

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:

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11212

EVENT NAME: Mortandad/Sandia (Cr Inv/MDA C)
MY2017 Q3

SAMPLE ID: CASA-17-132334

WORK ORDER:

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	05/03/2017	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	1033		MEDIA:	UA	
PRS ID:	OK		SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-67		FIELD PREP:	UF	
LOCATION TYPE:	OK		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	MSGP-Hg	1 LITER POLY	1	HNO3	Y	NA
	WSP-CN(T)	250 ML POLY	1	NAOH		
	WSP-LL-H-3	1 LITER POLY	1	NONE		
	WSP-TKN+TOC	500 ML AMBER GLASS	1	H2SO4		

SAMPLE COMMENTS: Sampled 50ft. from running diesel

LOCATION COMMENTS: Breezy while sampling

FIELD PARAMETERS:

Sample Time	10:33	HH:MM	Dissolved Oxygen	6.14	Flow (in gpm)	4.05
Oxidation-Reduction Potential	123.3		pH	8.20	Specific Conductance	173.4
Temperature	19.5		Turbidity	2.34		

COLLECTED BY (PRINT): A. Stanfield

RELINQUISHED BY (Printed Name) (Signature)	Date/Time 5/3/2017 1135	RECEIVED BY (Printed Name) (Signature)	Date/Time 5/3/17 1135
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 05/02/2017

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11212

EVENT NAME: Mortandad/Sandia (Cr Inv/MDA C)
MY2017 Q3

SAMPLE ID: CAMO-17-132236

WORK ORDER:

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	05-03-2017	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	12:24		MEDIA:	UA	
PRS ID:	NA		SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-60		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	MSGP-Hg	1 LITER POLY	1	HNO3	Y	NA
	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	2	HCL		
	WSP-8270C-SVOA	1 LITER AMBER GLASS	2	ICE		
	WSP-CN(T)	250 ML POLY	1	NAOH		
	WSP-LL-H-3	1 LITER POLY	1	NONE		
	WSP-TKN+TOC	500 ML AMBER GLASS	1	H2SO4		

SAMPLE COMMENTS:

~10 mph wind during sampling; sampled ~50' upwind of running diesel generator

LOCATION COMMENTS:

None

FIELD PARAMETERS:

Sample Time	12:24	HH:MM	Dissolved Oxygen	5.99	Flow (in gpm)	2.75
Oxidation-Reduction Potential	85.5		pH	8.25	Specific Conductance	126.5
Temperature	24.0		Turbidity	2.79		

COLLECTED BY (PRINT): W. Pryce, A. Vigil

RELINQUISHED BY (Printed Name) ANDREW VIGIL (Signature) <i>Andrew Vigil</i>	Date/Time 05/03/2017 1310	RECEIVED BY <i>Sherwood</i> (Printed Name) <i>Sherwood</i> (Signature) <i>Sherwood</i>	Date/Time 5/3/17 1310
	Date/Time		Date/Time

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11212

EVENT NAME: Mortandad/Sandia (Cr Inv/MDA C)
MY2017 Q3

SAMPLE ID: CASA-17-132337

WORK ORDER:

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	05/03/2017	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	1033		MEDIA:	UA	
PRS ID:	OK		SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-67		FIELD PREP:	UF	
LOCATION TYPE:	OK		FIELD QC TYPE:	FD	
TOP DEPTH:			SAMPLE USAGE:	QC	
BOTTOM DEPTH:			EXCAVATED:		YES / NO / NA

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
NA	MSGP-Hg	1 LITER POLY	1	HNO3	Y	MA
	WSP-CN(T)	250 ML POLY	1	NAOH		
	WSP-LL-H-3	1 LITER POLY	1	NONE		
	WSP-TKN+TOC	500 ML AMBER GLASS	1	H2SO4		

SAMPLE COMMENTS:

LOCATION COMMENTS:

FIELD PARAMETERS:

Sample Time _____ HH:MM _____ Dissolved Oxygen _____ Flow (in gpm) _____
Oxidation-Reduction _____ pH _____ Specific _____
Potential _____ Conductance _____
Temperature _____ Turbidity _____

COLLECTED BY (PRINT): A. Stanford

RELINQUISHED BY (Printed Name) (Signature)	Date/Time 05/03/2017 1135	RECEIVED BY (Printed Name) (Signature)	Date/Time 5/3/17 1135
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 05/02/2017

DATA VALIDATION REPORT

Chain Of Custody No. 2017-1483

1. Distribution Of Samples In EDD.

SDG	Analytical Method	Regular Samples	Field Duplicates	Trip Blanks	Field Blanks	Equipment Blanks
ARS1-17-01257	Generic:Low_Level_Tritium	2	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
ARS1-17-01257	Generic:Low_Level_Tritium	ARS1-B17-	ARS1-B17-	2	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	CAMO-17-132236	ARS1-B17-01047-09	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CASA-17-132334	ARS1-B17-01047-10	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CASA-17-132337	ARS1-B17-01047-11	FD	1	0	0	0
Generic:Low_Level_Tritium	RAD	LCS	ARS1-B17-01047-01	LCS	0	0	1	0
Generic:Low_Level_Tritium	RAD	LCSD	ARS1-B17-01047-02	LCSD	0	0	1	0
Generic:Low_Level_Tritium	RAD	MB	ARS1-B17-01047-03	MB	1	0	0	0

3. Are any analytes missing?

No.

4. Were any holding times exceeded?

No.

5. Any contaminants in blanks?

DATA VALIDATION REPORT

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?

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.

