2/14/2006

Attn: Mr. Loren Hueter
United States Nuclear Regulatory Commission
Region III
Licensing Section, Suite 210
2443 Warrenville Road
Lisle, Illinois 60532-4352

Re: Request a license amendment for Rose-Hulman Institute of Technology (RHIT).

Dear Sir,

This communication is to request an amendment to our license 13-17582-02.

The two main points addressed in this communication are; removal of Cs 137 from our license, and permission to demolish the old storage shed that is no longer in use for **any kind** of source storage. I will provide a supporting narrative along with necessary documentation that will hopefully illustrate the steps we have taken to comply with the necessary and relevant regulations.

Old Shed

In the last amendment to our license (amendment no. 4, Dec. 13th, 2005) we had requested the authority to relocate the two Pu-Be sources from the old storage shed to a new, more secure location. This request was granted but our amendment did not authorize RHIT unrestricted usage of this old shed.

As previously described in our license amendment request dated, all radioactive materials (Pu-Be sources) have been removed from this building to the new facility described in that request. Additionally, as described in the survey report that accompanies and supports this request, all contaminated items and radioactive waste have been removed from the and shipped for disposal. I am attaching a report that has been prepared by RAM services that details the cleanup of the old shed (see enclosed). The report also provides details about the survey procedure, calibration of equipment used, and any subsequent cleanup that took place. I would also like to state that our other source (Am-241) is not stored in this shed. It is stored in a lead vault in a secure room (DL-105) inside a locked secure cabinet that displays the proper warning signs.

In short, the old shed now contains absolutely no sources or radioactive contamination of any significant level. This is established in detail in the report that is enclosed herewith.

Cs-137

During the renewal of our license in 2005, your office had placed Cs-137 back on our license with the understanding that once necessary documentation of it safe removal from the shed and subsequent disposal have been provided, this item will betaken off our license. Given that this disposal took place before my arrival at Rose-Hulman Institute of Technology, I do not have first hand knowledge of the details. However, I have collected some shipping manifests from the time that this work was done. Also please refer to the section on page 2 of the Ram Services report. This section is titled, "Historical Site Assessment". It provides a summary of the nature of Cs-137 sources and contamination that I was able to establish from some old documents and correspondence (see enclosed). These documents establish when and where the Cs-137 source(s) were disposed. In addition, the latest survey of the facility indicates that only one small area of residual, apparently fixed, low-level Cs-137 contamination remains on the concrete

floor; this contamination is far below the current average Cs-137 screening values established by the NRC for structures [at 63 FR 64132 – 64134]. Relevant details are attached to this correspondence.

Here is a list of items attached.

1. Ram Services report (28 pages).
    i) Survey Details
    ii) Instrument Calibration Certificates
    iii) Shipping Manifest for Low Level Waste

2. Old Manifests (details of Cs-137 removal in 1998).

We thank you for considering this amendment request and we will promptly provide any additional information that you may require to complete your evaluation. Please contact Maarij Syed (RSO) at 812 877 8957 with any questions regarding the issues in this correspondence.

Respectfully,

Maarij Syed
RSO
Off: 812 877 8957
Fax: 812 877 8023

NRC FORM 540 (6-1995) — U.S. NUCLEAR REGULATORY COMMISSION

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST
SHIPPING PAPER

Estimated burden per response to comply with this information collection request: ... The uniform manifest is required by NRC to meet reporting requirements of Federal and State agencies for the same transportation and disposal of low-level waste. Forward comments regarding burden estimate to the ... U.S. Nuclear Regulatory Commission, Washington, DC 20555 ... Office of Management and Budget, Washington, DC 20503. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

Field	Entry
1. Emergency Telephone Number (Include Area Code)	(423) 376-0193
Organization	BIONOMICS
2. Is this an "Exclusive Use" shipment?	☒ Yes ☐ No
3. Total number of packages identified on this manifest	1
4. DOT/EPA regulated waste requiring a manifest accompany this shipment? If "Yes," provide Manifest Number	☐ Yes ☒ No
EPA Manifest Number	N/A
5. Shipper — Name and Facility	[illegible] Institute, 3500 Wabash Ave, Terre Haute IN 47803
Shipper I.D. Number	
Collector / Processor	
User Permit Number	
Shipment Number	
Generator Type (Specify)	X A
Contact	Dan Hasten
Telephone Number	[illegible]
6. Carrier — Name and Address	TRC Transport, Rockwood St., Rockwood TN 37854
EPA I.D. Number	TN[illegible]
Shipping Date	9-29-98
Contact	Gary Kindrick
Telephone Number (Include Area Code)	(423) 354-[illegible]
Signature — Authorized carrier acknowledging waste receipt	[signature]
Date	9-29-98
7. NRC Form 540 and 540A ... Page 1 of ... pages; NRC Form 541 and 541A ... pages; NRC Form 542 and 542A ... pages; Additional information ... pages	
8. Manifest Number (Use this number on all continuation pages)	92998
9. Consignee — Name and Address	GTS Duratek, 1560 Bear Creek Rd, Oak Ridge TN 37830
Contact	Fred Schultz
Telephone Number (Include Area Code)	(423) 481-0222
Signature — Authorized consignee acknowledging waste receipt	
Date	

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 are in proper condition for transportation and disposal as described in accordance with the applicable requirements of 10 CFR Parts 20 and 61, or equivalent state regulations.

Authorized Signature	Title	Date
Daniel L. [signature]	Radiation Safety Officer	9/29/98

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 (SI Units)	17. LSA/SCO Class	18. Total Weight or Volume (Use appropriate units)	19. Identification Number of Package
Radioactive Material, LSA, N.O.S. 7, UN 2912	N/A	N/A	Solid / Oxides	Cs 137			0.74 MBq	LSA II	0.68 FT3	RH-1

FOR CONSIGNEE USE ONLY

NRC FORM 540 (6-1995)

SHIPPER COPY

APPROVED BY OMB: NO. 3150-0166 EXPIRES: 05/31/2001

Estimated burden per response to comply with [illegible] ... The uniform manifest is required by NRC to meet ... Forward comments regarding burden ... (T-6 F33), U.S. Nuclear Regulatory Commission ... Budget, Washington, DC 20503. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor ...

