

WIPP MLU Shipment Preliminary Document

Date: 7/16/2020

To: Ronnie York, LANL MLU Team Lead

From: Amber Allardice, SNL RP Project Lead (TA-5)
Edward Walton, SNL RP Sr. RCT (TA-5)

Subject: Pre-Shipment Start Documentation

The following SNL document contains required information as part of final preparation for the LANL MLU shipping team. The documents pertain to MLU shipment activities scheduled at Sandia National Laboratories (SNL) in TA-5, for the week of July 20th – 24th.

- EILOT (Escort In Lieu Of Training) for MLU team members and crane operators
- SNL-RP characterization surveys for the 11 SCA due for shipment

The EILOT document is listed first. The remaining pages are the radiation and contamination surveys completed on the 11 SCA containers that are being loaded and shipped to WIPP.

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



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Albuquerque, New Mexico 87185-0351
Livermore, California 94551-0969

date: July 15, 2020

to: Rafe Campbell (1381), MS-1142

from: Michael Spoerner (1387), MS-1142

Amber Allardice (625), MS-1142

subject: Shielded Container Assembly Loading – Escort in Lieu of Training

The following personnel may use escort in lieu of training to enter and perform radiological work in Radiation Areas, Radioactive Material(s), and Controlled Areas located in the SPRF and AHCF during July 2020.

- Robert J. Semon, LANL
- Kelly A. Wohlwend, LANL
- Jacob R. Howard, LANL
- Ronald L. York, LANL
- James D. Branaman, LANL
- Carlos S. Quevedo, Crane Services
- Paul Raley, Crane Services

The radiological work to be performed is subject to the requirements in the following RTWD:

- SPRF-RTWD-018, Shielded Container Assembly Loading

The following Sandia personnel may provide escort to the personnel (listed above) to perform radiological work in the areas identified above:

- Bryan Green
- Mike Torneby
- Kevin MacRunnels
- Beth Hanson
- Richard Pratt
- Max Nager

Copy to:

MS-1142, Mitchell Callahan, 625

MS-1142, Steve Kegeler, 625

Radiological Survey Report

Survey I-20180918-22

General Information

Title: AHCF Campaign-19 WIPP SCA #SNL001401SC

Survey Date/Time: 9/18/2018 15:30

Location: 6597 High Bay

TWD or RTWD #: AHCF-RTWD-025

Purpose: Characterization

Requestor Org: 01387

Status: Approved by: Bonadore, Steven, 10/11/2018

Ready for Review by: Kemp, Justin, 10/11/2018

Lead Surveyor: Kemp, Justin

Work Order/Task #: 96752 80.01.02.01

Additional Surveyors

Surveyor

Walton, Edward

Instruments Used

#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Serial #	Probe Type	Calibration Date	Efficiency	
								β/γ	α
1	RO20	12405	D	N/A	N/A	D	2/10/2019	N/A	N/A
2	RADEYE PX	10387	D	NRD	2210	D	11/10/2018	N/A	N/A
3	3030	278114	C	43-10-1	102768	C	10/10/2018	0.21	0.31

Instruments Used - Notes

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

Radiological Survey Report

Comments:

Survey for WIPPs required Shielded Container Assembly (SCA) Contact Dose Rate Survey Form (CCP-TP-81 Rev.2.). Contact dose rates taken on SCA were taken according to, and documented on CCP-TP-81 Rev.2.

Area posted as RA/RMA/ConA

30cm dose rate survey at highest on contact location and removable contamination surveys also performed.

Radionuclides of concern:

Activation Products: Co-60 principal;

Fission Products (beta-gamma) Sr-90, Cs-137 principal;

Fission Products (alpha) Pu-239, Am-241 principal;

Actinides: U-234, U-235, U-238 principal

Swipes taken on the SCA were counted on a Ludlum 3030 counter.

All swipes were less than removable contamination limits of 20 dpm/100cm² alpha, 200 dpm/100cm² beta/gamma

RO-20 with open window was used for beta/gamma dose readings, and RadeyePx w/NRD probe used for neutron dose readings.

Highest total contact dose rate measurement was less than WIPPs acceptance limit of 200 mR/hr

Highest dose rate on SCA was 80 mR/hr on contact and 20 mR/hr @ 30cm.

3030 MDA calculation worksheet sheet is attachment-1.

Copy of WIPP survey document CCP-TP-81 Rev.2. is attachment-2.

Radiological Survey Report

Itemized Details - Items

#	Item Location/Description	Comments
1	SCA Top	
2	SCA Bottom	
3	SCA Q1#1	
4	SCA Q1#2	
5	SCA Q1#3	
6	SCA Q2#1	
7	SCA Q2#2	
8	SCA Q2#3	
9	SCA Q3#1	
10	SCA Q3#2	
11	SCA Q3#3	
12	SCA Q4#1	
13	SCA Q4#2	
14	SCA Q4#3	

Alpha Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:3 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	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
7	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2
11	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2

Beta-Gamma Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:3 Eff: 0.21

Eff. for Total: Inst:N/A Eff:

Radionuclide: Cs-137

Default Bkg Value: 62

Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	49	cpm/100 cm2	62	cpm/100 cm2	R	ND	dpm/100 cm2
2	59	cpm/100 cm2	62	cpm/100 cm2	R	ND	dpm/100 cm2
3	54	cpm/100 cm2	62	cpm/100 cm2	R	ND	dpm/100 cm2
7	64	cpm/100 cm2	62	cpm/100 cm2	R	9.5	dpm/100 cm2
11	53	cpm/100 cm2	62	cpm/100 cm2	R	ND	dpm/100 cm2

Radiological Survey Report

Radiation Survey

Background: <0.1

Background Units: mR/hr

Radiation Type: Beta/Gamma

#	Radiation Type	Reading	Units	Distance From Source	Comment
1	Beta/Gamma	20	mR/hr	OC	Open Window
2	Beta/Gamma	44	mR/hr	OC	Open Window
3	Beta/Gamma	31	mR/hr	OC	Open Window
4	Beta/Gamma	25	mR/hr	OC	Open Window
5	Beta/Gamma	40	mR/hr	OC	Open Window
6	Beta/Gamma	10	mR/hr	OC	Open Window
7	Beta/Gamma	22	mR/hr	OC	Open Window
8	Beta/Gamma	38	mR/hr	OC	Open Window
9	Beta/Gamma	12	mR/hr	OC	Open Window
10	Beta/Gamma	24	mR/hr	OC	Open Window
11	Beta/Gamma	80/20	mR/hr	OC/30 cm	Open Window (highest reading)
12	Beta/Gamma	10	mR/hr	OC	Open Window
13	Beta/Gamma	27	mR/hr	OC	Open Window
14	Beta/Gamma	70	mR/hr	OC	Open Window

Additional Radiation Survey

Background: <0.1

Unit: mrem/hr

Radiation Type: Neutron

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

Radiological Survey Report

Attachments

Order	Filename	Description	Pages
1	MDA 3030 20180918.pdf	3030 MDA worksheet	1
2	WIPP survey SNL001401SC.pdf	Copy of WIPP SCA survey document	2

LUDLUM 3030 MDA CALCULATION WORKSHEET

Instrument #: <u>278114</u>	Calibration Expires: <u>10/10/18</u>	Location: Bldg. <u>6597</u> Room <u>highbay</u>
Probe Type: <u>43-10-1</u>	Probe #: <u>102768</u>	
CALCULATION BY: <u>Justin Kemp</u>		DATE: <u>9-18-18</u>

Expected Sample Radionuclide (α): <u>Pu-239</u>	α Detector Efficiency for expected radionuclide (cpd): <u>0.31</u>	
Expected Sample Radionuclide (β): <u>Cs-137</u>	β Detector Efficiency for expected radionuclide (cpd): <u>0.21</u>	
Background Count Time (min): <u>1</u>	If background and sample count times are the same, use MDA calculation method 4.6.1.	
Sample Count Time (min): <u>1</u>	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 <u>0</u> cpm	β <u>62</u> 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: <u>9</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>	Nuclide	dpm
β MDA: <u>188</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>		
		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):		<u>M-20180918-2</u>	<u>M-20180918-11</u>
			<u>I-20180918-22</u>
REVIEWED BY: <u>WJ Callahan</u>		DATE: <u>9/18/18</u>	
Radiation Protection Line Support Project Leader (or Designee)			

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey (Continued)

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R020 open window All <0.1 AR/hr

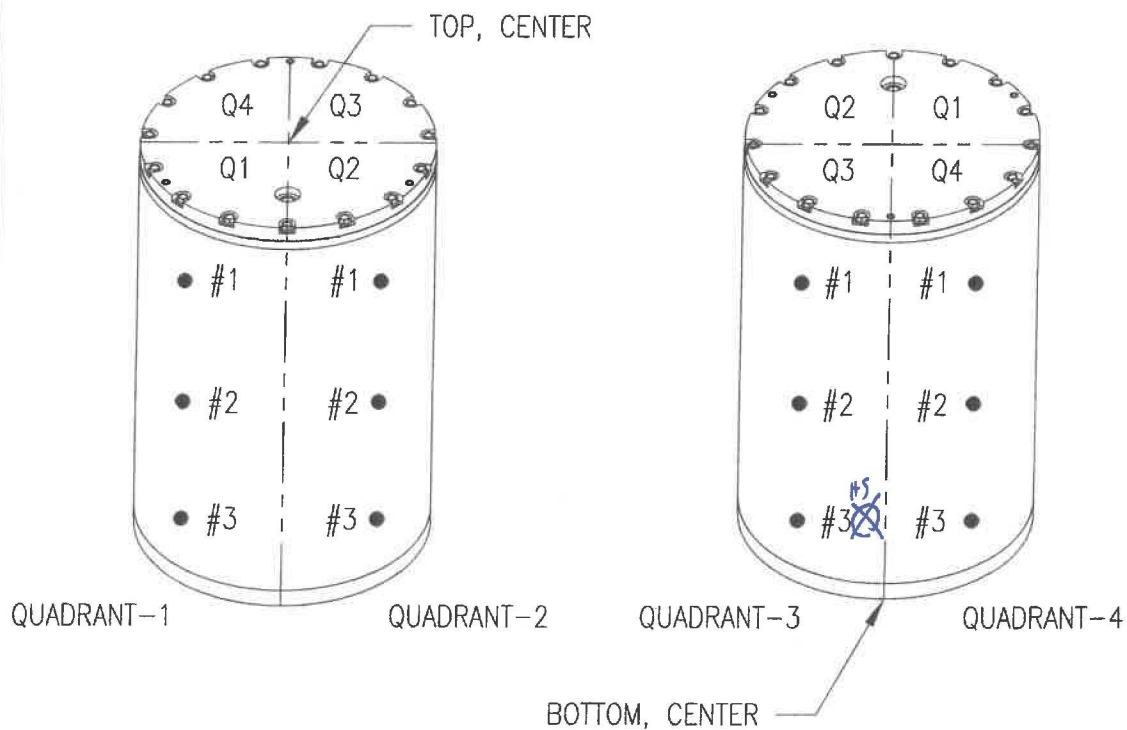
Shielded Container Assembly Contact Dose Rate Survey Form			
Shielded Container Assembly ID: <u>SWL001401SC</u>			
Record highest contact dose rate measurements for beta/gamma and neutron. Sum the two values and record the total dose rates.			
Contact Dose Rate Measurement	Beta/Gamma (mrem/hr)	Neutron (mrem/hr)	Total Dose Rate
SCA Top ① 0/49	20	<0.1	20
SCA Bottom ⑤ 0/59	44	<0.1	44
SCA Q1 #1 ② 0/54	31	<0.1	31
SCA Q1 #2	25	<0.1	25
SCA Q1 #3	40	<0.1	40
SCA Q2 #1	10	<0.1	10
SCA Q2 #2 ③ 1/64	22	<0.1	22
SCA Q2 #3	38	<0.1	38
SCA Q3 #1	12	<0.1	12
SCA Q3 #2	24	<0.1	24
SCA Q3 #3 ④ 1/53	80 [*] /20'	<0.1	80
SCA Q4 #1	10	<0.1	10
SCA Q4 #2	27	<0.1	27
SCA Q4 #3	70	<0.1	70
Verify the highest total contact dose rate measurement is ≤200 mrem/hr on the external surface of the SCA, and record as the contact dose rate of record: <u>80</u> mrem/hr.			
I certify that the contact dose rate data recorded is correct.			
<u>L. C. H. C.</u>		9-18-18	
Transportation Certification Official (or designee)		Date	

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey

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SCA CONTACT DOSE RATE SURVEY AREAS



Radiological Survey Report

Survey I-20180919-20

General Information

Title: AHCF Campaign-19 WIPP SCA #SNL001402SC
Survey Date/Time: 9/19/2018 15:30
Location: 6597 High Bay
TWD or RTWD #: AHCF-RTWD-025
Purpose: Characterization
Requestor Org: 01387
Status: Approved by: Bonadore, Steven, 10/11/2018
Ready for Review by: Kemp, Justin, 10/11/2018

Lead Surveyor: Kemp, Justin
Work Order/Task #: 96752 80.01.02.01

Additional Surveyors

Surveyor

Walton, Edward

Instruments Used

#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Serial #	Probe Type	Calibration Date	Efficiency	
								β/γ	α
1	RO20	12405	D	N/A	N/A	D	2/10/2019	N/A	N/A
2	RADEYE PX	10387	D	NRD	2210	D	11/10/2018	N/A	N/A
3	3030	278114	C	43-10-1	102768	C	10/10/2018	0.21	0.31

Instruments Used - Notes

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

Radiological Survey Report

Comments:

Survey for WIPPs required Shielded Container Assembly (SCA) Contact Dose Rate Survey Form (CCP-TP-81 Rev.2.). Contact dose rates taken on SCA were taken according to, and documented on CCP-TP-81 Rev.2.

Area posted as RA/RMA/ConA

30cm dose rate survey at highest on contact location and removable contamination surveys also performed.

Radionuclides of concern:

Activation Products: Co-60 principal;

Fission Products (beta-gamma) Sr-90, Cs-137 principal;

Fission Products (alpha) Pu-239, Am-241 principal;

Actinides: U-234, U-235, U-238 principal

Swipes taken on the SCA were counted on a Ludlum 3030 counter.

