Preliminary and Incoming LANL MLU Surveys Document

Date: 10/18/2021

To: Kelly Wohlwend, LANL MLU Team Lead

From: Amber Allardice, SNL RP Project Lead (TA-5)

Subject: Preliminary and Incoming LANL MLU Surveys

The following SNL document contains requested radiological survey information, as part of the documentation for the MLU shipment being performed by the LANL MLU team. The surveys were performed in TA-5, on October 11th - 15th, 2021. These surveys were of the shipping containers, the dunnage container, MLU equipment trailer, and contracted mobile crane.

- Receipt of LANL MLU Shipment Containers to AHCF (Characterization/Movement): I-20211011-4
- LANL Incoming Dunnage Survey: I-20211011-5
- LANL Incoming MLU Truck: I-20211012-5
- LANL MLU Shipment – Pre-Use Survey of Mobile Crane: I-20211015-1

All information contained was completed, reviewed, and approved by SNL RP personnel, and is intended for receipt and use by the LANL MLU Team at their discretion.

U.S. DEPARTMENT OF ENERGY

NNSA National Nuclear Security Administration

Sandia National Laboratories

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

Radiological Survey Report

Survey I-20211011-4

General Information

Title: Receipt of LANL MLU Shipment Containers to AHCF (Characterization/Movement)

Survey Date/Time: 10/11/2021 11:31

Lead Surveyor: Rollins, Andrew

Location: 6597 / OUTSIDE

Work Order/Task #: N/A

TWD or RTWD #: AHCF-RTWD-035 rev-0

Purpose: Characterization/Movement

Requestor Org: 01387

Status: Approved by: Walton, Edward, 10/18/2021

Ready for Review by: Bowman, Brian, 10/14/2021

Instruments Used

#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Serial #	Probe Type	Calibration Date	Efficiency	
								β/γ	α
1	RO20	12310	D			D	1/10/2022		
2	3030	276345	C	SHP380AB	113586	C	12/10/2021	0.21	0.31

Instruments Used - Notes

#	Notes
1	N/A
2	N/A

Radiological Survey Report

Comments:

Survey of incoming Pu-ICE containers (7) outside of AHCF from Corporate Storage.
Containers will be used for the LANL MLU shipment.
The containers were tagged and stored behind a CSI array in the 6597 High Bay.

Radionuclides of concern.
Pu-239 and its fission products.

Contamination limits.
Removable: 20dpm/100cm2 (alpha); 1000dpm/100cm2 (beta/gamma).

Swipes taken on the vehicles were counted on a Ludlum 3030 counter.
All swipes were less than removable contamination limits.
3030 MDA sheet attached.

Containers are OK to move to SPRF for loading onto trailer/MLU shipment.

Itemized Details - Items

#	Item Location/Description	Comments
1	C190200	
2	C190200	
3	SNL/NM007536	
4	SNL/NM007536	
5	C160126	
6	C160126	
7	SNL/NM007533	
8	SNL/NM007533	
9	SNL/NM007534	
10	SNL/NM007534	
11	SNL/NM007535	
12	SNL/NM007535	
13	SNL/NM007574	
14	SNL/NM007574	

Alpha Activity

Counting Data Attached: ☐ Yes ☑ No
Eff. for Removable: **Inst:** 2 **Eff:** 0.31
Eff. for Total: **Inst:** N/A **Eff:**