NRC FORM 541 (6-1999) — U.S. NUCLEAR REGULATORY COMMISSION

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

[illegible]	NET WASTE VOLUME (m³)	NET WASTE WEIGHT (kg)	SPECIAL NUCLEAR MATERIAL U-233	U-235	[illegible]
1	0.019	4.5	NP	NP	[illegible]

ACTIVITY (MBq) ALL NUCLIDES	TRITIUM	C-14	Tc-99	I-129
0.740	NP	NP	NP	[illegible]

PAGE 1 OF 1 PAGE(S)

[illegible] Hindman

DISPOSAL CONTAINER DESCRIPTION / WASTE DESCRIPTION FOR EACH WASTE TYPE

5. CONTAINER IDENTIFICATION NUMBER/ GENERATOR ID NUMBER(S)	6. CONTAINER DESCRIPTION (See Note 1)	7. VOLUME (m³)	8. WASTE AND CONTAINER WEIGHT (kg)	9. SURFACE RADIATION LEVEL (µSv/h) / (mSv/hr)	10. SURFACE CONTAMINATION MBq/100 cm² ALPHA	BETA-GAMMA	11. WASTE DESCRIPTOR (See Note 2)	12. APPROXIMATE WASTE VOLUME(S) IN CONTAINER	13. SORBENT SOLIDIFICATION, STABILIZATION, MEDIA (See Note 3)	14. CHEMICAL FORM/ CHELATING AGENT	WEIGHT % CHELATING AGENT IF > 0.1%	15. RADIOLOGICAL DESCRIPTION: PRINCIPAL RADIONUCLIDES AND ACTIVITY (MBq) AND CONTAINER TOTAL, OR CONTAINER TOTAL ACTIVITY AND RADIONUCLIDE PERCENT	16. WASTE CLASSIFICATION AS-Class A Stable AU-Class A Unstable B-Class B C-Class C
[illegible] 1	4	0.019	4.5	0.4	<1.67E-7	<1.67E-6	39	>85%	100	OXIDES NP	NP	Cs-137 = 0.740	AU

Note 1: Container Description Codes. For containers used for disposal in approved structural overpacks, the container code must be followed by "-[illegible]".

1. Wooden Box or Crate
2. [illegible] Box
3. [illegible] Drum or Pail
4. [illegible] Drum or Pail
5. Metal Tank or Liner
6. Concrete Tank or Liner
7. Polyethylene Tank or Liner
8. Fiberglass Tank or Liner
9. D[illegible]
10. G[illegible]
11. [illegible] packaged Waste
12. U[illegible] Components
13. [illegible] Integrity Container
19. Other. Describe in item 6, or additional page

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 3: For solidification media that meet disposal site [illegible] stability requirements, the numerical code must be followed by "[illegible]". For all solidification media, the vendor (manufacturer) [illegible] must also be identified in item 13. Code 100=NONE REQUIRED.

Sorption

60. Speedi Dri
61. Celatom
62. Floor Dry/ Superfine
63. Hi Dri
64. Safe T Sorb
65. Safe N Dri
66. Florco
67. Florco X
68. Solid A Sorb
69. Chemsil 30
70. Chemsil 50
71. Chem[illegible]
72. Diaper[illegible]
73. Diaper[illegible]
74. [illegible]
75. [illegible] II
89. Other. Describe in item 13, or additional page

Solidification

90. Cement
91. Concrete (encapsulation)
92. Bitumen
93. Vinyl Chloride
94. Vinyl Ester Styrene
99. Other. [illegible]

APPROVED BY OMB: NO. 3150-0164 — Estimated burden per response to comply with this information collection request: 15 minutes. This collection is required by NRC to meet reporting requirements of Federal and State Agencies for the same transportation and disposal of low-Level waste. Send comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0164), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

NRC FORM 540 (5-1998) — U.S. NUCLEAR REGULATORY COMMISSION

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

SHIPPING PAPER

1. GENERATOR (Name and Address)	Rose Tech Institute 3500 Wabash Ave Terre Haute IN 47803
1. EMERGENCY TELEPHONE NUMBER (Include Area Code)	(423) 396-6193
ORGANIZATION	Biomedics
2. STATE CONTROL (If any)	YES / NO
3. TOTAL NUMBER OF PACKAGES IDENTIFIED ON THIS MANIFEST	1
4. GENERATOR'S FACILITY HAS/HAS NOT APPLIED FOR/RECEIVED A SITE SPECIFIC EPA ID NUMBER (If "Yes," provide Manifest Number)	YES / NO (NO)
EPA MANIFEST NUMBER	N/A
5. TRANSPORTER 1 (Name and Address)	TMC Transport Rockwood St. Rockwood TN 37854
CONTACT	Gary Kincaid
TELEPHONE NUMBER	(423) 354-6927
SIGNATURE – Authorized consignee acknowledging waste receipt	
DATE	9-29-98
SHIPPER I.D. NUMBER	
COLLECTOR	
PROCESSOR	
USER PERMIT NUMBER	
SHIPMENT NUMBER	
GENERATION TYPE (Specify)	X A
CONTACT	Dan Harden
TELEPHONE NUMBER	(423) 877-6127
EPA I.D. NUMBER	TNR000003111
SHIPPING DATE	9-29-98
6. DESIGNATED FACILITY (Name and Address)	Perma-Fix 1940 NW 67th Place Gainesville FL 32653
CONTACT	Bryan Whittle
TELEPHONE NUMBER (Include Area Code)	(352) 373-6066
SIGNATURE – Authorized consignee acknowledging waste receipt	
DATE	
7. NRC FORM 540 AND 540A / NRC FORM 541 AND 541A / NRC FORM 542 AND 542A / ADDITIONAL INFORMATION	PAGE 1 OF 1 PAGE(S) / 0 PAGE(S) / 0 PAGE(S) / PAGE(S)
8. MANIFEST NUMBER (Use this number on all continuation pages)	2998

10. CERTIFICATION

This is to certify that the below-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 are in proper condition for transportation and disposal as described in accordance with the applicable requirements of 10 CFR Parts 20 and 61, or equivalent state regulations.

AUTHORIZED SIGNATURE: Samuel K. Hamilton — TITLE: Radiation Safety Officer — DATE: 9/29/98

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 IN SI UNITS	17. LSA/SCO CLASS	18. TOTAL WEIGHT OR VOLUME (Use appropriate units)	19. IDENTIFICATION NUMBER OF PACKAGE
Radioactive Material, N.O.S.	Yellow III	2.0	Solid Onions	226 Ra/Be	Cs 137		373.927 MBq	N/A	4.1 FT³	RH-2
7, UN 2982										

FOR CONSIGNEE USE ONLY

NRC FORM 540 (5-1998)

SHIPPER COPY

APPROVED BY OMB: NO. 3150-0166
EXPIRES: 06/31/2001

Estimated burden per response to comply with this information collection request: 5.43 hours. The uniform manifest is required by NRC to meet reporting requirements of Federal and State Agencies for the safe transportation and disposal of low-level waste. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Desk Officer, Reduction Project (3150-0166), Office of Management and Budget, Washington, DC 20503. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

NRC FORM 541 (6-1
U.S. NUCLEAR REGULATORY COMMISSION

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 DISPOSAL CONTAINERS	NET WASTE VOLUME (m^3)	NET WASTE WEIGHT (kg)	SPECIAL NUCLEAR MATERIAL U-233	U-235		CURIE
1	0.56	45	ND	NP	NP	NP

ACTIVITY (MBq) ALL NUCLIDES	TRITIUM	C-14	Tc-99	I-129	Pu
373.922	NP	NP	NP	NP	ND

2. MANIFEST NUMBER 29982

3. PAGE 1 OF 1 PAGE(S)

4. SHIPPER NAME Rose Mountain

SHIPPER ID NUMBER

DISPOSAL CONTAINER DESCRIPTION

WASTE DESCRIPTION FOR EACH WASTE TYPE IN CONTAINER

5. CONTAINER IDENTIFICATION NUMBER/ GENERATOR ID NUMBER(S)	6. CONTAINER DESCRIPTION (See Note 1)	7. VOLUME (m^3)	8. WASTE AND CONTAINER WEIGHT (kg)	9. SURFACE RADIATION LEVEL (mSv/hr)	10. SURFACE CONTAMINATION MBq/100 cm^2 ALPHA	BETA-GAMMA	11. PHYSICAL DESCRIPTION: WASTE DESCRIPTOR (See Note 2)	12. APPROXIMATE WASTE VOLUME(m^3) IN CONTAINER	13. SORBENT SOLIDIFICATION, 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 (MBq) AND CONTAINER TOTAL; OR CONTAINER TOTAL ACTIVITY AND RADIONUCLIDE PERCENT	16. WASTE CLASSIFICATION A/S-Class A Stable A/U-Class A Unstable B-Class B C-Class C
RH-2	4	0.115	45	0.7	$<1.67E^{-1}$	$<1.67E^{-1}$	36	0.056	100	OXIDES/NP	NP	Cs137 = 114.922 Pb/Bi 226 = 185.0 Ra 226 = 74.0 TOTAL = 373.922	C

NOTE 1: Container Description Codes. For [illegible] waste requiring disposal in approved structural [illegible] the numerical code must be followed by "-S."

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. [illegible] Tank or Liner
9. Dewar/Cryostat
10. Gas Cylinder
11. Shielded/Unpackaged Waste
12. Unshielded Components
13. High Integrity Container
19. Other. Describe in Item 6, or additional page

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 Sources/Devices
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 3: For solidification media that meet disposal site structural stability requirements, the numerical code must be followed by "-S." For all solidification media, the vendor (manufacturer) and brand name must also be identified in Item 13. Code 100=NONE REQUIRED.

Sorption

60. Speedi Dri
61. Quikson
62. Rasa Dry/ Sugarlite
63. 14 Dri
64. Safe T Sorb
65. Safe N Dri
66. Flexsorb
67. Floro X
68. Solid A Sorb
69. Chemsil 30
70. Chemsil 50
71. Chemsil [illegible]
72. Diasperse
73. Diasperse [illegible]
74. Petroset
75. Petroset II
76. Aquaset
77. Aquaset II
89. Other. Describe in Item 13, or additional page

Solidification

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

Final Status Survey of the Radioactive Source Storage Building at the Rose-Hulman Institute of Technology

27 September 2005

RAM Services, Inc.
510 County Highway V
Two Rivers, WI 54241
Voice: +1-920-686-3889
Fax: +1-920-686-3899

This report was prepared by the staff of RAM Services, Inc based on documentary materials provided by Rose-Hulman personnel and on measurements made by RAM Services.

Please contact RAM Services, Inc. for additional information about this survey, for clarification of any items, or to report errors.

Summary

Mr. Jerry Wiza of RAM Services, Inc. conducted a preliminary survey of the radioactive source storage outbuilding, which is located about 60 feet north of Moench Hall, from 21 to 22 June 2005. Lead bricks contaminated with Cs-137 were discovered at this time in the northwest corner and further survey and decontamination efforts were suspended until they were removed. Wipe samples to detect removable contamination were collected at his time from the floor and walls and analyzed shortly thereafter. None of these samples displayed any radioactivity significantly above background. Consequently, and also in view of the ultimate fate of this structure, wipe samples were not collected on subsequent visits.

On 04 through 06 August 2005 Mr. Wiza returned to the facility to package the contaminated lead, cement blocks beneath the lead vault and other radioactive waste. The contaminated lead was transferred by Philotechnics under waste manifest 0866-01-0012 for disposal at Envirocare of Utah. The cement blocks, dismantled steel vault frame, and other radioactive waste, as described in the attached manifest 05-0307 L was removed by ADCO Services, Inc. on 17 August 2005 for final disposal.

On 6 August 2005 Mr. Wiza also scanned 100% of the storage building floor for total (fixed and removable) alpha and beta contamination. Elevated beta contamination, amounting to 4200 dpm, was discovered at one floor grid location (number F-11). Approximately 1/8" of the surface concrete was removed with an air hammer equipped with a brush head attachment until radiation levels were at background levels. The resulting rubble was disposed as radioactive waste. No other alpha or beta contamination was found on the floor, except for some very low-level fixed beta contamination (approximately 540 dpm) that remains in grid F-3. Mr. Wiza also measured gamma radiation rates at the surface of the floor and detected nothing significantly above background.

Mr. Wiza scanned 100% of the lower two meters of the walls for total alpha and beta contamination on 6 August 2005 and detected no residual contamination significantly above background. Fixed measurements of wall surfaces and were not obtained on this date because background reference measurements at the surface of the cinder block walls in Room 17 of Demming Hall were found to be significantly lower than those measured in the waste storage building. Further investigation indicated renovations made at Demming Hall after it was initially constructed had replaced the original cinder block walls with blocks having a different composition of raw materials from a later time period.

Mr. Wiza also measured gamma radiation levels at the wall surfaces and discovered nothing significantly above background. Measurements taken on this date were not

used because a suitable background reference area could not be established on 6 August.

The space beneath the grade-level concrete floor was not investigated in this survey. The exterior of the building, except for a few wipe samples, and the adjacent grounds were not investigated since contamination of these elements seemed highly improbable.

We recommend that Rose-Hulman retain this document, and all others pertaining to decontamination and decommissioning of the outbuilding, indefinitely so as to support any future license termination.

Historical Site Assessment

The Rose-Hulman Institute of Technology currently holds U.S. NRC license 13-17582-01. A copy of the license renewal application, dated 27 April 2004 and signed by Maarji Syed, Radiation Safety Officer, indicates that Rose-Hulman continues to possess one 100 millicurie Am-241 source, New England Nuclear Model NER-476S, and two Pu-239Be neutron "howitzers", which were described in a 26 January 1973 letter to the U.S. Atomic Energy Commission. The neutron sources contain a total of 80 grams of Pu-239 and are described in that application as in storage in an outbuilding, a.k.a. "shed", located approximately "...60 feet north of the northwest corner of Moench Hall (the Institute's main class-room building)" awaiting removal by the Off-Site Recovery Project of Los Alamos National Laboratory. These neutron sources appear to be further identified by an attachment to the 2001 license amendment, described below, as "MRC 40, 15g" and "MRC 371, 58g".

A license amendment application dated 15 August 2001 and signed by Daniel L. Hatten, Radiation Safety Officer states that the purpose of the amendment is to identify personnel changes, apparently including the R.S.O., and to remove the "regulated" Cs-137 sources, which apparently had been disposed, from the license.