All swipes were less than removable contamination limits of 20 dpm/100cm² alpha, 200 dpm/100cm² beta/gamma

RO-20 with open window was used for beta/gamma dose readings, and RadeyePx w/NRD probe used for neutron dose readings.

Highest total contact dose rate measurement was less than WIPPs acceptance limit of 200 mR/hr

Highest dose rate on SCA was 80 mR/hr on contact and 30 mR/hr @ 30cm.

3030 MDA calculation worksheet sheet is attachment-1.

Copy of WIPP survey document CCP-TP-81 Rev.2. is attachment-2.

Radiological Survey Report

Itemized Details - Items

#	Item Location/Description	Comments
1	SCA Top	
2	SCA Bottom	
3	SCA Q1 #1	
4	SCA Q1 #2	
5	SCA Q1 #3	
6	SCA Q2 #1	
7	SCA Q2 #2	
8	SCA Q2 #3	
9	SCA Q3 #1	
10	SCA Q3 #2	
11	SCA Q3 #3	
12	SCA Q4 #1	
13	SCA Q4 #2	
14	SCA Q4 #3	

Alpha Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:3 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	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
7	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2
11	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2

Beta-Gamma Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:3 Eff: 0.21

Eff. for Total: Inst:N/A Eff:

Radionuclide: Cs-137

Default Bkg Value: 58

Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	51	cpm/100 cm2	58	cpm/100 cm2	R	ND	dpm/100 cm2
2	53	cpm/100 cm2	58	cpm/100 cm2	R	ND	dpm/100 cm2
3	47	cpm/100 cm2	58	cpm/100 cm2	R	ND	dpm/100 cm2
7	49	cpm/100 cm2	58	cpm/100 cm2	R	ND	dpm/100 cm2
11	55	cpm/100 cm2	58	cpm/100 cm2	R	ND	dpm/100 cm2

Radiological Survey Report

Radiation Survey

Background: <0.1

Background Units: mR/hr

Radiation Type: Beta/Gamma

#	Radiation Type	Reading	Units	Distance From Source	Comment
1	Beta/Gamma	48	mR/hr	OC	Open Window
2	Beta/Gamma	60	mR/hr	OC	Open Window
3	Beta/Gamma	47	mR/hr	OC	Open Window
4	Beta/Gamma	60	mR/hr	OC	Open Window
5	Beta/Gamma	80	mR/hr	OC	Open Window
6	Beta/Gamma	29	mR/hr	OC	Open Window
7	Beta/Gamma	60	mR/hr	OC	Open Window
8	Beta/Gamma	60	mR/hr	OC	Open Window
9	Beta/Gamma	47	mR/hr	OC	Open Window
10	Beta/Gamma	80/30	mR/hr	OC/30 cm	Open Window (highest reading)
11	Beta/Gamma	70	mR/hr	OC	Open Window
12	Beta/Gamma	38	mR/hr	OC	Open Window
13	Beta/Gamma	60	mR/hr	OC	Open Window
14	Beta/Gamma	70	mR/hr	OC	Open Window

Additional Radiation Survey

Background: <0.1

Unit: mrem/hr

Radiation Type: Neutron

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

Radiological Survey Report

Attachments

Order	Filename	Description	Pages
1	MDA 3030 20180919.pdf	3030 MDA worksheet	1
2	WIPP survey SNL001402SC.pdf	Copy of WIPP SCA survey document	2

Instrument #: <u>278114</u>	Calibration Expires: <u>10/10/18</u>	Location: Bldg. <u>6597</u> Room <u>highbay</u>
Probe Type: <u>43-10-1</u>	Probe #: <u>102768</u>	
CALCULATION BY: <u>Justin Kemp</u>		DATE: <u>9-19-18</u>

Expected Sample Radionuclide (α): <u>Pu-239</u>	α Detector Efficiency for expected radionuclide (cpd): <u>0.31</u>
Expected Sample Radionuclide (β): <u>Cs-137</u>	β Detector Efficiency for expected radionuclide (cpd): <u>0.21</u>
Background Count Time (min): <u>1</u>	If background and sample count times are the same, use MDA calculation method 4.6.1.
Sample Count Time (min): <u>1</u>	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 <u>0</u> cpm	β <u>58</u> 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)	
		Nuclide	dpm
α MDA: <u>9</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>		
β MDA: <u>182</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>		
		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):	<u>M-20180919-4</u>	<u>M-20180919-14</u>	<u>I-20180919-20</u>
REVIEWED BY: <u>[Signature]</u>	DATE: <u>9/19/18</u>		
Radiation Protection Line Support Project Leader (or Designee)			

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey (Continued)

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9-19-2018

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Shielded Container Assembly Contact Dose Rate Survey Form			
Shielded Container Assembly ID: <u>SNL001402SC</u>			
Record highest contact dose rate measurements for beta/gamma and neutron. Sum the two values and record the total dose rates.			
Contact Dose Rate Measurement	Beta/Gamma (mrem/hr)	Neutron (mrem/hr)	Total Dose Rate
SCA Top (1) 0/51	48	< 0.1	48
SCA Bottom (5) 0/453	60	< 0.1	60
SCA Q1 #1 (2) 0/47	47	< 0.1	47
SCA Q1 #2	60	< 0.1	60
SCA Q1 #3	80	< 0.1	80
SCA Q2 #1	29	< 0.1	29
SCA Q2 #2 (3) 1/49	60	< 0.1	60
SCA Q2 #3	60	< 0.1	60
SCA Q3 #1	47	< 0.1	47
SCA Q3 #2	80 → +30	< 0.1	80
SCA Q3 #3 (4) 1/55	70	< 0.1	70
SCA Q4 #1	38	< 0.1	38
SCA Q4 #2	60	< 0.1	60
SCA Q4 #3	70	< 0.1	70
Verify the highest total contact dose rate measurement is ≤200 mrem/hr on the external surface of the SCA, and record as the contact dose rate of record: _____ mrem/hr.			
I certify that the contact dose rate data recorded is correct.			
_____ Transportation Certification Official (or designee)		_____ Date	

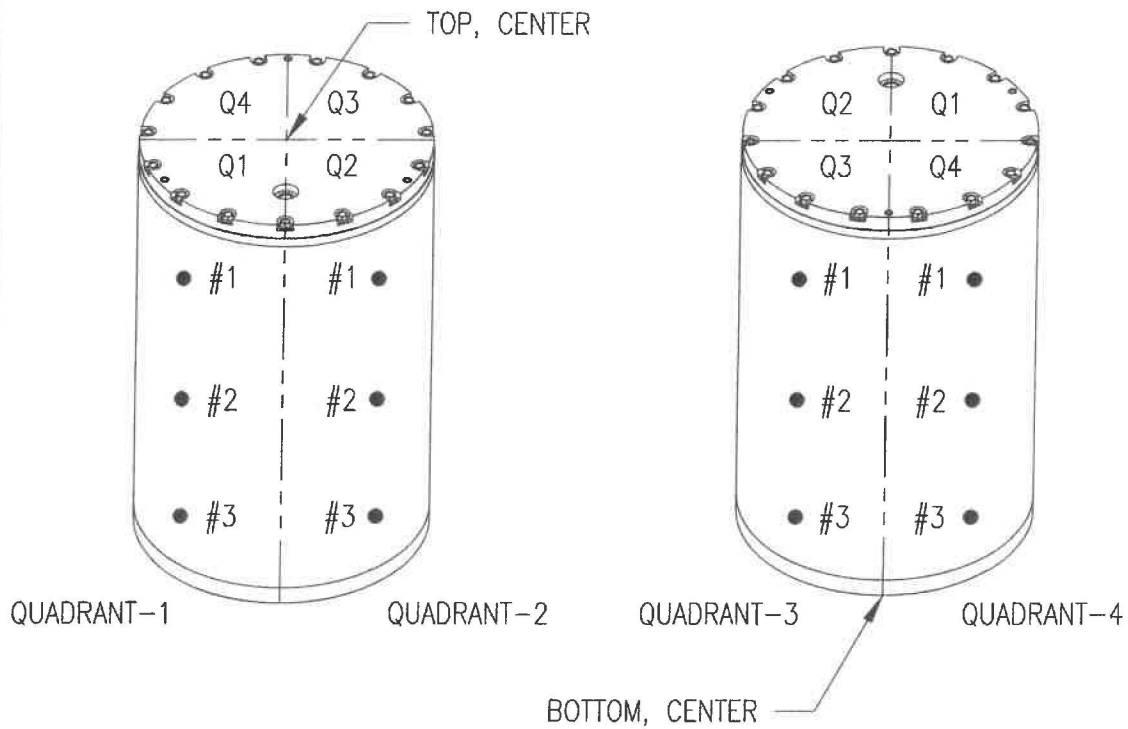
Swipes (5) Bottom edge

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey

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SCA CONTACT DOSE RATE SURVEY AREAS



Radiological Survey Report

Survey I-20180920-4

General Information

Title: AHCF Campaign-19 WIPP SCA #SNL001403SC
Survey Date/Time: 9/20/2018 15:00
Location: 6597 High Bay
TWD or RTWD #: AHCF-RTWD-025
Purpose: Characterization
Requestor Org: 01387
Status: Approved by: Bonadore, Steven, 10/11/2018
Ready for Review by: Kemp, Justin, 10/11/2018

Lead Surveyor: Kemp, Justin
Work Order/Task #: 96752 80.01.02.01

Additional Surveyors

Surveyor

Walton, Edward

Instruments Used

#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Serial #	Probe Type	Calibration Date	Efficiency	
								β/γ	α
1	RO20	12405	D	N/A	N/A	D	2/10/2019	N/A	N/A
2	RADEYE PX	10387	D	NRD	2210	D	11/10/2018	N/A	N/A
3	3030	278114	C	43-10-1	102768	C	10/10/2018	0.21	0.31

Instruments Used - Notes

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

Radiological Survey Report

Comments:

Survey for WIPPs required Shielded Container Assembly (SCA) Contact Dose Rate Survey Form (CCP-TP-81 Rev.2.). Contact dose rates taken on SCA were taken according to, and documented on CCP-TP-81 Rev.2.

Area posted as RA/RMA/ConA

30cm dose rate survey at highest on contact location and removable contamination surveys also performed.

Radionuclides of concern:

Activation Products: Co-60 principal;

Fission Products (beta-gamma) Sr-90, Cs-137 principal;

Fission Products (alpha) Pu-239, Am-241 principal;

Actinides: U-234, U-235, U-238 principal

Swipes taken on the SCA were counted on a Ludlum 3030 counter.

All swipes were less than removable contamination limits of 20 dpm/100cm² alpha, 200 dpm/100cm² beta/gamma

RO-20 with open window was used for beta/gamma dose readings, and RadeyePx w/NRD probe used for neutron dose readings.

Highest total contact dose rate measurement was less than WIPPs acceptance limit of 200 mR/hr

Highest dose rate on SCA was 150 mR/hr on contact and 40 mR/hr @ 30cm.

3030 MDA calculation worksheet sheet is attachment-1.

Copy of WIPP survey document CCP-TP-81 Rev.2. is attachment-2.

Radiological Survey Report

Itemized Details - Items

#	Item Location/Description	Comments
1	SCA Top	
2	SCA Bottom	
3	SCA Q1 #1	
4	SCA Q1 #2	
5	SCA Q1 #3	
6	SCA Q2 #1	
7	SCA Q2 #2	
8	SCA Q2 #3	
9	SCA Q3 #1	
10	SCA Q3 #2	
11	SCA Q3 #3	
12	SCA Q4 #1	
13	SCA Q4 #2	
14	SCA Q4 #3	

Alpha Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:3 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
3	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
7	2	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
11	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:3 Eff: 0.21

Eff. for Total: Inst:N/A Eff:

Radionuclide: Cs-137

Default Bkg Value: 49

Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	37	cpm/100 cm2	49	cpm/100 cm2	R	ND	dpm/100 cm2
2	50	cpm/100 cm2	49	cpm/100 cm2	R	4.8	dpm/100 cm2
3	42	cpm/100 cm2	49	cpm/100 cm2	R	ND	dpm/100 cm2
7	52	cpm/100 cm2	49	cpm/100 cm2	R	14.3	dpm/100 cm2
11	45	cpm/100 cm2	49	cpm/100 cm2	R	ND	dpm/100 cm2

Radiological Survey Report

Radiation Survey

Background: <0.1

Background Units: mR/hr

Radiation Type: Beta/Gamma

#	Radiation Type	Reading	Units	Distance From Source	Comment
1	Beta/Gamma	21	mR/hr	OC	Open window
2	Beta/Gamma	70	mR/hr	OC	Open window
3	Beta/Gamma	16	mR/hr	OC	Open window
4	Beta/Gamma	23	mR/hr	OC	Open window
5	Beta/Gamma	60	mR/hr	OC	Open window
6	Beta/Gamma	18	mR/hr	OC	Open window
7	Beta/Gamma	50	mR/hr	OC	Open window
8	Beta/Gamma	150/40	mR/hr	OC	Open Window (highest reading)
9	Beta/Gamma	13	mR/hr	OC	Open window
10	Beta/Gamma	36	mR/hr	OC	Open window
11	Beta/Gamma	90	mR/hr	OC	Open window
12	Beta/Gamma	15	mR/hr	OC	Open window
13	Beta/Gamma	28	mR/hr	OC	Open window
14	Beta/Gamma	44	mR/hr	OC	Open window

Additional Radiation Survey

Background: <0.1

Unit: mrem/hr

Radiation Type: Neutron

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

Radiological Survey Report

Attachments

Order	Filename	Description	Pages
1	MDA 3030 20180920.pdf	3030 MDA worksheet	1
2	WIPP survey SNL001403SC.pdf	Copy of WIPP SCA survey document	2

LUDLUM 3030 MDA CALCULATION WORKSHEET

Instrument #: <u>278114</u>	Calibration Expires: <u>10/10/18</u>	Location: Bldg. <u>6597</u> Room <u>highbay</u>
Probe Type: <u>43-10-1</u>	Probe #: <u>102768</u>	
CALCULATION BY: <u>Edward Walton</u>		DATE: <u>9/20/18</u>