Radionuclide: Pu-239
Default Bkg Value: 0
Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	0	cpm/100 cm2	0	cpm/100 cm2	R	***ND***	dpm/100 cm2
2	0	cpm/100 cm2	0	cpm/100 cm2	R	***ND***	dpm/100 cm2
3	1	cpm/100 cm2	0	cpm/100 cm2	R	***3.2***	dpm/100 cm2
4	1	cpm/100 cm2	0	cpm/100 cm2	R	***3.2***	dpm/100 cm2
5	2	cpm/100 cm2	0	cpm/100 cm2	R	***6.5***	dpm/100 cm2
6	1	cpm/100 cm2	0	cpm/100 cm2	R	***3.2***	dpm/100 cm2
7	1	cpm/100 cm2	0	cpm/100 cm2	R	***3.2***	dpm/100 cm2
8	0	cpm/100 cm2	0	cpm/100 cm2	R	***ND***	dpm/100 cm2
9	3	cpm/100 cm2	0	cpm/100 cm2	R	***9.7***	dpm/100 cm2
10	4	cpm/100 cm2	0	cpm/100 cm2	R	***12.9***	dpm/100 cm2
11	3	cpm/100 cm2	0	cpm/100 cm2	R	***9.7***	dpm/100 cm2
12	4	cpm/100 cm2	0	cpm/100 cm2	R	***12.9***	dpm/100 cm2
13	3	cpm/100 cm2	0	cpm/100 cm2	R	***9.7***	dpm/100 cm2
14	2	cpm/100 cm2	0	cpm/100 cm2	R	***6.5***	dpm/100 cm2

Beta-Gamma Activity

Counting Data Attached: ☐ Yes ☑ No
Eff. for Removable: **Inst:** 2 **Eff:** 0.21
Eff. for Total: **Inst:** N/A **Eff:**

Radionuclide: Cs-137
Default Bkg Value: 53
Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	66	cpm/100 cm2	61	cpm/100 cm2	R	***23.8***	dpm/100 cm2
2	76	cpm/100 cm2	61	cpm/100 cm2	R	***71.4***	dpm/100 cm2
3	65	cpm/100 cm2	61	cpm/100 cm2	R	***19***	dpm/100 cm2
4	69	cpm/100 cm2	61	cpm/100 cm2	R	***38.1***	dpm/100 cm2
5	76	cpm/100 cm2	61	cpm/100 cm2	R	***71.4***	dpm/100 cm2
6	70	cpm/100 cm2	61	cpm/100 cm2	R	***42.9***	dpm/100 cm2
7	97	cpm/100 cm2	61	cpm/100 cm2	R	***171.4***	dpm/100 cm2
8	75	cpm/100 cm2	61	cpm/100 cm2	R	***66.7***	dpm/100 cm2
9	80	cpm/100 cm2	61	cpm/100 cm2	R	***90.5***	dpm/100 cm2
10	79	cpm/100 cm2	61	cpm/100 cm2	R	***85.7***	dpm/100 cm2
11	85	cpm/100 cm2	61	cpm/100 cm2	R	***114.3***	dpm/100 cm2
12	85	cpm/100 cm2	61	cpm/100 cm2	R	***114.3***	dpm/100 cm2
13	76	cpm/100 cm2	61	cpm/100 cm2	R	***71.4***	dpm/100 cm2
14	93	cpm/100 cm2	61	cpm/100 cm2	R	***152.4***	dpm/100 cm2

Radiation Survey

Background: <0.1
Background Units: mR/hr
Radiation Type: Gamma

#	Radiation Type	Reading	Units	Distance From Source	Comment
1	Gamma	<0.1	mR/hr	OC	
2	Gamma	<0.1	mR/hr	OC	
3	Gamma	<0.1	mR/hr	OC	
4	Gamma	<0.1	mR/hr	OC	
5	Gamma	<0.1	mR/hr	OC	
6	Gamma	<0.1	mR/hr	OC	
7	Gamma	<0.1	mR/hr	OC	
8	Gamma	<0.1	mR/hr	OC	
9	Gamma	<0.1	mR/hr	OC	
10	Gamma	<0.1	mR/hr	OC	
11	Gamma	<0.1	mR/hr	OC	
12	Gamma	<0.1	mR/hr	OC	
13	Gamma	<0.1	mR/hr	OC	
14	Gamma	<0.1	mR/hr	OC	

Attachments

Order	Filename	Description	Pages
1	S6591-2-KM-21101115240.pdf	3030 MDA Sheet	1

LUDLUM 3030 MDA CALCULATION WORKSHEET

Instrument #: 276345 Calibration Expires: 12/10/21 Location: Bldg. 6597/ Highbay

Probe Type: 43-10-1 Probe #: 113586

CALCULATION BY: Israel Devine **DATE:** 10-11-21

Expected Sample Radionuclide (α):	Pu-239	α Detector Efficiency for expected radionuclide (cpd):	0.31 (Pu-239)
Expected Sample Radionuclide (β):	Cs-137	β Detector Efficiency for expected radionuclide (cpd):	0.21 (Cs-137)
Background Count Time (min):	1	If background and sample count times are the same, use MDA calculation method 4.6.1.	
Sample Count Time (min):	1	If background and sample count times are different then use MDA calculation method 4.6.2.	

