	300.00		5/28/2017	4:21:01 PM	
48	12	B17-00871-11	5.450	21.699	206.45			25.11	300.00		5/28/2017	9:32:43 PM	
48	13	B17-00871-12	1.002	4.270	187.60			23.46	300.00		5/29/2017	2:44:34 AM	
48	14	B17-00871-13	4.865	16.678	255.54			29.17	300.00		5/29/2017	7:56:15 AM	

Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
5-26-17	1045	5-26-17 EC B17-00871-01	B17-00871	1214	EC
		-02			EC
		-03			EC
		-04			EC
		-05			EC
		-06			EC
		-07			EC
		-08			EC
		-09			EC
		-10			EC
		-11			EC
		-12			EC
		-13			
5-26-17	1236	SNC5	QA	QA	JS
5-30-17 SW					



2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

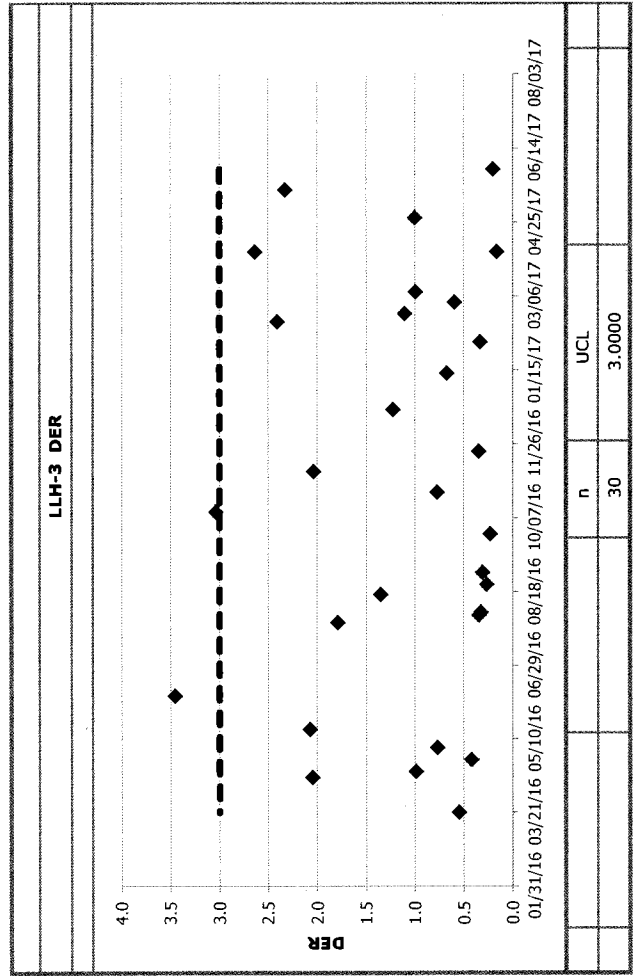
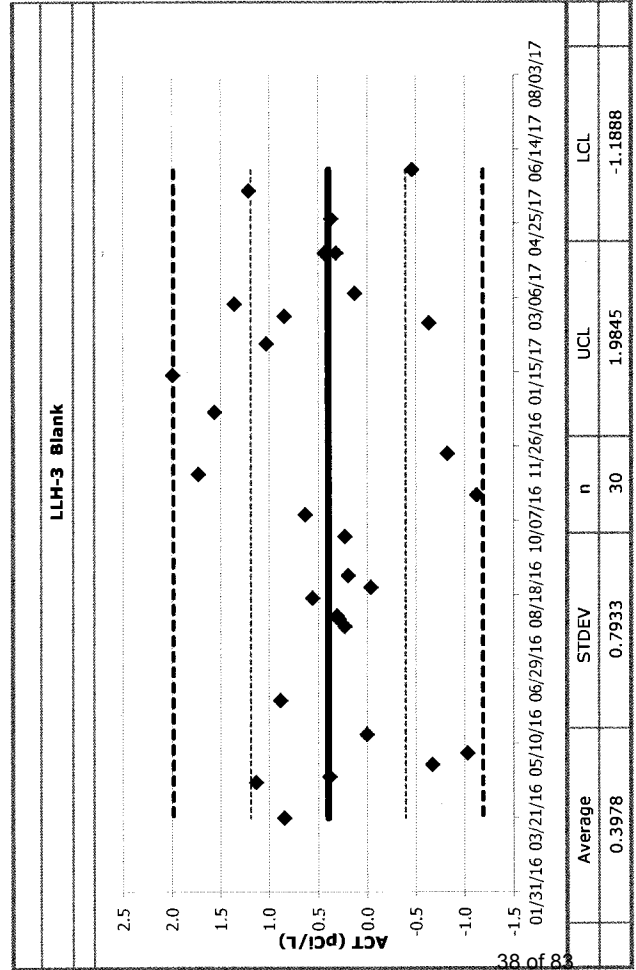
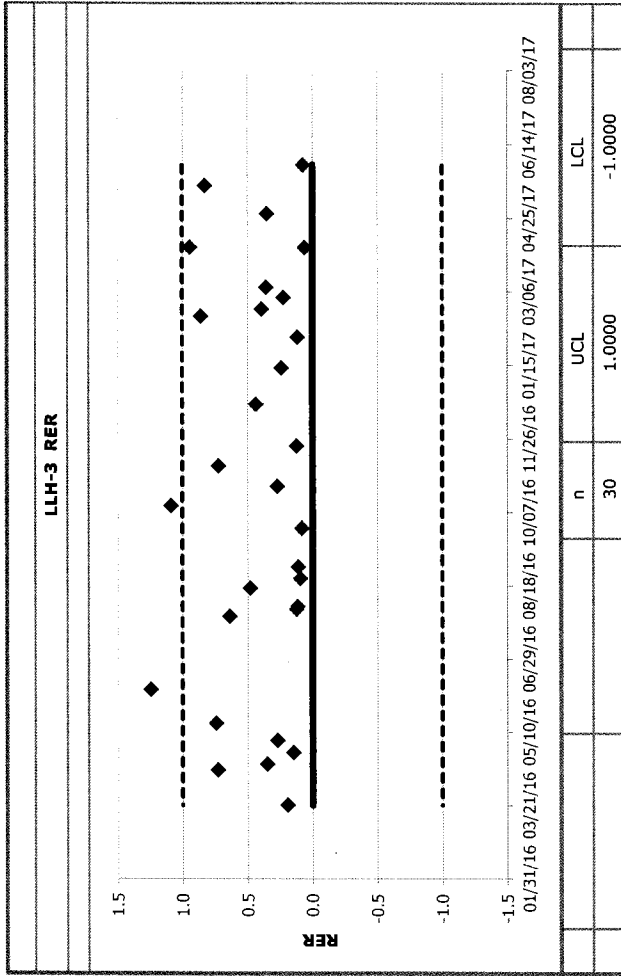
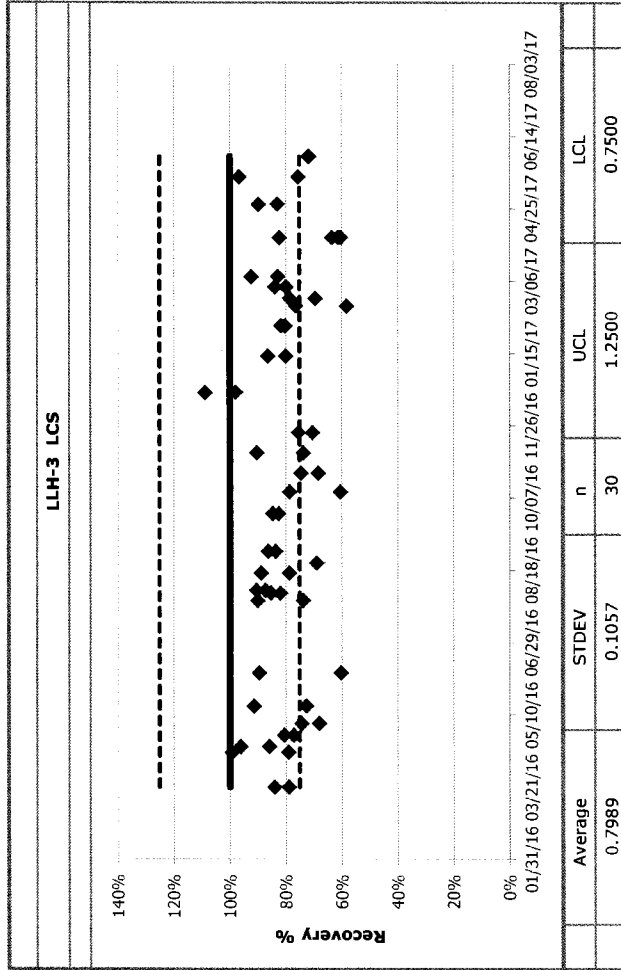
American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