Expected Sample Radionuclide (α): <u>Pu-239</u>	α Detector Efficiency for expected radionuclide (cpd): <u>0.31</u>
Expected Sample Radionuclide (β): <u>Cs-137</u>	β Detector Efficiency for expected radionuclide (cpd): <u>0.21</u>
Background Count Time (min): <u>1</u>	If background and sample count times are the same, use MDA calculation method 4.6.1.
Sample Count Time (min): <u>1</u>	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 <u>0</u> cpm	β <u>49</u> 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: <u>9</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>	Nuclide	dpm
β MDA: <u>168</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>		
		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):	<u>M-20180920-3</u>	<u>M-20180920-8</u>	<u>I-20180920-4</u>
REVIEWED BY: <u>MP Callahan</u>	DATE: <u>9/20/18</u>		
Radiation Protection Line Support Project Leader (or Designee)			

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey (Continued)

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Shielded Container Assembly Contact Dose Rate Survey Form			
Shielded Container Assembly ID: <u>SAL001403SC</u>			
Record highest contact dose rate measurements for beta/gamma and neutron. Sum the two values and record the total dose rates.			
Contact Dose Rate Measurement	Beta/Gamma (mrem/hr)	Neutron (mrem/hr)	Total Dose Rate
SCA Top ① 2/37	21	<0.1	21
SCA Bottom ⑤ 0/50	70	<0.1	70
SCA Q1 #1 ② 0/42	16	<0.1	16
SCA Q1 #2	23	<0.1	23
SCA Q1 #3	60	<0.1	60
SCA Q2 #1	18	<0.1	18
SCA Q2 #2 ③ 2/52	50	<0.1	50
SCA Q2 #3	150* / 40'	<0.1	150
SCA Q3 #1	13	<0.1	13
SCA Q3 #2	36	<0.1	36
SCA Q3 #3 ④ 0/45	90	<0.1	90
SCA Q4 #1	15	<0.1	15
SCA Q4 #2	28	<0.1	28
SCA Q4 #3	44	<0.1	44
Verify the highest total contact dose rate measurement is ≤ 200 mrem/hr on the external surface of the SCA, and record as the contact dose rate of record: _____ mrem/hr.			
I certify that the contact dose rate data recorded is correct.			
_____ Transportation Certification Official (or designee)		_____ Date	

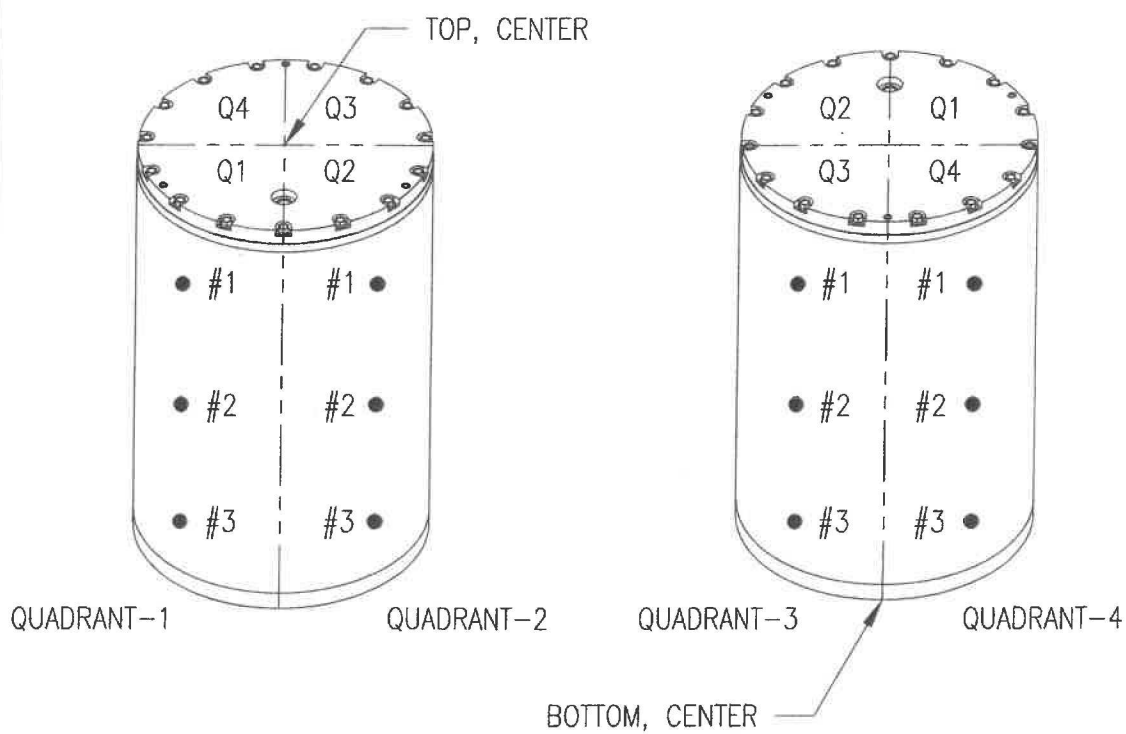
④ swipes

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey

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SCA CONTACT DOSE RATE SURVEY AREAS



Radiological Survey Report

Survey I-20180921-2

General Information

Title: AHCF Campaign-19 WIPP SCA #SNL001509SC
Survey Date/Time: 9/21/2018 13:00
Location: 6597 High Bay
TWD or RTWD #: AHCF-RTWD-025
Purpose: Characterization
Requestor Org: 01387
Status: Approved by: Bonadore, Steven, 10/11/2018
Ready for Review by: Kemp, Justin, 10/11/2018

Lead Surveyor: Kemp, Justin
Work Order/Task #: 96752 80.01.02.01

Instruments Used

#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Serial #	Probe Type	Calibration Date	Efficiency	
								β/γ	α
1	RO20	12405	D	N/A	N/A	D	2/10/2019	N/A	N/A
2	RADEYE PX	10387	D	NRD	2210	D	11/10/2018	N/A	N/A
3	3030	278114	C	43-10-1	102768	C	10/10/2018	0.21	0.31

Instruments Used - Notes

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

Radiological Survey Report

Comments:

Survey for WIPPs required Shielded Container Assembly (SCA) Contact Dose Rate Survey Form (CCP-TP-81 Rev.2.). Contact dose rates taken on SCA were taken according to, and documented on CCP-TP-81 Rev.2.

Area posted as RA/RMA/ConA

30cm dose rate survey at highest on contact location and removable contamination surveys also performed.

Radionuclides of concern:

Activation Products: Co-60 principal;

Fission Products (beta-gamma) Sr-90, Cs-137 principal;

Fission Products (alpha) Pu-239, Am-241 principal;

Actinides: U-234, U-235, U-238 principal

Swipes taken on the SCA were counted on a Ludlum 3030 counter.

All swipes were less than removable contamination limits of 20 dpm/100cm² alpha, 200 dpm/100cm² beta/gamma

RO-20 with open window was used for beta/gamma dose readings, and RadeyePx w/NRD probe used for neutron dose readings.

Highest total contact dose rate measurement was less than WIPPs acceptance limit of 200 mR/hr

Highest dose rate on SCA was 14 mR/hr on contact and 3.4 mR/hr @ 30cm.

3030 MDA calculation worksheet sheet is attachment-1.

Copy of WIPP survey document CCP-TP-81 Rev.2. is attachment-2.

Radiological Survey Report

Itemized Details - Items

#	Item Location/Description	Comments
1	SCA Top	
2	SCA Bottom	
3	SCA Q1 #1	
4	SCA Q1 #2	
5	SCA Q1 #3	
6	SCA Q2 #1	
7	SCA Q2 #2	
8	SCA Q2 #3	
9	SCA Q3 #1	
10	SCA Q3 #2	
11	SCA Q3 #3	
12	SCA Q4 #1	
13	SCA Q4 #2	
14	SCA Q4 #3	

Alpha Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:3 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
7	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2
11	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:3 Eff: 0.31

Eff. for Total: Inst:N/A Eff:

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	48	cpm/100 cm2	42	cpm/100 cm2	R	19.4	dpm/100 cm2
2	38	cpm/100 cm2	42	cpm/100 cm2	R	ND	dpm/100 cm2
3	38	cpm/100 cm2	42	cpm/100 cm2	R	ND	dpm/100 cm2
7	43	cpm/100 cm2	42	cpm/100 cm2	R	3.2	dpm/100 cm2
11	45	cpm/100 cm2	42	cpm/100 cm2	R	9.7	dpm/100 cm2

Radiological Survey Report

Radiation Survey

Background: <0.1

Background Units: mR/hr

Radiation Type: Beta/Gamma

#	Radiation Type	Reading	Units	Distance From Source	Comment
1	Beta/Gamma	3.1	mR/hr	OC	Open window
2	Beta/Gamma	9	mR/hr	OC	Open window
3	Beta/Gamma	2.0	mR/hr	OC	Open window
4	Beta/Gamma	4.0	mR/hr	OC	Open window
5	Beta/Gamma	4.1	mR/hr	OC	Open window
6	Beta/Gamma	2.0	mR/hr	OC	Open window
7	Beta/Gamma	12	mR/hr	OC	Open window
8	Beta/Gamma	9	mR/hr	OC	Open window
9	Beta/Gamma	2.2	mR/hr	OC	Open window
10	Beta/Gamma	14/3.4	mR/hr	OC/30 cm	Open window (highest reading)
11	Beta/Gamma	10	mR/hr	OC	Open window
12	Beta/Gamma	2.1	mR/hr	OC	Open window
13	Beta/Gamma	4.6	mR/hr	OC	Open window
14	Beta/Gamma	4.5	mR/hr	OC	Open window

Additional Radiation Survey

Background: <0.1

Unit: mrem/hr

Radiation Type: Neutron

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

Radiological Survey Report

Attachments

Order	Filename	Description	Pages
1	MDA 3030 20180921.pdf	3030 MDA worksheet	1
2	WIPP survey SNL001509SC.pdf	Copy of WIPP SCA survey document	2

LUDLUM 3030 MDA CALCULATION WORKSHEET

Instrument #: <u>278114</u>	Calibration Expires: <u>10/10/18</u>	Location: Bldg. <u>6597</u> Room <u>highbay</u>
Probe Type: <u>43-10-1</u>	Probe #: <u>102768</u>	
CALCULATION BY: <u>SS Addonway</u>		DATE: <u>9/21/18</u>

Expected Sample Radionuclide (α): <u>Pu-239</u>	α Detector Efficiency for expected radionuclide (cpd): <u>0.31</u>	
Expected Sample Radionuclide (β): <u>Cs-137</u>	β Detector Efficiency for expected radionuclide (cpd): <u>0.21</u>	
Background Count Time (min): <u>1</u>	If background and sample count times are the same, use MDA calculation method 4.6.1.	
Sample Count Time (min): <u>1</u>	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 <u>0</u> cpm	β <u>42</u> 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: <u>9</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>	Nuclide	dpm
β MDA: <u>157</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>		
		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):		<u>M-20180921-1</u>	<u>I-20180921-2</u>
REVIEWED BY: <u>W. Callahan</u>		DATE: <u>9/21/18</u>	
Radiation Protection Line Support Project Leader (or Designee)			

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey (Continued)

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I-20180921-2

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13:00

Shielded Container Assembly Contact Dose Rate Survey Form			
Shielded Container Assembly ID: <u>SNL001509 SC</u>			
Record highest contact dose rate measurements for beta/gamma and neutron. Sum the two values and record the total dose rates.			
Contact Dose Rate Measurement	Beta/Gamma (mrem/hr)	Neutron (mrem/hr)	Total Dose Rate
SCA Top ① 0/48	3.1	< 0.1	3.1
SCA Bottom ⑤ 0/38	9	< 0.1	9
SCA Q1 #1 ② 1/38	2.0	< 0.1	2.0
SCA Q1 #2	4.0	< 0.1	4.0
SCA Q1 #3	4.1	< 0.1	4.1
SCA Q2 #1	2.2	< 0.1	2.2
SCA Q2 #2 ③ 1/43	12* / 3.4	< 0.1	12
SCA Q2 #3	9	< 0.1	9
SCA Q3 #1	2.2	< 0.1	2.2
SCA Q3 #2	14* / 3.4	< 0.1	14
SCA Q3 #3 ④ 0/45	10	< 0.1	10
SCA Q4 #1	2.1	< 0.1	2.1
SCA Q4 #2	4.6	< 0.1	4.6
SCA Q4 #3	4.5	< 0.1	4.5
Verify the highest total contact dose rate measurement is ≤ 200 mrem/hr on the external surface of the SCA, and record as the contact dose rate of record: _____ mrem/hr.			
I certify that the contact dose rate data recorded is correct.			
Transportation Certification Official (or designee)		Date	

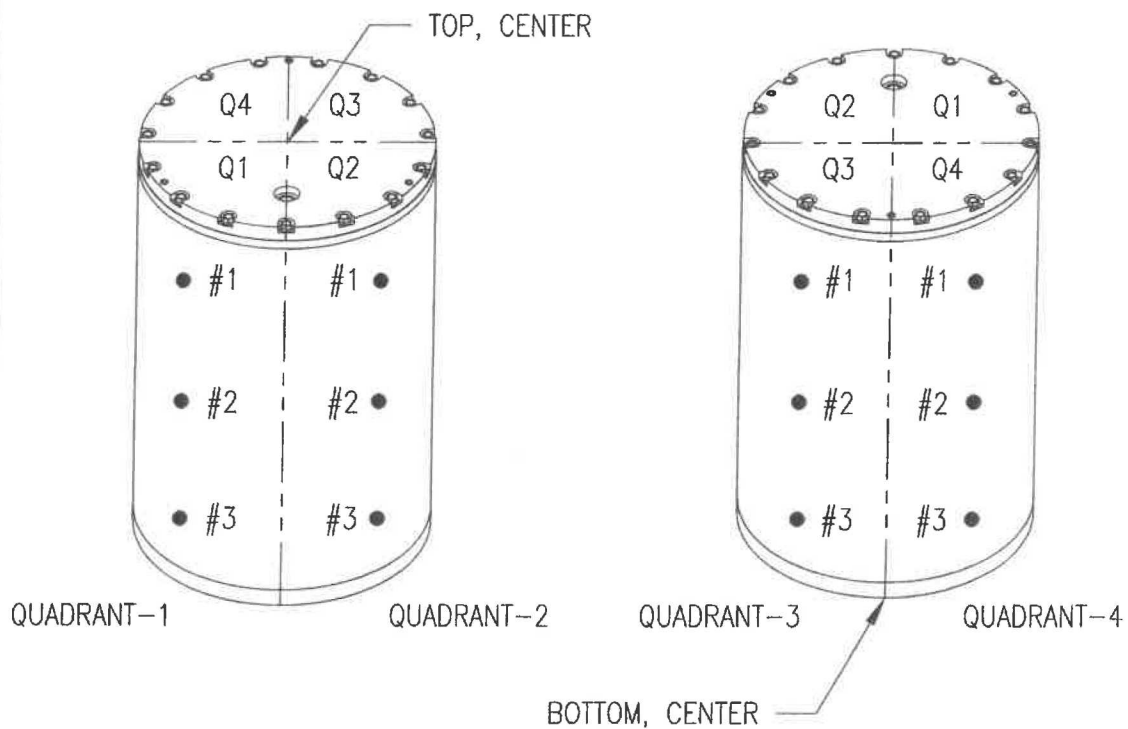
④ Swipe

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey

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SCA CONTACT DOSE RATE SURVEY AREAS