RAM Services was provided with a copy of a facsimile sent by Mr. Hatten to Bionomics, a radioactive waste brokerage company, on 15 July 1998 that includes a handwritten document captioned "Rose-Hulman Waste Inventory". The items listed were:

Table 1. Rose-Hulman Waste Inventory from 15 July 1998	
1.	*5 quarter-size copper buttons with Cs-137 deposited on them*
2.	1 coffee can with (I believe) wipe cloths from cleanup of Cs-137
3.	Nuclear Chicago Model P22A instrument with a 3 millicurie Cs-137 source in it
4.	1 Nuclear Chicago Model P21 instrument with a 5 millicurie RaBe source in it
5.	1 Nuclear Chicago 5846 instrument with a 2 millicurie Ra 226 source in it.
6.	A few dozen unregulated button sources.

Another facsimile sent by Mr. Hatten on 22 July 1998 describes the radiation from the Cs-137 buttons as "≈50 mR/hr @ about 2" distance" and an additional item, which he wants to call "Item 7 on my list", described as "...a cylindrical lead vessel ... with 100 µCi of Cs-137 in it". There is no additional description of the chemical or physical form of the Cs-137.

An NRC Form 540 dated 29 September 1998 describes a waste shipment to Perma-Fix in Gainesville, Florida comprising a total of 373.922 MBq of Ra-226Be and Cs-137. The documentary materials from that time period provided to RAM Services also include an application for NARM disposal at Richland, Washington. The application is only dated "1999" and requests permission to dispose 7 mCi of Ra-226".

The license 2004 renewal application and the 2001 amendment request state [See Application Item 10] that "[s]ealed sources (the Am-241 and Pu/Be sources) are wipe tested for leakage at least as often as once every six months" and both documents assert that "... no leakage has ever been detected." In August 2004, the Pu-239BE sources were leak tested before removal from the radioactive storage shed for storage until final disposal can be arranged. The new storage building is a small metal structure located approximately 100 yards east of the Facilities Operations Building.

Facility Description

The radioactive materials license application from 2004 describes the use of the Am-241 and Pu-239Be sources for teaching purposes in Moench Hall rooms CL-117 and DL-105. These rooms were not investigated as part of this preliminary survey and are not encompassed by this report.

The 2004 license renewal application and the 2001 amendment request describe a small outbuilding used for source storage. This building, the sole subject of this report, is described in the 2004 renewal application as:

> "...a cinder block building of 100 – 150 square feet located about 60 feet northwest of the north end of Moench Hall (the Institute's main class-room building). This outbuilding contains a lead storage vault and is used to store licensable sources (the Pu/Be neutron sources, and the Am-241 source) when not in use in student laboratories."

Based on this description we indicate the approximate location of this out building on the campus map[1] included below as Figure 1. A photograph of the site made by RAM Services personnel as part of this survey, and included as Figure 2, shows another similar building, used for chemical storage, which was not investigated during this survey, located slightly to the north and east of the radioactive source storage building.

[1] Obtained from the "Interactive Map" displayed on the current Rose-Hulman Web site, "www.rose-hulman.edu".

A second photograph of the site, Figure 3, shows the source storage building in relation to other campus buildings.

The lead vault described above rests on a concrete block platform located in the northwest corner of the building. There are two circular floor penetrations near the southern edge of this platform and two sewer vent pipes rise from the floor along the western wall. Two ladders that rise a few feet above the floor level were built into the eastern wall for access to the lower level of the structure where water pumping equipment was previously used. The lower level of the building was not investigated as part of this survey. The locations of these elements are approximately indicated in the diagram displayed in Figure 3.

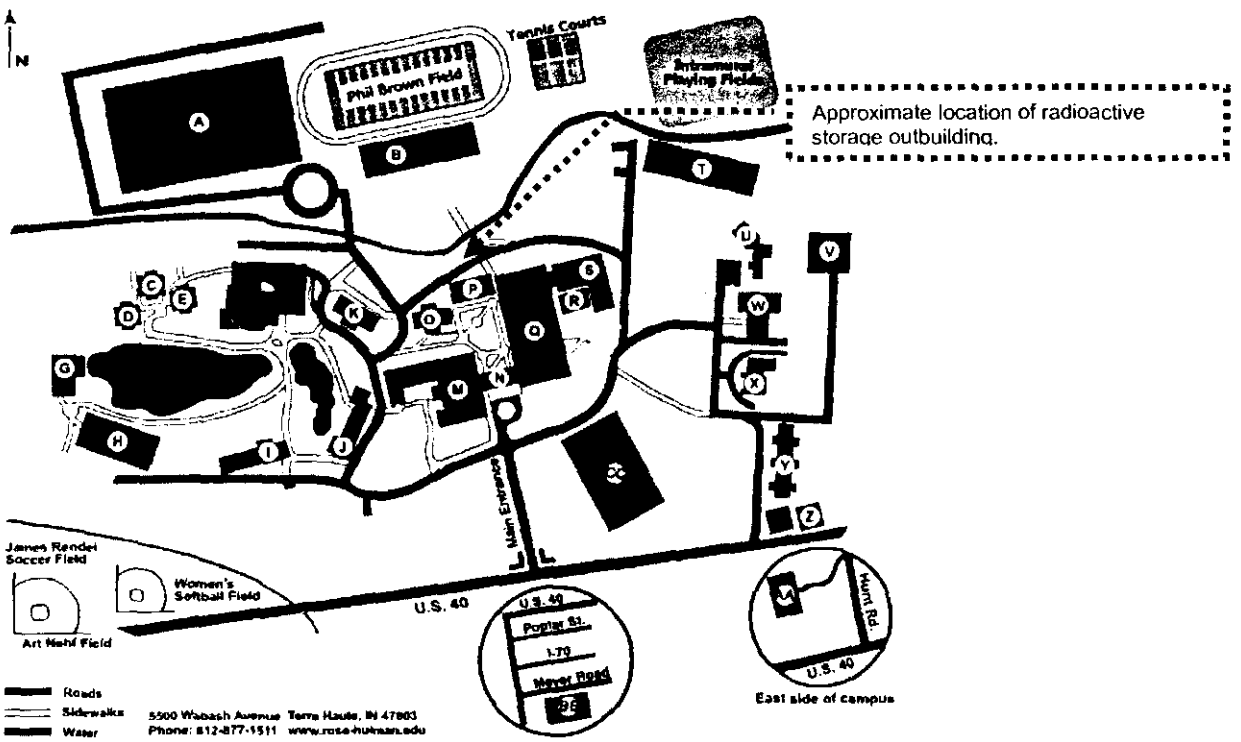

Figure 1. Rose-Hulman Campus Map.