Low Level Tritium by Low Level Liquid Scintillation Counting Control Charts

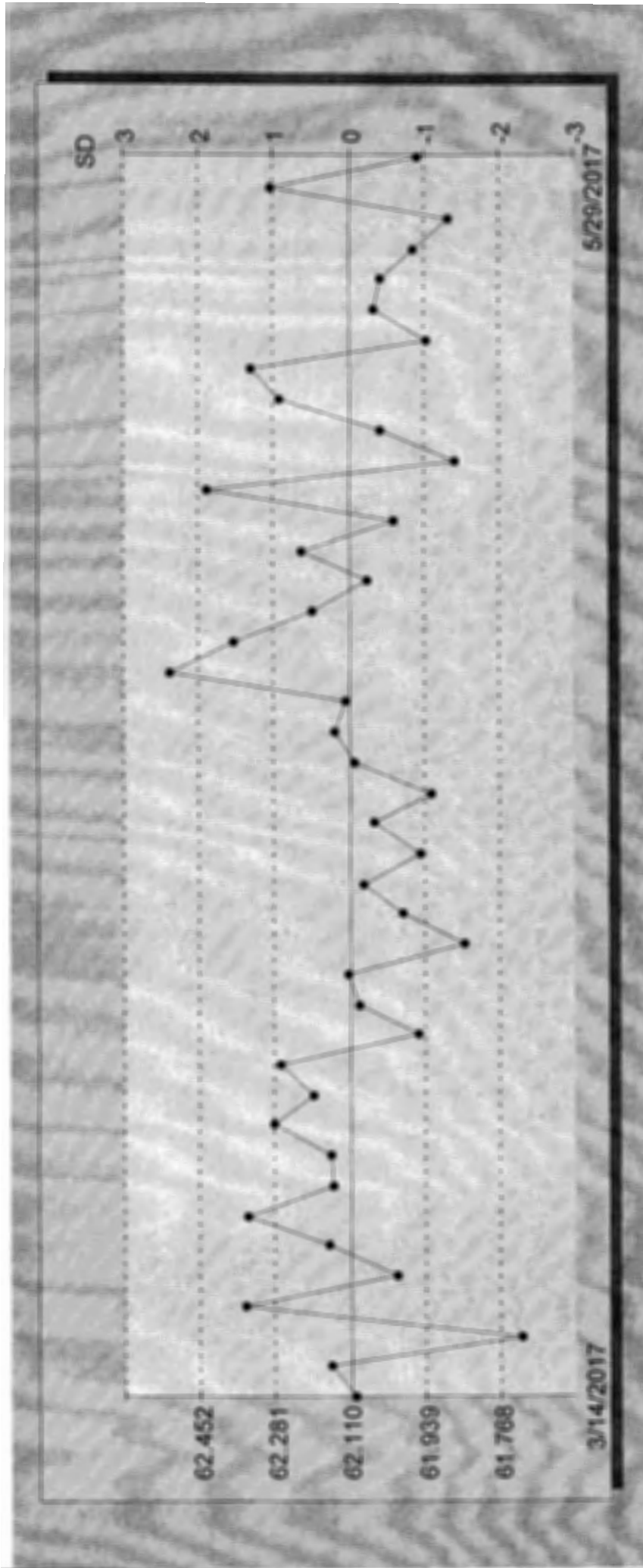
QC chart



3H Efficiency : 2371
Total # pts : 42
Valid # pts : 62.11
Mean : 62.11
SD : 0.17

Date	Value	Valid Pt
Mar 14, 2017	62.09	X
Mar 15, 2017	62.15	X
Mar 16, 2017	61.72	X
Mar 20, 2017	62.35	X
Mar 23, 2017	62.00	X
Mar 23, 2017	62.16	X
Apr 03, 2017	62.34	X
Apr 04, 2017	62.15	X
Apr 04, 2017	62.15	X
Apr 04, 2017	62.28	X
Apr 05, 2017	62.19	X
Apr 05, 2017	62.27	X
Apr 05, 2017	61.95	X
Apr 05, 2017	62.09	X
Apr 05, 2017	62.11	X
Apr 12, 2017	61.85	X
Apr 15, 2017	61.99	X
Apr 17, 2017	62.08	X
Apr 18, 2017	61.95	X
Apr 21, 2017	62.05	X
Apr 24, 2017	61.92	X
Apr 24, 2017	62.10	X
Apr 24, 2017	62.14	X
Apr 24, 2017	62.12	X
Apr 27, 2017	62.51	X
Apr 29, 2017	62.37	X
May 02, 2017	62.19	X
May 02, 2017	62.07	X
May 05, 2017	62.22	X
May 08, 2017	62.01	X
May 11, 2017	62.43	X
May 11, 2017	61.87	X
May 14, 2017	62.04	X
May 16, 2017	62.27	X
May 16, 2017	62.33	X
May 17, 2017	61.93	X
May 17, 2017	62.05	X
May 18, 2017	62.04	X
May 22, 2017	61.96	X
May 24, 2017	61.88	X
May 26, 2017	62.29	X
May 29, 2017	61.95	X