Radiological Survey Report

Survey I-20180924-2

General Information

Title: AHCF Campaign-19 WIPP SCA #SNL001602SC
Survey Date/Time: 9/24/2018 13:00
Location: 6597 High Bay
TWD or RTWD #: AHCF-RTWD-025
Purpose: Characterization
Requestor Org: 01387
Status: Approved by: Bonadore, Steven, 10/12/2018
Ready for Review by: Kemp, Justin, 10/11/2018

Lead Surveyor: Kemp, Justin
Work Order/Task #: 96752 80.01.02.01

Additional Surveyors

Surveyor

Walton, Edward

Instruments Used

#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Serial #	Probe Type	Calibration Date	Efficiency	
								β/γ	α
1	R020	12405	D	N/A	N/A	D	2/10/2019	N/A	N/A
2	RADEYE PX	10387	D	NRD	2210	D	11/10/2018	N/A	N/A
3	3030	278114	C	43-10-1	102768	C	10/10/2018	0.21	0.31

Instruments Used - Notes

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

Radiological Survey Report

Comments:

Survey for WIPPs required Shielded Container Assembly (SCA) Contact Dose Rate Survey Form (CCP-TP-81 Rev.2.). Contact dose rates taken on SCA were taken according to, and documented on CCP-TP-81 Rev.2.

Area posted as RA/RMA/ConA

30cm dose rate survey at highest on contact location and removable contamination surveys also performed.

Radionuclides of concern:

Activation Products: Co-60 principal;

Fission Products (beta-gamma) Sr-90, Cs-137 principal;

Fission Products (alpha) Pu-239, Am-241 principal;

Actinides: U-234, U-235, U-238 principal

Swipes taken on the SCA were counted on a Ludlum 3030 counter.

All swipes were less than removable contamination limits of 20 dpm/100cm² alpha, 200 dpm/100cm² beta/gamma

RO-20 with open window was used for beta/gamma dose readings, and RadeyePx w/NRD probe used for neutron dose readings.

Highest total contact dose rate measurement was less than WIPPs acceptance limit of 200 mR/hr

Highest dose rate on SCA was 100 mR/hr on contact and 33 mR/hr @ 30cm.

3030 MDA calculation worksheet sheet is attachment-1.

Copy of WIPP survey document CCP-TP-81 Rev.2. is attachment-2.

Radiological Survey Report

Itemized Details - Items

#	Item Location/Description	Comments
1	SCA Top	
2	SCA Bottom	
3	SCA Q1 #1	
4	SCA Q1 #2	
5	SCA Q1 #3	
6	SCA Q2 #1	
7	SCA Q2 #2	
8	SCA Q2 #3	
9	SCA Q3 #1	
10	SCA Q3 #2	
11	SCA Q3 #3	
12	SCA Q4 #1	
13	SCA Q4 #2	
14	SCA Q4 #3	

Alpha Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:3 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	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	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
7	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
11	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:3 Eff: 0.21

Eff. for Total: Inst:N/A Eff:

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	58	cpm/100 cm2	42	cpm/100 cm2	R	76.2	dpm/100 cm2
2	44	cpm/100 cm2	42	cpm/100 cm2	R	9.5	dpm/100 cm2
3	47	cpm/100 cm2	42	cpm/100 cm2	R	23.8	dpm/100 cm2
7	40	cpm/100 cm2	42	cpm/100 cm2	R	ND	dpm/100 cm2
11	46	cpm/100 cm2	42	cpm/100 cm2	R	19	dpm/100 cm2

Radiological Survey Report

Radiation Survey

Background: <0.1

Background Units: mR/hr

Radiation Type: Beta/Gamma

#	Radiation Type	Reading	Units	Distance From Source	Comment
1	Beta/Gamma	37	mR/hr	OC	Open window
2	Beta/Gamma	70	mR/hr	OC	Open window
3	Beta/Gamma	90	mR/hr	OC	Open window
4	Beta/Gamma	100/33	mR/hr	OC/30 cm	Open window (highest reading)
5	Beta/Gamma	36	mR/hr	OC	Open window
6	Beta/Gamma	35	mR/hr	OC	Open window
7	Beta/Gamma	34	mR/hr	OC	Open window
8	Beta/Gamma	100/29	mR/hr	OC/30 cm	Open window
9	Beta/Gamma	32	mR/hr	OC	Open window
10	Beta/Gamma	44	mR/hr	OC	Open window
11	Beta/Gamma	60	mR/hr	OC	Open window
12	Beta/Gamma	33	mR/hr	OC	Open window
13	Beta/Gamma	46	mR/hr	OC	Open window
14	Beta/Gamma	80	mR/hr	OC	Open window

Additional Radiation Survey

Background: <0.1

Unit: mrem/hr

Radiation Type: Neutron

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

Radiological Survey Report

Attachments

Order	Filename	Description	Pages
1	MDA 3030 20180924.pdf	3030 MDA worksheet	1
2	WIPP survey SNL001602SC.pdf	Copy of WIPP SCA survey document	2

LUDLUM 3030 MDA CALCULATION WORKSHEET

Instrument #: <u>278114</u>	Calibration Expires: <u>10/10/18</u>	Location: Bldg. <u>6597</u> Room <u>highbay</u>
Probe Type: <u>43-10-1</u>	Probe #: <u>102768</u>	
CALCULATION BY: <u>Edward Walton</u>		DATE: <u>9/24/18</u>

Expected Sample Radionuclide (α): <u>Pu-239</u>	α Detector Efficiency for expected radionuclide (cpd): <u>0.31</u>	
Expected Sample Radionuclide (β): <u>Cs-137</u>	β Detector Efficiency for expected radionuclide (cpd): <u>0.21</u>	
Background Count Time (min): <u>1</u>	If background and sample count times are the same, use MDA calculation method 4.6.1.	
Sample Count Time (min): <u>1</u>	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 <u>0</u> cpm	β <u>42</u> 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: <u>9</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>	Nuclide	dpm
β MDA: <u>157</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>		
		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):		<u>M-20180924-5</u>	<u>M-20180924-7</u>
		<u>I-20180924-1</u>	
REVIEWED BY: <u>MP Callahan</u>		DATE: <u>9/24/18</u>	
Radiation Protection Line Support Project Leader (or Designee)			

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey (Continued)

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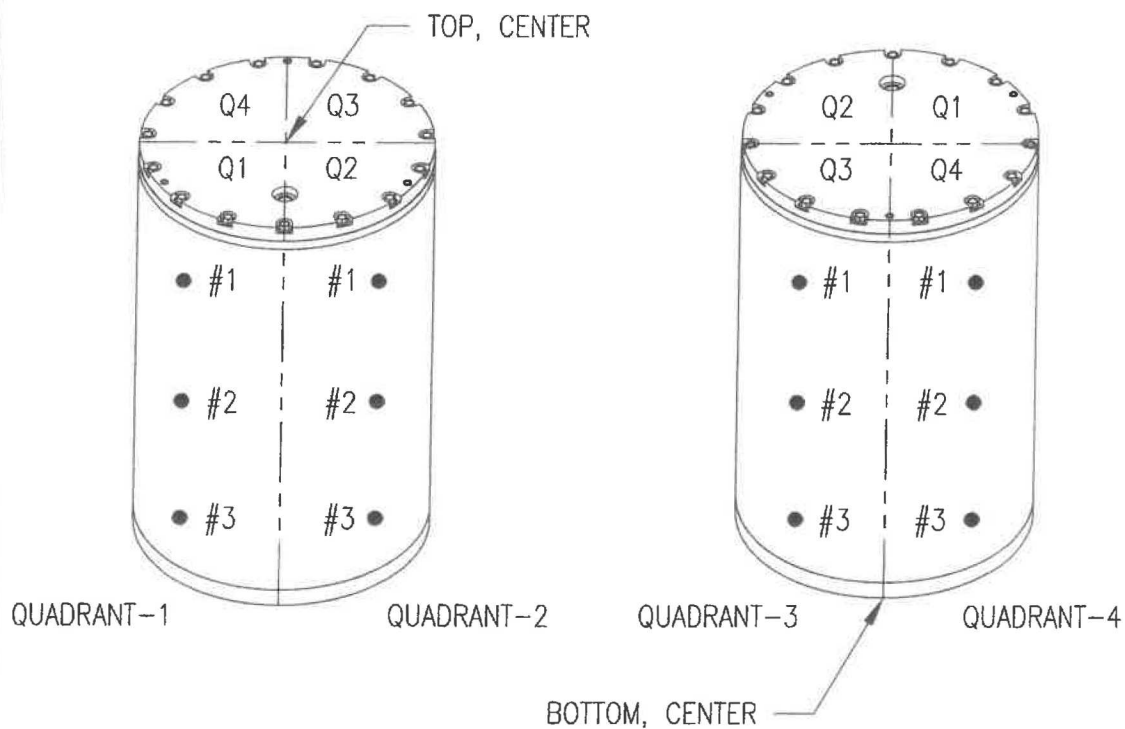
Shielded Container Assembly Contact Dose Rate Survey Form			
Shielded Container Assembly ID: <u>SL001602SC</u>			
Record highest contact dose rate measurements for beta/gamma and neutron. Sum the two values and record the total dose rates.			
Contact Dose Rate Measurement	Beta/Gamma (mrem/hr)	Neutron (mrem/hr)	Total Dose Rate
SCA Top (1) 1/58	37	<0.1	37
SCA Bottom (5) 1/44	70		70
SCA Q1 #1 (2) 2/47	90		90
SCA Q1 #2	100 / 33		100
SCA Q1 #3	36		36
SCA Q2 #1	35		35
SCA Q2 #2 (3) 0/40	34		34
SCA Q2 #3	100 / 29		100
SCA Q3 #1	32		32
SCA Q3 #2	44		44
SCA Q3 #3 (4) 0/46	60		60
SCA Q4 #1	33		33
SCA Q4 #2	46		46
SCA Q4 #3	80		80
Verify the highest total contact dose rate measurement is ≤ 200 mrem/hr on the external surface of the SCA, and record as the contact dose rate of record: <u>100</u> mrem/hr.			
I certify that the contact dose rate data recorded is correct. <u>9-24-2018</u>			
Transportation Certification Official (or designee)		Date	

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey

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SCA CONTACT DOSE RATE SURVEY AREAS



Radiological Survey Report

Survey I-20180925-1

General Information

Title: AHCF Campaign-19 WIPP SCA #SNL001705SC
Survey Date/Time: 9/25/2018 13:00
Location: 6597 High Bay
TWD or RTWD #: AHCF-RTWD-025
Purpose: Characterization
Requestor Org: 01387
Status: Approved by: Bonadore, Steven, 10/12/2018
Ready for Review by: Kemp, Justin, 10/11/2018

Lead Surveyor: Walton, Edward
Work Order/Task #: 96752 80.01.02.01

Additional Surveyors

Surveyor

Kemp, Justin

Instruments Used

#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Serial #	Probe Type	Calibration Date	Efficiency	
								β/γ	α
1	RO20	12405	D	N/A	N/A	D	2/10/2019	N/A	N/A
2	RADEYEPX	10387	D	NRD	2210	D	11/10/2018	N/A	N/A
3	3030	278114	C	43-10-1	102768	C	10/10/2018	0.21	0.31

Instruments Used - Notes

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

Radiological Survey Report

Comments:

Survey for WIPPs required Shielded Container Assembly (SCA) Contact Dose Rate Survey Form (CCP-TP-81 Rev.2.). Contact dose rates taken on SCA were taken according to, and documented on CCP-TP-81 Rev.2.

Area posted as RA/RMA/ConA

30cm dose rate survey at highest on contact location and removable contamination surveys also performed.

Radionuclides of concern:

Activation Products: Co-60 principal;

Fission Products (beta-gamma) Sr-90, Cs-137 principal;

Fission Products (alpha) Pu-239, Am-241 principal;

Actinides: U-234, U-235, U-238 principal

Swipes taken on the SCA were counted on a Ludlum 3030 counter.

All swipes were less than removable contamination limits of 20 dpm/100cm² alpha, 200 dpm/100cm² beta/gamma

RO-20 with open window was used for beta/gamma dose readings, and RadeyePx w/NRD probe used for neutron dose readings.

Highest total contact dose rate measurement was less than WIPPs acceptance limit of 200 mR/hr

Highest dose rate on SCA was 16 mR/hr on contact and 5.5 mR/hr @ 30cm.

3030 MDA calculation worksheet sheet is attachment-1.

Copy of WIPP survey document CCP-TP-81 Rev.2. is attachment-2.