Daily check background count rate shall be used for MDA determination.

α 0 cpm β 61 cpm

Method 4.4.2:
Use when background and sample count times are the same.

$$MDA = \frac{2.71 + 4.65\sqrt{(R_b * t_b)}}{t_b * E}$$

Method 4.4.3:
Use when background and sample count times are different.

$$MDA = \frac{2.71 + 3.29\sqrt{(R_b * t_s)\left(1 + \frac{t_s}{t_b}\right)}}{t_s * E}$$

Where:

MDA = Minimum Detectable Activity level in dpm

R_b = Background count rate in counts per minute

t_s = Sample count time in minutes

t_b = Background count time in minutes

E = Detector efficiency (α or β) in counts per disintegration (cpd)

Instrument MDA Calculation Results	Acceptable	MDA Acceptance Limits† (from Table 6-1, RPPM)	
α MDA: 9	Y ☒ N ☐ N/A ☐	Nuclide	dpm
β MDA: 186	Y ☒ N ☐ N/A ☐	Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20
		Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200
		Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90.	1000
		U-natural, U-235, U-238 and associated decay products	1000 (alpha)

†Assumes swipe area is 100 cm²

List Applicable Survey Number(s): I-20211011-4 I-20211011-5

REVIEWED BY: _____ **DATE:** 10/11/21

Radiation Protection Line Support Project Leader (or Designee)

Radiological Survey Report

Survey I-20211011-5

General Information

Title: LANL MLU Incoming Dunnage Survey

Survey Date/Time: 10/11/2021 11:39

Lead Surveyor: Rollins, Andrew

Location: 6597 / OUTSIDE

Work Order/Task #: N/A

TWD or RTWD #: AHCF-RTWD-035-Rev-0

Purpose: Characterization

Requestor Org: 01387

Status: Approved by: Walton, Edward, 10/18/2021

Ready for Review by: Rollins, Andrew, 10/18/2021

Instruments Used

#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Serial #	Probe Type	Calibration Date	Efficiency β/γ	Efficiency α
1	RO20	12310	D			D	1/10/2022		
2	3030	276345	C	43-10-1	113586	C	12/10/2021	0.21	0.31

Instruments Used - Notes

#	Notes
1	N/A
2	N/A

Comments:

Survey for characterization of the incoming LANL Pu-ICE Dunnage SWB. TID#039252L, SNL110042
This survey was done to assess the arrival conditions of the dunnage container after entry in to TA-V and before entry into AHCF.
At time of survey, dunnage was labeled Empty.

Dunnage was moved into 6597 / Mid-Bay

Radionuclides of concern
Activation Products: Co-60 principal
Fission Products: Cs-137, Sr-90 principal
Actinides: U-234, U-235, U-238 principal
Transuranics: Pu-239, Np-237, Am-241 principal

Contamination limits
Removable: 20dpm/100cm2 (alpha); 1000dpm/100cm2 (beta/gamma)

Swipes taken on the dunnage were counted on a Ludlum 3030 counter.
All swipes were less than removable contamination limits.
3030 MDA sheet attached

Itemized Details - Items

#	Item Location/Description	Comments
1	Dunnage Container	
2	Dunnage Container	

Alpha Activity

Counting Data Attached: ☐ Yes ☑ No
Eff. for Removable: **Inst:** 2 **Eff:** 0.31
Eff. for Total: **Inst:** N/A **Eff:**

Radionuclide: Pu-239
Default Bkg Value: 0
Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	2	cpm/100 cm2	0	cpm/100 cm2	R	***6.5***	dpm/100 cm2
2	0	cpm/100 cm2	0	cpm/100 cm2	R	***ND***	dpm/100 cm2