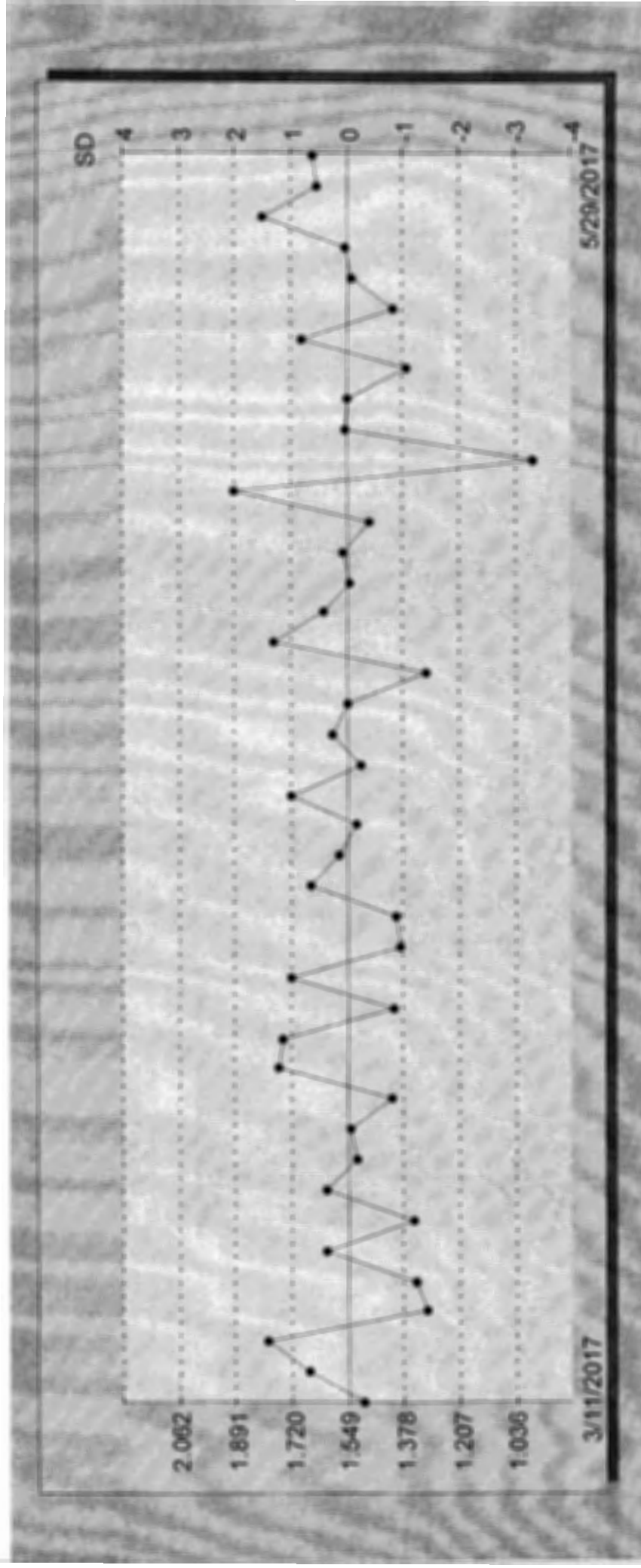
3H Efficiency : 2371
Total # pts : 42
Valid # pts : 62.11
Mean : 62.11
SD : 0.17



3H Background
Total # pts : 2323
Valid # pts : 42
Mean : 1.55
SD : 0.17

Date	Value	Valid Pt
Mar 11, 2017	1.50	X
Mar 14, 2017	1.67	X
Mar 15, 2017	1.79	X
Mar 16, 2017	1.30	X
Mar 20, 2017	1.34	X
Mar 23, 2017	1.61	X
Apr 03, 2017	1.34	X
Apr 04, 2017	1.61	X
Apr 04, 2017	1.52	X
Apr 04, 2017	1.54	X
Apr 05, 2017	1.41	X
Apr 05, 2017	1.76	X
Apr 05, 2017	1.74	X
Apr 05, 2017	1.40	X
Apr 05, 2017	1.72	X
Apr 12, 2017	1.38	X
Apr 15, 2017	1.40	X
Apr 17, 2017	1.66	X
Apr 18, 2017	1.57	X
Apr 21, 2017	1.52	X
Apr 24, 2017	1.72	X
Apr 24, 2017	1.51	X
Apr 24, 2017	1.59	X
Apr 24, 2017	1.54	X
Apr 27, 2017	1.31	X
Apr 29, 2017	1.77	X
May 02, 2017	1.62	X
May 02, 2017	1.54	X
May 05, 2017	1.56	X
May 08, 2017	1.48	X
May 11, 2017	1.89	X
May 11, 2017	0.98	X
May 14, 2017	1.55	X
May 16, 2017	1.54	X
May 16, 2017	1.37	X
May 17, 2017	1.69	X
May 17, 2017	1.41	X
May 18, 2017	1.53	X
May 22, 2017	1.55	X
May 24, 2017	1.81	X
May 26, 2017	1.64	X
May 29, 2017	1.65	X

3H Background
Total # pts : 2323
Valid # pts : 42
Mean : 1.55
SD : 0.17





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

Tritium- Screening by Low Level Liquid Scintillation Counting



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

Tritium-Screening by Low Level Liquid Scintillation Counting Samples



ARS Batch ID: ARS1-B17-00667
ARS SDG ID(s): ARS1-17-00921; 922; 923; 924

If activity is > 150 pCi/L, report to LANL and do not analyze by electrolytic enrichment

Please recout

B17-00667-07

(ARSI-17-00921-004)

2022

4-13-17

Please run all by LSC-A-022
SOL 4-14-17



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

Tritium-Screening by Low Level Liquid Scintillation Counting Laboratory Records

Analytical Batch Report

Analysis Batch ID ARS1-B17-00667												
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	Prep Code	Client ID	Group Name	Lab Deadline	
ARS1-B17-00667-01	LCS											
ARS1-B17-00667-02	LCSD											
ARS1-B17-00667-03	MBL											
ARS1-B17-00667-04	TRG				ARS1-17-00921	001	1		CAPA-17-130709	STD	05/14/17	
ARS1-B17-00667-05	TRG				ARS1-17-00921	002	1		CAPA-17-130759	STD	05/14/17	
ARS1-B17-00667-06	TRG				ARS1-17-00921	003	1		CAPA-17-130723	STD	05/14/17	
ARS1-B17-00667-07	TRG				ARS1-17-00921	004	1		CAPA-17-130724	STD	05/14/17	
ARS1-B17-00667-08	TRG				ARS1-17-00921	005	1		CAPA-17-130731	STD	05/14/17	
ARS1-B17-00667-09	TRG				ARS1-17-00921	006	1		CAPA-17-130732	STD	05/14/17	
ARS1-B17-00667-10	TRG				ARS1-17-00922	001	1		CAMO-17-131758	STD	05/14/17	
ARS1-B17-00667-11	TRG				ARS1-17-00923	001	1		CrEx-1-17-132311	STD	05/14/17	
ARS1-B17-00667-12	TRG				ARS1-17-00924	001	1		CAPA-17-130707	STD	05/14/17	
ARS1-B17-00667-13	TRG				ARS1-17-00924	002	1		CAPA-17-130710	STD	05/14/17	

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_3\20170412_1109
 Raw Results Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3_3\20170412_1109\20170412_1109.results
 RTF File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3_3\20170412_1109\LLH3.rtf
 Comma-Delimited File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3_3\20170412_1109\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): 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