Radiological Survey Report

Itemized Details - Items

#	Item Location/Description	Comments
1	SCA Top	
2	SCA Bottom	
3	SCA Q1 #1	
4	SCA Q1 #2	
5	SCA Q1 #3	
6	SCA Q2 #1	
7	SCA Q2 #2	
8	SCA Q2 #3	
9	SCA Q3 #1	
10	SCA Q3 #2	
11	SCA Q3 #3	
12	SCA Q4 #1	
13	SCA Q4 #2	
14	SCA Q4 #3	

Alpha Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:3 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	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
7	2	cpm/100 cm2	0	cpm/100 cm2	R	6.5	dpm/100 cm2
11	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2

Beta-Gamma Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:3 Eff: 0.21

Eff. for Total: Inst:N/A Eff:

Radionuclide: Cs-137

Default Bkg Value: 48

Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	51	cpm/100 cm2	48	cpm/100 cm2	R	14.3	dpm/100 cm2
2	38	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
3	46	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
7	37	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
11	51	cpm/100 cm2	48	cpm/100 cm2	R	14.3	dpm/100 cm2

Radiological Survey Report

Radiation Survey

Background: <0.1

Background Units: mR/hr

Radiation Type: Beta/Gamma

#	Radiation Type	Reading	Units	Distance From Source	Comment
1	Beta/Gamma	3.8	mR/hr	OC	Open window
2	Beta/Gamma	1.7	mR/hr	OC	Open window
3	Beta/Gamma	11/4	mR/hr	OC/30 cm	Open window
4	Beta/Gamma	16/5.5	mR/hr	OC/30 cm	Open window (Highest reading)
5	Beta/Gamma	3.5	mR/hr	OC	Open window
6	Beta/Gamma	1.4	mR/hr	OC	Open window
7	Beta/Gamma	2.1	mR/hr	OC	Open window
8	Beta/Gamma	2.3	mR/hr	OC	Open window
9	Beta/Gamma	1.6	mR/hr	OC	Open window
10	Beta/Gamma	2.8	mR/hr	OC	Open window
11	Beta/Gamma	3.5	mR/hr	OC	Open window
12	Beta/Gamma	1.5	mR/hr	OC	Open window
13	Beta/Gamma	2.1	mR/hr	OC	Open window
14	Beta/Gamma	1.8	mR/hr	OC	Open window

Additional Radiation Survey

Background: <0.1

Unit: mrem/hr

Radiation Type: Neutron

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

Radiological Survey Report

Attachments

Order	Filename	Description	Pages
1	MDA sheet for AHCF 9-25-2018.pdf	MDA sheet	1
2	AHCF WIPP SCA survey sheet 9-25-18.pdf	CCP-TP-81 Rev.2 sheet copy	2

LUDLUM 3030 MDA CALCULATION WORKSHEET

Instrument #: <u>278114</u>	Calibration Expires: <u>10/10/18</u>	Location: Bldg. <u>6597</u> Room <u>highbay</u>
Probe Type: <u>43-10-1</u>	Probe #: <u>102768</u>	
CALCULATION BY: <u>Edward Walton</u>		DATE: <u>9/25/18</u>

Expected Sample Radionuclide (α): <u>Pu-239</u>	α Detector Efficiency for expected radionuclide (cpd): <u>0.31</u>
Expected Sample Radionuclide (β): <u>Cs-137</u>	β Detector Efficiency for expected radionuclide (cpd): <u>0.21</u>
Background Count Time (min): <u>1</u>	If background and sample count times are the same, use MDA calculation method 4.6.1.
Sample Count Time (min): <u>1</u>	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 <u>0</u> cpm	β <u>48</u> 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: <u>9</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>	Nuclide	dpm
β MDA: <u>167</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>		
		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):		<u>M-20180925-3</u>	<u>M-20180925-1</u>
		<u>I-20180925-1</u>	
REVIEWED BY: <u>MA Callahan</u>		DATE: <u>9/25/18</u>	
Radiation Protection Line Support Project Leader (or Designee)			

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey (Continued)

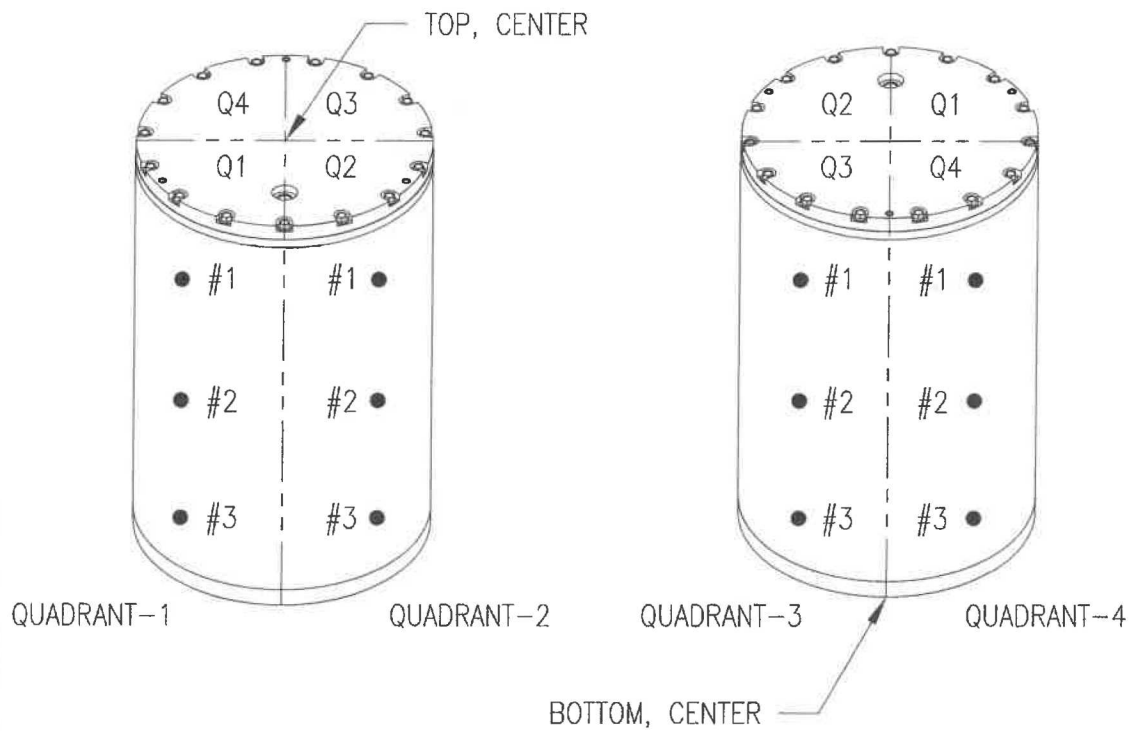
Page 2 of 2

Shielded Container Assembly Contact Dose Rate Survey Form			
Shielded Container Assembly ID: <u>SNL001705SC</u>			
Record highest contact dose rate measurements for beta/gamma and neutron. Sum the two values and record the total dose rates.			
Contact Dose Rate Measurement	Beta/Gamma (mrem/hr)	Neutron (mrem/hr)	Total Dose Rate
SCA Top	3.8	<0.1	3.8
SCA Bottom	1.7	<0.1	1.7
SCA Q1 #1	11	<0.1	11
SCA Q1 #2	16	<0.1	16
SCA Q1 #3	3.5	<0.1	3.5
SCA Q2 #1	1.4	<0.1	1.4
SCA Q2 #2	2.1	<0.1	2.1
SCA Q2 #3	2.3	<0.1	2.3
SCA Q3 #1	1.6	<0.1	1.6
SCA Q3 #2	2.8	<0.1	2.8
SCA Q3 #3	3.5	<0.1	3.5
SCA Q4 #1	1.5	<0.1	1.5
SCA Q4 #2	2.1	<0.1	2.1
SCA Q4 #3	1.8	<0.1	1.8
Verify the highest total contact dose rate measurement is ≤ 200 mrem/hr on the external surface of the SCA, and record as the contact dose rate of record: <u>16</u> mrem/hr.			
I certify that the contact dose rate data recorded is correct.			
<u>[Signature]</u>		1 <u>09-25-18</u>	
Transportation Certification Official (or designee)		Date	

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey

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SCA CONTACT DOSE RATE SURVEY AREAS



Radiological Survey Report

Survey I-20180926-1

General Information

Title: AHCF Campaign-19 WIPP SCA #SNL001708SC
Survey Date/Time: 9/26/2018 13:30
Location: 6597 High Bay
TWD or RTWD #: AHCF-RTWD-025
Purpose: Characterization
Requestor Org: 01387
Status: Approved by: Bonadore, Steven, 10/12/2018
Ready for Review by: Kemp, Justin, 10/11/2018

Lead Surveyor: Kemp, Justin
Work Order/Task #: 213283 80.01.05.01

Additional Surveyors

Surveyor

Walton, Edward

Instruments Used

#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Serial #	Probe Type	Calibration Date	Efficiency	
								β/γ	α
1	RO20	12405	D	N/A	N/A	D	2/10/2019	N/A	N/A
2	RADEYE PX	10387	D	NRD	2210	D	11/10/2018	N/A	N/A
3	3030	278114	C	43-10-1	102768	C	10/10/2018	0.21	0.31

Instruments Used - Notes

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

Radiological Survey Report

Comments:

Survey for WIPPs required Shielded Container Assembly (SCA) Contact Dose Rate Survey Form (CCP-TP-81 Rev.2.). Contact dose rates taken on SCA were taken according to, and documented on CCP-TP-81 Rev.2.

Area posted as RA/RMA/ConA

30cm dose rate survey at highest on contact location and removable contamination surveys also performed.

Radionuclides of concern:

Activation Products: Co-60 principal;

Fission Products (beta-gamma) Sr-90, Cs-137 principal;

Fission Products (alpha) Pu-239, Am-241 principal;

Actinides: U-234, U-235, U-238 principal

Swipes taken on the SCA were counted on a Ludlum 3030 counter.

All swipes were less than removable contamination limits of 20 dpm/100cm² alpha, 200 dpm/100cm² beta/gamma

RO-20 with open window was used for beta/gamma dose readings, and RadeyePx w/NRD probe used for neutron dose readings.

Highest total contact dose rate measurement was less than WIPPs acceptance limit of 200 mR/hr

Highest dose rate on SCA was 31 mR/hr on contact and 12 mR/hr @ 30cm.

3030 MDA calculation worksheet sheet is attachment-1.

Copy of WIPP survey document CCP-TP-81 Rev.2. is attachment-2.

Radiological Survey Report

Itemized Details - Items

#	Item Location/Description	Comments
1	SCA Top	
2	SCA Bottom	
3	SCA Q1 #1	
4	SCA Q1 #2	
5	SCA Q1 #3	
6	SCA Q2 #1	
7	SCA Q2 #2	
8	SCA Q2 #3	
9	SCA Q3 #1	
10	SCA Q3 #2	
11	SCA Q3 #3	
12	SCA Q4 #1	
13	SCA Q4 #2	
14	SCA Q4 #3	

Alpha Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:3 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	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
7	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
11	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:3 Eff: 0.21

Eff. for Total: Inst:N/A Eff:

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	33	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	41	cpm/100 cm2	42	cpm/100 cm2	R	ND	dpm/100 cm2
7	42	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

Radiological Survey Report

Radiation Survey

Background: <0.1

Background Units: mR/hr

Radiation Type: Beta/Gamma

#	Radiation Type	Reading	Units	Distance From Source	Comment
1	Beta/Gamma	5	mR/hr	OC	Open window
2	Beta/Gamma	31/12	mR/hr	OC/30 cm	Open window (Highest reading)
3	Beta/Gamma	11	mR/hr	OC	Open window
4	Beta/Gamma	10	mR/hr	OC	Open window
5	Beta/Gamma	8	mR/hr	OC	Open window
6	Beta/Gamma	7	mR/hr	OC	Open window
7	Beta/Gamma	7	mR/hr	OC	Open window
8	Beta/Gamma	16	mR/hr	OC	Open window
9	Beta/Gamma	6	mR/hr	OC	Open window
10	Beta/Gamma	9	mR/hr	OC	Open window
11	Beta/Gamma	26/9	mR/hr	OC/30 cm	Open window
12	Beta/Gamma	7	mR/hr	OC	Open window
13	Beta/Gamma	8	mR/hr	OC	Open window
14	Beta/Gamma	11	mR/hr	OC	Open window

Additional Radiation Survey

Background: <0.1

Unit: mrem/hr

Radiation Type: Neutron

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

Radiological Survey Report

Attachments

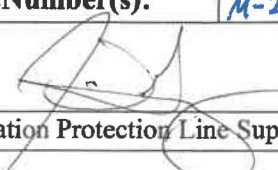
Order	Filename	Description	Pages
1	MDA 3030 20180926.pdf	3030 MDA worksheet	1
2	WIPP survey SNL001708SC.pdf	Copy of WIPP SCA survey document	2

LUDLUM 3030 MDA CALCULATION WORKSHEET

Instrument #: <u>278114</u>	Calibration Expires: <u>10/10/18</u>	Location: Bldg. <u>6597</u> Room <u>highbay</u>
Probe Type: <u>43-10-1</u>	Probe #: <u>102768</u>	
CALCULATION BY: <u>Justin Kew</u>		DATE: <u>9-26-2018</u>

Expected Sample Radionuclide (α): <u>Pu-239</u>	α Detector Efficiency for expected radionuclide (cpd): <u>0.31</u>
Expected Sample Radionuclide (β): <u>Cs-137</u>	β Detector Efficiency for expected radionuclide (cpd): <u>0.21</u>
Background Count Time (min): <u>1</u>	If background and sample count times are the same, use MDA calculation method 4.6.1.
Sample Count Time (min): <u>1</u>	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 <u>0</u> cpm	β <u>42</u> 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: <u>9</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>	Nuclide	dpm
β MDA: <u>157</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>		
		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):		<u>M-20180926-1</u>	<u>M-20180926-2</u> <u>I-20180926-1</u>
REVIEWED BY: 		DATE: <u>9-26-18</u>	
Radiation Protection Line Support Project Leader (or Designee)			

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey (Continued)