Beta-Gamma Activity

Counting Data Attached: ☐ Yes ☑ No
Eff. for Removable: **Inst:** 2 **Eff:** 0.21
Eff. for Total: **Inst:** N/A **Eff:**

Radionuclide: Cs-137
Default Bkg Value: 61
Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	56	cpm/100 cm2	61	cpm/100 cm2	R	***ND***	dpm/100 cm2
2	47	cpm/100 cm2	61	cpm/100 cm2	R	***ND***	dpm/100 cm2

Radiation Survey

Background: <0.1
Background Units: mR/hr
Radiation Type: Gamma

#	Radiation Type	Reading	Units	Distance From Source	Comment
1	Gamma	<0.1	mR/hr	OC	
2	Gamma	<0.1	mR/hr	OC	

Attachments

Order	Filename	Description	Pages
1	S6591-2-KM-21101809520.pdf	3030 MDA Sheet	1

LUDLUM 3030 MDA CALCULATION WORKSHEET

Instrument #: 276345 Calibration Expires: 12/10/21 Location: Bldg. 6597 Room Hibay

Probe Type: 43-10-1 Probe #: 113586

CALCULATION BY: Andrew Tollins **DATE:** 10/11/21

Expected Sample Radionuclide (α): Pu-239 α Detector Efficiency for expected radionuclide (cpd): 0.31 (Pu239)

Expected Sample Radionuclide (β): Cs-137 β Detector Efficiency for expected radionuclide (cpd): 0.21 (Cs137)

Background Count Time (min): 1 If background and sample count times are the same, use MDA calculation method 4.6.1.

Sample Count Time (min): 1 If background and sample count times are different then use MDA calculation method 4.6.2.

Daily check background count rate shall be used for MDA determination.

α 0 cpm β 61 cpm

Method 4.4.2: Use when background and sample count times are the same.	**Method 4.4.3:** Use when background and sample count times are different.
$MDA = \frac{2.71 + 4.65\sqrt{(R_b * t_b)}}{t_b * E}$	$MDA = \frac{2.71 + 3.29\sqrt{(R_b * t_s)\left(1 + \frac{t_s}{t_b}\right)}}{t_s * E}$

Where:

MDA = Minimum Detectable Activity level in dpm

R_b = Background count rate in counts per minute

t_s = Sample count time in minutes

t_b = Background count time in minutes

E = Detector efficiency (α or β) in counts per disintegration (cpd)

Instrument MDA Calculation Results	**Acceptable**	**MDA Acceptance Limits†** (from Table 6-1, RPPM)	
α MDA: 9	Y ☒ N ☐ N/A ☐	**Nuclide**	**dpm**
β MDA: 186	Y ☒ N ☐ N/A ☐		
		Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20
		Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200
		Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90.	1000
		U-natural, U-235, U-238 and associated decay products	1000 (alpha)

†Assumes swipe area is 100 cm^2

List Applicable Survey Number(s): 1-20211011-5

REVIEWED BY: [signature] **DATE:** 101921

Radiation Protection Line Support Project Leader (or Designee)

Radiological Survey Report

Survey I-20211012-5

General Information

Title: LANL Incoming MLU Truck

Survey Date/Time: 10/12/2021 10:26

Lead Surveyor: Rollins, Andrew

Location: 6577 / OUTSIDE

Work Order/Task #: N/A

TWD or RTWD #: TAV-RTWD-023 rev-0

Purpose: Characterization

Requestor Org: 01381

Status: Approved by: Walton, Edward, 10/18/2021

Ready for Review by: Rollins, Andrew, 10/18/2021

Instruments Used

#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Serial #	Probe Type	Calibration Date	Efficiency	
								β/γ	α
1	RO20	12310	D			D	1/10/2022		
2	3030	278104	C	43-10-1	105184	C	2/10/2022	0.21	0.31
3	RADEYESX	11127	C	SHP380AB	760	C	11/10/2021	0.14	0.15

Instruments Used - Notes

#	Notes
1	N/A
2	N/A
3	N/A

Comments:

Survey for characterization of the incoming MLU equipment trailer. This survey was done to assess the arrival conditions of the vehicle.
The MLU trailer was surveyed on the roadway south of bldg-6577.
At time of survey, no parts of the either vehicle were labeled as being or containing rad material.