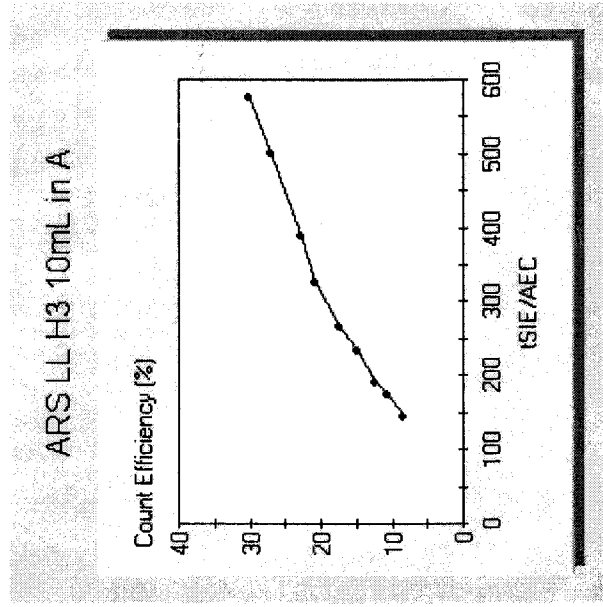
Count Corrections-

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	Units	Reference Date	Reference Time
Regions Half Life			

A
 B
 C

Cycle 1 Results
 Quench Curve Block Data



Date Acquired: 08/23/2014
 Date Modified:
 ARS LL H3 10mL in A

tSIE/AEC	Count Efficiency (%)
579.14	30.08
502.50	27.05
390.30	22.96
328.76	20.79
269.84	17.56
235.00	14.99
193.53	12.42
175.30	10.70
145.76	8.35

QuantaSmart (TM) - 2.03 - Serial# 423814

P#	S#	SMPL_ID	CPMA	DPM1	TSIE	Eff	Nuc1	In	A	Count	Time	DATE	TIME	MESSAGES
10	1	BACKGROUND	0.976	4.16	404.32			23.47		120.00		4/12/2017	11:17:55 AM	
10	2	B17-00667-04	1.268	5.48	394.92			23.12		120.00		4/12/2017	1:27:47 PM	
10	3	B17-00667-05	1.158	4.88	411.42			23.73		120.00		4/12/2017	3:37:37 PM	
10	4	B17-00667-06	1.122	4.80	401.57			23.37		120.00		4/12/2017	5:47:23 PM	
10	5	B17-00667-07	2.285	9.98	388.33			22.89		120.00		4/12/2017	7:57:09 PM	
10	6	B17-00667-08	1.161	4.99	398.82			23.27		120.00		4/12/2017	10:06:56 PM	
10	7	B17-00667-09	0.958	4.12	399.02			23.27		120.00		4/13/2017	12:16:42 AM	
10	8	B17-00667-10	1.302	5.57	401.40			23.36		120.00		4/13/2017	2:26:28 AM	
10	9	B17-00667-11	1.506	6.64	382.72			22.69		120.00		4/13/2017	4:36:17 AM	
10	10	B17-00667-12	1.276	5.42	407.11			23.57		120.00		4/13/2017	6:46:04 AM	
10	11	B17-00667-13	1.327	5.53	419.12			24.01		120.00		4/13/2017	8:55:50 AM	

ARS-054

ARS International
Baton Rouge Laboratory

Procedure Data									
ABatch Sample ID	Client ID	Parent	ICOC ID	Aliquot 1 Vol/Wt	Aliquot 1 Units	Aliquot 2 Vol/Wt	Aliquot 2 Units	User ID	
ARS1-B17-00667-01								SWHITE	
ARS1-B17-00667-02								SWHITE	
ARS1-B17-00667-03								SWHITE	
ARS1-B17-00667-04	CAPA-17-130709					0.0100 L	L	SWHITE	
ARS1-B17-00667-05	CAPA-17-130759					0.0100 L	L	SWHITE	
ARS1-B17-00667-06	CAPA-17-130723					0.0100 L	L	SWHITE	
ARS1-B17-00667-07	CAPA-17-130724					0.0100 L	L	SWHITE	
ARS1-B17-00667-08	CAPA-17-130731					0.0100 L	L	SWHITE	
ARS1-B17-00667-09	CAPA-17-130732					0.0100 L	L	SWHITE	
ARS1-B17-00667-10	CAMO-17-131758					0.0100 L	L	SWHITE	
ARS1-B17-00667-11	CrEx-1-17-132311					0.0100 L	L	SWHITE	
ARS1-B17-00667-12	CAPA-17-130707					0.0100 L	L	SWHITE	
ARS1-B17-00667-13	CAPA-17-130710					0.0100 L	L	SWHITE	

Reagent Amounts			
ABatch Sample ID	Client ID	14.1.5 OPTIONAL AQ W/O DIST - Add scint cocktail - Ultima Gold LLT Reagent Grade (mL)	User ID
ARS1-B17-00667-04	CAPA-17-130709	10.00	SWHITE
ARS1-B17-00667-05	CAPA-17-130759	10.00	SWHITE
ARS1-B17-00667-06	CAPA-17-130723	10.00	SWHITE
ARS1-B17-00667-07	CAPA-17-130724	10.00	SWHITE
ARS1-B17-00667-08	CAPA-17-130731	10.00	SWHITE
ARS1-B17-00667-09	CAPA-17-130732	10.00	SWHITE
ARS1-B17-00667-10	CAMO-17-131758	10.00	SWHITE
ARS1-B17-00667-11	CFEx-1-17-132311	10.00	SWHITE
ARS1-B17-00667-12	CAPA-17-130707	10.00	SWHITE
ARS1-B17-00667-13	CAPA-17-130710	10.00	SWHITE

Reagent Tracking	
Procedure Section	Reagent ID
14.1.5 OPTIONAL AQ W/O DIST - Add scint cocktail	R16-00058

Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
5-17	16:45	Background	BL7-00604	1647	SW
		BL7-00604-04			SW
		05			SW
		06			SW
		07			SW
		08			SW
		09			SW
		10			SW
		11			SW
		12			SW
		13			SW
		14			SW
		15			SW
		16			SW
		SVC 9	QA	QA	SW
4-12-17	09:22	SVC 9	QA	QA	SW
4-12-17	11:10	Background	BL7-00667	1109	SW
		BL7-00667-04			SW
		05			SW
		06			SW

Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
4-12-17	11:10	B17-00667-07	B17-00667	1109	SW
		08			SW
		09			SW
		10			SW
		11			SW
		12			SW
		13			SW
		SWC	9	9A	SW
<div> <div>4</div> <div>13</div> <div>11</div> </div>					

Low Level Tritium pH Checks

[illegible]