13. Display Flagged Data.

DATA VALIDATION REPORT

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-60	2017-1483	CAMO-17-132236	REG	INIT	RAD	Generic:Low_Level_Tritium	Tritium	U	U	R5	N	1.851	pCi/L	1.851	pCi/L	2.553	0.835	W	05/03/2017		ARS1-B17-01047	VAL	Y
R-67	2017-1483	CASA-17-132334	REG	INIT	RAD	Generic:Low_Level_Tritium	Tritium	U	U	R5	N	2.209	pCi/L	2.209	pCi/L	2.646	0.886	W	05/03/2017		ARS1-B17-01047	VAL	Y
R-67	2017-1483	CASA-17-132337	FD	INIT	RAD	Generic:Low_Level_Tritium	Tritium	U	U	R5	N	0.492	pCi/L	0.492	pCi/L	2.244	0.674	W	05/03/2017		ARS1-B17-01047	VAL	Y

Reason Code

Description

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
CAMO-17-132236	R-60	REG	Generic:Low_Level_Tritium	0	1
CASA-17-132334	R-67	REG	Generic:Low_Level_Tritium	0	1
CASA-17-132337	R-67	FD	Generic:Low_Level_Tritium	0	1



ARS International, LLC

Laboratory Analysis Report

ARS1-17-01257

Prepared for:

Los Alamos National Laboratory

**Keith Greene
P.O. 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

July 17, 2017

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

LANL Request Number: **2017-1483**
ARS SDG: **ARS1-17-01257**
Project : **ADEP**

Dear Mr. Greene;

On May 5, 2017, ARS International received three (3) 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



2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

**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)
2017-1483	CAMO-17-132236	ARS1-17-01257-001
2017-1483	CASA-17-132334	ARS1-17-01257-002
2017-1483	CASA-17-132337	ARS1-17-01257-003

SAMPLE RECEIPT

The samples were received in good condition and were 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".

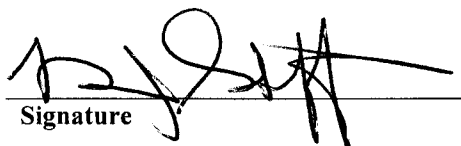
ANALYTICAL RESULTS

All QC criteria were met.

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

7-18-17
Date



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

ARS Sample Delivery Group: ARS1-17-01257
Client Sample ID: CAMO-17-132236
Sample Collection Date: 05/03/17
Sample Matrix: Aqueous
Percent Solids: N/A

Request or PO Number: 2017-1483
ARS Sample ID: ARS1-17-01257-001
Date Received: 05/05/17
Report Date: 07/17/17

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	1.851	0.835	2.553	1.236	3.221	U	pCi/L	ARS-040	06/27/17 20:54	ECAMP	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



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

ARS Sample Delivery Group: ARS1-17-01257

Client Sample ID: CASA-17-132334

Sample Collection Date: 05/03/17

Sample Matrix: Aqueous

Percent Solids: N/A

Request or PO Number: 2017-1483

ARS Sample ID: ARS1-17-01257-002

Date Received: 05/05/17

Report Date: 07/17/17

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	2.209	0.886	2.646	1.281	3.221	U	pCi/L	ARS-040	06/28/17 2:36	ECAMP	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: ARS1-17-01257

Client Sample ID: CASA-17-132337

Sample Collection Date: 05/03/17

Sample Matrix: Aqueous

Percent Solids: N/A

Request or PO Number: 2017-1483

ARS Sample ID: ARS1-17-01257-003

Date Received: 05/05/17

Report Date: 07/17/17

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	0.492	0.674	2.244	1.086	3.221	U	pCi/L	ARS-040	06/28/17 8:17	ECAMP	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



QC Results per Analytical Batch

Analytical Batch	ARS1-B17-01047
SDG	ARS1-17-01257
Analysis	Low Level Tritium by Electrolytic Enrichment
Analysis Test Method	ARS-040/
Analysis Code	LSC-A-022
Report Units	pCi/L

Acceptable QC Performance Ranges

QC Sample Type	Performance Items and Ranges		
Laboratory Control Sample	Recovery (%):	> 80	< 120
Matrix Spike	Recovery (%):	> 60	< 140
Duplicate	Replicate Error Ratio (RER):	< 1	
	Duplicate Error Ratio (DER):	< 3	
	Relative Percent Difference (RPD %):	≤ 25	

Laboratory Control Sample			Analysis Date	06/25/17 23:21	Analysis Technician	ECAMP	
Analysis Batch Sample ID	QC Type	Analyte	Results	CSU (1s)	Expected Value	LCS Rec (%)	MDC
ARS1-B17-01047-01	LCS	ENRICHED H-3	31.507	4.891	36.149	87.2	2.635

Duplicate RER/DER/RPD			Analysis Date	06/26/17 05:03	Analysis Technician	ECAMP	
Analyte	Results LCS	CSU LCS (1s)	Results LCSD	CSU LCSD (1s)	RER	DER	RPD
ENRICHED H-3	31.507	4.891	33.539	5.187	0.202	0.285	6.2

Method Blank		Analysis Date	06/26/17 10:45	Analysis Technician	ECAMP	
Analysis Batch Sample ID	QC Type	Analyte	Results	CSU (1s)	MDC	Qual
ARS1-B17-01047-03	MBL	ENRICHED H-3	1.524	0.771	2.400	U

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

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

COC/Lab Request #:
2017-1483
Page 1 of 1

Special Instructions:					
Relinquished by:	Print Name: <i>Miss. Mack</i>	Date/Time: <i>5/17/31</i>	Received by: <i>[Signature]</i>	Print Name: <i>W. L. Lott</i>	Date/Time: <i>5-5-47</i>
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time: