GM Global Research and Development

November 02, 2020

U.S. NRC Region III
2443 Warrenville Road
Suite 210
Lisle, Illinois 60532-4352
Attn: Materials Licensing Branch

Re: License #21-00016-04, Amendment to remove the Warren radiometric laboratory from our materials license.

Dear Sirs:

General Motors LLC ("GM") requests an amendment to our license to remove the radiometric laboratory situated at 30500 Mound Rd., Warren MI. This request follows several years of decommissioning the facility and movement of the current laboratory to the 777 Joslyn rd., Pontiac, MI location.

NRC form 313 and the Final Status Survey (FSS), prepared by GHD and SC&A are attached. NRC form 314 and copies of waste manifests are attached also.

Razing of the Warren facility is expected to begin by years end. The proposal is to knock down and dispose of all above ground structures and associated utilities. The foundation is to remain intact and covered. While we understand the entire approval process may take several months, we would appreciate informing us in a timely manner as to when the razing process may begin. Additionally, if anything concerning the physical nature of the facility needs to be addressed, please inform us likewise.

Please let us know if you have any questions, concerns, or items that we need to address further.

Sincerely,

Daniel H. Blossfeld (RSO)

Encl : NRC Form 313 and FSS

General Motors Company
Research & Development
Chemical & Materials Systems Lab
Mail Code 480-106-RA3
30500 Mound Road
Warren, Michigan 48090-9055
Office 586-986-0842
Cell 248-912-7991

Bionomics

P.O. Box 817 – Kingston, TN 37763 – (865) 220-8501

April 3, 2018

LOREN SALISBURY

GENERAL MOTORS
31295 CH. KETERING RD.
WARREN, MI 48092

Dear Loren,

As required by 10 CFR Part 20 (Appendix G), this letter is notification that Bionomics, Inc. has received the shipment recently picked up at your facility on **March 28, 2018.**

Attached you will find a copy of your NRC Form 540, the only change from the original is in Item No.9 "signature" which identifies that Bionomics, Inc. is acknowledging receipt of waste from your facility.

Please keep this with your original, as well as future disposal certifications.

If you have any questions please feel free to contact me at (865) 220-8501.

Sincerely,

Paul Nipper

Paul Nipper
QA Manager

Cc: File BIO-04-18

FORM 540 — Bionomics, Inc.

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

SHIPPING PAPER

1. EMERGENCY TELEPHONE NUMBER (Include Area Code)
(800) 424-9300

ORGANIZATION
CHEMTREC / CNN825454

2. IS THIS AN "EXCLUSIVE USE" SHIPMENT?
[X] YES
[ ] NO

3. TOTAL NUMBER OF PACKAGES IDENTIFIED ON THIS MANIFEST ==========> 17

4. DOES EPA REGULATED WASTE REQUIRING A MANIFEST ACCOMPANY THIS SHIPMENT? [ ] YES [X] NO
If "Yes", provide Manifest Number ==========>

EPA MANIFEST NUMBER
N/A

5. SHIPPER - NAME AND FACILITY
Bionomics, Inc for General Motors
GTMC RCEL Building, 31295 Charles Kettering Road
Warren, MI 48092

USER PERMIT NUMBER

SHIPMENT NUMBER
0318GM

CONTACT
Loren Salisbury

TELEPHONE NUMBER (Include Area Code)
(269) 208-3097

6. CARRIER - Name and Address
Bionomics, Inc.
1550 Bear Creek Road
Oak Ridge, TN 37830

Truck #:

Trailer #:

CONTACT
John McCormick

TELEPHONE NUMBER (Include Area Code)
865-220-8501

SIGNATURE - Authorized carrier acknowledging waste receipt

DATE
3/28/2018

SHIPMENT ID NUMBER
03262018MIOH

COLLECTOR

PROCESSOR

X GENERATOR TYPE (Specify) I

EPA I.D. NUMBER
TND982116493

SHIPPING DATE
03/28/2018

7. FORM 540 AND 540A PAGE 1 OF 3 PAGE(S)
FORM 541 AND 541A 6 PAGE(S)
FORM 542 AND 542A 1 PAGE(S)
ADDITIONAL INFORMATION 1 PAGE(S)

8. MANIFEST NUMBER
(Use this number on all continuation pages)
0318GM

9. CONSIGNEE - Name and Facility Address
Bionomics, Inc
Operated By Bionomics, Inc.
1550 Bear Creek Road
Oak Ridge, TN 37830

CONTACT
John McCormick

TELEPHONE NUMBER (Include Area Code)
(865) 220-8501

SIGNATURE - Authorized consignee acknowledging waste receipt
Paul Nupper

DATE
4/2/18

10. CERTIFICATION

This is to certify that the herein-named materials are properly classified, described, packaged, marked, and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation. This also certifies that the materials are classified, packaged, marked, and labeled and in proper condition for transportation and disposal in accordance with the requirements of 10 CFR Parts 20 and 61, or equivalent state regulation.

AUTHORIZED SIGNATURE **TITLE** On Behalf of GM LLC **DATE** 3-28-18

11. U.S. DEPARTMENT OF TRANSPORTATION DESCRIPTION (Including proper shipping name, hazard class, UN ID number, and any additional information)	12. DOT LABEL "RADIOACTIVE"	13. TRANSPORT INDEX	14. PHYSICAL AND CHEMICAL FORM	15. INDIVIDUAL RADIONUCLIDES	16. TOTAL PACKAGE ACTIVITY MBq	16. TOTAL PACKAGE ACTIVITY mCi	17. LSA/SCO CLASS	18. TOTAL WEIGHT OR VOLUME (Use appropriate units)	19. IDENTIFICATION NUMBER OF PACKAGE
UN3321, Radioactive material, low specific activity (LSA-II), 7 METAL 1 - 55 GAL METAL DRUM	NA	NA	SOLID/OXIDES	C-14 , TH(NAT), U (NAT)	5 9200E+01	(1 6000E+00)	LSA II	7 50 ft³ 235 00 lb	GM-DRUM1 (18-000527)
UN2910, Radioactive material, excepted package-limited quantity of material, 7 METAL 1 - 55 GAL METAL DRUM	NA	NA	SOLID/OXIDES	C-14 , U (NAT)	7 4000E+00	(2 0000E-01)	NA	7 50 ft³ 176 00 lb	GM-DRUM2 (18-000528)
UN2910, Radioactive material, excepted package-limited quantity of material, 7 METAL 1 - 30 GAL METAL DRUM	NA	NA	SOLID/OXIDES	C-14 , U (NAT)	5.5500E+01	(1 5000E+00)	NA	4 01 ft³ 158.00 lb	GM-DRUM3 (18-000529)
UN2910, Radioactive material, excepted package-limited quantity of material, 7 METAL 1 - 55 GAL METAL DRUM	NA	NA	SOLID/OXIDES	C-14 , U (NAT)	7.4000E+00	(2.0000E-01)	NA	7 50 ft³ 175.00 lb	GM-DRUM4 (18-000530)
UN2910, Radioactive material, excepted package-limited quantity of material, 7 DAW 1 - CUBIC YARD FIBER BOX	NA	NA	SOLID/OXIDES	C-14 , TH(NAT), U (NAT)	9 4350E+01	(2 5500E+00)	NA	27 00 ft³ 169 00 lb	GM-BOX1 (18-000532)

FOR CONSIGNEE USE ONLY

BIO-04-18

___ Record Waste Description Inadequate
___ Contamination or Leakage Detected
___ Unexpected Exposure Rates Detected
___ Labels, Markings, etc. Inadequate
___ Container Integrity Inadequate
___ Other
X No Violations Detected on this Shipment

19. TERMS AND CONDITIONS

A. HAZARDOUS MATERIALS. Generator represents & warrants that Waste Material ___ is (or) X is not hazardous waste as defined in 40 CFR 261. Where the material is a hazardous waste, this shipment is also accompanied by a separate and completed hazardous waste manifest, along with the appropriate land-disposal restriction notice and/or certification as required by 40 CFR 268.1.

B. TITLE: Upon acceptance at the disposal site by EnergySolutions, Inc. and all appropriate regulatory authorities, title to the Waste Material which conforms to Generator's representations herein shall then pass from Generator and be vested in EnergySolutions, Inc.

C. WASTE MATERIAL: Generator represents and warrants that all data set forth in this UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST are true and correct in all respects and in accordance with all applicable governmental laws, rules, and regulations and Envirocare of Utah, Inc.'s facility license.

D. INDEMNIFICATION: Generator agrees to indemnify EnergySolutions, Inc., its officers, employees, and agents against all losses and liability whatsoever if such losses or liability results from the failure of the Waste Material to conform in all material respects to the data supplied on the UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST, or if this shipment fails to meet the standards prescribed by the Department of Transportation or any governmental agency having jurisdiction over such matters.

FORM 540A

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

SHIPPING PAPER (CONTINUATION)

Bionomics, Inc.

8. MANIFEST NUMBER (Use this number on all continuation pages)
0318GM

11. U.S. DEPARTMENT OF TRANSPORTATION DESCRIPTION (Including proper shipping name, hazard class, UN ID number, and any additional information)	12. DOT LABEL "RADIOACTIVE"	13. TRANSPORT INDEX	14. PHYSICAL AND CHEMICAL FORM	15. INDIVIDUAL RADIONUCLIDES	16. TOTAL PACKAGE ACTIVITY MBq	mCi	17. LSA/SCO CLASS	18. TOTAL WEIGHT OR VOLUME (Use appropriate units)	19. IDENTIFICATION NUMBER OF PACKAGE
UN2910, Radioactive material, excepted package-limited quantity of material, 7 DAW 1 - CUBIC YARD FIBER BOX	NA	NA	SOLID/OXIDES	C-14 , U (NAT)	5 5500E+01	(1.5000E+00)	NA	27 00 ft³ 242 00 lb	GM-BOX2 (18-000533)
UN2910, Radioactive material, excepted package-limited quantity of material, 7 DAW 1 - CUBIC YARD FIBER BOX	NA	NA	SOLID/OXIDES	C-14 , U (NAT)	5 5500E+01	(1.5000E+00)	NA	27 00 ft³ 242 00 lb	GM-BOX3 (18-000534)
UN2910, Radioactive material, excepted package-limited quantity of material, 7 DAW 1 - 0 13 M3 FIBER BOX	NA	NA	SOLID/OXIDES	C-14 , U (NAT)	4.0700E+00	(1 1000E-01)	NA	4 59 ft³ 28 00 lb	GM-BOX4 (18-000535)
UN2910, Radioactive material, excepted package-limited quantity of material, 7 METAL 1 - METAL BOX	NA	NA	SOLID/OXIDES	C-14 , CS-137 , U (NAT)	5 9200E+01	(1 6000E+00)	NA	32 00 ft³ 556 00 lb	GM-MBOX1 (18-000538)
UN2910, Radioactive material, excepted package-limited quantity of material, 7 METAL 1 - METAL BOX	NA	NA	SOLID/OXIDES	C-14 , U (NAT)	5 5500E+01	(1 5000E+00)	NA	32 00 ft³ 404 00 lb	GM-MBOX2 (18-000539)
Non-Radioactive per DOT METAL 1 - 55 GAL METAL DRUM	NA	NA	SOLID/OXIDES	C-14	3.7000E+00	(1.0000E-01)	NA	7 50 ft³ 101 00 lb	GM-DRUM5 (18-000531)
Non-Radioactive per DOT LEAD 1 - 30 GAL METAL DRUM	NA	NA	SOLID/OXIDES	C-14	3 7000E+01	(1 0000E+00)	NA	4 01 ft³ 300 00 lb	GM-LEAD1 (18-000536)
Non-Radioactive per DOT METAL 1 - Pallet	NA	NA	SOLID/OXIDES	C-14	3 7000E+01	(1 0000E+00)	NA	8 00 ft³ 425 00 lb	MOTOR-01 (18-000540)
Non-Radioactive per DOT, Glove Box on Pallet METAL 1 - Pallet	NA	NA	SOLID/OXIDES	C-14 , CO-60 , FE-55 , MN-54 , NI-63	5 7424E+01	(1 5520E+00)	NA	13 00 ft³ 152 00 lb	GM-GB1 (18-000541)

Modified Date 04/06/2018 10 06

FORM 540A

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

SHIPPING PAPER (CONTINUATION)

Bionomics, Inc.