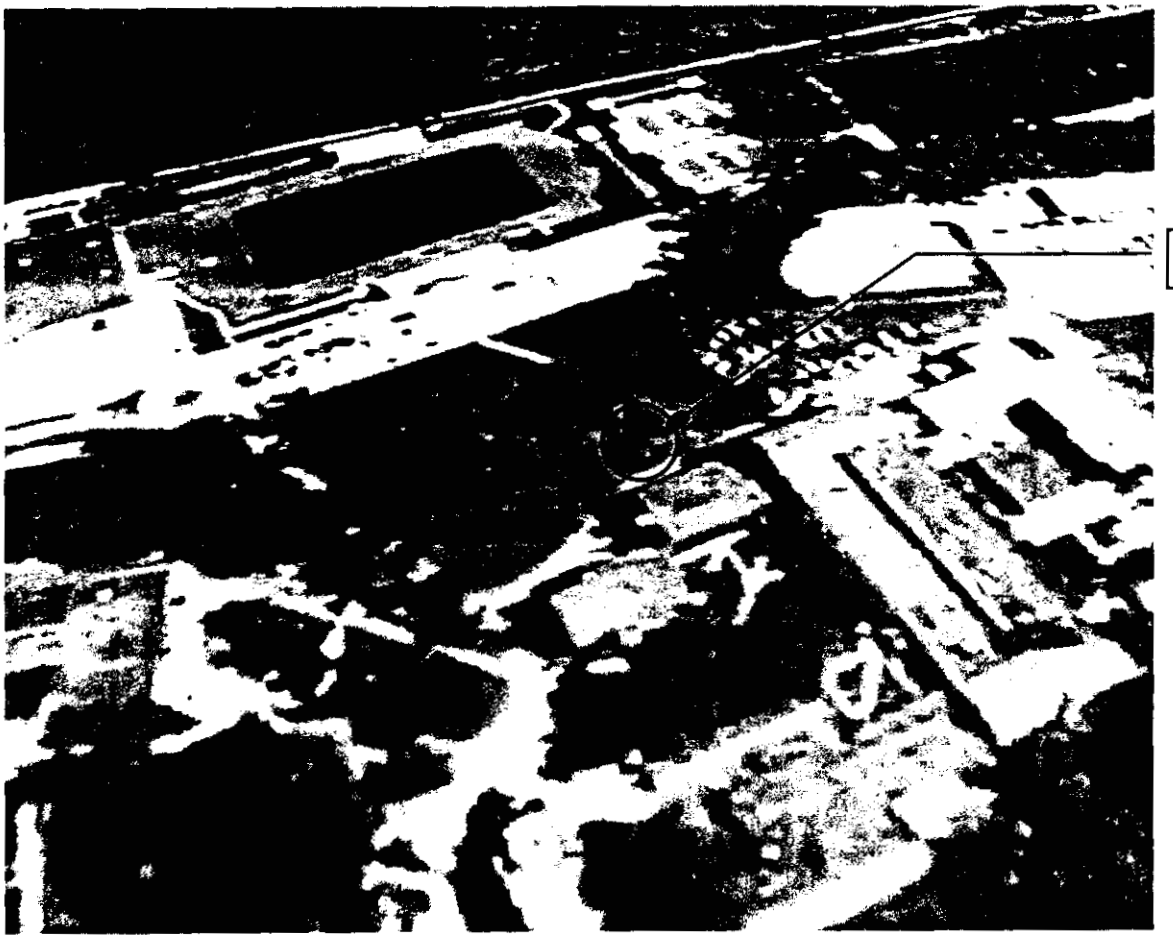

Figure 2. Aerial Photograph of Rose-Hulman Campus[2]

[2] Aerial photograph obtained from Google Earth on 14 November 2005. The exact date of the photograph is unknown but was claimed to be sometime in 2003.

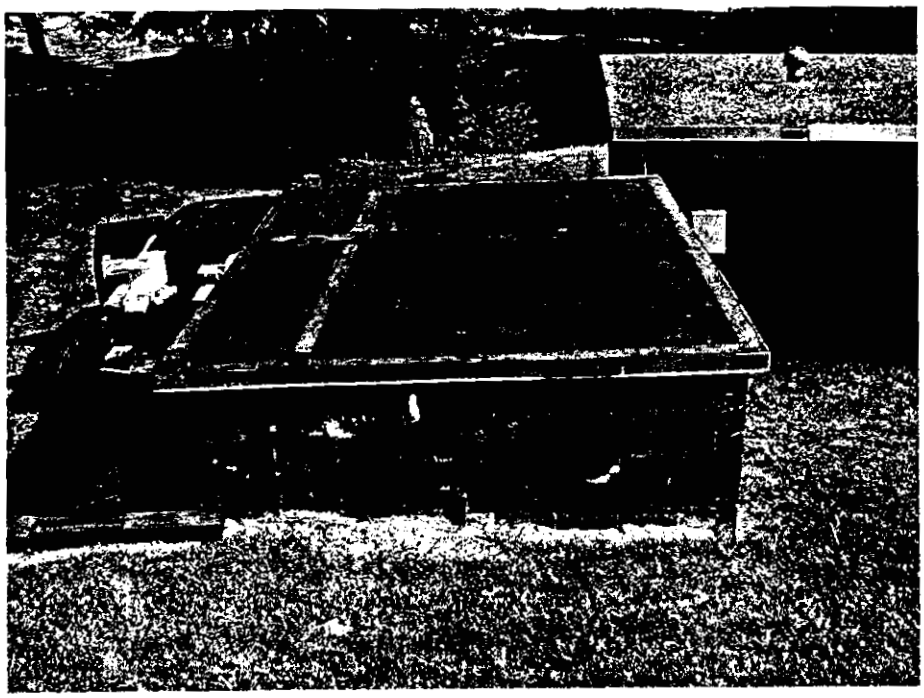

Figure 3. Radioactive source storage "shed" viewed from the south.

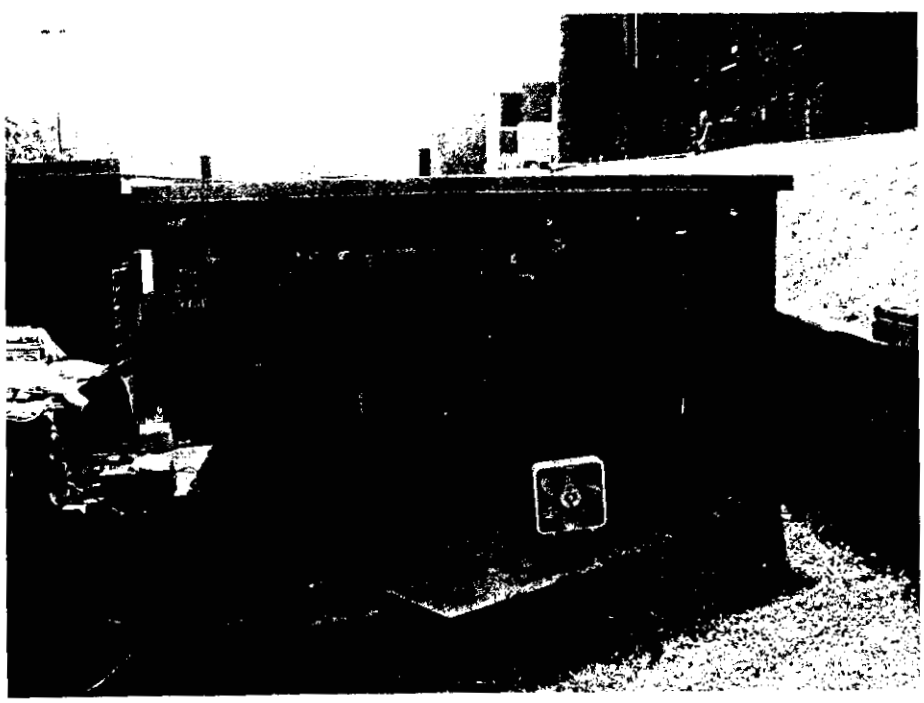

Figure 4. Storage building viewed from the west.