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

Tritium-Screening by Low Level Liquid Scintillation Counting Control Charts

3H Efficiency

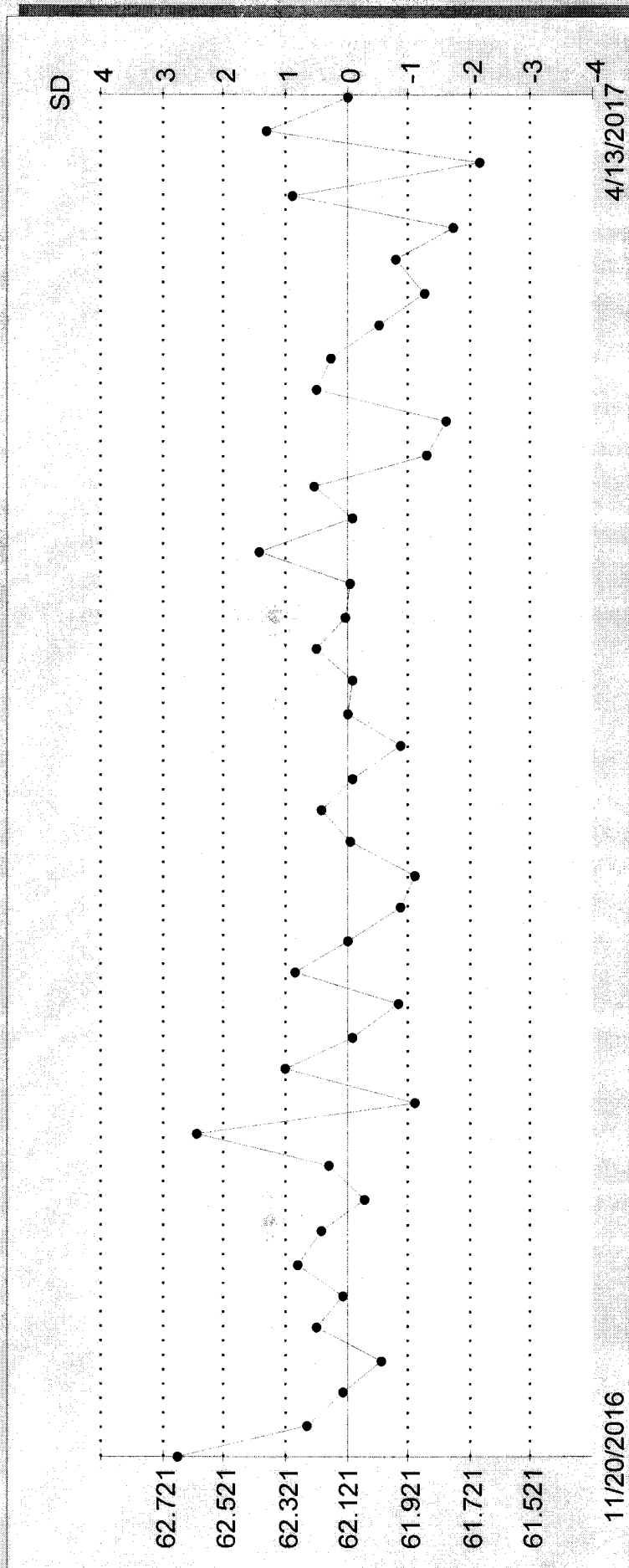
Total # pts : 6433
Valid # pts : 43
Mean : 62.12
SD : 0.20

Date	Value	Valid Pt
Nov 20, 2016	62.67	X
Nov 21, 2016	62.25	X
Nov 24, 2016	62.13	X
Nov 28, 2016	62.01	X
Dec 07, 2016	62.21	X
Dec 12, 2016	62.13	X
Dec 16, 2016	62.28	X
Dec 21, 2016	62.20	X
Dec 22, 2016	62.06	X
Dec 27, 2016	62.18	X
Dec 29, 2016	62.61	X
Jan 04, 2017	61.90	X
Jan 05, 2017	62.32	X
Jan 05, 2017	62.10	X
Jan 05, 2017	61.95	X
Jan 05, 2017	62.29	X
Jan 05, 2017	62.12	X
Jan 05, 2017	61.95	X
Jan 05, 2017	61.90	X
Jan 09, 2017	62.11	X
Jan 12, 2017	62.21	X
Jan 27, 2017	62.10	X
Jan 29, 2017	61.95	X
Jan 30, 2017	62.12	X
Feb 03, 2017	62.10	X
Feb 03, 2017	62.22	X
Feb 15, 2017	62.13	X
Feb 17, 2017	62.11	X
Feb 17, 2017	62.41	X
Feb 22, 2017	62.10	X
Feb 23, 2017	62.23	X
Feb 27, 2017	61.86	X
Mar 03, 2017	61.80	X
Mar 10, 2017	62.22	X
Mar 13, 2017	62.17	X
Mar 13, 2017	62.02	X
Mar 24, 2017	61.87	X
Mar 30, 2017	61.96	X
Apr 05, 2017	61.77	X
Apr 05, 2017	62.30	X
Apr 07, 2017	61.69	X
Apr 12, 2017	62.38	X

x

Apr 13, 2017 62.11

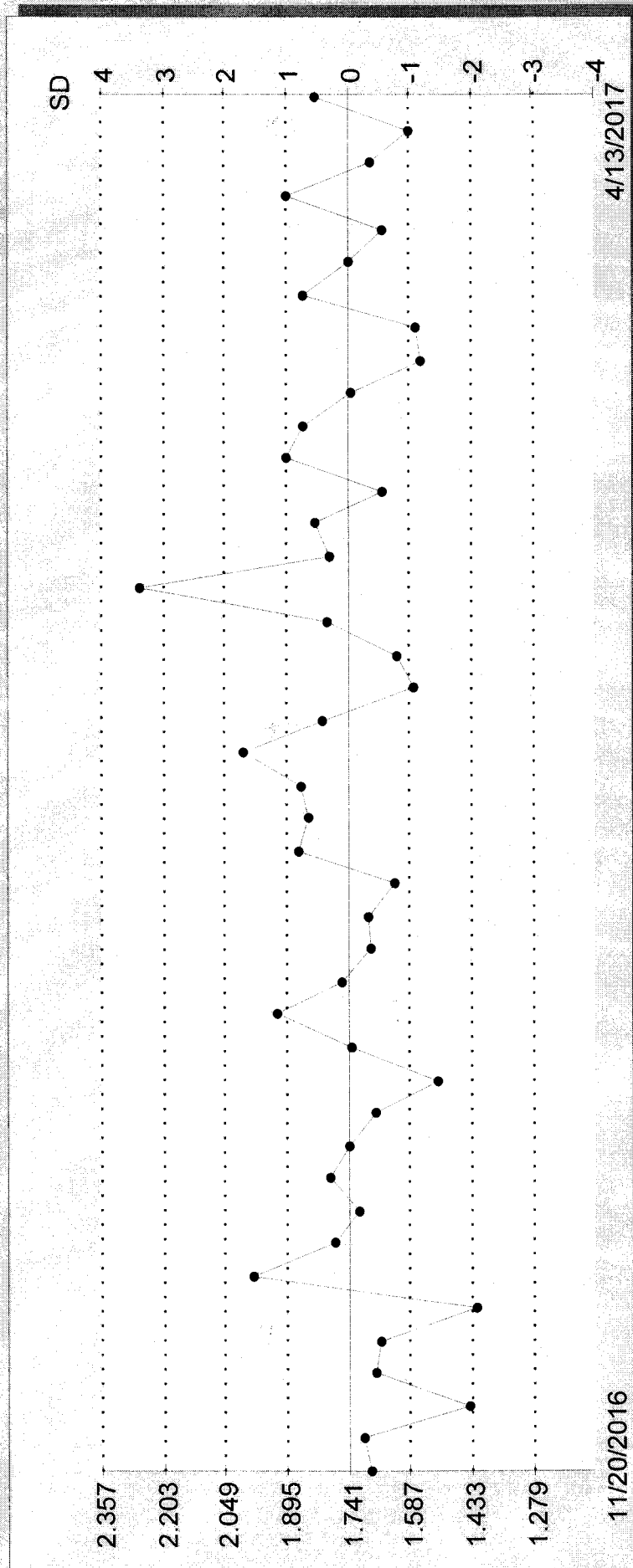
3H Efficiency
Total # pts : 6433
Valid # pts : 43
Mean : 62.12
SD : 0.20