8. MANIFEST NUMBER (Use this number on all continuation pages)
0318GM

11. U.S. DEPARTMENT OF TRANSPORTATION DESCRIPTION (Including proper shipping name, hazard class, UN ID number, and any additional information)	12. DOT LABEL "RADIOACTIVE"	13. TRANSPORT INDEX	14. PHYSICAL AND CHEMICAL FORM	15. INDIVIDUAL RADIONUCLIDES	16. TOTAL PACKAGE ACTIVITY MBq	16. TOTAL PACKAGE ACTIVITY mCi	17. LSA/SCO CLASS	18. TOTAL WEIGHT OR VOLUME (Use appropriate units)	19. IDENTIFICATION NUMBER OF PACKAGE
Non-Radioactive per DOT, Glove Box on Pallet METAL 1 - Pallet	NA	NA	SOLID/OXIDES	C-14 , CO-60 , FE-55 , MN-54 , NI-63	5 7424E+01	(1 5520E+00)	NA	13 00 ft^3 162 00 lb	GM-GB2 (18-000542)
Non-Radioactive per DOT, Glove Box on Pallet METAL 1 - Pallet	NA	NA	SOLID/OXIDES	C-14 , CO-60 , FE-55 , MN-54 , NI-63	5 7424E+01	(1 5520E+00)	NA	13 00 ft^3 184 00 lb	GM-GB3 (18-000543)
Non-Radioactive per DOT, Glove Box on Pallet METAL 1 - Pallet	NA	NA	SOLID/OXIDES	C-14 , CO-60 , FE-55 , MN-54 , NI-63	5 7424E+01	(1 5520E+00)	NA	13 00 ft^3 184 00 lb	GM-GB4 (18-000544)

Modified Date: 04/06/2018 10 06

FORM 541 **Bionomics, Inc.**

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

CONTAINER AND WASTE DESCRIPTION

Additional Nuclear Regulatory Commission (NRC) Requirements for Control, Transfer and Disposal of Radioactive Waste

1. MANIFEST TOTALS

NUMBER OF PACKAGES/ DISPOSAL CONTAINERS	NET WASTE VOLUME	NET WASTE WEIGHT	SPECIAL NUCLEAR MATERIAL (grams) U-233	U-235	Pu	TOTAL
17	m^3 7.1107 ft^3 251.1008	kg 1338.09 ton 1.48	NP	NP	NP	NP

ACTIVITY (MBq/mCi) (LLD UNITS IN uCi/cc)

	ALL NUCLIDES	TRITIUM	C-14	Tc-99	I-129	SOURCE
MBq	7.6102E+02	NP	5.1430E+02	NP	NP	kg 6.6114E+00
mCi	2.0568E+01	NP	1.3900E+01	NP	NP	ton 7.2879E-03

2. MANIFEST NUMBER 0318GM

3. PAGE 1 OF 6 PAGE(S)

4. SHIPPER NAME Bionomics, Inc. for General Motors

SHIPMENT ID NUMBER 03262018MIOH

DISPOSAL CONTAINER DESCRIPTION / WASTE DESCRIPTION FOR EACH WASTE TYPE IN CONTAINER

5. CONTAINER IDENTIFICATION NUMBER # - Innerpack Container	6. CONTAINER DESCRIPTION (See Note 1 & 1A)	7. VOLUME m^3 / ft^3	8. WASTE AND CONTAINER WEIGHT kg / ton	9. SURFACE RADIATION LEVEL mSv/hr / mrem/hr	10. SURFACE CONTAMINATION MBq/100 cm² / dpm/100 cm² ALPHA	BETA-GAMMA	11. WASTE DESCRIPTOR (See Note 2 & Note 2A)	12. APPROXIMATE WASTE VOLUME(S) IN CONTAINER m^3 / ft^3	13. SOLIDIFICATION OR STABILIZATION MEDIA (See Note 3)	14. CHEMICAL DESCRIPTION CHEMICAL FORM/ CHELATING AGENT	WEIGHT % CHELATING AGENT IF > 0.1%	15. RADIOLOGICAL DESCRIPTION INDIVIDUAL RADIONUCLIDES AND ACTIVITY AND CONTAINER TOTAL; OR CONTAINER TOTAL ACTIVITY AND RADIONUCLIDE PERCENT RADIONUCLIDES	pCi/gm	MBq	mCi	16. WASTE CLASSIFICATION AS - Class A Stable AU - Class A Unstable B - Class B C - Class C
18-000527 (GM-DRUM1)	4	0.2124	74.84	0.03	< 0.000000334	< 0.0000167	H 40	0.2124	100	SOLID OXIDES / NP	NP	C-14	9.5853E+03	1.8500E+01	5.0000E-01	AU
												TH(NAT)	1.9171E+03	3.7000E+00	1.0000E-01	
Origin: MI		7.5000	0.08	3	< 20	< 1000		7.5000						[4.5455E-01 kg]		
General Motors												U (NAT)	1.9171E+04	3.7000E+01	1.0000E+00	
GTMC RCEL Building, 30200 Mound Road														[1.4085E+00 kg]		
Warren, MI 48092												Sub Total	3.0673E+04	5.9200E+01	1.6000E+00	
														[1.8630E+00 kg]		
Package Total													3.0673E+04	5.9200E+01	1.6000E+00	
														[1.8630E+00 kg]		
18-000528 (GM-DRUM2)	4	0.2124	74.84	< 0.005	< 0.000000334	< 0.0000167	H 40	0.2124	100	SOLID OXIDES / NP	NP	C-14	1.9171E+03	3.7000E+00	1.0000E-01	AU
												U (NAT)	1.9171E+03	3.7000E+00	1.0000E-01	
Origin: MI		7.5000	0.08	< 0.5	< 20	< 1000		7.5000						[1.4085E-01 kg]		
General Motors																
GTMC RCEL Building, 30200 Mound Road												Sub Total	3.8341E+03	7.4000E+00	2.0000E-01	
Warren, MI 48092														[1.4085E-01 kg]		
Package Total													3.8341E+03	7.4000E+00	2.0000E-01	
														[1.4085E-01 kg]		

NOTE 1: Container Description Codes. For containers/waste requiring disposal in approved structural overpacks, the numerical code must be followed by "-OP."

1. Wooden Box or Crate
2. Metal Box
3. Plastic Drum or Pail
4. Metal Drum or Pail
5. Metal Tank or Liner
6. Concrete Tank or Liner
7. Polyethylene Tank or Liner
8. Fiberglass Tank or Liner
9. Demineralizer
10. Gas Cylinder
11. Bulk, Unpacked Waste
12. Unpackaged Components
13. High Integrity Container
19. Other. Describe in item 6, or additional page

NOTE 1A: Bulk Packaging Description Codes (Choose one code as may be applicable.)

A Gondola
B Intermodal
C End-dump
D Roll-off
E Seavan

NOTE 2: Waste Descriptor Codes. (Choose up to three which predominate by volume.)

20. Charcoal
21. Incinerator Ash
22. Soil
23. Gas
24. Oil
25. Aqueous Liquid
26. Filter Media
27. Mechanical Filter
28. EPA or State Hazardous
29. Demolition Rubble
30. Cation Ion-exchange Media
31. Anion Ion-exchange Media
32. Mixed Bed Ion-exchange Media
33. Contaminated Equipment
34. Organic Liquid (except oil)
35. Glassware or Labware
36. Sealed Source/Device
37. Paint or Plating
38. Evaporator Bottoms/Sludges/ Concentrates
39. Compactible Trash
40. Noncompactible Trash
41. Animal Carcass
42. Biological Material (except animal carcass)
43. Activated Material
59. Other. Describe in item 11, or additional page

NOTE 2A: Specific Waste Descriptions (Choose all applicable codes.)

G Dewatered
H Solid
I Combustible
J Non-combustible
K Air Filtration Filters
L Asbestos

NOTE 3: Solidification and Stabilization Media Codes. (Choose up to three which predominate by volume.) For media meeting disposal site structral stability requirements, the numerical code must be followed by "-S" and the media vendor and brand name must also be identified in item 13. Code 100=None Required

Solidification

90. Cement
91. Concrete (encapsulation)
92. Bitumen
93. Vinyl Chloride
94. Vinyl Ester Styrene
99. Other. Describe in item 13, or additional page
100. None Required

 * - Indicates Cross Contamination

FORM 541A

Bionomics, Inc.

2. MANIFEST NUMBER 0318GM

3.

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

CONTAINER AND WASTE DESCRIPTION (CONTINUATION)

DISPOSAL CONTAINER DESCRIPTION							WASTE DESCRIPTION FOR EACH WASTE TYPE IN CONTAINER							
							PHYSICAL DESCRIPTION			14. CHEMICAL DESCRIPTION		15. RADIOLOGICAL DESCRIPTION			
5. CONTAINER IDENTIFICATION NUMBER # - Innerpack Container	6. CONTAINER DESCRIPTION (See Note 1 & 1A)	7. VOLUME m^3 / ft^3	8. WASTE AND CONTAINER WEIGHT kg / ton	9. SURFACE RADIATION LEVEL mSv/hr / mrem/hr	10. SURFACE CONTAMINATION MBq/100 cm^2 / dpm/100 cm^2 ALPHA	BETA-GAMMA	11. WASTE DESCRIPTOR (See Note 2 & Note 2A)	12. APPROXIMATE WASTE VOLUME(S) IN CONTAINER m^3 / ft^3	13. SOLIDIFICATION OR STABILIZATION MEDIA (See Note 3)	CHEMICAL FORM/ CHELATING AGENT	WEIGHT % CHELATING AGENT IF > 0.1%	INDIVIDUAL RADIONUCLIDES AND ACTIVITY AND CONTAINER TOTAL; OR CONTAINER TOTAL ACTIVITY AND RADIONUCLIDE PERCENT RADIONUCLIDES	pCi/gm	MBq	mCi	16. WASTE CLASSIFICATION AS - Class A Stable AU - Class A Unstable B - Class B C - Class C
18-000529 (GM-DRUM3) Origin: MI General Motors GTMC RCEL Building, 30200 Mound Road Warren, MI 48092	4	0.2124 7.5000	68.04 0.08	< 0.005 < 0.5	< 0.000000334 < 20	< 0.0000167 < 1000	H 40	0.2124 7.5000	100	SOLID OXIDES / NP	NP	C-14 U (NAT) Sub Total	2.2046E+04 1.1023E+04 3.3069E+04	3.7000E+01 1.8500E+01 [7.0423E-01 kg] 5.5500E+01 [7.0423E-01 kg]	1.0000E+00 5.0000E-01 1.5000E+00	AU
Package Total													3.3069E+04	5.5500E+01 [7.0423E-01 kg]	1.5000E+00	
18-000530 (GM-DRUM4) Origin: MI General Motors GTMC RCEL Building, 30200 Mound Road Warren, MI 48092	4	0.2124 7.5000	58.97 0.07	< 0.005 < 0.5	< 0.000000334 < 20	< 0.0000167 < 1000	H 40	0.2124 7.5000	100	SOLID OXIDES / NP	NP	C-14 U (NAT) Sub Total	2.7558E+03 2.7558E+03 5.5116E+03	3.7000E+00 3.7000E+00 [1.4085E-01 kg] 7.4000E+00 [1.4085E-01 kg]	1.0000E-01 1.0000E-01 2.0000E-01	AU
Package Total													5.5116E+03	7.4000E+00 [1.4085E-01 kg]	2.0000E-01	
18-000532 (GM-BOX1) Origin: MI General Motors GTMC RCEL Building, 30200 Mound Road Warren, MI 48092	19 Fiber Box	0.7646 27.0000	54.43 0.06	< 0.005 < 0.5	< 0.000000334 < 20	< 0.0000167 < 1000	H 40 39	0.7646 27.0000	100	SOLID OXIDES / NP	NP	C-14 TH(NAT) U (NAT) Sub Total	3.6744E+04 9.1859E+02 9.1859E+03 4.6848E+04	7.4000E+01 1.8500E+00 [2.2727E-01 kg] 1.8500E+01 [7.0423E-01 kg] 9.4350E+01 [9.3150E-01 kg]	2.0000E+00 5.0000E-02 5.0000E-01 2.5500E+00	AU
Package Total													4.6848E+04	9.4350E+01 [9.3150E-01 kg]	2.5500E+00	

Form 541A (10-96) * - Indicates Cross Contamination

FORM 541A

Bionomics, Inc.