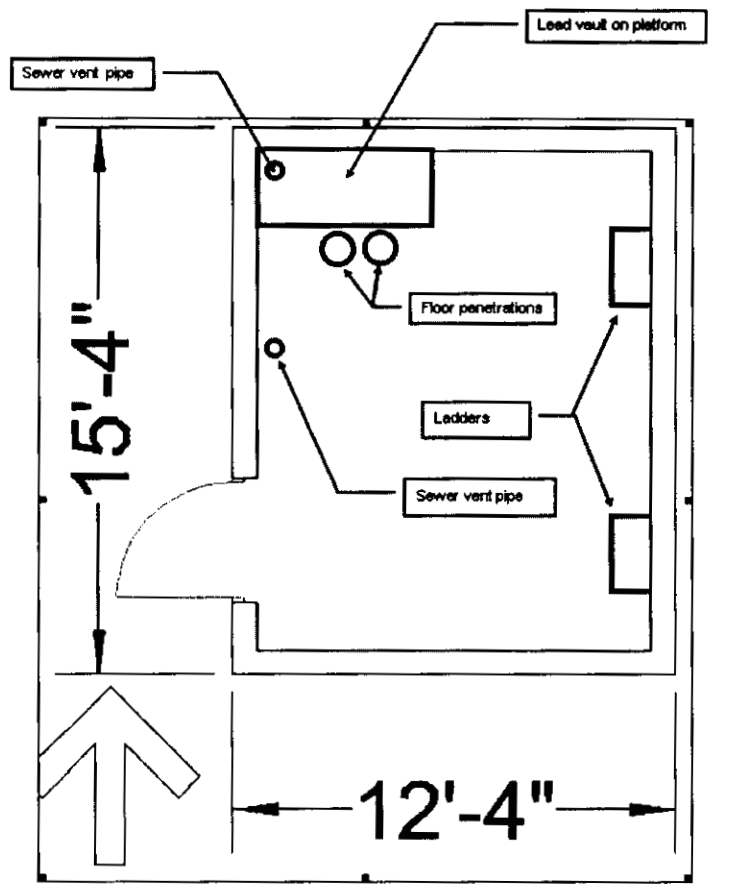

Figure 5. Floor plan of radioactive storage shed.

Item 10 of the license renewal application states that the Pu/Be sources are stored in the outbuilding in galvanized steel drums filled with paraffin and that "[t]he photon sources are stored in lead shields in a locked cabinet in Room DL105, Moench Hall. Shields include a cylindrical pig with 3" walls and a well constructed of 2 X 4 X 8" lead bricks." As of the date of this survey, the Pu-239Be sources had been removed from the outbuilding but a shield, apparently the storage vault referred to above, constructed of an estimated 184 lead bricks and measuring approximately 36" wide X 24" deep and 16" high remained near the northwest corner of the building.

Survey Methods

The floors and lower walls to a height of 2 meters were marked off in a 1-meter by 1-meter grid. The grid locations are numbered as described in Figure 5.

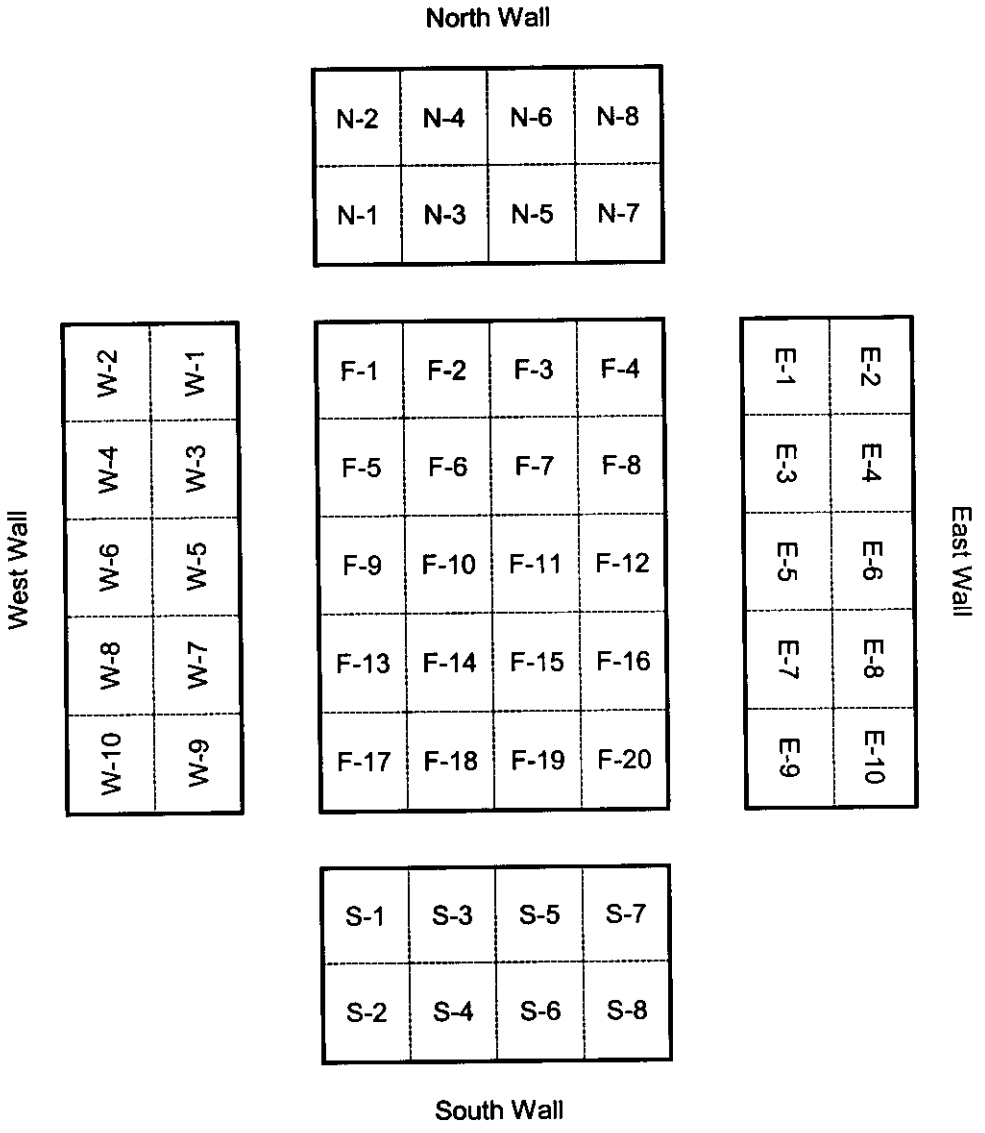

Figure 6. Radioactive Storage Shed Survey Grid.