No posting required for survey.

Radionuclides of concern
Activation Products: Co-60 principal
Fission Products: Cs-137, Sr-90 principal
Actinides: U-234, U-235, U-238 principal
Transuranics: Pu-239, Np-237, Am-241 principal

Contamination limits
Removable: 20dpm/100cm2 (alpha); 200dpm/100cm2 (beta/gamma)
Total: 100dpm/100cm2 (alpha); 1000dpm/100cm2 (beta/gamma)

All swipes were less than removable contamination limits.

Direct scans on the MLU trailer were done with a RadeyeSX w/SHP-380AB probe.
Radeye SX BKG=0 cpm alpha, 278 cpm beta-gamma
Radeye SX MDA= 18 dpm alpha, 574 dpm beta-gamma
All scans were less than total contamination limits.
Attachment-1: 3030 MDA calculation sheet for MLU trailer survey

Itemized Details - Items

#	Item Location/Description	Comments
1	MLU trailer - End of Trailer	
2	MLU trailer - Back Right Tire	
3	MLU trailer - Side of Trailer	
4	MLU trailer - Middle Right Tire	
5	MLU trailer - Passenger Side Step	
6	MLU trailer - Driver Side Step	
7	MLU trailer - Middle Left Tire	
8	MLU trailer - Back Left Tire	
9	MLU trailer - End of Trailer	
10	MLU trailer - Driver Side Door Handle	
11	MLU trailer - Driver Side Seat	
12	MLU trailer - Passenger Side Seat	
13	MLU trailer - Back of Cab	

Alpha Activity

Counting Data Attached: ☐ Yes ☑ No
Eff. for Removable: **Inst:** 2 **Eff:** 0.31
Eff. for Total: **Inst:** N/A **Eff:**

Radionuclide: Pu-239
Default Bkg Value: 0
Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	0	cpm/100 cm2	0	cpm/100 cm2	R	***ND***	dpm/100 cm2
2	1	cpm/100 cm2	0	cpm/100 cm2	R	***3.2***	dpm/100 cm2
3	2	cpm/100 cm2	0	cpm/100 cm2	R	***6.5***	dpm/100 cm2
4	0	cpm/100 cm2	0	cpm/100 cm2	R	***ND***	dpm/100 cm2
5	4	cpm/100 cm2	0	cpm/100 cm2	R	***12.9***	dpm/100 cm2
6	3	cpm/100 cm2	0	cpm/100 cm2	R	***9.7***	dpm/100 cm2
7	1	cpm/100 cm2	0	cpm/100 cm2	R	***3.2***	dpm/100 cm2
8	1	cpm/100 cm2	0	cpm/100 cm2	R	***3.2***	dpm/100 cm2
9	3	cpm/100 cm2	0	cpm/100 cm2	R	***9.7***	dpm/100 cm2
10	0	cpm/100 cm2	0	cpm/100 cm2	R	***ND***	dpm/100 cm2

Beta-Gamma Activity

Counting Data Attached: ☐ Yes ☑ No
Eff. for Removable: **Inst:** 2 **Eff:** 0.21
Eff. for Total: **Inst:** N/A **Eff:**

Radionuclide: Cs-137
Default Bkg Value: 46
Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	39	cpm/100 cm2	46	cpm/100 cm2	R	***ND***	dpm/100 cm2
2	48	cpm/100 cm2	46	cpm/100 cm2	R	***9.5***	dpm/100 cm2
3	52	cpm/100 cm2	46	cpm/100 cm2	R	***28.6***	dpm/100 cm2
4	35	cpm/100 cm2	46	cpm/100 cm2	R	***ND***	dpm/100 cm2
5	42	cpm/100 cm2	46	cpm/100 cm2	R	***ND***	dpm/100 cm2
6	50	cpm/100 cm2	46	cpm/100 cm2	R	***19***	dpm/100 cm2
7	43	cpm/100 cm2	46	cpm/100 cm2	R	***ND***	dpm/100 cm2
8	47	cpm/100 cm2	46	cpm/100 cm2	R	***4.8***	dpm/100 cm2
9	45	cpm/100 cm2	46	cpm/100 cm2	R	***ND***	dpm/100 cm2
10	53	cpm/100 cm2	46	cpm/100 cm2	R	***33.3***	dpm/100 cm2