2. MANIFEST NUMBER 0318GM

3. PAGE 3 OF 6 PAGE(S)

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

CONTAINER AND WASTE DESCRIPTION (CONTINUATION)

DISPOSAL CONTAINER DESCRIPTION							WASTE DESCRIPTION FOR EACH WASTE TYPE IN CONTAINER								
							PHYSICAL DESCRIPTION			14. CHEMICAL DESCRIPTION		15. RADIOLOGICAL DESCRIPTION			
5. CONTAINER IDENTIFICATION NUMBER # - Innerpack Container	6. CONTAINER DESCRIPTION (See Note 1 & 1A)	7. VOLUME m^3 / ft^3	8. WASTE AND CONTAINER WEIGHT kg / ton	9. SURFACE RADIATION LEVEL mSv/hr / mrem/hr	10. SURFACE CONTAMINATION MBq/100 cm^2 / dpm/100 cm^2 ALPHA	BETA-GAMMA	11. WASTE DESCRIPTOR (See Note 2 & Note 2A)	12. APPROXIMATE WASTE VOLUME(S) IN CONTAINER m^3 / ft^3	13. SOLIDIFICATION OR STABILIZATION MEDIA (See Note 3)	CHEMICAL FORM/ CHELATING AGENT	WEIGHT % CHELATING AGENT IF > 0.1%	INDIVIDUAL RADIONUCLIDES AND ACTIVITY AND CONTAINER TOTAL; OR CONTAINER TOTAL ACTIVITY AND RADIONUCLIDE PERCENT RADIONUCLIDES	pCi/gm	MBq	mCi	16. WASTE CLASSIFICATION AS - Class A Stable AU - Class A Unstable B - Class B C - Class C
18-000533 (GM-BOX2) Origin: MI General Motors GTMC RCEL Building, 30200 Mound Road Warren, MI 48092	19 Fiber Box	0.7646 27.0000	102.06 0.11	< 0.005 < 0.5	< 0.000000334 < 20	< 0.0000167 < 1000	H 40 39	0.7646 27.0000	100	SOLID OXIDES / NP	NP	C-14 U (NAT) Sub Total	9.7983E+03 4.8992E+03 1.4697E+04	3.7000E+01 1.8500E+01 [7.0423E-01 kg] 5.5500E+01 [7.0423E-01 kg]	1.0000E+00 5.0000E-01 1.5000E+00	AU
Package Total													1.4697E+04	5.5500E+01 [7.0423E-01 kg]	1.5000E+00	
18-000534 (GM-BOX3) Origin: MI General Motors GTMC RCEL Building, 30200 Mound Road Warren, MI 48092	19 Fiber Box	0.7646 27.0000	124.74 0.14	< 0.005 < 0.5	< 0.000000334 < 20	< 0.0000167 < 1000	H 40 39	0.7646 27.0000	100	SOLID OXIDES / NP	NP	C-14 U (NAT) Sub Total	8.0168E+03 4.0084E+03 1.2025E+04	3.7000E+01 1.8500E+01 [7.0423E-01 kg] 5.5500E+01 [7.0423E-01 kg]	1.0000E+00 5.0000E-01 1.5000E+00	AU
Package Total													1.2025E+04	5.5500E+01 [7.0423E-01 kg]	1.5000E+00	
18-000535 (GM-BOX4) Origin: MI General Motors GTMC RCEL Building, 30200 Mound Road Warren, MI 48092	0.13 M3 FIBER BOX	0.1300 4.5908	13.61 0.02	< 0.005 < 0.5	< 0.000000334 < 20	< 0.0000167 < 1000	H 40 39	0.1300 4.5908	100	SOLID OXIDES / NP	NP	C-14 U (NAT) Sub Total	7.3487E+03 7.3487E+02 8.0836E+03	3.7000E+00 3.7000E-01 [1.4085E-02 kg] 4.0700E+00 [1.4085E-02 kg]	1.0000E-01 1.0000E-02 1.1000E-01	AU
Package Total													8.0836E+03	4.0700E+00 [1.4085E-02 kg]	1.1000E-01	

Form 541A (10-96) * - Indicates Cross Contamination

FORM 541A

Bionomics, Inc.

2. MANIFEST NUMBER 0318GM

3.

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

CONTAINER AND WASTE DESCRIPTION (CONTINUATION)

DISPOSAL CONTAINER DESCRIPTION							WASTE DESCRIPTION FOR EACH WASTE TYPE IN CONTAINER								
							PHYSICAL DESCRIPTION			14. CHEMICAL DESCRIPTION		15. RADIOLOGICAL DESCRIPTION			16. WASTE CLASSIFICATION AS - Class A Stable AU - Class A Unstable B - Class B C - Class C
5. CONTAINER IDENTIFICATION NUMBER # - Innerpack Container	6. CONTAINER DESCRIPTION (See Note 1 & 1A)	7. VOLUME m^3 / ft^3	8. WASTE AND CONTAINER WEIGHT kg / ton	9. SURFACE RADIATION LEVEL mSv/hr / mrem/hr	10. SURFACE CONTAMINATION MBq/100 cm^2 / dpm/100 cm^2 ALPHA	BETA-GAMMA	11. WASTE DESCRIPTOR (See Note 2 & Note 2A)	12. APPROXIMATE WASTE VOLUME(S) IN CONTAINER m^3 / ft^3	13. SOLIDIFICATION OR STABILIZATION MEDIA (See Note 3)	CHEMICAL FORM/ CHELATING AGENT	WEIGHT % CHELATING AGENT IF > 0.1%	INDIVIDUAL RADIONUCLIDES AND ACTIVITY AND CONTAINER TOTAL; OR CONTAINER TOTAL ACTIVITY AND RADIONUCLIDE PERCENT				
												RADIONUCLIDES	pCi/gm	MBq	mCi	
18-000538 (GM-MBOX1) Origin: MI General Motors GTMC RCEL Building, 30200 Mound Road Warren, MI 48092	2	0.9062 / 32.0000	181.44 / 0.20	< 0.005 / < 0.5	< 0.000000334 / < 20	< 0.0000167 / < 1000	H 40	0.9062 / 32.0000	100	SOLID OXIDES / NP	NP	C-14 CS-137 U (NAT) Sub Total	6.1240E+03 6.1240E+02 3.0620E+03 9.7983E+03	3.7000E+01 3.7000E+00 1.8500E+01 [7.0423E-01 kg] 5.9200E+01 [7.0423E-01 kg]	1.0000E+00 1.0000E-01 5.0000E-01 1.6000E+00	AU
Package Total													9.7983E+03	5.9200E+01 [7.0423E-01 kg]	1.6000E+00	
18-000539 (GM-MBOX2) Origin: MI General Motors GTMC RCEL Building, 30200 Mound Road Warren, MI 48092	2	0.9062 / 32.0000	136.08 / 0.15	< 0.005 / < 0.5	< 0.000000334 / < 20	< 0.0000167 / < 1000	H 40	0.9062 / 32.0000	100	SOLID OXIDES / NP	NP	C-14 U (NAT) Sub Total	8.4793E+03 4.2397E+03 1.2719E+04	3.7000E+01 1.8500E+01 [7.0423E-01 kg] 5.5500E+01 [7.0423E-01 kg]	1.0000E+00 5.0000E-01 1.5000E+00	AU
Package Total													1.2719E+04	5.5500E+01 [7.0423E-01 kg]	1.5000E+00	
18-000531 (GM-DRUM5) Origin: MI General Motors GTMC RCEL Building, 30200 Mound Road Warren, MI 48092	4	0.2124 / 7.5000	40.82 / 0.05	< 0.005 / < 0.5	< 0.000000334 / < 20	< 0.0000167 / < 1000	H 40	0.2124 / 7.5000	100	SOLID OXIDES / NP	NP	C-14 Sub Total	5.5116E+03 5.5116E+03	3.7000E+00 3.7000E+00	1.0000E-01 1.0000E-01	AU
Package Total													5.5116E+03	3.7000E+00	1.0000E-01	

 * - Indicates Cross Contamination

FORM 541A

Bionomics, Inc.

2. MANIFEST NUMBER 0318GM

3.

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

CONTAINER AND WASTE DESCRIPTION (CONTINUATION)

DISPOSAL CONTAINER DESCRIPTION							WASTE DESCRIPTION FOR EACH WASTE TYPE IN CONTAINER									
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												RADIONUCLIDES	pCi/gm	MBq	mCi	
18-000536 (GM-LEAD1)	4	0.1136	136.08	< 0.005	< 0.000000334	< 0.0000167	H 59(LEAD) 28	0.1136	100	SOLID OXIDES / NP	NP	C-14	8.1653E+03	3.7000E+01	1.0000E+00	AU
Origin: MI General Motors GTMC RCEL Building, 30200 Mound Road Warren, MI 48092		4.0100	0.15	< 0.5	< 20	< 1000		4.0100				Sub Total	8.1653E+03	3.7000E+01	1.0000E+00	
Package Total													8.1653E+03	3.7000E+01	1.0000E+00	
18-000540 (MOTOR-01)	Pallet	0.2265	226.80	< 0.005	< 0.000000334	< 0.0000167	H 40	0.2265	100	SOLID OXIDES / NP	NP	C-14	4.7927E+03	3.7000E+01	1.0000E+00	AU
Origin: MI General Motors GTMC RCEL Building, 30200 Mound Road Warren, MI 48092		8.0000	0.25	< 0.5	< 20	< 1000		8.0000				Sub Total	4.7927E+03	3.7000E+01	1.0000E+00	
Package Total													4.7927E+03	3.7000E+01	1.0000E+00	
18-000541 (GM-GB1)	Pallet	0.3681	74.84	< 0.005	< 0.000000334	< 0.0000167	H 40	0.3681	100	SOLID OXIDES / NP	NP	C-14	1.7637E+04	3.7000E+01	1.0000E+00	AU
												CO-60	1.7637E+01	3.7000E-02	1.0000E-03	
Origin: MI General Motors GTMC RCEL Building, 30200 Mound Road Warren, MI 48092		13.0000	0.08	< 0.5	< 20	< 1000		13.0000				FE-55	8.8185E+02	1.8500E+00	5.0000E-02	
												MN-54	1.7637E+01	3.7000E-02	1.0000E-03	
												NI-63	8.8185E+03	1.8500E+01	5.0000E-01	
												Sub Total	2.7373E+04	5.7424E+01	1.5520E+00	
Package Total													2.7373E+04	5.7424E+01	1.5520E+00	
18-000542 (GM-GB2)	Pallet	0.3681	74.84	< 0.005	< 0.000000334	< 0.0000167	H 40	0.3681	100	SOLID OXIDES / NP	NP	C-14	1.7637E+04	3.7000E+01	1.0000E+00	AU
												CO-60	1.7637E+01	3.7000E-02	1.0000E-03	
Origin: MI General Motors GTMC RCEL Building, 30200 Mound Road Warren, MI 48092		13.0000	0.08	< 0.5	< 20	< 1000		13.0000				FE-55	8.8185E+02	1.8500E+00	5.0000E-02	
												MN-54	1.7637E+01	3.7000E-02	1.0000E-03	
												NI-63	8.8185E+03	1.8500E+01	5.0000E-01	
												Sub Total	2.7373E+04	5.7424E+01	1.5520E+00	
Package Total													2.7373E+04	5.7424E+01	1.5520E+00	

Form 541A (10-96)

* - Indicates Cross Contamination

FORM 541A

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												RADIONUCLIDES	pCi/gm	MBq	mCi	
18-000543 (GM-GB3)	Pallet	0.3681	74.84	< 0.005	< 0.000000334	< 0.0000167	H 40	0.3681	100	SOLID OXIDES / NP	NP	C-14	1.7637E+04	3.7000E+01	1.0000E+00	AU
Origin: MI		13.0000	0.08	< 0.5	< 20	< 1000		13.0000				CO-60	1.7637E+01	3.7000E-02	1.0000E-03	
General Motors												FE-55	8.8185E+02	1.8500E+00	5.0000E-02	
GTMC RCEL Building, 30200 Mound Road												MN-54	1.7637E+01	3.7000E-02	1.0000E-03	
Warren, MI 48092												NI-63	8.8185E+03	1.8500E+01	5.0000E-01	
												Sub Total	2.7373E+04	5.7424E+01	1.5520E+00	
Package Total													2.7373E+04	5.7424E+01	1.5520E+00	
18-000544 (GM-GB4)	Pallet	0.3681	74.84	< 0.005	< 0.000000334	< 0.0000167	H 40	0.3681	100	SOLID OXIDES / NP	NP	C-14	1.7637E+04	3.7000E+01	1.0000E+00	AU
Origin: MI		13.0000	0.08	< 0.5	< 20	< 1000		13.0000				CO-60	1.7637E+01	3.7000E-02	1.0000E-03	
General Motors												FE-55	8.8185E+02	1.8500E+00	5.0000E-02	
GTMC RCEL Building, 30200 Mound Road												MN-54	1.7637E+01	3.7000E-02	1.0000E-03	
Warren, MI 48092												NI-63	8.8185E+03	1.8500E+01	5.0000E-01	
												Sub Total	2.7373E+04	5.7424E+01	1.5520E+00	
Package Total													2.7373E+04	5.7424E+01	1.5520E+00	
Shipment Total		7.1107	1592.11											7.6102E+02	2.0568E+01	
		251.1008	1.76											[6.6114E+00 kg]		

Form 541A (10-96) * - Indicates Cross Contamination

NRC FORM 314
(02-2017)
10 CFR 30.36(j)(1); 40.42(j)(1); 70.38(j)(1); and 72.54(k)(5)(i)(1)

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF DISPOSITION OF MATERIALS

APPROVED BY OMB: NO. 3150-0028 EXPIRES: 02/29/2020

LICENSEE NAME AND ADDRESS	LICENSE NUMBER	DOCKET NUMBER
General Motors LLC Research and Development Center 30500 Mound Road Warren, MI 48090	21-00016-04	030-04779
	LICENSE EXPIRATION DATE: December 31, 2025	

A. LICENSE STATUS (Check the appropriate box)

☐ This license has expired. ☐ This license has not yet expired; please terminate it.