Alpha/beta surface contamination measurements were made with a Ludlum M/N 2224 Scaler/Ratemeter, S/N 170346, coupled to a 100 cm^2 (open area) alpha/beta probe, Ludlum M/N 43-89, S/N 182428. This system was calibrated on 18 July 2005 by the

manufacturer, who measured 2π detection efficiencies of 38.9% for Cs-137 and 42% for Pu-239 at that time.

Gamma radiation levels were measured with a Bicron "microanalyst", S/N B863H, which had been calibrated by Ludlum on 07 December 2004.

Calibration certificates for both instruments are included with this report as Attachment 1.

Proper operation of the alpha/beta scaler was verified on each day-of-use by recording 10 1-minute counts of reference check sources and comparing these measurements with previously obtained Conventionally True Values. The instrument was found to be in proper working order on both survey days.

RAM Services, Inc. Dual Scaler Operational Check Worksheet

Ludlum Model 2224 S/N 170346 Probe Model 43-89 S/N PR-182428

Calibration Date 18-Jul-2005 **Calibration Due** 18-Jul-2006

ALPHA Check Source

Isotope	Lot No.	Ref. DPM
Th-230	00TH4700764	7,580

Reference Count Rate 1,526 cpm

Beta Check Source

Isotope	Lot No.	Ref. DPM
Cs-137	00CS000766	270,840

Reference Count Rate 922 cpm

Date	Average Net Alpha Count	Average Alpha Bkg.	1 Minute Alpha MDA	Deviation	Alpha X^2	Average Net Beta	Average Beta Bkg.	1 Minute Beta MDA	Deviation	Beta X^2	Initials
	counts	counts	dpm			counts	cpm	dpm			
5-Aug-05	1468.0	0.1	21.3	3.8%	9.41	891.9	107.7	263.5	3.2%	7.55	JPW
6-Aug-05	1507.8	0.7	32.8	1.2%	15.30	899.9	107.1	262.8	2.4%	9.00	JPW
27-Sep-05	1522.0	0.4	28.3	0.3%	6.04	911.6	97.5	251.5	1.1%	8.70	JPW

Proper operation of the Bicron microanalyst was verified on each day-of use by measuring surface radiation levels from a "Delaware" radium dial watch. On each day the Bicron responded with the CTV value of 450 µRem/hr.

A gamma spectrum of the contamination on the surface of the lead was obtained with an EG&G Ortec µ Nomad portable NaI(Tl) spectrometer using a Bicron M/N 2M2 /2 detector, S/N 600003-00475-1, installed in an Ortec M/N 296 Scintipack PMT Base. The energy scale of the spectrometer was calibrated on the day of use with a 5 µCi Cs-137 check source.

100% of the surface of each floor and wall grid was scanned for alpha and beta contamination. If no elevated radiation was detected, then a 1-minute direct reading was recorded for each grid for both alpha and beta radiation.

"Smear" samples for removable contamination were collected from 100 cm^2 of each grid location, the roof vents, and a wooden box stored in the shed. Wipe samples were sent to RAM Services Wisconsin facility for analysis by liquid scintillation counting.

The wipe samples were counted for 10 minutes each using a protocol that included counting windows and efficiency corrections for H-3 and C-14, which were not isotopes of interest for this survey. The counting protocol did, however, also include a wide open counting window which would have detected any high-energy beta emitting isotopes (such as Cs-137) or alpha emitting isotopes with good (essentially 100%) efficiency.

Proper operation of the liquid scintillation counter was verified on the date the samples were counted by a Quality Assurance procedure that conforms to the ANSI N42.15-1997 Standard.

Background Measurements

Since the entire facility, i.e., the source storage shed, was the object of this survey obtaining a representative "background" reference became a problem. Moreover, measurements suggested that the nearby chemical storage shed, although outwardly similar to the source storage building, had been constructed of very dissimilar materials. Consequently, separate background measurements were obtained from different portions of the Rose-Hulman campus believed to be similar to the storage shed's floor and wall materials in age and composition.

The floor reference background was obtained on 06 August 2005 from the floor of the water conditioning room in Room 17 of Demming Hall, which is approximately the same age as the storage shed. The wall background reference was measured on 27 September 2005 at the surface of the south wall (F Boiler Room of Moench Hall) inside of door FL-201 at a height of 15 feet from floor and 8 feet from East doorway. In Table 1 below we present the averages and standard deviations of 10 1-minute counts obtained at these locations.

Table 1. Reference Background Measurements

Date	Location	Alpha	Beta
06 August 2005	Floor	2.9 ± 1.4	174.2 ± 14.7
27 September 2005	Walls	2.3 ± 1.1	154.6 ± 10.5

A gamma background of 7.5 µRem/hour was measured just outside of the source storage building on 06 August 2005. This background was not subtracted from the gamma survey measurement in order to provide a clearer picture of radiation levels inside the structure.

Minimum Detectable Activities

We computed the Minimum Detectable Activities [MDA] for the alpha and beta measurements using the different background reference values for the walls and the floor in Equation 3-12 of NUREG 1507 [December 1997]:

$$MDA = \frac{3 + 4.65\sqrt{B \times t}}{E \times t},$$

where B is the background count rate relevant for the particular structural feature and E is the efficiency appropriate for the radiation. The count time t is 1 minute for all alpha and beta measurements.

Survey Findings

During the 21-22 June 2005 preliminary survey Mr. Wiza discovered that several lead bricks comprising the lead storage vault in the northwest corner of the source storage building were contaminated. The maximum fixed contamination measured on the accessible lead brick surfaces was 33,667 cpm over the 100 cm^2 probe area. Assuming the C-14 calibrated[3] beta detection efficiency of 26.7% implies a surface contamination of 125,575 dpm. A NaI(Tl) gamma spectrum of the contaminated lead, displayed below as Figure 6, is consistent with Cs-137 as the likely contaminant. Upon finding unexpected contamination, further survey of the facility was terminated because no provision had been made for radioactive waste disposal.

Wipe samples for removable contamination were, however, collected during the preliminary survey and analyzed the following day at RAM Services facility in Two Rivers, WI. The wipe samples did not indicate the presence of any removable contamination significantly above background. A complete report of the wipe sample analysis is included as Table 2 below. Since these samples displayed no unusual activity, they were not repeated during the final survey.

[3] A different instrument was used in the preliminary survey. Since no other quantitative measurements employing this instrument are presented here, we have omitted its calibration data.