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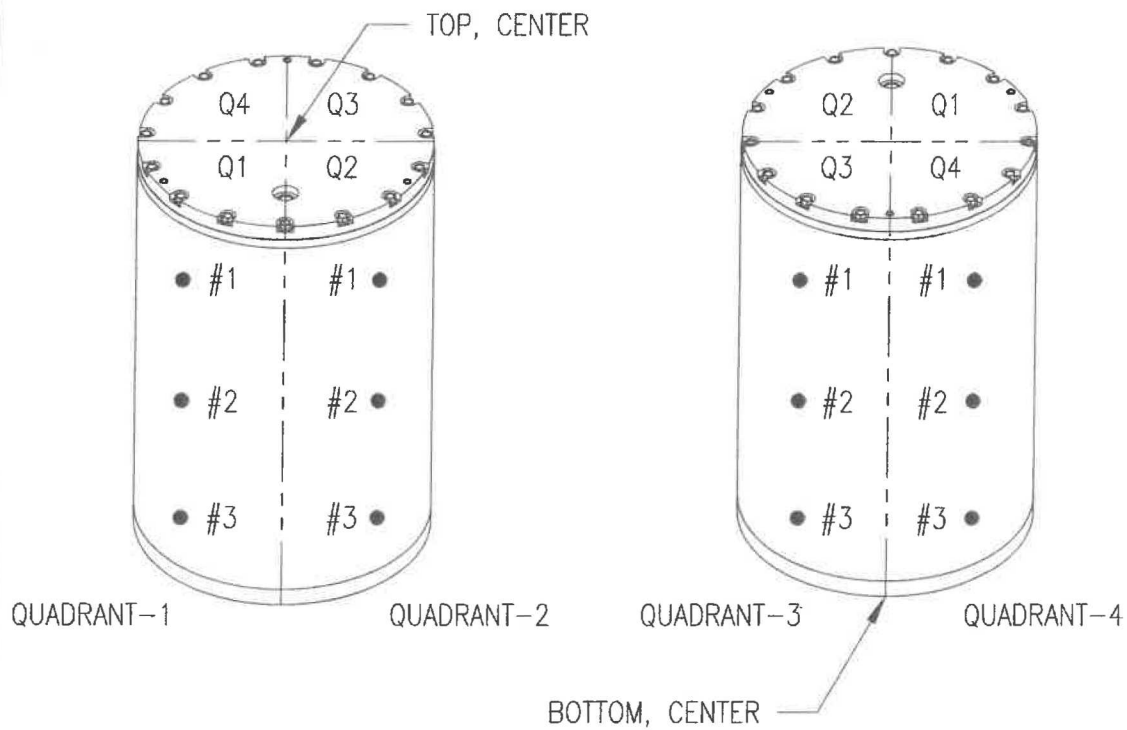
Shielded Container Assembly Contact Dose Rate Survey Form			
Shielded Container Assembly ID: <u>SNL001708 SC</u>			
Record highest contact dose rate measurements for beta/gamma and neutron. Sum the two values and record the total dose rates.			
Contact Dose Rate Measurement	Beta/Gamma (mrem/hr)	Neutron (mrem/hr)	Total Dose Rate
SCA Top	5	<0.1	5
SCA Bottom	31	<0.1	31
SCA Q1 #1	11	<0.1	11
SCA Q1 #2	10	<0.1	10
SCA Q1 #3	8	<0.1	8
SCA Q2 #1	7	<0.1	7
SCA Q2 #2	7	<0.1	7
SCA Q2 #3	16	<0.1	16
SCA Q3 #1	6	<0.1	6
SCA Q3 #2	9	<0.1	9
SCA Q3 #3	26	<0.1	26
SCA Q4 #1	7	<0.1	7
SCA Q4 #2	8	<0.1	8
SCA Q4 #3	11	<0.1	11
Verify the highest total contact dose rate measurement is ≤ 200 mrem/hr on the external surface of the SCA, and record as the contact dose rate of record: <u>31</u> mrem/hr.			
I certify that the contact dose rate data recorded is correct.			
<u>Thomas</u>		<u>1 09-26-18</u>	
Transportation Certification Official (or designee)		Date	

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey

COPY

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SCA CONTACT DOSE RATE SURVEY AREAS



Radiological Survey Report

Survey I-20180927-1

General Information

Title: AHCF Campaign-19 WIPP SCA #SNL001703SC

Survey Date/Time: 9/27/2018 13:45

Location: 6597 High Bay

TWD or RTWD #: AHCF-RTWD-025

Purpose: Characterization

Requestor Org: 01387

Status: Approved by: Bonadore, Steven, 10/16/2018

Ready for Review by: Walton, Edward, 10/15/2018

Lead Surveyor: Walton, Edward

Work Order/Task #: 213283 80.01.05.01

Additional Surveyors

Surveyor

Kemp, Justin

Instruments Used

#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Serial #	Probe Type	Calibration Date	Efficiency	
								β/γ	α
1	RO20	12405	D	N/A	N/A	D	2/10/2019	N/A	N/A
2	RADEYE PX	10387	D	NRD	2210	D	11/10/2018	N/A	N/A
3	3030	278114	C	43-10-1	102768	C	10/10/2018	0.21	0.31

Instruments Used - Notes

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

Radiological Survey Report

Comments:

Survey for WIPP's required Shielded Container Assembly (SCA) on Contact Dose Rate Survey form CCP-TP-81 Rev.2. Contact dose rates taken on SCA in accordance to, and documented on, CCP-TP-81 Rev.2.

Area posted as RA/RMA/ConA

30cm dose rate survey at highest on contact location and removable contamination surveys also performed.

Radionuclides of concern:

Activation Products: Co-60 principal;

Fission Products (beta-gamma) Sr-90, Cs-137 principal;

Fission Products (alpha) Pu-239, Am-241 principal;

Actinides: U-234, U-235, U-238 principal

Swipes taken on the SCA were counted on a Ludlum 3030 counter.

All swipes were less than removable contamination limits of 20dpm/100cm² alpha, 200dpm/100cm² beta/gamma

RO-20 with open window was used for beta/gamma dose readings, and RadeyePx w/NRD probe used for neutron dose readings.

Highest total contact dose rate measurement was less than WIPPs acceptance limit of 200mR/hr

Highest dose rate on SCA was 36mR/hr on-contact. A reading of 9mR/hr @30cm measured for radiological posting purposes only.

3030 MDA calculation worksheet sheet is attachment-1.

Copy of WIPP survey document CCP-TP-81 Rev.2. is attachment-2.

Radiological Survey Report

Itemized Details - Items

#	Item Location/Description	Comments
1	SCA Top	
2	SCA Bottom	
3	SCA Q1 #1	
4	SCA Q1 #2	
5	SCA Q1 #3	
6	SCA Q2 #1	
7	SCA Q2 #2	
8	SCA Q2 #3	
9	SCA Q3 #1	
10	SCA Q3 #2	
11	SCA Q3 #3	
12	SCA Q4 #1	
13	SCA Q4 #2	
14	SCA Q4 #3	

Alpha Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:3 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	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	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
7	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
11	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:3 Eff: 0.21

Eff. for Total: Inst:N/A Eff:

Radionuclide: Cs-137

Default Bkg Value: 54

Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	41	cpm/100 cm2	54	cpm/100 cm2	R	ND	dpm/100 cm2
2	50	cpm/100 cm2	54	cpm/100 cm2	R	ND	dpm/100 cm2
3	53	cpm/100 cm2	54	cpm/100 cm2	R	ND	dpm/100 cm2
7	48	cpm/100 cm2	54	cpm/100 cm2	R	ND	dpm/100 cm2
11	39	cpm/100 cm2	54	cpm/100 cm2	R	ND	dpm/100 cm2

Radiological Survey Report

Radiation Survey

Background: <0.1

Background Units: mR/hr

Radiation Type: Beta/Gamma

#	Radiation Type	Reading	Units	Distance From Source	Comment
1	Beta/Gamma	4.8	mR/hr	OC	Open window
2	Beta/Gamma	10	mR/hr	OC	Open window
3	Beta/Gamma	2.4	mR/hr	OC	Open window
4	Beta/Gamma	6	mR/hr	OC	Open window
5	Beta/Gamma	34	mR/hr	OC	Open window
6	Beta/Gamma	2.7	mR/hr	OC	Open window
7	Beta/Gamma	5	mR/hr	OC	Open window
8	Beta/Gamma	36/9	mR/hr	OC/30 cm	Open window (Highest reading)
9	Beta/Gamma	4.7	mR/hr	OC	Open window
10	Beta/Gamma	8	mR/hr	OC	Open window
11	Beta/Gamma	9	mR/hr	OC	Open window
12	Beta/Gamma	10	mR/hr	OC	Open window
13	Beta/Gamma	12	mR/hr	OC	Open window
14	Beta/Gamma	12	mR/hr	OC	Open window

Additional Radiation Survey

Background: <0.1

Unit: mrem/hr

Radiation Type: Neutron

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

Radiological Survey Report

Attachments

Order	Filename	Description	Pages
1	MDA 3030 20180927.pdf	3030 MDA worksheet	1
2	AHCF WIPP SCA survey sheet 9-27-18.pdf	CCP-TP-81 Rev.2 form	2

LUDLUM 3030 MDA CALCULATION WORKSHEET

Instrument #: <u>278114</u>	Calibration Expires: <u>10/10/18</u> Location: Bldg. <u>6597</u> Room <u>highbay</u>
Probe Type: <u>43-10-1</u>	Probe #: <u>102768</u>
CALCULATION BY: <u>SS. Edouard</u>	DATE: <u>9/27/18</u>

Expected Sample Radionuclide (α): <u>Pu-239</u>	α Detector Efficiency for expected radionuclide (cpd): <u>0.31</u>
Expected Sample Radionuclide (β): <u>Cs-137</u>	β Detector Efficiency for expected radionuclide (cpd): <u>0.21</u>
Background Count Time (min): <u>1</u>	If background and sample count times are the same, use MDA calculation method 4.6.1.
Sample Count Time (min): <u>1</u>	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 <u>2</u> cpm	β <u>54</u> 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: <u>9</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>	Nuclide	dpm
β MDA: <u>176</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>		
		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):		<u>M-20180927-4</u>	<u>M-20180927-5</u>
		<u>I-20180927-1</u>	
REVIEWED BY: <u>[Signature]</u>		DATE: <u>9-27-18</u>	
Radiation Protection Line Support Project Leader (or Designee)			

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey (Continued)

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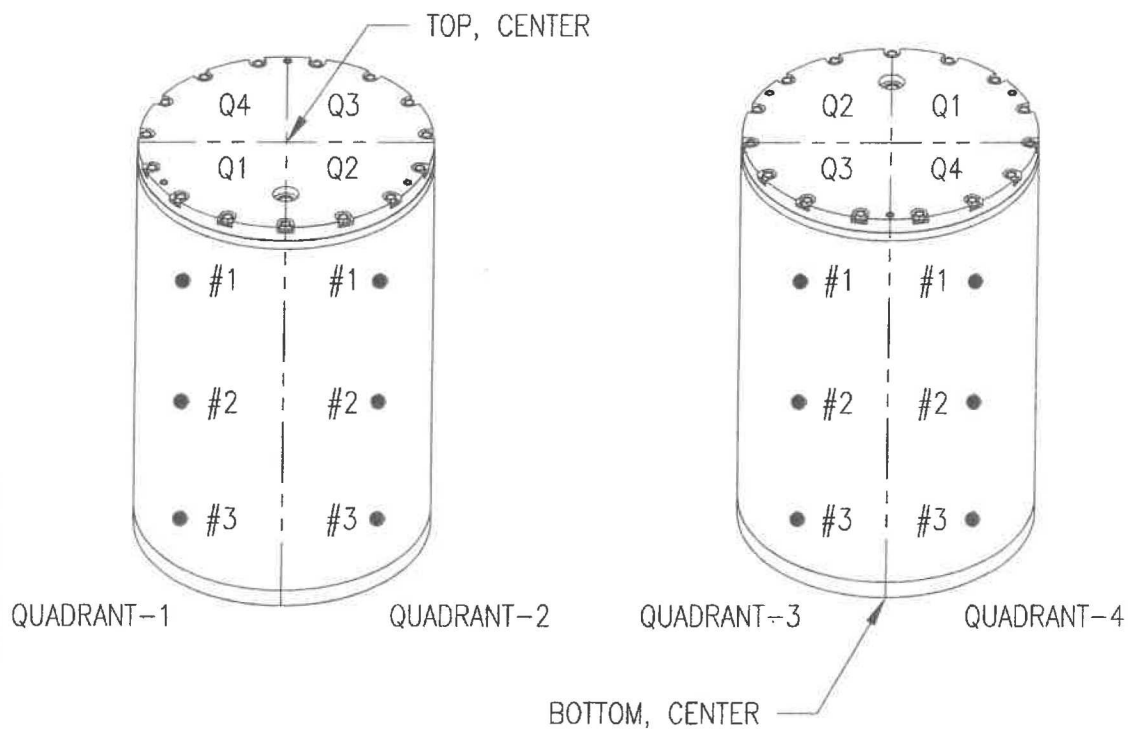
Shielded Container Assembly Contact Dose Rate Survey Form			
Shielded Container Assembly ID: <u>SNL001703SC</u>			
Record highest contact dose rate measurements for beta/gamma and neutron. Sum the two values and record the total dose rates.			
Contact Dose Rate Measurement	Beta/Gamma (mrem/hr)	Neutron (mrem/hr)	Total Dose Rate
SCA Top	4.8	< 0.1	4.8
SCA Bottom	10	< 0.1	10
SCA Q1 #1	2.4	< 0.1	2.4
SCA Q1 #2	6	< 0.1	6
SCA Q1 #3	34	< 0.1	34
SCA Q2 #1	2.7	< 0.1	2.7
SCA Q2 #2	5.0	< 0.1	5.0
SCA Q2 #3	36	< 0.1	36
SCA Q3 #1	4.7	< 0.1	4.7
SCA Q3 #2	8	< 0.1	8
SCA Q3 #3	9	< 0.1	9
SCA Q4 #1	10	< 0.1	10
SCA Q4 #2	12	< 0.1	12
SCA Q4 #3	12	< 0.1	12
Verify the highest total contact dose rate measurement is ≤ 200 mrem/hr on the external surface of the SCA, and record as the contact dose rate of record: <u>36</u> mrem/hr.			
I certify that the contact dose rate data recorded is correct.			
<u>Thomas</u>		1 09-27-18	
Transportation Certification Official (or designee)		Date	

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey

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SCA CONTACT DOSE RATE SURVEY AREAS



Radiological Survey Report

Survey I-20181001-2

General Information

Title: AHCF Campaign-19 WIPP SCA #SNL001711SC
Survey Date/Time: 10/1/2018 13:00
Location: 6597 High Bay
TWD or RTWD #: AHCF-RTWD-025
Purpose: Characterization
Requestor Org: 01387
Status: Approved by: Bonadore, Steven, 10/12/2018
Ready for Review by: Kemp, Justin, 10/11/2018

Lead Surveyor: Kemp, Justin
Work Order/Task #: 213283 80.01.05.01

Instruments Used

#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Serial #	Probe Type	Calibration Date	Efficiency	
								β/γ	α
1	RO20	12405	D	N/A	N/A	D	2/10/2019	N/A	N/A
2	RADEYE PX	10387	D	NRD	2210	D	11/10/2018	N/A	N/A
3	3030	278114	C	43-10-1	102768	C	10/10/2018	0.21	0.31

Instruments Used - Notes

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

Radiological Survey Report

Comments:

Survey for WIPPs required Shielded Container Assembly (SCA) Contact Dose Rate Survey Form (CCP-TP-81 Rev.2.). Contact dose rates taken on SCA were taken according to, and documented on CCP-TP-81 Rev.2.