B. DISPOSAL OF RADIOACTIVE MATERIAL

(Check the appropriate boxes and complete as necessary. If additional space is needed, provide attachments)

The licensee, or any individual executing this certificate on behalf of the licensee, certifies that:

☐ 1. No radioactive materials have ever been procured or possessed by the licensee under this license.

☑ 2. All activities authorized by this license have ceased, and all radioactive materials procured and/or possessed by the licensee under this license number cited above have been disposed of in the following manner.

☐ a. Transfer of radioactive materials to the licensee listed below:

☑ b. Disposal of radioactive materials:

☐ 1. Directly by the licensee:

☐ 2. By licensed disposal site:

☑ 3. By waste contractor:

Chase Environmental Group, Inc., Bionomics, Inc., and Valicor Environmental Services.

☑ c. All radioactive materials have been removed such that any remaining residual radioactivity is within the limits of 10 CFR Part 20, Subpart E, and is ALARA.

C. SURVEYS PERFORMED AND REPORTED

☑ 1. A radiation survey was conducted by the licensee. The survey confirms:

☐ a. the absence of licensed radioactive materials

☑ b. that any remaining residual radioactivity is within the limits of 10 CFR 20, Subpart E, and is ALARA.

☐ 2. A copy of the radiation survey results:

☑ a. is attached; or ☐ b. is not attached (Provide explanation); or ☐ c. was forwarded to NRC on: _____ Date

☐ 3. A radiation survey is not required as only sealed sources were ever possessed under this license, and

☐ a. The results of the latest leak test are attached; and/or ☐ b. No leaking sources have ever been identified.

The person to be contacted regarding the information provided on this form:

NAME	TITLE	TELEPHONE (Include Area Code)	E-MAIL ADDRESS
Daniel Blossfeld	Radiation Safety Officer	(586) 651-2001	daniel.h.blossfeld@gm.com

Mail all future correspondence regarding this license to:

777 Joslyn Ave., Pontiac, MI 48340.

C. CERTIFYING OFFICIAL

I CERTIFY UNDER PENALTY OF PERJURY THAT THE FOREGOING IS TRUE AND CORRECT

PRINTED NAME AND TITLE	SIGNATURE	DATE
Mark W. Verbrugge	Mark W. Verbrugge	10/30/20

WARNING: FALSE STATEMENTS IN THIS CERTIFICATE MAY BE SUBJECT TO CIVIL AND/OR CRIMINAL PENALTIES. NRC REGULATIONS REQUIRE THAT SUBMISSIONS TO THE NRC BE COMPLETE AND ACCURATE IN ALL MATERIAL RESPECT. 18 U.S.C. SECTION 1001 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

Radiological Final Status Survey Report
for the
Research and Chemical Engineering Laboratory (RCEL)
Building 102

Prepared for:

General Motors

Global Technical Center

Warren, Michigan

Prepared by:

GHD

26850 Haggerty Road

Farmington Hills, MI 48331

and

SC&A

7 Balmoral Drive

Pittstown, NJ 08867

October 2020

Table of Contents

List of Figures

List of Appendices

List of Acronyms, Abbreviations, and Units of Measurement

bgs	Below Ground Surface
BKG	Background
BRA	Background Reference Area
C-14	Carbon-14
cpm	Counts Per Minute
DCGL	Derived Concentration Guideline Levels
DOE	United States Department of Energy
dpm	Disintegrations Per Minute
DQO	Data Quality Objective
EML	Elevated Measurement Location
EPA	United States Environmental Protection Agency
FSP	Field Sampling Plan
FSS	Final Status Survey
FSSR	Final Status Survey Report
GFPC	Gas Flow Proportional Counter
H_o	Null Hypothesis
HVAC	Heating, Ventilation, Air Conditioning
LSC	Liquid Scintillation Counting
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Man
MDA	Minimum Detectable Activity
MDC	Minimum Detectable Concentration
NaI	Sodium Iodide
NELAP	National Environmental Laboratory Accreditation Program
NIST	National Institute of Standards and Technology
NORM	Naturally Occurring Radioactive Materials
NRC	Nuclear Regulatory Commission
QC	Quality Control
RCEL	Research and Chemical Engineering Laboratory
RML	Radioactive Materials License
ROC	Radionuclide of Concern
SC&A	SC&A, Inc.

SOF	Sum of Fraction
SU	Survey Unit
Th-230	Thorium-230

EXECUTIVE SUMMARY

This report presents the results of the radiological Final Status Survey (FSS) performed of Building 102, systems, equipment and applicable surrounding land areas at the General Motors (GM) Warren Technical Center's Research and Chemical Engineering Laboratory (RCEL) in Warren, Michigan. The survey was performed in October 2019 by SC&A, Inc. (SC&A). Radiological data were collected in accordance with the *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)* (EPA, 2000) and the *Field Sampling Plan for the Radiological Final Status Survey of the Research and Chemical Engineering Laboratory Building 102* (FSP, SC&A, October 2019) included as **Appendix A** of this FSSR. The purpose of the survey was to verify the RCEL meets the release criteria specified in the FSP. These criteria are for unrestricted release of building and soil surfaces, and are based on the Screening Criteria found in *NUREG-1757* (NRC, 2006), Appendix H, Tables H.1 and H.2.

The RCEL Building is located in the northwest corner of the Warren Technical Center, and was used in the performance of licensed activities under GM's Broad Scope Radioactive Materials License (RML) No. 21-0001-04 issued by NRC. Its principal function was research and development for automotive engine performance testing.

The RCEL Building underwent FSS activities during the period October 7-25, 2019. FSS was performed in all remaining lab areas that were used to support licensed activities, which included eastern portions of the lower level, first level, and the roof where air-handling discharge utilities were located. Surveys were completed in five (5) Class 3 facility structure Survey Units (SUs) and three (3) Class 2 facility structure SUs (floors, lower walls). During the FSS of one of the Class 2 SUs, a small elevated measurement location (EML, less than 100 cm^2) was identified and decontaminated. The associated area, a storage cage on the lower level, was reclassified as a Class 1 SU and underwent commensurate FSS activities. Additionally, utilities in all SUs, and utilities in previously decommissioned areas underwent FSS. The outside areas associated with the lab discharge water collection vaults (vaults) also underwent media sampling, and are counted as two of the five Class 3 facility structure SUs.

The results of the FSS activities concluded that all Class 3 and prevailing Class 2 SUs met the release criteria for unrestricted use. The reclassified Class 1 SU also met the release criteria for unrestricted use following successful decontamination efforts. One sink drain line was identified as containing elevated radioactivity, and was removed and managed as radioactive waste. Subsequently, all remaining utilities throughout the facility met the release criteria for unrestricted use.

1 INTRODUCTION AND OVERVIEW

This Final Status Survey Report (FSSR) exists as part of GM's *Limited Building Decommissioning Assessment & Final Status Survey Research and Chemical Laboratory – Building 102 GM Global Technical Center, Warren, Michigan* (LBDAR) prepared by GHD.

This FSSR presents the results of the radiological FSS performed of Building 102, systems, equipment and applicable surrounding land areas at the GM Warren Technical Center's RCEL Building in Warren, Michigan. **Figure 1** shows the RCEL Building location on the Warren Technical Center Campus. The survey was performed in October 2019 by SC&A with support form GHD. Radiological data were collected in accordance with the *MARSSIM* and the FSP. The FSP is included in this FSS Report as **Appendix A**. The purpose of the survey was to verify the RCEL Building meets the release criteria specified in the FSP. These criteria are for unrestricted release of building and soil surfaces, and are based on the Screening Criteria found in *NUREG-1757* (NRC, 2006), Appendix H, Tables H.1 and H.2.

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The FSP laid out prospective Class 2 and Class 3 SUs to undergo FSS activities. Refer to Table 4-1 in the FSP (**Appendix A**) for a tabular summary of SU classification, survey planning parameters, and survey and sampling information.

The primary SU FSS activities were focused on the floors and lower walls in the active indoor licensed areas. **Figure 2** shows the licensed areas with respect to the RCEL Building floor plan. These primary indoor SUs existed on the lower level, first floor, and on the roof where air-handling discharge occurred from the licensed labs. The primary outdoor SUs focused on the soils around the vaults and on the interior concrete floor surface of the vaults. Secondary SU activities were focused on the utilities (and equipment) associated with the indoor structural SUs. The utilities were assigned different SU identifications from the associated structural areas because the slight differences in survey types[1], and because the utilities were spread out throughout the licensed areas, offering a lower density of available areas for surveys.

Each SU was first subject to gamma walkover surveys to identify any gamma-emitting radioactive contamination or elevated NORM in structure materials that might affect quantitative FSS measurements. The gamma walkover surveys identified the one lab sink drain line **(Room 196)** as exhibiting elevated gamma levels. Additional isotope identification was performed for waste characterization purposes using a handheld isotope identifier. The length of impacted line was removed and placed in a 55-gallon drum. No other abnormal gamma levels were identified that might indicate gamma-emitting radioactive contamination, or that might potentially affect subsequent FSS activities.

Next, beta scans were performed in each SU on the floors (at closer to 100% coverage) and on the lower walls (at closer to 25% coverage). No elevated readings were identified on lower walls. One small area in the lower-level storage cage (previously part of the Class 2 SU 10) was

[1] Utilities did not consistently offer a surface geometry conducive to the beta scans and static direct measurements that were used throughout the structural SUs; therefore, some utilities underwent only removable smear surveys.

identified as an EML. RCEL staff performed standard decontamination procedures with SC&A performing cleanup surveys to monitor progress. Once the EML was cleaned to below applicable Derived Concentration Guideline Levels DCGLs, the cage area was reclassified as Class 1 SU11, and subject to Class 1 level FSS. No other SUs were affected or modified as a result of beta scans.

Following the completion of gamma and beta scans in each SU, the quantitative data collection process commenced. The FSS Plan was implemented in each SU, including at each "sample" location the direct measurement of beta (and alpha)[2] total surface activity, and the collection and measurement of removable beta (and alpha) surface activity. The number of measurements for each structural SU met the minimum sample number recommended based on the MARSSIM methods. All results for total and removable beta (and alpha) surface activity were below the associated DCGLs.

Additionally, smear samples were collected at specified locations for laboratory Liquid Scintillation Counting (LSC) analysis of "hard to detect" beta emitters (^{14}C, ^{3}H, ^{55}Fe and ^{63}Ni). The number of LSC smear samples were not based on the MARSSIM methods, but rather based on SU area coverage and biased locations in an effort to identify the presence of the associated Radionuclides of Concern ROCs at any residual levels comparable to the DCGLs. All LSC results for all ROCs were in the range of the MDC values. The MDC values are small fractions of the associated DCGL values for all ROCs; therefore, the lab results were significantly lower than the applicable DCGLs.

Solid media samples were collected in select SUs and analyzed for volumetric activity concentration of applicable ROCs. The analytical results were used to supplement the surface activity FSS values. For example, SU06 was on the roof, which consisted of pea gravel (structural) and HVAC components (utilities). Therefore, the SU06 FSS evaluated the pea gravel both surficially (alpha/beta direct measurements,[3] LSC for beta removable "hard to detect" ROCs ^{14}C, ^{3}H, ^{55}Fe and ^{63}Ni, and wet leach / Gas Flow Proportional Counter (GFPC) for ^{36}Cl), and volumetrically (gamma spectroscopy for prominent gamma emitters ^{60}Co and ^{137}Cs). Similarly, the clay tile beneath the Dynamometer was evaluated both surficially and volumnetrically. All results were in the range of associated Minimum Detectable Activities MDAs and Minimum Detectable Concentrations (MDCs), and only small fractions of the associated DCGLs.

Solid media samples were also collected in and around the outside vaults that receive lab liquid effluents. Concrete core samples in the bottom of the vaults, and shallow soil samples surrounding the vaults were analyzed for a suite of ROCs.

The following table summarizes the FSS data assessment results [sample adequacy, Sum of Fraction (SOF)] for the nine (9) structure SUs.[4] All structure SUs meet unrestricted release

[2] No alpha emitters were identified as licensed-authorized radioactive materials, and no alpha emitters were expected to be identified at residual levels. However, it was decided to include alpha measurements to be conservative.