Radiation Survey

Background: <0.1
Background Units: mR/hr
Radiation Type: Beta/Gamma

#	Radiation Type	Reading	Units	Distance From Source	Comment
1	Gamma	<0.1	mR/hr	OC	
2	Gamma	<0.1	mR/hr	OC	
3	Gamma	<0.1	mR/hr	OC	
4	Gamma	<0.1	mR/hr	OC	
5	Gamma	<0.1	mR/hr	OC	
6	Gamma	<0.1	mR/hr	OC	
7	Gamma	<0.1	mR/hr	OC	
8	Gamma	<0.1	mR/hr	OC	
9	Gamma	<0.1	mR/hr	OC	
10	Gamma	<0.1	mR/hr	OC	
11	Gamma	<0.1	mR/hr	OC	Dose Rate Only
12	Gamma	<0.1	mR/hr	OC	Dose Rate Only
13	Gamma	<0.1	mR/hr	OC	Dose Rate Only

Attachments

Order	Filename	Description	Pages
1	S6591-2-KM-21101508430.pdf	3030 MDA Sheet	1

LUDLUM 3030 MDA CALCULATION WORKSHEET

Instrument #:	278104	Calibration Expires:	2/10/22	Location: Bldg.	6591/12D
Probe Type:	43-10-1	Probe #:	105184		
CALCULATION BY:	Andrew Rollins			**DATE:**	10-12-21

Expected Sample Radionuclide (α):	Pu-239	α Detector Efficiency for expected radionuclide (cpd):	0.31 (Pu-239)
Expected Sample Radionuclide (β):	Cs-137	β Detector Efficiency for expected radionuclide (cpd):	0.21 (Cs-137)
Background Count Time (min):	1	If background and sample count times are the same, use MDA calculation method 4.6.1.	
Sample Count Time (min):	1	If background and sample count times are different then use MDA calculation method 4.6.2.	

Daily check background count rate shall be used for MDA determination.

α 0 cpm β 46 cpm

Method 4.4.2: Use when background and sample count times are the same.	**Method 4.4.3:** Use when background and sample count times are different.
$MDA = \frac{2.71 + 4.65\sqrt{(R_b * t_b)}}{t_b * E}$	$MDA = \frac{2.71 + 3.29\sqrt{(R_b * t_s)\left(1 + \frac{t_s}{t_b}\right)}}{t_s * E}$

Where:

MDA = Minimum Detectable Activity level in dpm

R_b = Background count rate in counts per minute

t_s = Sample count time in minutes

t_b = Background count time in minutes

E = Detector efficiency (α or β) in counts per disintegration (cpd)

Instrument MDA Calculation Results	**Acceptable**	**MDA Acceptance Limits†** (from Table 6-1, RPPM)	
α MDA: 9	Y ☒ N ☐ N/A ☐	**Nuclide**	**dpm**
β MDA: 163	Y ☒ N ☐ N/A ☐		
		Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20
		Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200
		Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90.	1000
		U-natural, U-235, U-238 and associated decay products	1000 (alpha)

†Assumes swipe area is 100 cm^2

List Applicable Survey Number(s): 1-20211012-5

REVIEWED BY: [signature] **DATE:** 10/15/2021

Radiation Protection Line Support Project Leader (or Designee)

Radiological Survey Report

Survey I-20211015-1

General Information

Title: LANL MLU Shipment- Pre-Use Survey of Mobile Crane

Survey Date/Time: 10/15/2021 11:29

Lead Surveyor: Bowman, Brian

Location: 6590 / OUTSIDE

Work Order/Task #: N/A

TWD or RTWD #: TAV-RTWD-023 rev-0

Purpose: Characterization

Requestor Org: 01381

Status: Approved by: Walton, Edward, 10/18/2021

Ready for Review by: Bowman, Brian, 10/18/2021

Additional Surveyors

Surveyor
Molina, Vanessa
Rollins, Andrew

Instruments Used

#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Serial #	Probe Type	Calibration Date	Efficiency β/γ	Efficiency α
1	RADEYE SX	11127	C	SHP380AB	760	C	11/10/2021	0.14	0.15
2	3030	278104	C	43-10-1	105184	C	2/10/2022	0.21	0.31
3	RO20	12310	D	N/A	N/A	D	1/10/2022	N/A	N/A