Area posted as RA/RMA/ConA

30cm dose rate survey at highest on contact location and removable contamination surveys also performed.

Radionuclides of concern:

Activation Products: Co-60 principal;

Fission Products (beta-gamma) Sr-90, Cs-137 principal;

Fission Products (alpha) Pu-239, Am-241 principal;

Actinides: U-234, U-235, U-238 principal

Swipes taken on the SCA were counted on a Ludlum 3030 counter.

All swipes were less than removable contamination limits of 20 dpm/100cm² alpha, 200 dpm/100cm² beta/gamma

RO-20 with open window was used for beta/gamma dose readings, and RadeyePx w/NRD probe used for neutron dose readings.

Highest total contact dose rate measurement was less than WIPPs acceptance limit of 200 mR/hr

Highest dose rate on SCA was 150 mR/hr on contact and 60 mR/hr @ 30cm.

3030 MDA calculation worksheet sheet is attachment-1.

Copy of WIPP survey document CCP-TP-81 Rev.2. is attachment-2.

Radiological Survey Report

Itemized Details - Items

#	Item Location/Description	Comments
1	SCA Top	
2	SCA Bottom	
3	SCA Q1 #1	
4	SCA Q1 #2	
5	SCA Q1 #3	
6	SCA Q2 #1	
7	SCA Q2 #2	
8	SCA Q2 #3	
9	SCA Q3 #1	
10	SCA Q3 #2	
11	SCA Q3 #3	
12	SCA Q4 #1	
13	SCA Q4 #2	
14	SCA Q4 #3	

Alpha Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:3 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	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2
2	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2
3	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
11	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2

Beta-Gamma Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:3 Eff: 0.21

Eff. for Total: Inst:N/A Eff:

Radionuclide: Cs-137

Default Bkg Value: 49

Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	49	cpm/100 cm2	49	cpm/100 cm2	R	ND	dpm/100 cm2
2	44	cpm/100 cm2	49	cpm/100 cm2	R	ND	dpm/100 cm2
3	53	cpm/100 cm2	49	cpm/100 cm2	R	19	dpm/100 cm2
7	48	cpm/100 cm2	49	cpm/100 cm2	R	ND	dpm/100 cm2
11	45	cpm/100 cm2	49	cpm/100 cm2	R	ND	dpm/100 cm2

Radiological Survey Report

Radiation Survey

Background: <0.1

Background Units: mR/hr

Radiation Type: Beta/Gamma

#	Radiation Type	Reading	Units	Distance From Source	Comment
1	Beta/Gamma	16	mR/hr	OC	Open window
2	Beta/Gamma	150/60	mR/hr	OC/30 cm	Open window (Highest reading)
3	Beta/Gamma	10	mR/hr	OC	Open window
4	Beta/Gamma	21	mR/hr	OC	Open window
5	Beta/Gamma	70	mR/hr	OC	Open window
6	Beta/Gamma	7	mR/hr	OC	Open window
7	Beta/Gamma	24	mR/hr	OC	Open window
8	Beta/Gamma	65	mR/hr	OC	Open window
9	Beta/Gamma	9	mR/hr	OC	Open window
10	Beta/Gamma	15	mR/hr	OC	Open window
11	Beta/Gamma	60	mR/hr	OC	Open window
12	Beta/Gamma	8	mR/hr	OC	Open window
13	Beta/Gamma	29	mR/hr	OC	Open window
14	Beta/Gamma	145	mR/hr	OC	Open window

Additional Radiation Survey

Background: <0.1

Unit: mrem/hr

Radiation Type: Neutron

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

Radiological Survey Report

Attachments

Order	Filename	Description	Pages
1	MDA 3030 20181001.pdf	3030 MDA worksheet	1
2	WIPP survey SNL001711SC.pdf	Copy of WIPP SCA survey document	2

LUDLUM 3030 MDA CALCULATION WORKSHEET

Instrument #: <u>278114</u>	Calibration Expires: <u>10/10/18</u>	Location: Bldg. <u>6597</u> Room <u>highbay</u>
Probe Type: <u>43-10-1</u>	Probe #: <u>102768</u>	
CALCULATION BY: <u>Justin Kemp</u>		DATE: <u>10-01-2018</u>

Expected Sample Radionuclide (α): <u>Pu-239</u>	α Detector Efficiency for expected radionuclide (cpd): <u>0.31</u>
Expected Sample Radionuclide (β): <u>Cs-137</u>	β Detector Efficiency for expected radionuclide (cpd): <u>0.21</u>
Background Count Time (min): <u>1</u>	If background and sample count times are the same, use MDA calculation method 4.6.1.
Sample Count Time (min): <u>1</u>	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 <u>0</u> cpm	β <u>49</u> 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: <u>9</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>	Nuclide	dpm
β MDA: <u>168</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>		
		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):		<u>M-20181001-1</u>	<u>M-20181001-2</u>
		<u>I-20181001-2</u>	
REVIEWED BY: <u>[Signature]</u>		DATE: <u>10/1/18</u>	
Radiation Protection Line Support Project Leader (or Designee)			

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey (Continued)

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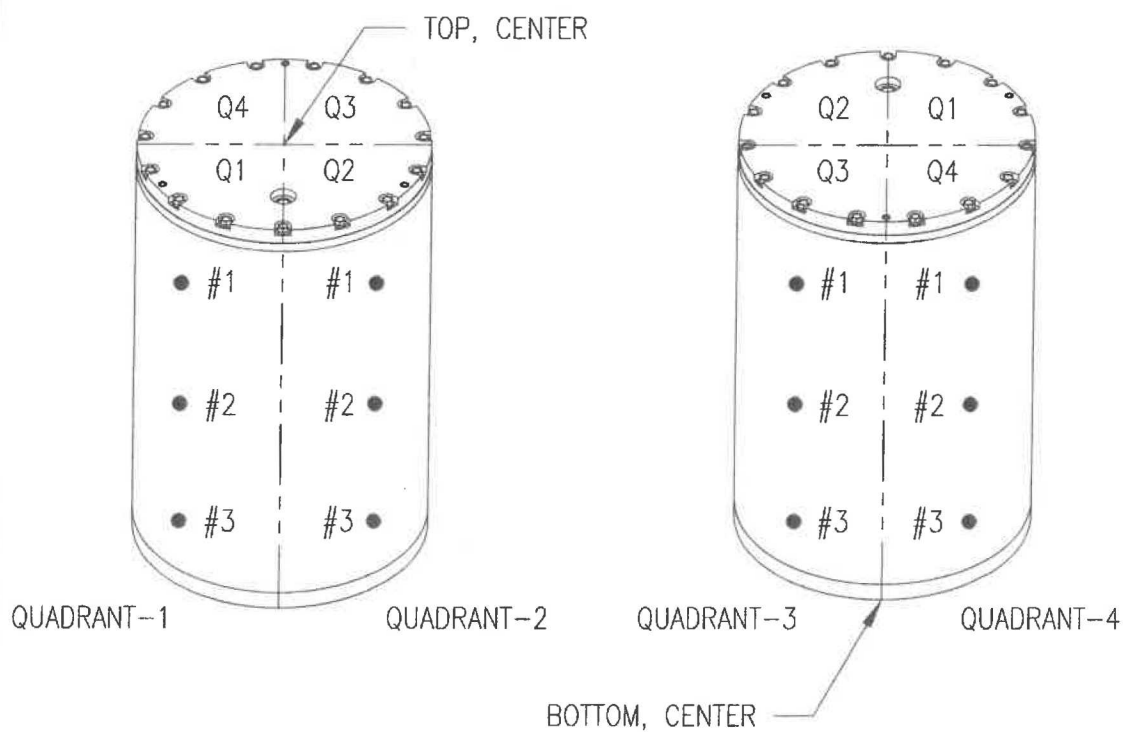
Shielded Container Assembly Contact Dose Rate Survey Form			
Shielded Container Assembly ID: <u>SNL 001711 SC</u>			
Record highest contact dose rate measurements for beta/gamma and neutron. Sum the two values and record the total does rates.			
Contact Dose Rate Measurement	Beta/Gamma (mrem/hr)	Neutron (mrem/hr)	Total Dose Rate
SCA Top	16	<0.1	16
SCA Bottom	150	<0.1	150
SCA Q1 #1	10	<0.1	10
SCA Q1 #2	21	<0.1	21
SCA Q1 #3	70	<0.1	70
SCA Q2 #1	7	<0.1	7
SCA Q2 #2	24	<0.1	24
SCA Q2 #3	65	<0.1	65
SCA Q3 #1	9	<0.1	9
SCA Q3 #2	15	<0.1	15
SCA Q3 #3	60	<0.1	60
SCA Q4 #1	8	<0.1	8
SCA Q4 #2	29	<0.1	29
SCA Q4 #3	145	<0.1	145
Verify the highest total contact dose rate measurement is ≤ 200 mrem/hr on the external surface of the SCA, and record as the contact dose rate of record: <u>150</u> mrem/hr.			
I certify that the contact dose rate data recorded is correct.			
<u>Thomas</u>		1 <u>10-01-18</u>	
Transportation Certification Official (or designee)		Date	

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey

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SCA CONTACT DOSE RATE SURVEY AREAS



Radiological Survey Report

Survey I-20181002-1

General Information

Title: AHCF Campaign-19 WIPP SCA #SNL001704SC
Survey Date/Time: 10/2/2018 13:00
Location: 6597 High Bay
TWD or RTWD #: AHCF-RTWD-025
Purpose: Characterization
Requestor Org: 01387
Status: Approved by: Bonadore, Steven, 10/12/2018
Ready for Review by: Kemp, Justin, 10/11/2018

Lead Surveyor: Kemp, Justin
Work Order/Task #: 213283 80.01.05.01

Instruments Used

#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Serial #	Probe Type	Calibration Date	Efficiency	
								β/γ	α
1	RO20	12405	D	N/A	N/A	D	2/10/2019	N/A	N/A
2	RADEYE PX	10387	D	NRD	2210	D	11/10/2018	N/A	N/A
3	3030	278114	C	43-10-1	102768	C	10/10/2018	0.21	0.31

Instruments Used - Notes

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

Radiological Survey Report

Comments:

Survey for WIPPs required Shielded Container Assembly (SCA) Contact Dose Rate Survey Form (CCP-TP-81 Rev.2.). Contact dose rates taken on SCA were taken according to, and documented on CCP-TP-81 Rev.2.

Area posted as RA/RMA/ConA

30cm dose rate survey at highest on contact location and removable contamination surveys also performed.

Radionuclides of concern:

Activation Products: Co-60 principal;

Fission Products (beta-gamma) Sr-90, Cs-137 principal;

Fission Products (alpha) Pu-239, Am-241 principal;

Actinides: U-234, U-235, U-238 principal

Swipes taken on the SCA were counted on a Ludlum 3030 counter.

All swipes were less than removable contamination limits of 20 dpm/100cm² alpha, 200 dpm/100cm² beta/gamma

RO-20 with open window was used for beta/gamma dose readings, and RadeyePx w/NRD probe used for neutron dose readings.

Highest total contact dose rate measurement was less than WIPPs acceptance limit of 200 mR/hr

Highest dose rate on SCA was 7 mR/hr on contact and 2.3 mR/hr @ 30cm.

3030 MDA calculation worksheet sheet is attachment-1.

Copy of WIPP survey document CCP-TP-81 Rev.2. is attachment-2.