3H Background
Total # pts : 6354
Valid # pts : 43
Mean : 1.74
SD : 0.15

Date	Value	Valid Pt
Nov 20, 2016	1.69	X
Nov 21, 2016	1.70	X
Nov 24, 2016	1.44	X
Nov 28, 2016	1.67	X
Dec 07, 2016	1.66	X
Dec 12, 2016	1.42	X
Dec 16, 2016	1.98	X
Dec 21, 2016	1.77	X
Dec 22, 2016	1.72	X
Dec 27, 2016	1.79	X
Dec 29, 2016	1.74	X
Jan 04, 2017	1.67	X
Jan 05, 2017	1.52	X
Jan 05, 2017	1.73	X
Jan 05, 2017	1.92	X
Jan 05, 2017	1.76	X
Jan 05, 2017	1.68	X
Jan 05, 2017	1.69	X
Jan 05, 2017	1.63	X
Jan 09, 2017	1.87	X
Jan 12, 2017	1.84	X
Jan 27, 2017	1.86	X
Jan 29, 2017	2.00	X
Jan 30, 2017	1.81	X
Feb 03, 2017	1.58	X
Feb 03, 2017	1.62	X
Feb 15, 2017	1.79	X
Feb 17, 2017	2.26	X
Feb 17, 2017	1.79	X
Feb 22, 2017	1.82	X
Feb 23, 2017	1.66	X
Feb 27, 2017	1.90	X
Mar 03, 2017	1.85	X
Mar 10, 2017	1.74	X
Mar 13, 2017	1.56	X
Mar 13, 2017	1.57	X
Mar 24, 2017	1.85	X
Mar 30, 2017	1.74	X
Apr 05, 2017	1.66	X
Apr 05, 2017	1.89	X
Apr 07, 2017	1.69	X
Apr 12, 2017	1.59	X

3H Background
 Total # pts : 6354
 Valid # pts : 43
 Mean : 1.74
 SD : 0.15





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 Liquid Scintillation Counting

Calibration Information



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

VERIFICATION DATE **10/24/2016 20:42** date counted
 STANDARD REFERENCE # **S-0318**

Principal Radionuclide
H-3

ENTER --> Half Life, Years
1.232E+01

OR --> Half Life, Days
4.4998E+03
4.4998E+03

Radionuclide **H-3**

Dilution Reference Date **10/24/2016 14:38**

Dilution Activity **2.72** pCi per gram ==> dpm/g **6.03**
 Verif. Date Decay Corrected **2.72** pCi per gram ==> dpm/g **6.03**

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-0318-V1	19.36	1	LSC	0.3005	10.09	5.008	6.16	2.77
S-0318-V2	19.04	1	LSC	0.3009	10.09	4.977	5.98	2.69
S-0318-V3	19.21	1	LSC	0.3010	10.09	4.985	6.08	2.74
S-0318-V4	18.99	1	LSC	0.3015	10.09	4.995	5.91	2.66
S-0318-V5	19.03	1	LSC	0.3008	10.09	5.020	5.92	2.67

Average **6.01** **2.71**
 Two Sigma Uncertainty **0.21** **0.09**
 Standard Deviation percent of known concentration **1.78%** **1.78%**
 Target Activity **6.03** **2.72**
 % Diff **-0.34%** **-0.34%**

10% Max PASS **5% Max PASS**

Verification Expiration Date: **October 24, 2017**

Prepared & Counted By Jacob Byrd

Date: **10/24/2016 20:42**

Verified & Approved By [Signature]

Date: **10-31-16**

QC Approval [Signature]

Date: **10-31-16**

S-0318



H-3

Verified **10/24/16**

SL

Expires 10/24/17

Manufacturer NIST SRM 4927F

Sol Matrix H2O

Ref No NIST SRM 4927F

Tech Unknown

Parent ID S-0316



RADIOACTIVE STANDARDS -- BATON ROUGE LABORATORY

STD ID: S-0318

ARS INTERNATIONAL		Add/Edit Secondary Stds	Parent Standard Data			
Planning		Parent Solution Reference #	NIST SRM 4927F			
Planning Comments	Create a H-3 LCS Standard	Parent Solution #	S-0316			
Target dpm/g (on dil. date)	6	Parent Principal Radionuclide	H-3	Half Life (Days)	4499.8000000	
Target Final volume mL	2000	Parent Reference Date	08/10/2016 14:49			
Appx mass g of Parent Sol'n	5.091121556	Parent Certified Act	2384.430444	Certf Act/Vol Units	dpm	g
Appx vol mL of Parent Sol'n	5.1003021	Parent Cert Act Uncert 1 Sigma	0.0036			
Expected Addition for Analysis g	5	Parent Sp. Gravity G/Ml	0.9982			
Standards Preparation / Dilution		Parent Supplier	NIST SRM 4927F			
Secondary Solution #	S-0318	Parent Date Recvd	01/02/00			
Dilution Date (New Ref Date)	10/24/2016 14:38	Parent Received By	Unknown			
Ampoule, Empty (g)		Parent Cert Exp Date				
Ampoule /Solution Gross (g)		Parent Matrix	H2O			
Net Wt Removed (g)		Certified dpm/g At Ref Date	2384.430444			
Transfer Container, empty (g)	17.3192	Certified dpm/g on 10/24/2016 14:38	2357.044488			
Container Plus Solution (g)	22.4163	Parent Comments	Intermediate level H-3 standard for creating LCS solutions and matrix spikes. Dilution performed as stated above by Jacob Byrd. JPB 08/10/2016			
Net Wt Transferred (g)	5.0971					
DPM Xferred on 10/24/2016 14:38	12014.09146					
Diluent/matrix	Deionized H2O	Parent Tech	Unknown			
Diluent Density Cont, empty (g)		Is_Primary	FALSE			
Test Mass of 5 mL of Diluent (g)		Is_LCS	TRUE			
Diluent Density Test - (g/mL)		Is_Tracer	FALSE			
Dilution Empty Container Mass (g)	402.37	Is_Calib	FALSE			
Dilution Full Cont g (if measured)	2394.73					
Dilution Final Volume mL (if measured)	2000					
Final Dilution Density (g/mL)	0.99618					
Final Dilution Measured Mass g	1992.36					
Comments	H3 LCS Intermediate standard. Dilution performed as stated above by Jacob Byrd. JPB 10/24/2016.					
Final Dilution dpm/g	6.030080637					
Final Dil New Ref Date/Time	10/24/2016 14:38					

Assay Definition

Assay Description:
 H3 Normal Lvl
 Assay Type: DPM (Single)
 Report Name: Report1
 Output Data Path: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl 2\20161024_1817
 Raw Results Path: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl 2\20161024_1817\20161024_1817.results
 RTF File Name: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl 2\20161024_1817\H3 Results.rtf
 Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl 2\20161024_1817\H3 Results.csv
 Assay File Name: C:\Packard\Tricarb\Assays\H3 Normal Lvl 2.1sa