Instruments Used - Notes

#	Notes
1	BKGD CPM (a/B) = 1/299
2	BKGD CPM (a/B) = 0/42
3	BKGD = <0.1 mR/hr

Comments:

Survey for characterization/baseline of mobile crane prior to use for loading of the MLU trailer.
This survey was done to assess the arrival conditions of the mobile crane.

Radionuclides of Concern:
Activation Products: Co-60 principal
Fission Products: Cs-137, Sr-90 principal
Actinides: U-234, U-235, U-238 principal
Transuranics: Pu-239, Np-237, Am-241 principal

Removable Contamination Limits:
20dpm/100cm2 (alpha)
1000dpm/100cm2 (beta/gamma)

All swipes were less than removable contamination limits.

Swipes counted using the 30-30.
30-30 MDA sheet is attached.

Field check of swipes were done with a RadeyeSX w/SHP-380AB probe.
Radeye SX BKG= 1 cpm alpha, 299 cpm beta-gamma
Radeye SX MDA= 49 dpm alpha, 594 dpm beta-gamma

All scans were less than total contamination limits.
Attachment-1: 3030 MDA calculation sheet for MLU trailer survey

Itemized Details - Items

#	Item Location/Description	Comments
1	Crane Gas Pedal	
2	Back Left Stairs	
3	Back Left Tire	
4	Left Middle Stairs	
5	Front Left Tire	
6	Drivers Cab Seat	
7	Small Hook	
8	Large Hook	
9	Rigging	
10	Front Right Tire	
11	Middle Right Stairs	
12	Back Right Tire	

Alpha Activity

Counting Data Attached: ☐ **Yes** ☑ **No**
Eff. for Removable: **Inst:** 2 **Eff:** 0.31
Eff. for Total: **Inst:** N/A **Eff:** N/A

Radionuclide: Pu-239
Default Bkg Value: 0
Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	1	cpm/100 cm2	0	cpm/100 cm2	R	***3.2***	dpm/100 cm2
2	0	cpm/100 cm2	0	cpm/100 cm2	R	***ND***	dpm/100 cm2
3	0	cpm/100 cm2	0	cpm/100 cm2	R	***ND***	dpm/100 cm2
4	0	cpm/100 cm2	0	cpm/100 cm2	R	***ND***	dpm/100 cm2
5	2	cpm/100 cm2	0	cpm/100 cm2	R	***6.5***	dpm/100 cm2
6	1	cpm/100 cm2	0	cpm/100 cm2	R	***3.2***	dpm/100 cm2
7	0	cpm/100 cm2	0	cpm/100 cm2	R	***ND***	dpm/100 cm2
8	1	cpm/100 cm2	0	cpm/100 cm2	R	***3.2***	dpm/100 cm2
9	4	cpm/100 cm2	0	cpm/100 cm2	R	***12.9***	dpm/100 cm2
10	3	cpm/100 cm2	0	cpm/100 cm2	R	***9.7***	dpm/100 cm2
11	0	cpm/100 cm2	0	cpm/100 cm2	R	***ND***	dpm/100 cm2
12	2	cpm/100 cm2	0	cpm/100 cm2	R	***6.5***	dpm/100 cm2

Beta-Gamma Activity

Counting Data Attached: ☐ Yes ☑ No
Eff. for Removable: **Inst:** 2 **Eff:** 0.21
Eff. for Total: **Inst:** N/A **Eff:** N/A