Radiological Survey Report

Itemized Details - Items

#	Item Location/Description	Comments
1	SCA Top	
2	SCA Bottom	
3	SCA Q1#1	
4	SCA Q1#2	
5	SCA Q1#3	
6	SCA Q2#1	
7	SCA Q2#2	
8	SCA Q2#3	
9	SCA Q3#1	
10	SCA Q3#2	
11	SCA Q3#3	
12	SCA Q4#1	
13	SCA Q4#2	
14	SCA Q4#3	

Alpha Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:3 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
7	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
11	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2

Beta-Gamma Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:3 Eff: 0.21

Eff. for Total: Inst:N/A Eff:

Radionuclide: Cs-137

Default Bkg Value: 64

Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	61	cpm/100 cm2	64	cpm/100 cm2	R	ND	dpm/100 cm2
2	51	cpm/100 cm2	64	cpm/100 cm2	R	ND	dpm/100 cm2
3	42	cpm/100 cm2	64	cpm/100 cm2	R	ND	dpm/100 cm2
7	58	cpm/100 cm2	64	cpm/100 cm2	R	ND	dpm/100 cm2
11	57	cpm/100 cm2	64	cpm/100 cm2	R	ND	dpm/100 cm2

Radiological Survey Report

Radiation Survey

Background: <0.1

Background Units: mR/hr

Radiation Type: Beta/Gamma

#	Radiation Type	Reading	Units	Distance From Source	Comment
1	Beta/Gamma	4.0	mR/hr	OC	Open Window
2	Beta/Gamma	1.6	mR/hr	OC	Open Window
3	Beta/Gamma	6	mR/hr	OC	Open Window
4	Beta/Gamma	7	mR/hr	OC	Open Window
5	Beta/Gamma	2.3	mR/hr	OC	Open Window
6	Beta/Gamma	7	mR/hr	OC	Open Window
7	Beta/Gamma	7/2.3	mR/hr	OC/30 cm	Open Window (highest reading)
8	Beta/Gamma	2.6	mR/hr	OC	Open Window
9	Beta/Gamma	3.6	mR/hr	OC	Open Window
10	Beta/Gamma	3.5	mR/hr	OC	Open Window
11	Beta/Gamma	1.2	mR/hr	OC	Open Window
12	Beta/Gamma	4.4	mR/hr	OC	Open Window
13	Beta/Gamma	4.5	mR/hr	OC	Open Window
14	Beta/Gamma	2.5	mR/hr	OC	Open Window

Additional Radiation Survey

Background: <0.1

Unit: mrem/hr

Radiation Type: Neutron

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

Radiological Survey Report

Attachments

Order	Filename	Description	Pages
1	MDA 3030 20181002.pdf	3030 MDA worksheet	1
2	WIPP survey SNL001704SC.pdf	Copy of WIPP SCA survey document	2

Instrument #: 278114 Calibration Expires: 10/10/18 Location: Bldg. 6597 Room highbay
 Probe Type: 43-10-1 Probe #: 102768
 CALCULATION BY: Justin Kemp DATE: 10-2-18

Expected Sample Radionuclide (α): Pu-239 α Detector Efficiency for expected radionuclide (cpd): 0.31
 Expected Sample Radionuclide (β): Cs-137 β Detector Efficiency for expected radionuclide (cpd): 0.21
 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 64 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:

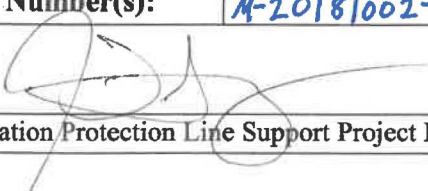
MDA = Minimum Detectable Activity level in dpm

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)	
		Nuclide	dpm
α MDA: <u>9</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>	Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20
β MDA: <u>191</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>	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):	<u>M-20181002-2</u>	<u>M-20181002-4</u>	<u>I-20181002-1</u>
REVIEWED BY:			DATE: <u>10-2-18</u>
Radiation Protection Line Support Project Leader (or Designee)			

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey (Continued)

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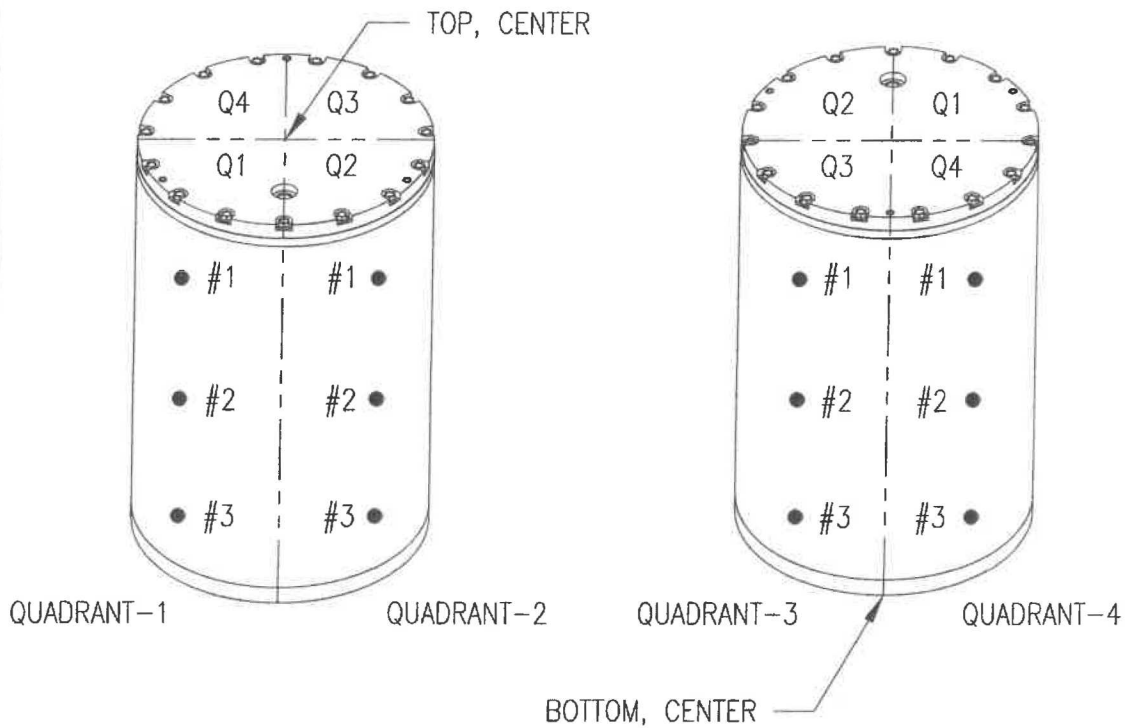
Shielded Container Assembly Contact Dose Rate Survey Form			
Shielded Container Assembly ID: <u>SNL001704SC</u>			
Record highest contact dose rate measurements for beta/gamma and neutron. Sum the two values and record the total does rates.			
Contact Dose Rate Measurement	Beta/Gamma (mrem/hr)	Neutron (mrem/hr)	Total Dose Rate
SCA Top	4.0	<0.1	4.0
SCA Bottom	1.6	<0.1	1.6
SCA Q1 #1	6	<0.1	6
SCA Q1 #2	7	<0.1	7
SCA Q1 #3	2.3	<0.1	2.3
SCA Q2 #1	7	<0.1	7
SCA Q2 #2	7	<0.1	7
SCA Q2 #3	2.6	<0.1	2.6
SCA Q3 #1	3.6	<0.1	3.6
SCA Q3 #2	3.5	<0.1	3.5
SCA Q3 #3	1.2	<0.1	1.2
SCA Q4 #1	4.4	<0.1	4.4
SCA Q4 #2	4.5	<0.1	4.5
SCA Q4 #3	2.5	<0.1	2.5
Verify the highest total contact dose rate measurement is ≤ 200 mrem/hr on the external surface of the SCA, and record as the contact dose rate of record: <u>7</u> mrem/hr.			
I certify that the contact dose rate data recorded is correct.			
<u>Thomas</u>		<u>10-02-18</u>	
Transportation Certification Official (or designee)		Date	

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey

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SCA CONTACT DOSE RATE SURVEY AREAS



Radiological Survey Report

Survey I-20181003-2

General Information

Title: AHCF Campaign-19 WIPP SCA #SNL001702SC
Survey Date/Time: 10/3/2018 13:00
Location: 6597 High Bay
TWD or RTWD #: AHCF-RTWD-025
Purpose: Characterization
Requestor Org: 01387
Status: Approved by: Bonadore, Steven, 10/12/2018
Ready for Review by: Kemp, Justin, 10/11/2018

Lead Surveyor: Kemp, Justin
Work Order/Task #: 213283 80.01.05.01

Additional Surveyors

Surveyor

Walton, Edward

Instruments Used

#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Serial #	Probe Type	Calibration Date	Efficiency	
								β/γ	α
1	R020	12405	D	N/A	N/A	D	2/10/2019	N/A	N/A
2	RADEYE PX	10387	D	NRD	2210	D	11/10/2018	N/A	N/A
3	3030	278114	C	43-10-1	102768	C	10/10/2018	0.21	0.31

Instruments Used - Notes

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

Radiological Survey Report

Comments:

Survey for WIPPs required Shielded Container Assembly (SCA) Contact Dose Rate Survey Form (CCP-TP-81 Rev.2.). Contact dose rates taken on SCA were taken according to, and documented on CCP-TP-81 Rev.2.

Area posted as RA/RMA/ConA

30cm dose rate survey at highest on contact location and removable contamination surveys also performed.

Radionuclides of concern:

Activation Products: Co-60 principal;

Fission Products (beta-gamma) Sr-90, Cs-137 principal;

Fission Products (alpha) Pu-239, Am-241 principal;

Actinides: U-234, U-235, U-238 principal

Swipes taken on the SCA were counted on a Ludlum 3030 counter.

All swipes were less than removable contamination limits of 20 dpm/100cm² alpha, 200 dpm/100cm² beta/gamma

RO-20 with open window was used for beta/gamma dose readings, and RadeyePx w/NRD probe used for neutron dose readings.

Highest total contact dose rate measurement was less than WIPPs acceptance limit of 200 mR/hr

Highest dose rate on SCA was 18 mR/hr on contact and 6 mR/hr @ 30cm.

3030 MDA calculation worksheet sheet is attachment-1.

Copy of WIPP survey document CCP-TP-81 Rev.2. is attachment-2.

Radiological Survey Report

Itemized Details - Items

#	Item Location/Description	Comments
1	SCA Top	
2	SCA Bottom	
3	SCA Q1 #1	
4	SCA Q1 #2	
5	SCA Q1 #3	
6	SCA Q2 #1	
7	SCA Q2 #2	
8	SCA Q2 #3	
9	SCA Q3 #1	
10	SCA Q3 #2	
11	SCA Q3 #3	
12	SCA Q4 #1	
13	SCA Q4 #2	
14	SCA Q4 #3	

Alpha Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:3 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	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2
2	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2
3	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
7	0	cpm/100 cm2	0	cpm/100 cm2	R	ND	dpm/100 cm2
11	1	cpm/100 cm2	0	cpm/100 cm2	R	3.2	dpm/100 cm2

Beta-Gamma Activity

Counting Data Attached: ☐ Yes ☒ No

Eff. for Removable: Inst:3 Eff: 0.21

Eff. for Total: Inst:N/A Eff:

Radionuclide: Cs-137

Default Bkg Value: 48

Default Bkg Units: cpm/100 cm2

#	Data	Data Units	Bkg.	Bkg. Units	T/R	Activity	Activity Units
1	46	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
2	51	cpm/100 cm2	48	cpm/100 cm2	R	14.3	dpm/100 cm2
3	43	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
7	46	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2
11	38	cpm/100 cm2	48	cpm/100 cm2	R	ND	dpm/100 cm2

Radiological Survey Report

Radiation Survey

Background: <0.1

Background Units: mR/hr

Radiation Type: Beta/Gamma

#	Radiation Type	Reading	Units	Distance From Source	Comment
1	Beta/Gamma	3	mR/hr	OC	Open window
2	Beta/Gamma	18/6	mR/hr	OC/30 cm	Open window (Highest reading)
3	Beta/Gamma	4	mR/hr	OC	Open window
4	Beta/Gamma	3	mR/hr	OC	Open window
5	Beta/Gamma	10/4.2	mR/hr	OC/30 cm	Open window
6	Beta/Gamma	3.5	mR/hr	OC	Open window
7	Beta/Gamma	4	mR/hr	OC	Open window
8	Beta/Gamma	8	mR/hr	OC	Open window
9	Beta/Gamma	3	mR/hr	OC	Open window
10	Beta/Gamma	3.5	mR/hr	OC	Open window
11	Beta/Gamma	6	mR/hr	OC	Open window
12	Beta/Gamma	3	mR/hr	OC	Open window
13	Beta/Gamma	4	mR/hr	OC	Open window
14	Beta/Gamma	6	mR/hr	OC	Open window

Additional Radiation Survey

Background: <0.1

Unit: mrem/hr

Radiation Type: Neutron

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

Radiological Survey Report

Attachments

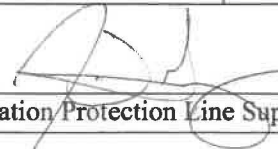
Order	Filename	Description	Pages
1	MDA 3030 20181003.pdf	3030 MDA worksheet	1
2	WIPP survey SNL001702SC.pdf	Copy of WIPP SCA survey document	2

LUDLUM 3030 MDA CALCULATION WORKSHEET

Instrument #: <u>278114</u>	Calibration Expires: <u>10/10/18</u>	Location: Bldg. <u>6597</u> Room <u>highbay</u>
Probe Type: <u>43-10-1</u>	Probe #: <u>102768</u>	
CALCULATION BY: <u>Justin Keno</u>		DATE: <u>10-3-2018</u>

Expected Sample Radionuclide (α): <u>Pu-239</u>	α Detector Efficiency for expected radionuclide (cpd): <u>0.31</u>
Expected Sample Radionuclide (β): <u>Cs-137</u>	β Detector Efficiency for expected radionuclide (cpd): <u>0.21</u>
Background Count Time (min): <u>1</u>	If background and sample count times are the same, use MDA calculation method 4.6.1.
Sample Count Time (min): <u>1</u>	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 <u>0</u> cpm	β <u>48</u> 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: <u>9</u> β MDA: <u>167</u>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/> Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/>	Nuclide	dpm
		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):		<u>m-2018/003-1</u>	<u>m-2018/003-2</u>
		<u>I-2018/003-2</u>	
REVIEWED BY: 		DATE: <u>10-3-18</u>	
Radiation Protection Line Support Project Leader (or Designee)			

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey (Continued)

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Shielded Container Assembly Contact Dose Rate Survey Form			
Shielded Container Assembly ID: <u>SNL001702 SC</u>			
Record highest contact dose rate measurements for beta/gamma and neutron. Sum the two values and record the total does rates.			
Contact Dose Rate Measurement	Beta/Gamma (mrem/hr)	Neutron (mrem/hr)	Total Dose Rate
SCA Top	3	<0.1	3
SCA Bottom	18	<0.1	18
SCA Q1 #1	4	<0.1	4
SCA Q1 #2	3	<0.1	3
SCA Q1 #3	10	<0.1	10
SCA Q2 #1	3.5	<0.1	3.5
SCA Q2 #2	4	<0.1	4
SCA Q2 #3	8	<0.1	8
SCA Q3 #1	3	<0.1	3
SCA Q3 #2	3.5	<0.1	3.5
SCA Q3 #3	6	<0.1	6
SCA Q4 #1	3	<0.1	3
SCA Q4 #2	4	<0.1	4
SCA Q4 #3	6	<0.1	6
Verify the highest total contact dose rate measurement is ≤ 200 mrem/hr on the external surface of the SCA, and record as the contact dose rate of record: <u>18</u> mrem/hr.			
I certify that the contact dose rate data recorded is correct.			
<u>B. Thomas</u>		<u>10-03-18</u>	
Transportation Certification Official (or designee)		Date	

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey

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SCA CONTACT DOSE RATE SURVEY AREAS