[3] Collection of quality removable smear samples was determined to be impractical based on the roof's surface stone configuration, therefore the decision was made not to attempt to collect and report gross alpha/beta removable surface activity values.

[4] The vault and surrounding soils were included as separate "structure" SUs for evaluation and summary purposes.

criteria.

Structure Survey Unit	Class	Recommended N/2[1]	Actual N/2[2]	SOF[3]
SU01	3	8	23	0.2
SU02	2	8	38	0.5
SU03	2	8	38	0.1
SU06	3	8	9	0.8
SU07	2	8	40	0.4
SU08	3	8	36	0.2
SU11	1	8	45	0.4
SU13	3	8	6	0.4
SU14	3	8	13	0.7

(1) N/2 = Number of samples taken in the SU. Taken as the maximum value from the corresponding SU Data Table.

(2) Taken as the minimum value from the corresponding SU Data Table.

(3) Taken as the value from the corresponding SU Data Table: Value based on DQO Step 5, Decision Rule #2 (difference between maximum ROC values and minimum background values).

The following table summarizes the FSS data assessment results (sample adequacy, SOF) for the six (6) utility SUs. All utility SUs meet unrestricted release criteria.

Utilities Survey Unit	Class	SOF[1]
SU04 Utilities	3	0.2
SU05 Utilities	3	0.5
SU06 Utilities	3	0.1
SU09 Utilities	3	0.7
SU10 Utilities	3	0.2
SU12 Utilities	3	0.2

(1) Taken as the value from the corresponding Utilities SU Data Table: Value based on DQO Step 5, Decision Rule #2 (difference between maximum ROC values and minimum background values).

2 RELEASE CRITERIA

The criteria for releasing the RCEL Building licensed areas for unrestricted use are found in the FSP Section 2.2. Specifically, the surface contamination and volumetric activity concentration DCGLs are summarized in FSP Section 2.2.3 Table 2-2.

Although there was no history of licensed use of alpha-emitting radionuclides reported by the Licensee, it was decided to perform gross alpha surveys as part of the FSS process. If elevated levels of alpha-emitting surface activity were identified, then additional assessments would be performed and additional release criteria specifically for any identified alpha emitters would have been applied. Otherwise, the survey results for total and removable alpha surveys would be added to the corresponding total and removable beta survey results, resulting in a total surface activity value to compare to the applicable DCGLs.

3 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) were developed in the FSP to define the purpose of the radiological survey, clarify what data should be collected to satisfy the purpose, and specify the performance requirements for the quality of information to be obtained from the data. The DQOs applicable to this FSSR are detailed in Section 3 of the FSP.

4 INSTRUMENTATION

The following table summarizes the instrumentation used to implement the FSP and generate the survey information included in this report.

Survey Instrumentation and Uses

Instrumentation	Measurement Type	Survey Types	Purpose
Ludlum Model 2221 Scaler/Ratemeter Model 44-10 2" Sodium Iodide (NaI) Gamma Detector	Gross Gamma	Gamma Walkover Scans of floors, walls, utilities Gamma scans inside utilities (e.g., drains) Gamma scans of solid media/samples	Elevated NORM identification Elevated gamma emitter identification
Ludlum Model 239-14 Floor Monitor Model 2360 Dual Channel Data Logger Model 43-37 Large Area GFPC	Gross Alpha Beta	Alpha/beta scans of floors	Elevated alpha/beta Measurement Locations that might be missed by static measurements
Ludlum Model 2360 Dual Channel Data Logger Model 43-89 or 43-93 Dual Phosphor Detector	Gross Alpha Beta	Alpha/beta scans of lower walls, utilities, equipment Static alpha/beta surveys of FSS measurement locations	Quantitative data collection of total alpha/beta surface activity for compliance demonstration
Ludlum Model 2929 Low Background Sample Counter	Gross Alpha Beta	Alpha/beta counting of dry smear samples	Quantitative data collection of removable alpha/beta surface activity for compliance demonstration
Radiation Alert™ Ranger Spectra	Isotopic Gamma	Field gamma spectroscopy surveys	Isotope identification of elevated gamma materials

5 SURVEY PLAN

The FSP Section 5 laid out the Final Status Survey Plan parameters. Table 4-1 of the FSP summarizes the parameters, including SU designations, classifications, survey/sampling types, and measurement location (survey grid) dimensions. These parameters were used in the field to lay out the survey locations in each SU. For all Class 1, 2, and 3 SUs, the default layout of sampling patterns were systematic, on a triangular grid pattern. However, numerous measurement locations throughout the SUs had to be relocated (no more than ⅓ of the value of L, the distance between sample locations) due to obstacles. Any locations that could not be relocated within ⅓L were either reestablished elsewhere within the SU if data adequacy and coverage were of concern, or eliminated if data adequacy and coverage were not of concern.

The survey plan layout for each SU is shown in **Appendix B, Figures 1.3a – 3.3a.**

6 SURVEY UNIT DESCRIPTION AND DATA COLLECTION

The data collected according to project DQOs and survey data collection requirements specified in the FSP are both quantitative and qualitative in nature. Both probability-based (random) and judgmental (targeted) methods were used to collect data, as described in the survey design in Section 4 of the FSP. The data were reviewed, verified, and validated during and after collection. Data were quantitatively analyzed for direct comparison to action levels and qualitatively reviewed to determine further investigation during the project.

6.1 Background Reference Areas

Background Reference Areas (BRAs) were established for the Lower Level, 1st Floor, and the Roof as described below.

6.1.1 Lower Level Background Reference Area

Ten static alpha/beta measurements were taken in an area southwest of the lower level licensed area that was constructed of materials similar to those found in the licensed area. 5 Tile floor and 5 bare concrete measurements were taken and averaged to determine the background for the lower level. The field survey results are included in the corresponding Radiological Survey Report in **Appendix C**. The Lower Level Floor BRA data was available to be used in the event it was necessary to perform the MARSSIM Wilcoxon Rank Sum Test. Additionally, background data could also be derived from the licensed survey areas data if necessary.

6.1.2 1st Floor Background Reference Area

Fifteen static alpha/beta measurements were taken in an area west of the licensed area that was constructed of materials similar to those found in the licensed area. 5 tile floor, 5 concrete wall, and 5 bare concrete floor measurements were collected and averaged to compare to the measurements taken in the 1st floor licensed area. The field survey results are included in the corresponding Radiological Survey Report in **Appendix C**. The 1st Floor BRA data was available to be used in the event it was necessary to perform the MARSSIM Wilcoxon Rank Sum Test. Additionally, background data could also be derived from the licensed survey areas data if necessary.

6.1.3 Roof Background Reference Area

Fifteen static alpha/beta measurements were collected on the roof, west of SU06. These measurements were averaged to determine the background for the roof. The field survey results are included in the corresponding Radiological Survey Report in **Appendix C**. The Roof Floor BRA data was available to be used in the event it was necessary to perform the MARSSIM Wilcoxon Rank Sum Test. Additionally, background data could also be derived from the licensed survey areas data if necessary.

6.2 Survey Units

The RCEL licensed area was limited to the north eastern portion of the building and was divided into three levels:

- Lower Level
- First Floor
- Roof

6.2.1 Lower Level

The licensed areas in the Lower Level included the following:

- Three Structure SUs
  - SU07 – Class 2, Machine Shop Area[5]
  - SU08 – Class 3, Rooms B-185, B-186, B-187, Corridors
  - SU11 – Class 1, Storage Cage
- Three Utility SUs
  - SU09 – Class 3, Machine Shop Utilities and Equipment
  - SU10 – Class 3, General Areas outside the Machine Shop First Floor
  - SU12 – Class 3, Storage Cage Shelving

6.2.1.1 SU07

The machine shop and closet in the lower level of the licensed area were designated as SU07. The shop was originally used for machining parts that may have come in contact with radioactive material and the closet was used for raw material storage. The shop is located on the northeast side of the lower level licensed area. The surfaces surveyed were painted concrete floors.

First, gamma walkover surveys and alpha/beta scans were performed on 100% of all the accessible floor surfaces, and over at least 25% of all lower wall and accessible utility surfaces. A map of the gamma surveys can be found in **Appendix B**.

Static alpha/beta measurements were taken at 40 locations on the painted concrete floor. Dry smears were also taken at each of these locations and counted on a bench-top counter. These locations were selected by following MARSSIM protocols. LSC smears were taken in "five-on-die-pattern," and were sent to a lab for analysis. A map of the static locations can be found in **Appendix B**.

A total of 40 static measurements, 40 dry smears, and 5 LSC smears were collected in SU07. The field survey results are included in **Appendix C**.

[5] Initially the Storage Cage on the east side of the Machine Shop was included in SU07; however, after an EML was identified in the Cage, it was separated from the Class 2 SU07 and designated as a single Class 1 SU11.

6.2.1.2 SU08

Rooms B-185, B-186, B-187, and the hallways and common area of the lower licensed area were designated as SU08. These rooms and common area occupy the south side of the lower licensed area. Room B-185 was the only room that had tile flooring. B-186 and B-187 both had painted concrete floors and painted concrete block walls. The common area and hallway flooring had been stripped down to bare concrete.

First, gamma walkover surveys and alpha/beta scans were performed on 100% of all the accessible floor surfaces, and over at least 25% of all lower wall and accessible utility surfaces. A map of the gamma surveys can be found in **Appendix B**.

Static alpha/beta measurements and dry smears were collected in 36 locations that were determined using MARSSIM protocols. The dry smears were analyzed with a bench-top counter. Five wet smears were collected in a "five-on-a-die" pattern and sent to a lab for analysis. A map of the static locations can be found in **Appendix B**.

A total of 36 static measurements, 36 dry smears, and 5 LSC smears were taken in SU08. The field survey results are included in **Appendix C**.

6.2.1.3 SU11

The isotope storage cage adjacent to the machine shop in the lower level was designated as SU11. It was originally part of the Machine Shop (Class 2 SU07) but an EML was identified on the floor just inside the cage door and it was reclassified as its own Class 1 SU. Surfaces were constructed of bare concrete and metal shelving.

First, gamma walkover surveys and alpha/beta scans were performed on 100% of all the accessible floor surfaces, lower wall and accessible utility surfaces. A map of the gamma surveys can be found in **Appendix B**.

Elevated alpha and beta levels were noted with the floor monitor, and an EML was located, isolated, and decontaminated to levels less than the DCGL.

Alpha and Beta static measurements were performed at 45 locations on the floor. Direct static measurements and dry smears were performed at each location and LSC smears were taken in a "five-on-a-die" pattern on the floor in the cage. Static counts, dry smears, and LSC smears were also taken on the shelving on the north side of the isotope storage cage (designated as SU12). A map of the static locations can be found in **Appendix B**.

A total of 45 static measurements, 45 dry smears and 5 LSC smears were collected in SU11. The field survey results are included in **Appendix C**.

6.2.1.4 SU09 (Utilities)

SU09 consisted of three floor drains in the Lower Level, which were surveyed in

detail to determine if there was any residual contamination that might have been transferred to downstream reservoirs. These drains were located in the main corridor, Room B-186, and adjacent to a subgrade sump.

First, gamma surveys were performed prior to and after drain cover removal. Next, direct measurements for total alpha and beta surface activity were performed on the drain covers. Based on the cylindrical geometry of the drain line, direct measurements could not be performed within the drain lines. Dry smears and LSC smears were collected within each drain to the extents that could be reached. Solid media was collected from the drains and sent to the lab for analysis.

A total of 7 static measurements, 13 dry smears and 2 LSC smears were collected in SU09. The field survey results are included in **Appendix C**.

6.2.1.5 SU10 (Utilities)

SU10 consisted of utilities and equipment in the Lower Level Machine Shop (SU07), including sinks, traps, drain lines, shelving and countertops.

A total of 30 static measurements, 30 dry smears and 9 LSC smears were collected in SU10. The field survey results are included in **Appendix C**.

6.2.1.6 SU12 (Utilities)

SU12 consisted of shelving in the Lower Level Storage Cage (SU011). Although SU11 was designated as Class 1 SU based on an EML identified during initial surveys, the shelving was remote from the EML and was initially found to be consistent with background levels.

A total of 10 static measurements, 10 dry smears and 3 LSC smears were collected in SU12. The field survey results are included in **Appendix C**.