Radionuclide: Cs-137
Default Bkg Value: 42
Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	40	cpm/100 cm2	42	cpm/100 cm2	R	***ND***	dpm/100 cm2
2	46	cpm/100 cm2	42	cpm/100 cm2	R	***19***	dpm/100 cm2
3	43	cpm/100 cm2	42	cpm/100 cm2	R	***4.8***	dpm/100 cm2
4	36	cpm/100 cm2	42	cpm/100 cm2	R	***ND***	dpm/100 cm2
5	38	cpm/100 cm2	42	cpm/100 cm2	R	***ND***	dpm/100 cm2
6	44	cpm/100 cm2	42	cpm/100 cm2	R	***9.5***	dpm/100 cm2
7	43	cpm/100 cm2	42	cpm/100 cm2	R	***4.8***	dpm/100 cm2
8	51	cpm/100 cm2	42	cpm/100 cm2	R	***42.9***	dpm/100 cm2
9	52	cpm/100 cm2	42	cpm/100 cm2	R	***47.6***	dpm/100 cm2
10	30	cpm/100 cm2	42	cpm/100 cm2	R	***ND***	dpm/100 cm2
11	45	cpm/100 cm2	42	cpm/100 cm2	R	***14.3***	dpm/100 cm2
12	44	cpm/100 cm2	42	cpm/100 cm2	R	***9.5***	dpm/100 cm2

Radiation Survey

Background: <0.1
Background Units: mR/hr
Radiation Type: Beta/Gamma

#	Radiation Type	Reading	Units	Distance From Source	Comment
1	Gamma	<0.1	mR/hr	OC	
2	Gamma	<0.1	mR/hr	OC	
3	Gamma	<0.1	mR/hr	OC	
4	Gamma	<0.1	mR/hr	OC	
5	Gamma	<0.1	mR/hr	OC	
6	Gamma	<0.1	mR/hr	OC	
7	Gamma	<0.1	mR/hr	OC	
8	Gamma	<0.1	mR/hr	OC	
9	Gamma	<0.1	mR/hr	OC	
10	Gamma	<0.1	mR/hr	OC	
11	Gamma	<0.1	mR/hr	OC	
12	Gamma	<0.1	mR/hr	OC	

Attachments

Order	Filename	Description	Pages
1	S6591-2-KM-21101514100.pdf	3030 MDA Sheet	1

LUDLUM 3030 MDA CALCULATION WORKSHEET

Instrument #:	278104	Calibration Expires:	2/10/22	Location:	Bldg. 6593 / Outside
Probe Type:	43-10-1	Probe #:	105184		
CALCULATION BY:	Vanessa Molina			**DATE:**	10/15/21

Expected Sample Radionuclide (α):	Pu-239	α Detector Efficiency for expected radionuclide (cpd):	0.31 (Pu-239)
Expected Sample Radionuclide (β):	Cs-137	β Detector Efficiency for expected radionuclide (cpd):	0.21 (Cs-137)
Background Count Time (min):	1	If background and sample count times are the same, use MDA calculation method 4.6.1.	
Sample Count Time (min):	1	If background and sample count times are different then use MDA calculation method 4.6.2.	

Daily check background count rate shall be used for MDA determination.

α 0 cpm β 42 cpm

Method 4.4.2: Use when background and sample count times are the same.	**Method 4.4.3:** Use when background and sample count times are different.
$MDA = \frac{2.71 + 4.65\sqrt{(R_b * t_b)}}{t_b * E}$	$MDA = \frac{2.71 + 3.29\sqrt{(R_b * t_s)\left(1 + \frac{t_s}{t_b}\right)}}{t_s * E}$

Where:

MDA = Minimum Detectable Activity level in dpm

R_b = Background count rate in counts per minute

t_s = Sample count time in minutes

t_b = Background count time in minutes

E = Detector efficiency (α or β) in counts per disintegration (cpd)

Instrument MDA Calculation Results	**Acceptable**	**MDA Acceptance Limits†** (from Table 6-1, RPPM)	
α MDA: 9	Y ☑ N ☐ N/A ☐	**Nuclide**	**dpm**
β MDA: ~~154.5~~ 157 AR	Y ☑ N ☐ N/A ☐		
		Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20
		Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200
		Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90.	1000
		U-natural, U-235, U-238 and associated decay products	1000 (alpha)

†Assumes swipe area is 100 cm²

List Applicable Survey Number(s): I-20211015-1

REVIEWED BY: _____ **DATE:** 10/15/21

Radiation Protection Line Support Project Leader (or Designee)