Count Conditions

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

Background Subtract

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

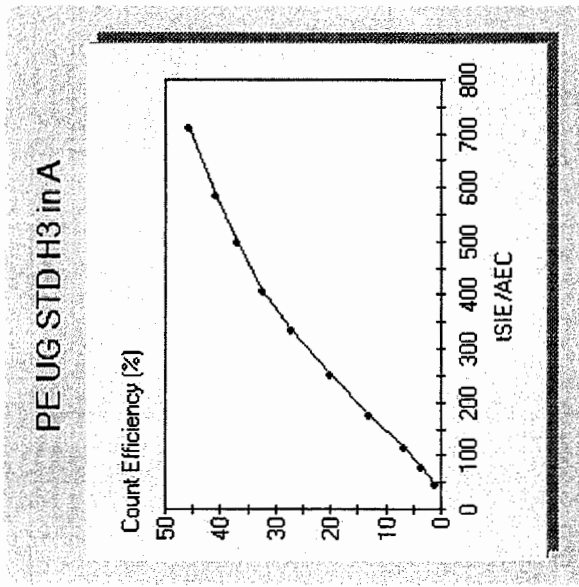
Regions	LL	UL	2Sigma % Terminator
A	2.0	18.6	0.50
B	0.0	2000.0	0.00
C	0.0	2000.0	0.00

Count Corrections

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

Cycle 1 Results

Quench Curve Block Data



Date Acquired: 08/19/2016

Date Modified:

PE UG STD H3 in A

tSIE/AEC	Count Efficiency (%)
713.96	45.87
587.32	40.89
498.20	36.92
407.51	32.24
337.27	26.99
254.20	20.17
178.24	13.10
115.35	6.77
80.47	3.53
47.41	1.20

P#	S#	SMPL ID	CPMA	DPM1	tSIE	Eff Nucl In A	Count Time	DATE	TIME	MESSAGES
----	----	---------	------	------	------	---------------	------------	------	------	----------

11	1	BACKGROUND	10.09	33.20	382.76	30.39	240.00	10/24/2016	6:17:40 PM
11	2	S-0318-V1	19.36	64.42	378.23	30.05	240.00	10/24/2016	10:42:16 PM
11	3	S-0318-V2	19.04	63.28	378.71	30.09	240.00	10/25/2016	3:06:46 AM
11	4	S-0318-V3	19.21	63.84	378.83	30.10	240.00	10/25/2016	7:31:20 AM
11	5	S-0318-V4	18.99	62.98	379.57	30.15	240.00	10/25/2016	11:55:54 AM
11	6	S-0318-V5	19.03	63.26	378.58	30.08	240.00	10/25/2016	4:20:23 PM

S-0318 Verification Weights

Tech:	JPB
Pipette:	FJ15820
Scale ID:	12332539
Standard ID:	S-0318

Sample ID	Std. Weight(g)
S-0318-V1	5.008
S-0318-V2	4.9772
S-0318-V3	4.9847
S-0318-V4	4.9946
S-0318-V5	5.0201



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

Folder Duplicate



Report Compilation Checklist

ARS SDG: 17-00921Client Name: LANLSample 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)? <small>Include subcontractor name and information</small>	Yes	No	N/A	
4) Form 1s Present for all Samples and Tests? <small>Note: Ensure original Subcontract Forms 1s included if applicable.</small>	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? <small>Include subcontractor QC reports if applicable</small>	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

Ensure all original subcontractor information is included, if applicable

	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

Ensure all original subcontractor information is included, if applicable

	1st Reviewer			
17) Preparation Raw Data Present 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

Management Review Signature

Date



LSC Technical Review Checklist

ARS SDG ARS1-17-00921

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

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

ARS A. Batch ID(s): Batch A: B17-00871 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	N/A	Yes	No	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	N/A	Yes	No	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): _____						
<div>Chemist Signature: <u>[Signature]</u> Date: <u>5-25-17</u> Verifier Review Signature: <u>[Signature]</u> Date: <u>5-25-17</u></div>						

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
<div>QA Officer Signature: <u>[Signature]</u> Date: <u>5-30-17</u></div>						
	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): _____						
<div>Analyst Signature: <u>[Signature]</u> Date: <u>5-30-17</u> Technical Reviewer Signature: <u>[Signature]</u> Date: <u>5-30-17</u></div>						



LSC
Technical Review Checklist

ARS SDG ARS1-17-00921

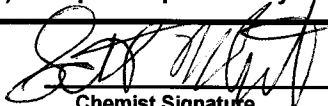

Sample Matrix: AQ Aliquot (Circle One): Dry As Received ☒ Filtered Other: _____

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


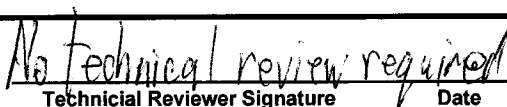
ARS A. Batch ID(s): Batch A: B17-00667 Batch B: N/A Batch C: N/A

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

A. RADIOCHEMICAL PREPARATION REVIEW

	Chemist Review			Verifier Review		
1) 100% of Manual Transcriptions Verified?	<input checked="" type="radio"/> Yes	No	N/A	<input checked="" type="radio"/> Yes	No	N/A
2) 100% of Manual Calculations Verified?	Yes	No	<input checked="" type="radio"/> N/A	Yes	No	<input checked="" type="radio"/> N/A
3) Blank Composition/Configuration Matches Calibration?	Yes	No	<input checked="" type="radio"/> N/A	Yes	No	<input checked="" type="radio"/> N/A
4) Deviations from procedure are documented and verified?	Yes	No	<input checked="" type="radio"/> N/A	Yes	No	<input checked="" type="radio"/> N/A
5) Appropriate Cocktail Selected?	<input checked="" type="radio"/> Yes	No	N/A	<input checked="" type="radio"/> 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 		Date <u>4-12-17</u>		Verifier Review Signature 		Date <u>4-12-17</u>

B. ANALYSIS REVIEW

	Analyst Review			QA Officer Review		
1) Calibrations Valid and Current?	<input checked="" type="radio"/> Yes	No	N/A	Yes	No	N/A
2) Backgrounds Valid and Current?	<input checked="" type="radio"/> Yes	No	N/A	Yes	No	N/A
3) Source Checks Completed and Acceptable?	<input checked="" type="radio"/> Yes	No	N/A	Yes	No	N/A
				QA Officer Signature _____ Date _____		
	Analyst Review			Technical Review		
4) Background Checks Complete and Acceptable?	<input checked="" type="radio"/> Yes	No	N/A	Yes	No	N/A
5) 100% of Manually Entered Parameters Verified Accurate?	<input checked="" type="radio"/> Yes	No	N/A	Yes	No	N/A
6) Appropriate QC samples initiated at required frequency?	<input checked="" type="radio"/> 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?	<input checked="" type="radio"/> Yes	No	N/A	<input checked="" type="radio"/> Yes	No	N/A
b) Spectra show no Evidence of Interferences?	<input checked="" type="radio"/> Yes	No	N/A	Yes	No	N/A
c) Sample Quench for All Samples within Range of Quench Curve?	<input checked="" type="radio"/> 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 		Date <u>4-13-17</u>		Technical Reviewer Signature 		Date _____

Batch A: B17-00667

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? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Tech Notes) NCR # (If initiated): _____		
<div style="display: flex; justify-content: space-between; align-items: flex-end;"><div style="width: 45%; text-align: center;"><hr style="width: 80%; margin: 0 auto;"/><div style="display: flex; justify-content: space-between; width: 80%; margin: 0 auto;">Project Manager SignatureDate</div></div><div style="width: 45%; text-align: center;"><hr style="width: 80%; margin: 0 auto;"/><div style="display: flex; justify-content: space-between; width: 80%; margin: 0 auto;">QA Officer SignatureDate</div></div></div>		