6.2.2 First Floor

The licensed areas on the First Floor included the following:

- Three Structure SUs
  - SU01 – Class 3, Rooms 183, 184, 185, 187, 189, 191, 195, 197
  - SU02 – Class 2, Rooms 188, 192
  - SU03 – Class 2, Rooms 196, 198
- Two Utility SUs
  - SU04 – Class 3, Decommissioned Labs Utilities in Rooms 178, 180
  - SU05 – Class 3, Rooms 184, 188, 192, 195, 196, 198

6.2.2.1 SU01

First Floor Rooms 183, 184, 185, 187, 189, 191, 195, 197, and the hallways

connecting them were designated as SU01. Rooms 183, 185, 187, 189, 191, and 195 were used as offices and conference rooms. Room 184 was originally a low-level beta/gamma counting room. Room 197 was a shielded sealed source storage room. These rooms and hallways occupy the northwest corner and south side of the licensed area on the first floor. The surfaces surveyed in 183, 184, 185, 187, 189, 195, 197, and the hallways consisted of floor tiles and painted concrete block walls. Room 191 had carpeted floors.

First, gamma walkover surveys and alpha/beta scans were performed on 100% of all the accessible floor surfaces, and over at least 25% of all lower wall and accessible utility surfaces. A map of the gamma surveys can be found in **Appendix B**.

Static alpha/beta measurements and dry smears were taken at 23 locations. The dry smears were counted on a bench-top counter. MARSSIM protocols were used to determine the locations for the dry smears and the static alpha/beta measurements. Five LSC smears were taken in a "five-on-a-die" pattern and sent to a lab for analysis. A map of the static locations can be found in **Appendix B**.

A total of 23 static measurements, 23 dry smears, and 5 wet smears were taken in SU01. The field survey results are included in **Appendix C**.

6.2.2.2 SU02

Rooms 188 and 192 were combined and designated as SU02. They occupy the northern middle portion of the licensed area. Room 188 was originally a prototype bench test lab and Room 192 was originally a chemical separation sample prep lab. The surfaces surveyed consisted of tile flooring and painted concrete blocks in the lower walls.

First, gamma walkover surveys and alpha/beta scans were performed on 100% of all the accessible floor surfaces, and over at least 25% of all lower wall and accessible utility surfaces. A map of the gamma surveys can be found in **Appendix B**.

A total of 38 alpha and beta measurements were performed in SU02 (18 in Room 188, 20 in Rom 192). A static measurement and dry smear were taken at each location. The dry smears were counted on a 2929 bench-top counting instrument. Ten locations were selected for LSC smears in a "five-on-a-die pattern," with one smear in each corner and on in the middle, and those smears were sent to a lab for analysis. A map of the static locations can be found in **Appendix B**.

A total of 38 static measurements, 38 dry smears, and 10 LSC smears were collected inside SU02. The field survey results are included in **Appendix C**.

6.2.2.3 SU03

Rooms 196 and 198 were combined and designated as SU03. They occupy the northeast corner of the licensed area. Room 196 was formerly a source receipt and storage room. Room 198 was originally an engine test room. The rooms contained tile floors and painted concrete lower walls.

One hundred percent of all accessible surfaces were surveyed for alpha, beta, and gamma radiation. A scintillator and floor monitor were used to perform preliminary surveys in the rooms. Maps with gamma measurements can be found in **Appendix B**.

It was previously reported by the Licensee that elevated gamma readings were identified in a 6-foot run of drain piping attached to the sink in Room 196. Prior to any FSS surveys, a portable hand-held gamma spectroscopy unit (Radiation Alert™ Ranger Spectra 1" NaI Isotope Identifier) was used to determine that the pipe contained Cs-137. The pipe and all associated utility components were isolated and removed from the wall for disposal prior to any decommissioning surveys being performed in Room 196.

As the first step in the FSS process, gamma walkover surveys and alpha/beta scans were performed on 100% of all the accessible floor surfaces, and over at least 25% of all lower wall and accessible utility surfaces. A map of the gamma surveys can be found in **Appendix B**.

Static alpha/beta measurements and dry smears were taken in 38 locations determined by MARSSIM protocols. The dry smears were counted on a 2929 bench-top counting instrument. Four of these locations were selected for wet smears to be performed. These were biased to possible points of contamination. Four samples of the tile located under the engine test apparatus (Dynamometer) in Room 198 were collected and analyzed for potential contamination.

A total of 38 static measurements, 38 dry smears, 4 LSC smears, and 4 tile samples were collected inside SU03. The field survey results are included in **Appendix C**.

6.2.2.4 SU04 (Utilities)

SU04 consisted of utilities and equipment in previously decommissioned labs in Rooms 178 and 180. When Rooms 178 and 180 were previously decommissioned the utilities were not included, so they were included within the scope of this FSP. The SU04 utilities and equipment consisted of sinks, sink drains vent hoods and vent hood drains.

A total of 8 static measurements, 8 dry smears and 2 LSC smears were collected in SU04. The field survey results are included in **Appendix C**.

6.2.2.5 SU05 (Utilities)

SU05 consisted of utilities and equipment throughout the First Floor in SU01, SU02, and SU03. These included sinks, shelving, vent hoods, HVAC interiors, floor stains near utilities, and air handling components for the Dynamometer in Room 198.

A total of 19 alpha and 33 beta static measurements, 52 dry smears and 5 LSC smears were collected in SU05. The field survey results are included in **Appendix C**.

6.2.3 Roof

The roof areas potentially impacted by licensed activities included the following:

- One Structure SU
  - SU06 – Class 3, pea gravel surface material
- One Utility SU
  - SU06 – Class 3, Lab HVAC vent plena discharging to roof

6.2.3.1 SU06

The roof surface above and servicing the licensed area of the RCEL building was designated as SU06. The surface consisted of pea gravel media in tar paper.

Surveys on the Roof were limited by safety hazards and media geometry. Therefore, certain survey limitations applied, requiring remote extension of detector probes to reach areas close to the unprotected roof edge, and absence of alpha/beta scans and dry smear removable activity measurements. Additionally, it was not practical to attempt collection of dry smears; therefore, no dry smears were collected on the roof surface media.

First, gamma surveys were performed on 100% of all the accessible roof and utility surfaces. A map of the gamma surveys can be found in **Appendix B**.

Static alpha/beta measurements were taken in 30 locations. Zinc sulfide detectors were used to perform one-minute static counts at each location. LSC smears were collected in 19 of the locations.

Solid media samples (roofing pea gravel material) were collected from each of the 30 locations were alpha/beta measurements were performed.

A total of 30 static measurements, 0 dry smears, 19 LSC smears, and 30 solid media samples were taken in SU06. The field survey results are included in **Appendix C**.

6.2.3.2 SU06 (Utilities)

The utilities on the roof surface above and servicing the licensed area of the RCEL building was designated as "SU06 Utilities." The utilities were constructed of sheet metal. There were five HVAC vent systems from licensed labs discharging in SU06.

No direct alpha/beta measurements were taken on the SU06 Utilities due to geometry issues. Dry smears were taken from the four eastern-most vent systems. Wet smears were also taken from the 4 eastern-most vent plena.

A total of 0 static measurements, 5 dry smears and 4 LSC smears were collected from the SU06 Utilities. The field survey results are included in **Appendix C**.

6.2.4 Outdoor Areas

The outdoor licensed areas included two vaults and surrounding soils that were the

subjects of previous investigations and considered potentially impacted by licensed activities. These areas are further described in the following sections of the LBDAR:

- Vaults -
  - Section 1.4.1 - Description
  - Section 2.1 - Sampling
- Soils -
  - Section 1.4.2 - Description
  - Section 2.2 - Sampling

Both were designated as "Structure SUs" for the purposes of assessment. The concrete floors of the vaults were composite sampled, and the surrounding soils were sampled down to 14 feet below ground surface (bgs). The SU designations were as follows -

- SU13 – Class 3, Vaults
- SU14 – Class 3, Surface and Shallow Subsurface Soils Around Vault

6.2.4.1 SU13

The concrete floors of the vaults were sampled as described in LBDA Section 2.1. A composite sample was collected from each of the six bays on the two vaults. Each composite sample was homogenized, and a representative sample collected from each composite for laboratory analysis.

6.2.4.2 SU14

The soils surrounding the vaults were sampled as described in LBDA Section 2.2. Soil samples were scanned using a shielded gamma detector configuration to determine if there were any elevated gamma levels in the soils. Based on the results, the sample from the depth interval exhibiting the highest gamma reading was selected for lab analyses, along with a sample from the deepest depth interval (bottom clean sample). Three additional locations were sampled based on previous radiological investigation results and professional judgment. Each of these locations was sampled from 0-1 foot bgs. In each case, the entire volume of soil collected from the selected depth interval was sent to the lab for analysis.

7 RESULTS

Implementation of the Survey and Data Collection process in Section 4 resulted in radiological survey and sampling data are herein presented. The data include:

- Field-generated direct and removable gross alpha/beta surface activity values representing "easy to detect" ROCs;
- Laboratory-generated LSC surface activity values for "hard to detect" ROCs;
- Radiochemistry and gross beta analysis of solid media samples to report "hard to detect" ROCs, and
- Laboratory-generated isotopic analysis of solid media samples to report gamma-emitting ROCs.

The following subsections summarize the data for each BRA and SU.

7.1 Summary Deliverables

The following summarizes the components of this FSSR that contain the FSS data.

- Appendix B - Gamma Survey Maps
- Appendix C - Field Radiological Survey Reports
- Appendix D - Survey Data Summary Tables
  - Tables 1,5,10 - BRA
  - Tables 2-4, 6-9, 11-19 - SU
    - Tables 2-4, 6, 11-13, 17-19 - Structure Surfaces
    - Tables 7-9, 14-16 - Utilities
- Appendix E – Laboratory Radioanalytical Data Packages

7.2 Data Evaluation Process

All survey data is summarized in the tables in **Appendix D** for data evaluation. Each Structure Material SU (SU01, SU02, SU03, SU06, SU07, SU08, SU11) data set table in **Appendix Z** is used to evaluate the following (refer to any Structure Material SU table as an example):

- Statistics for the Net Removable alpha/beta, Total alpha/beta, LSC Isotopic analytical, GFPC Isotopic analytical (SU06 only) and Gamma spectroscopy Isotopic (SU06 only) data sets -
  - Number of Measurements
  - Maximum Value
  - Average Value
  - Standard Deviation
  - MDA (alpha/beta) or Highest MDC
- Sample Adequacy Verification – Determination of N/2 values to confirm that an

adequate number of measurements were taken for the data set to be considered statistically significant.[6] If the actual N/2 value is equal to or greater than the Recommended N/2 value, then the data set is considered to be statistically significant.

- MARSSIM DQO Step 5, Decision Rule #2 Test – This test satisfies the requirements of FSP Section 3, DQO #5 (Decision Rules). Decision Rule #2 compares the highest gross value to the lowest corresponding background value (if applicable) for each measurement type. The following steps are performed –
- Determine Maximum Net Value, selected from Survey Data section of table
- Back-calculate the Maximum Gross Value using the Average Background (BKG) Value form the applicable BRA data set
- Determine the Minimum BKG Value form the applicable BRA data set
- Calculate the Difference between the Maximum Gross Value and the Minimum BKG Value (specific condition of DQO Step 5, Decision Rule #2)
- Sum the alpha and beta values for Removable Activity
- Sum the alpha and beta values for the Total Activity
- Calculate the Fraction - Divide Value by the corresponding DCGL
- Calculate the Sum of Fraction (SOF) Value - Add all the SU Fraction values together

If the SOF Value ≤ 1 then the Null Hypothesis (H_0) is REJECTED, the SU PASSES, and no further data evaluation is required.

However, if the SOF value for any SU resulting from the performance of DQO Step 5, Decision Rule #2 exceeds unity (SOF > 1), then the data evaluation proceeds to DQO Step 5, Decision Rule #3.

7.3 Background Reference Areas

The results of surveys of the BRAs are described below.

7.3.1 Lower Level Background Reference Area

The results of the field survey of the Lower Level BRA are detailed in the Radiological Survey Report in **Appendix C** and summarized in Table 10 of **Appendix D**. The combined results of the beta survey data from the two surface

[6] MARSSIM provides guidance on determining the value of N/2 (for statistical tests on data from measurement types that are present in background such as gross alpha/beta) and N (for statistical tests on data from measurement types that are not present in background such as isotopic analysis of anthropogenic radionuclides). For the purposes of this evaluation, Sample Adequacy was only required for gross alpha/beta measurements on structure surfaces; however, it was also performed for illustration purposes on the LSC, GFPC and gamma spectroscopy data in SU06.

materials exhibited a Standard Deviation of 13%; therefore, it was concluded that all beta direct survey data could be used as a single data set to represent background for all surface activity measurements in the SUs on the Lower Level.

7.3.2 1st Floor Background Reference Area

The results of the field survey of the 1st Floor BRA are detailed in the Radiological Survey Report in **Appendix C** and summarized in Table 1 of **Appendix D**. The combined results of the beta survey data from all three surface materials exhibited a Standard Deviation of 11%; therefore, it was concluded that all beta direct survey data could be used as a single data set to represent background for all surface activity measurements in the SUs on the 1st Floor.