GENERAL COMMENTS

SDG Report - Samples and Containers

SDG Specific Data											
SDG		ARS1-17-00921		TAT Days		40		Project Type		Environmental	
Sample Count		6		Rpt Level		4		Date Received		4/7/2017	
Client		Los Alamos National Laboratory		Client Deadline		5/17/2017		PO Number		2017-1321	
Client Code		114		Internal Deadline		5/16/2017		Job Number			
Profile Number		PN-00094		Lab Deadline		5/14/2017		Job Location			
Comment											
Samples and Containers Checked In Thus Far											
FR	Name	Matrix	Start Date	End Date	Disp	Hold	Arch	Storage	Conductivity	Comments	
001	CAPA-17-130709	AQ	4/5/2017 1:33 PM	4/5/2017 1:33 PM	H	90	5	M6			
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	VOA	Head	Temperature (C)
	259930	1	1000.00	HDP Bottle			80	14	N	N/A	
002	CAPA-17-130759	AQ	4/5/2017 1:33 PM	4/5/2017 1:33 PM	H	90	5	M6			
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	VOA	Head	Temperature (C)
	259931	1	1000.00	HDP Bottle			80	12	N	N/A	
003	CAPA-17-130723	AQ	4/4/2017 10:56 AM	4/4/2017 10:56 AM	H	90	5	M6			
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	VOA	Head	Temperature (C)
	259932	1	1000.00	HDP Bottle			90	14	N	N/A	
004	CAPA-17-130724	AQ	4/4/2017 12:51 PM	4/4/2017 12:51 PM	H	90	5	M6			
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	VOA	Head	Temperature (C)
	259933	1	1000.00	HDP Bottle			80	15	N	N/A	
005	CAPA-17-130731	AQ	4/4/2017 11:40 AM	4/4/2017 11:40 AM	H	90	5	M6			
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	VOA	Head	Temperature (C)
	259934	1	1000.00	HDP Bottle			90	13	N	N/A	
006	CAPA-17-130732	AQ	4/4/2017 12:50 PM	4/4/2017 12:50 PM	H	90	5	M6			
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	VOA	Head	Temperature (C)
	259935	1	1000.00	HDP Bottle			80	14	N	N/A	

DQO Report for SDG
ARS1-17-00921

Client Name: Los Alamos National Laboratory

Profile Name: Keith Greene (Site Alias)

Report Level: 4

Analysis Code	Prep Type	Units	Aliquot	Prep Code	Procedure	Count Time				
LSC-A-021	WRAD	pCi	L	N/A	ARS-054					
H-3		Analyte		RDL	LCS LL/UL	MS LL/UL	Rdy LL/UL	Grav LL/UL	RER	RPD
				150 pCi/L	75/125	60/140	30/110	40/110	1	25
LSC-A-022	WRAD	pCi	L	N/A	ARS-040					
Enriched H-3		Analyte		RDL	LCS LL/UL	MS LL/UL	Rdy LL/UL	Grav LL/UL	RER	RPD
				3.221 pCi/L	80/120	60/140	30/120	40/110	1	25

Legend: Blue - RDL source was client profile. Green - RDL source was analyte library.

Analysis Code	Fraction	Units	Aliquot	Conductivity	Analyte Count
LSC-A-021	001	pCi	L	N/A	1
LSC-A-021	002	pCi	L	N/A	1
LSC-A-021	003	pCi	L	N/A	1
LSC-A-021	004	pCi	L	N/A	1
LSC-A-021	005	pCi	L	N/A	1
LSC-A-021	006	pCi	L	N/A	1
LSC-A-022	001	pCi	L	N/A	1

DQO Report for SDG
ARS1-17-00921

LSC-A-022	002	pCi	Group	L	N/A	Analyte	1
LSC-A-022	003	pCi	Group	L	N/A	Analyte	1
LSC-A-022	004	pCi	Group	L	N/A	Analyte	1
LSC-A-022	005	pCi	Group	L	N/A	Analyte	1
LSC-A-022	006	pCi	Group	L	N/A	Analyte	1

SDG Report - Analysis Assignments

SDG	ARS1-17-00921	Sample Count	6
Client	Los Alamos National Laboratory	Analysis Count	2-12

Sample Count Totals Per Analysis		
Analysis Code	Analysis Description	Samples Count
LSC-A-021	Low Level Tritium Screen in (Aqueous)	6
LSC-A-022	Low Level Tritium by Enrichment Process in (Aqueous [AQ])	6

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
003	LSC-A-021	X
003	LSC-A-022	X
004	LSC-A-021	X
004	LSC-A-022	X
005	LSC-A-021	X
005	LSC-A-022	X
006	LSC-A-021	X
006	LSC-A-022	X

ARS FILE TRACKING SHEET

SDG: ARS1-17-00921

Task	Date / Time	Initials
Date & Time Samples Received	04-07-17 10:15	MEC
ICOC Initiated/Storage Location: <u>M6</u>	04-07-17 10:43	MEC
Technical Checks Performed	<i>See Batch</i>	
Report Written / EDD Generated <u>5-30-17/1601/SD</u>	<u>6-27-17/1223</u>	<i>SD</i>
Report / EDD Reviewed for accuracy and completeness	↓	
Quality Assurance Checks Performed on Report	<u>6-29-17 0931</u>	<i>JB</i>
Management Checks Performed on Report	<u>6-29-17 0931</u>	<i>JB</i>
Preliminary Report Scan		
Report E-mailed/Faxed		
Invoice Completed Invoice #: _____		
Requires Report Mailed Yes / No		
Requires Original COC mailed Yes / No		
Report Reviewed and Imaged		

EDD
Loaded
SD
5-30-17

SPECIAL REQUIREMENTS

Requirement	Yes	No
3 Hour Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
24 Hour Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
48 Hour Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3 Day Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5 Day Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
10 Day Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Standard Oil/Gas Client (5 Day)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Standard Turnaround	<input checked="" type="checkbox"/>	<input type="checkbox"/>

NOTES

SDG: AR51-17-

SHIPPING CONTAINER

COC PRESENT WITH SAMPLES

COC ☒ Yes ☐ No

SAMPLE CONTAINER(S)

Good Condition ☒ Yes ☐ No
 Sec. Seals ☒ Yes ☐ No
 Seal Intact ☒ Yes ☐ No ☒ N/A
 Radioactive ☒ Yes ☐ No
 # Samples Rcv 6
 Matrix ☐ AF ☒ AQ ☐ BI

Exposure Rate Meter:	<u>M3 269264</u>	Serial No.:	<u>PR 256427</u>	Calibration Due Date:	<u>3/13/18</u>
Count Rate Meter:	<u>M2 154859</u>	Serial No.:	<u>PR 121649</u>	Calibration Due Date:	<u>3/9/18</u>
<hr/>					
Background Exposure Rate ($\mu\text{R/hr}$)	<u>15</u>	Max. Exposure Rate on Shipping Containers Externals (Plus Bkgd)	<u>15</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)	<u>80</u>	cpm	

pH ≤ 2 is Acceptable

Acceptance Limits

$$<500^{\mu R}/hr \quad \sim \quad <100^{cpm}/cm^2$$
[illegible]

Surveyors' Name: Walter L. Jones

Date/Time Surveyed: 4-17-11 1015

COC/Lab Request #:
2017-1321
Page 1 of 1

[illegible]