7.3.3 Roof Background Reference Area

The results of the field survey of the Roof BRA are detailed in the Radiological Survey Report in **Appendix C** and summarized in Table 5 of **Appendix D**. The results of the beta survey data from the single type of surface materials exhibited a Standard Deviation of 32% therefore, it was concluded that all beta direct survey data could be used as a single data set to represent background for all surface activity measurements in the SUs on the 1st Floor.

7.4 Survey Units

The following describes the FSS results for each SU.

7.4.1 Lower Level

The SUs in the Lower Level are as follows:

- Three Structure SUs
  - SU07 – Class 2, Machine Shop Area
  - SU08 – Class 3, Rooms B-185, B-186, B-187, Corridors
  - SU11 – Class 1, Storage Cage
- Three Utility SUs
  - SU09 – Class 3, Machine Shop Utilities and Equipment
  - SU10 – Class 3, General Areas outside the Machine Shop First Floor
  - SU12 – Class 3, Storage Cage Shelving

7.4.1.1 SU07– Class 2, Machine Shop Area

The gamma walkover survey map of SU07 is shown in **Appendix B**. The survey map showing the SU07 survey locations is included in **Appendix B**. The total and removable alpha/beta survey results for SU07 are documented in the corresponding Radiological Survey Report in **Appendix C**. The laboratory analytical results for the LSC smears are in **Appendix E**. The full SU07 survey data set is included in Table 11 of **Appendix D**.

The results of the SU07 Data Evaluation performed in Table 11 of **Appendix D** are as follows:

Structure Survey Unit	Class	Recommended N/2[1]	Actual N/2[2]	SOF[3]	H_o	Survey Unit
SU07	2	8	40	0.4	REJECTED	PASSES

(1) Taken as the maximum value from the corresponding SU Data Table.

(2) Taken as the minimum value from the corresponding SU Data Table.

(3) Taken as the value from the corresponding SU Data Table: Value based on DQO Step 5, Decision Rule #2 (difference between maximum ROC values and minimum background values).

Based on the evaluation of all available data, SU07 meets unrestricted release criteria without the need for further evaluation.

7.4.1.2 SU08 – Class 3, Rooms B-185, B-186, B-187, Corridors

The gamma walkover survey map of SU08 is shown in **Appendix B.** The survey map showing the SU08 survey locations is included in **Appendix B.** The total and removable alpha/beta survey results for SU08 are documented in the corresponding Radiological Survey Report in **Appendix C.** The laboratory analytical results for the LSC smears are in **Appendix E.** The full SU08 survey data set is included in Table 12 of **Appendix D.**

The results of the SU08 Data Evaluation performed in Table 12 of **Appendix D** are as follows:

Structure Survey Unit	Class	Recommended N/2[1]	Actual N/2[2]	SOF[3]	H_o	Survey Unit
SU08	3	8	36	0.2	REJECTED	PASSES

(1) Taken as the maximum value from the corresponding SU Data Table.

(2) Taken as the minimum value from the corresponding SU Data Table.

(3) Taken as the value from the corresponding SU Data Table: Value based on DQO Step 5, Decision Rule #2 (difference between maximum ROC values and minimum background values).

Based on the evaluation of all available data, SU08 meets unrestricted release criteria without the need for further evaluation.

7.4.1.3 SU11- Class 1, Storage Cage

The gamma walkover survey map of SU11 is shown in **Appendix B**. The survey map showing the SU11 survey locations is included in **Appendix B**. The total and removable alpha/beta survey results for SU11 are documented in the corresponding Radiological Survey Report in **Appendix C**. The laboratory analytical results for the LSC smears are in **Appendix E**. The full SU11 survey data set is included in Table 17 of **Appendix D**.

The results of the SU11 Data Evaluation performed in Table 17 of **Appendix D** are as follows:

Structure Survey Unit	Class	Recommended N/2[1]	Actual N/2[2]	SOF[3]	H_o	Survey Unit
SU11	1	8	45	0.4	REJECTED	PASSES

(1) Taken as the maximum value from the corresponding SU Data Table.

(2) Taken as the minimum value from the corresponding SU Data Table.

(3) Taken as the value from the corresponding SU Data Table: Value based on DQO Step 5, Decision Rule #2 (difference between maximum ROC values and minimum background values).

Based on the evaluation of all available data, SU11 meets unrestricted release criteria without the need for further evaluation.

7.4.1.4 SU09 (Utilities) – Class 3, Machine Shop Utilities and Equipment

The gamma surveys of the drains in SU09 Utilities are included in the Radiological Survey Report in **Appendix C**, and any gamma walkover surveys of the drains are included in the gamma walkover survey map for SU08. The survey locations and the total and removable alpha/beta survey results for SU09 Utilities are documented in the corresponding Radiological Survey Report in **Appendix C**. The laboratory analytical results for the LSC smears are in **Appendix E**. The full SU09 Utilities survey data set is included in Table 14 of **Appendix D**.

The results of the SU09 Utilities Data Evaluation performed in Table 14 of **Appendix D** are as follows:

Utilities Survey Unit	Class	SOF[1]	H_o	Survey Unit
SU09 Utilities	3	0.7	REJECTED	PASSES

(1) Taken as the value from the corresponding Utilities SU Data Table: Value based on DQO Step 5, Decision Rule #2 (difference between maximum ROC values and minimum background values).

Based on the evaluation of all available data, SU09 Utilities meets unrestricted release criteria without the need for further evaluation.

7.4.1.5 SU10 (Utilities) – Class 3, General Areas outside the Machine Shop First Floor

The gamma surveys of the SU10 Utilities are included in the Radiological Survey Report in **Appendix C**, and any gamma walkover surveys of the SU10 Utilities are included in the gamma walkover survey map for SU07. The survey locations and the total and removable alpha/beta survey results for SU10 Utilities are documented in the corresponding Radiological Survey Report in **Appendix C**. The laboratory analytical results for the LSC smears are in Table 15 of **Appendix E**. The full SU10 Utilities survey data set is included in Table 15 of **Appendix D**.

The results of the SU10 Utilities Data Evaluation performed in **Appendix D** are as follows:

Utilities Survey Unit	Class	SOF[1]	H_o	Survey Unit
SU10 Utilities	3	0.2	REJECTED	PASSES

(1) Taken as the value from the corresponding Utilities SU Data Table: Value based on DQO Step 5, Decision Rule #2 (difference between maximum ROC values and minimum background values).

Based on the evaluation of all available data, SU10 Utilities meets unrestricted release criteria without the need for further evaluation.

7.4.1.6 SU12 (Utilities) - Class 3, Storage Cage Shelving

The gamma surveys of the SU12 Utilities are included in the Radiological Survey Report in **Appendix C**, and any gamma walkover surveys of the SU12 Utilities are included in the gamma walkover survey map for SU11. The survey locations and the total and removable alpha/beta survey results for SU12 Utilities are documented in the corresponding Radiological Survey Report for SU11 in **Appendix C**. The laboratory analytical results for the LSC smears are in **Appendix E**. The full SU12 Utilities survey data set is included in Table 16 of **Appendix D**.

The results of the SU12 Utilities Data Evaluation performed in Table 16 of **Appendix D** are as follows:

Utilities Survey Unit	Class	SOF[1]	H_o	Survey Unit
SU12 Utilities	3	0.2	REJECTED	PASSES

(1) Taken as the value from the corresponding Utilities SU Data Table: Value based on DQO Step 5, Decision Rule #2 (difference between maximum ROC values and minimum background values).

Based on the evaluation of all available data, SU12 Utilities meets unrestricted release criteria without the need for further evaluation.

7.4.2 First Floor

The SUs on the First Floor are as follows:

- Three Structure SUs
  - SU01 – Class 3, Rooms 183, 184, 185, 187, 191, 195, 197
  - SU02 – Class 2, Rooms 188, 192
  - SU03 – Class 2, Rooms 196, 198
- Two Utility SUs
  - SU04 – Class 3, Decommissioned Labs Utilities in Rooms 178, 180
  - SU05 – Class 3, Rooms 184, 188, 192, 195, 196, 198

7.4.2.1 SU01– Class 3, Rooms 183, 184, 185, 187, 191, 195, 197

The gamma walkover survey map of SU01 is shown in **Appendix B**. The survey map showing the SU01 survey locations is included in **Appendix B**. The total and removable alpha/beta survey results for SU01 are documented in the corresponding Radiological Survey Report in **Appendix C**. The laboratory analytical results for the LSC smears are in **Appendix E**. The full SU01 survey data set is included in Table 2 of **Appendix D**.

The results of the SU01 Data Evaluation performed in Table 2 of **Appendix D** are as follows:

Structure Survey Unit	Class	Recommended N/2[1]	Actual N/2[2]	SOF[3]	H_o	Survey Unit
SU01	3	8	23	0.2	REJECTED	PASSES

(1) Taken as the maximum value from the corresponding SU Data Table.

(2) Taken as the minimum value from the corresponding SU Data Table.

(3) Taken as the value from the corresponding SU Data Table: Value based on DQO Step 5, Decision Rule #2 (difference between maximum ROC values and minimum background values).

Based on the evaluation of all available data, SU01 meets unrestricted release criteria without the need for further evaluation.

7.4.2.2 SU02 - Class 2, Rooms 188, 192

The gamma walkover survey map of SU02 is shown in **Appendix B**. The survey map showing the SU02 survey locations is included in **Appendix B**. The total and removable alpha/beta survey results for SU02 are documented in the corresponding Radiological Survey Report in **Appendix C**. The laboratory analytical results for the LSC smears are in **Appendix E**. The full SU02 survey data set is included in Table 3 of **Appendix D**.

The results of the SU02 Data Evaluation performed in Table 3 of **Appendix D** are as follows:

Structure Survey Unit	Class	Recommended N/2[1]	Actual N/2[2]	SOF[3]	H_0	Survey Unit
SU02	2	8	38	0.5	REJECTED	PASSES

(1) Taken as the maximum value from the corresponding SU Data Table.

(2) Taken as the minimum value from the corresponding SU Data Table.

(3) Taken as the value from the corresponding SU Data Table: Value based on DQO Step 5, Decision Rule #2 (difference between maximum ROC values and minimum background values).

Based on the evaluation of all available data, SU02 meets unrestricted release criteria without the need for further evaluation.

7.4.2.3 SU03 - Class 2, Rooms 196, 198

The gamma walkover survey map of SU03 is shown in **Appendix B**. The survey map showing the SU03 survey locations is included in **Appendix B**. The total and removable alpha/beta survey results for SU03 are documented in the corresponding Radiological Survey Report in **Appendix C**. The laboratory analytical results for the LSC smears are in **Appendix E**. The full SU03 survey data set is included in Table 4 of **Appendix D**.

The results of the SU03 Data Evaluation performed in Table 4 of **Appendix D** are as follows:

Structure Survey Unit	Class	Recommended N/2[1]	Actual N/2[2]	SOF[3]	H_0	Survey Unit
SU03	2	8	38	0.1	REJECTED	PASSES

(1) Taken as the maximum value from the corresponding SU Data Table.

(2) Taken as the minimum value from the corresponding SU Data Table.

(3) Taken as the value from the corresponding SU Data Table: Value based on DQO Step 5, Decision Rule #2 (difference between maximum ROC values and minimum background values).

Based on the evaluation of all available data, SU03 meets unrestricted release criteria without the need for further evaluation.

7.4.2.4 SU13 – Vaults Concrete Floor

The gamma surveys of the vault floor could not be safely or effectively performed based on access issues. Therefore, only composite sampling was performed in the configuration described in LBDA Section 2.

The laboratory analytical results for the concrete samples are in **Appendix E**. The full SU13 lab analytical data set is included in Table 18 of **Appendix D**.

The results of the SU13 Data Evaluation performed in Table 18 of **Appendix D** are as follows:

Structure Survey Unit	Class	Recommended N/2[1]	Actual N/2[2]	SOF[3]	H_o	Survey Unit
SU13	3	8	6	0.4	REJECTED	PASSES

(1) Taken as the maximum value from the corresponding SU Data Table.

(2) Taken as the minimum value from the corresponding SU Data Table.

(3) Taken as the value from the corresponding SU Data Table: Value based on DQO Step 5, Decision Rule #2 (difference between maximum ROC values and minimum background values).

Based on the evaluation of all available data, SU13 meets unrestricted release criteria without the need for further evaluation.

7.4.2.5 SU14 – Soils

Surface and subsurface soil sampling was performed in the configuration described in LBDA Section 2. The lead-shielded gamma surveys of the soil samples did not produce any elevated gamma results in excess of about 1.5 times background.

The laboratory analytical results for the soil samples are in **Appendix E**. The full SU14 lab analytical data set is included in Table 19 of **Appendix D**.

The results of the SU14 Data Evaluation performed in Table 19 of **Appendix D** are as follows:

Structure Survey Unit	Class	Recommended N/2[1]	Actual N/2[2]	SOF[3]	H_0	Survey Unit
SU14	3	8	6	0.8	REJECTED	PASSES

(1) Taken as the maximum value from the corresponding SU Data Table.

(2) Taken as the minimum value from the corresponding SU Data Table.

(3) Taken as the value from the corresponding SU Data Table: Value based on DQO Step 5, Decision Rule #2 (difference between maximum ROC values and minimum background values).

Based on the evaluation of all available data, SU14 meets unrestricted release criteria without the need for further evaluation.

7.4.2.6 SU04 (Utilities) - Class 3, Decommissioned Labs Utilities in Rooms 178, 180

SU04 Utilities was located in the previously decommissioned labs. Therefore, gamma surveys of the SU04 Utilities were not performed. The survey locations and the total and removable alpha/beta survey results for SU04 Utilities are documented in the corresponding Radiological Survey Report in **Appendix C**. The laboratory analytical results for the LSC smears are in **Appendix E**. The full SU04 Utilities survey data set is included in Table 7 of **Appendix D**.

The results of the SU04 Utilities Data Evaluation performed in Table 7 of **Appendix D** are as follows:

Utilities Survey Unit	Class	SOF[1]	H_0	Survey Unit
SU04 Utilities	3	0.2	REJECTED	PASSES

(1) Taken as the value from the corresponding Utilities SU Data Table: Value based on DQO Step 5, Decision Rule #2 (difference between maximum ROC values and minimum background values).

Based on the evaluation of all available data, SU04 Utilities meets unrestricted release criteria without the need for further evaluation.

7.4.2.7 SU05 (Utilities) - Class 3, Rooms 184, 188, 192, 195, 196, 198

The gamma surveys of the SU05 Utilities are included in the Radiological Survey Report in **Appendix C**, and any gamma walkover surveys of the SU05 Utilities are included in the gamma walkover survey maps for SU01, SU02, and SU03. The survey locations and the total and removable alpha/beta survey results for SU05

Utilities are documented in the corresponding Radiological Survey Report in **Appendix C**. The laboratory analytical results for the LSC smears are in **Appendix E**. The full SU05 Utilities survey data set is included in Table 5 of **Appendix D**.

The results of the SU05 Utilities Data Evaluation performed in Table 5 of **Appendix D** are as follows:

Utilities Survey Unit	Class	SOF[1]	H_o	Survey Unit
SU05 Utilities	3	0.5	REJECTED	PASSES

(1) Taken as the value from the corresponding Utilities SU Data Table: Value based on DQO Step 5, Decision Rule #2 (difference between maximum ROC values and minimum background values).

Based on the evaluation of all available data, SU10 Utilities meets unrestricted release criteria without the need for further evaluation.

7.4.3 Roof

The SUs on the roof areas are as follows:

- One Structure SU
  - SU06 – Class 3, pea gravel surface material
- One Utility SU
  - SU06 – Class 3, Lab HVAC vent plena discharging to roof

7.4.3.1 SU06 - Class 3, pea gravel surface material

The gamma walkover survey map of SU06 is shown in **Appendix B**. The survey map showing the SU06 survey locations is included in **Appendix B**. The total and removable alpha/beta survey results for SU06 are documented in the corresponding Radiological Survey Report in **Appendix C**. The laboratory analytical results for the LSC smears are in **Appendix E**. The full SU06 survey data set is included in Table 6 of **Appendix D**.

The results of the SU06 Data Evaluation performed in Table 6 of **Appendix D** are as follows:

Structure Survey Unit	Class	Recommended N/2[1]	Actual N/2[2]	SOF[3]	H_o	Survey Unit
SU06	3	8	9	0.8	REJECTED	PASSES

(1) Taken as the maximum value from the corresponding SU Data Table.

(2) Taken as the minimum value from the corresponding SU Data Table.

(3) Taken as the value from the corresponding SU Data Table: Value based on DQO Step 5, Decision Rule #2 (difference between maximum ROC values and minimum background values).

Based on the evaluation of all available data, SU06 meets unrestricted release criteria without the need for further evaluation.

7.4.3.2 SU06 (Utilities) - Class 3, Lab HVAC vent plena discharging to roof

The gamma surveys of the SU06 Utilities are included in the Radiological Survey Report in **Appendix C**, and any gamma walkover surveys of the SU06 Utilities are included in the gamma walkover survey map for SU06. The survey locations and the total alpha/beta survey results for SU06 Utilities are documented in the corresponding Radiological Survey Report in **Appendix C**. The laboratory analytical results for the LSC smears are in **Appendix E**. The full SU06 Utilities survey data set is included in Table 9 of **Appendix D**.

The results of the SU06 Utilities Data Evaluation performed in Table 9 of **Appendix D** are as follows:

Utilities Survey Unit	Class	SOF[1]	H_0	Survey Unit
SU06 Utilities	3	0.1	REJECTED	PASSES

(1) Taken as the value from the corresponding Utilities SU Data Table: Value based on DQO Step 5, Decision Rule #2 (difference between maximum ROC values and minimum background values).

Based on the evaluation of all available data, SU06 Utilities meets unrestricted release criteria without the need for further evaluation.

8 QUALITY CONTROL

Survey data collection activities were performed in a controlled, deliberate manner by trained individuals with calibrated instruments following written procedures and/or protocols. Data were recorded and reviewed, and documentation is auditable. Instrumentation capable of detecting the radiation types and energies of interest were selected, calibrated, and maintained for survey data collection.

8.1 Precision, Accuracy, Representativeness, Comparability, and Completeness

Quality control (QC) measures were implemented to ensure data met known and suitable data quality criteria, i.e., precision, accuracy, representativeness, comparability, and completeness. Variables related to data precision and accuracy were monitored by instrument response checks designed to monitor the performance of the instrumentation used to collect the data. Duplicate analyses were performed by the analytical laboratory and the results compared. The representativeness of the data was ensured by the use of standardized data collection methods and techniques established in written procedures, listed in Table 5-1. Routine monitoring of surveyor performance and environmental factors was performed to ensure data comparability. The type and quantity of collected data were reviewed against project DQOs (see Section 2.0) to ensure data completeness.

8.2 Field Survey Instrumentation

Commercially available radiation detection and measurement instrumentation were selected based on reliable operation, detection sensitivity, operating characteristics, and expected performance in the field.

8.2.1 Calibration and Maintenance

Survey instruments were calibrated prior to use. Radiation detection instruments were calibrated for the radiation types and energies of interest. Radioactive sources used for calibration purposes are traceable to the National Institute of Standards and Technology (NIST). Instrumentation was inspected prior to use to ensure its proper working condition, and properly protected against inclement weather conditions in the operation. Copies of the instrument calibration sheets are provided in **Appendix F.**

8.2.2 Instrument Response

Instrument response checks were conducted to assure constancy in instrument response, to verify the detector was operating properly, and to demonstrate that measurement results were not the result of detector contamination. Instrument response was checked before and after instrument use each day data were collected. A check source was used that emits the same type of radiation (i.e., alpha, beta, and/or gamma) as the radiation being measured and that gives a similar instrument response. The response check was performed at a set location using a specified source-detector alignment that could easily be repeated.

Prior to initial instrument use, at least 10 measurements were made using a source representative of the radiation types and energies of interest. At least 10 one-minute measurements were also made with the source removed to determine the instrument's expected response to ambient background. Background was monitored qualitatively to assess daily variations that may have impacted instrument MDAs. From the initial source measurements, the mean of the observed count rate was calculated. The acceptance criterion was ± 20% of the mean of the initial source counts. Source checks were monitored using a control chart, with control limits set at ± 20% of the average count rate. The results of the daily source checks are provided in **Appendix F.**

8.2.3 Detection Sensitivity

The typical detection sensitivities of field instrumentation are shown in the table below. The results shown are based on representative count times, background counts and instrument and surface efficiencies. Instrument-specific values based on actual field conditions and backgrounds were used to establish a priori MDA values for scan and static measurements prior to instrument use. The MDA values were calculated as described in MARSSIM Section 6.7.1.

Typical Field Instrumentation Detection Sensitivities

Detector Model	*Type of Emission*	*Count Time (min)*	*Back-ground (cpm)*	*Detection Efficiency (cpm/dpm)*	*Scan MDA*[a] *(dpm/100 cm²)*	*Static MDA*[b] *(dpm/100 cm²)*
Ludlum 43-89 Ludlum 43-93	Alpha	1	3	0.21	416[c]	50[c]
Ludlum 43-89 Ludlum 43-93	Beta	1	180	0.22	1,300[c,d]	300[c,d]
Ludlum 2929	Alpha	1	<1	0.25[c]	N/A	12
Ludlum 2929	Beta	1	45	0.056[c]	N/A	620

Notes:

(a) Scan MDA is calculated per MARSSIM Equation 6-10 and assumes a surveyor efficiency of 0.5, and a value of 1.38 for acceptable false indications.

(b) Static MDA is calculated per MARSSIM Equation 6-7.

(c) Based on 4π detection efficiencies for alpha and beta of approximately 0.25 (Th-230) and 0.05 (C-14), respectively.

(d) Scan MDA is for surface activity above background.

The instrument efficiency, i.e., the ratio between the net count rate of the instrument and the 2π surface emission rate of a radiation source, was determined by counting the source with the detector in a fixed position from the source (reproducible geometry). A jig was used to create the reproducible geometry and a source to detector distance of 1 cm was used for scan measurements. For static measurements, the detector was placed on contact with the source. A surface efficiency of 0.5 was used for beta-emitting radiations. A value of 0.25 was used for alpha-emitting radiations. These values were established based on surface geometry considerations. The surface efficiency is the ratio between the number of radiation particles

emerging from the measurement surface of the area being surveyed (the source) and the total number of radiation particles being released within that source per unit time.

8.3 Analytical Laboratory Performance

Eurofins TestAmerica is authorized to provide National Environmental Laboratory Accreditation Program (NELAP) certification. Laboratory QC samples were analyzed to evaluate laboratory performance.

The analytical laboratory reviewed the data for consistency and reasonableness and determined program requirements had been satisfied. The QC sample results are found with the laboratory analytical data in **Appendix E.**

8.4 Data Validation and Verification

Survey data were reviewed to verify they are authentic, appropriately documented, and technically defensible. The review criteria for data acceptability were:

- The instruments used to collect the data were capable of detecting the radiation types and energies of interest at or below the action levels.
- The calibration of the instruments used to collect the data was current and radioactive sources used for calibration were NIST traceable.
- Instrument response was checked before and, where required, after instrument use each day data were collected.
- The MDAs/MDCs and the assumptions used to develop them were appropriate for the instruments and the survey methods used to collect the data.
- The survey methods used to collect the data were appropriate for the media and types of radiation being measured.
- The custody of samples collected for laboratory analysis was tracked from the point of collection until final results were obtained.

All of the survey data met all of the applicable criteria. All of the survey data were verified and validated for use in demonstrating compliance with the release criterion.

8.5 Data Quality Assessment

Survey data were verified to be reliable, appropriately documented, and technically defensible. Specifically, the following conclusions were made:

- The instruments used to collect the data were capable of detecting the radiation types and energies of interest at or below the action levels.
- The calibration of the instruments used to collect the data was current and radioactive sources used for calibration were NIST traceable.
- Instrument response was checked before and after instrument use each day data were collected.
- The MDAs and the assumptions used to develop them were appropriate for the

instruments and the survey methods used to collect the data.

- The survey methods used to collect the data were appropriate for the media and types of radiation being measured.
- The custody of samples collected for laboratory analysis was tracked from the point of collection until final results were obtained.
- The survey data consist of qualified measurement results that are representative of the area of interest and collected as prescribed by the survey design.

9 CONCLUSION

Implementation of the Survey, Data Collection and Evaluation processes in this FSSR resulted in radiological survey and sampling data are herein presented in a manner that supports the conclusion, in every case, that the RCEL licensed areas meet the requirements for removal from the RML and subsequent made available for unrestricted use.

10 REFERENCES

The following works were consulted in preparing this report.

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From: Lee, Peter
To: Pavon, Sandy
Subject: GM license amendment
Date: Wednesday, June 08, 2022 9:17:38 PM
Attachments: GM -cover letter.pdf
GM-314.pdf
GENERAL MOTORS Form 540.pdf
GM -541.pdf
GM-FSS.pdf

Hi Sandy,

Please put the enclosed documents in one ADAMS number. Thanks,

Peter