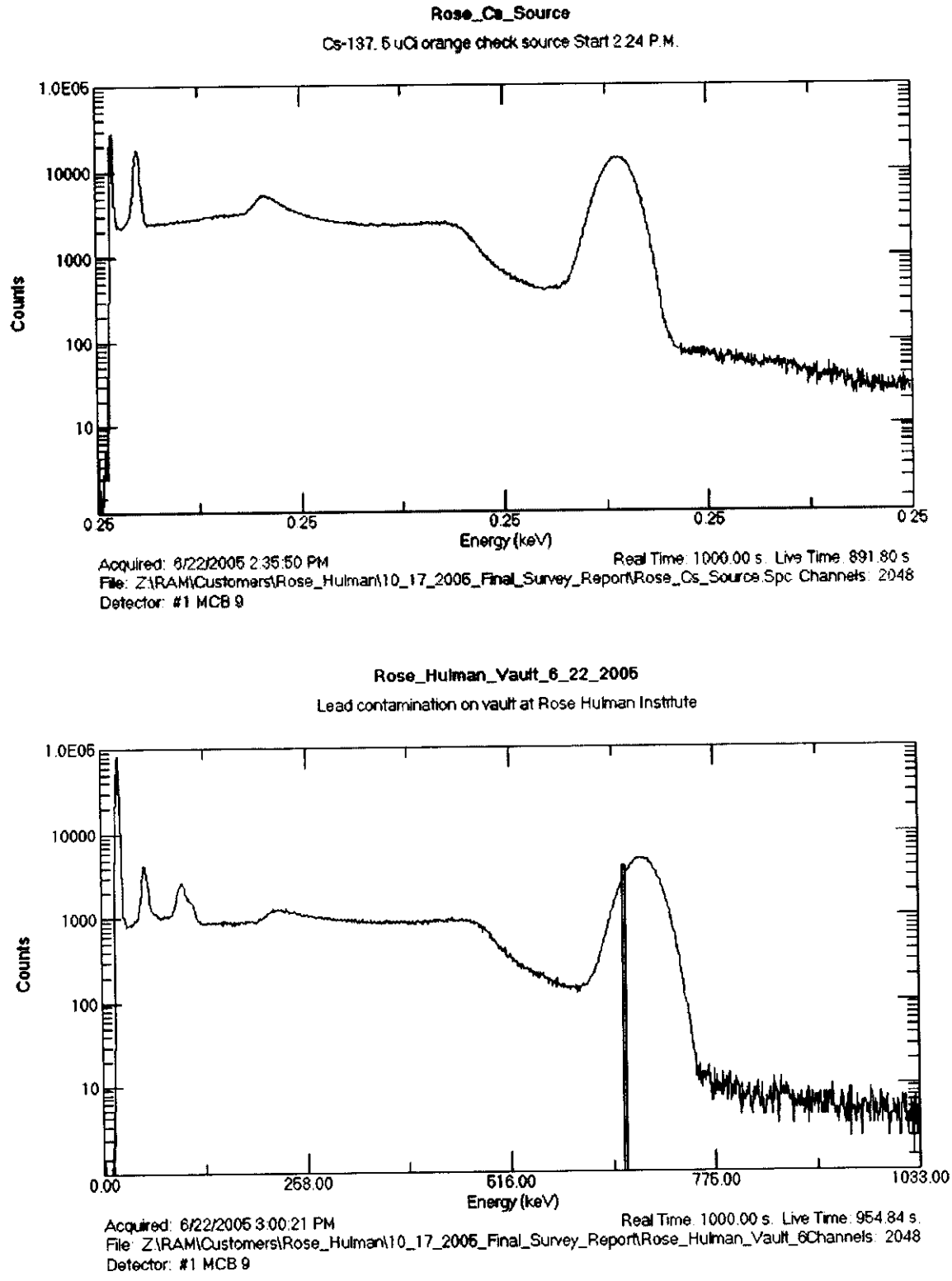

Figure 7. NaI(Tl) Spectrum of Contamination.

On 08 August 2005 Mr. Wiza scanned 100% of the floor grid locations for total alpha/beta contamination. Elevated beta radiation was found in grid F-11 and decontaminated to background levels by removing the top 1/8" of concrete. When corrected for background and counting efficiency, this localized contamination seemed to have an activity of approximately 4200 dpm over the 100 cm^2 active area of the detector.

Approximately 540 dpm/100 cm^2 of beta activity was detected at floor grid F-3, but this was not decontaminated. Beta activity was at or below the MDA over the remainder of the floor. Essentially no alpha activity was detected on the floor.

On 27 September 2005 Mr. Wiza scanned 100% of the interior wall surfaces to a height of 2 meters using the same instrumentation as employed on 06 August. No elevated alpha or beta activity was found on any of the walls.

Complete radiation measurements from the interior of the source storage building are presented in Table 3 below.

The exterior walls and the roof of the source storage shed were not investigated as part of this survey, except for a few wipes collect from the roof vents. Also, the grounds surrounding the building were not sampled for contamination. Since unsealed forms of radioactive materials were not actively used in this building, it seems extraordinarily unlikely that any of these elements would be radioactively contaminated.

Waste Disposal

On 17 August 2005 ADCO Services, Inc. removed the radioactive waste generated by dismantling the lead storage vault frame and decontaminating the facility. This waste had been packaged in one 10-gallon and two 55-gallon drums. The concrete blocks which had formed the base of the lead vault were packaged in a 32 ft^3 wooden box and removed for disposal. The total estimated activity in all these waste drums was 0.085 mCi.

Table 2. Removable Contamination Final Report

Wipe Date	Analysis Date	Report Date	Analyst
23-Jun-2005	24-Jun-2005	15-July-2005	Don Jordan

Location		H-3 Counting Window				C-14 Window				Wide Open Window		
Rose-Hulman Institute of Technology Utility out-building Terre Haute, IN 47803		Counting window automatically adjusted for quench. Background 11.34 dpm				Counting window automatically adjusted for quench. Background 10.67 dpm				Assume C-14 Efficiency Background 34.35 dpm		
Assay No.	Sample Description	Raw Count cpm	Efficiency %	MDA dpm	Activity dpm	Raw Count cpm	Efficiency %	MDA dpm	Activity dpm	Raw Count cpm	MDA dpm	Activity dpm
34075	F-1	5.40	40.16	13.08	-6.30	13.90	73.13	21.18	8.29	33.10	12.19	10.91
34076	F-2	6.10	37.45	14.02	-5.50	16.10	72.69	21.31	11.42	37.30	12.27	16.97
34077	F-3	6.20	34.59	15.18	-1.95	12.20	72.20	21.45	6.13	29.60	12.35	6.65
34078	F-4	8.40	48.62	10.80	1.51	9.00	74.41	20.82	1.30	25.20	11.98	-0.48
34079	F-5	4.80	21.12	24.87	-1.65	12.00	68.90	22.48	6.61	28.30	12.94	6.73
34080	F-6	6.50	34.79	15.10	0.48	9.90	72.23	21.44	2.91	26.80	12.35	2.76
34081	F-7	4.40	24.38	21.54	-3.79	10.90	69.92	22.15	4.82	27.00	12.75	4.27
34082	F-8	7.80	48.45	10.84	-0.09	9.80	74.39	20.82	2.40	26.80	11.99	1.68
34083	F-9	7.00	33.68	15.59	1.57	11.00	72.03	21.50	4.46	27.20	12.38	3.41
34084	F-10	5.50	34.42	15.26	-2.60	10.30	72.17	21.46	3.51	25.00	12.36	0.29
34085	F-11	5.70	39.52	13.29	-3.48	10.70	73.02	21.21	3.90	26.30	12.21	1.67
34086	F-12	8.20	48.48	10.83	0.23	10.80	74.39	20.82	3.74	27.30	11.99	2.35
34087	F-13	3.20	8.83	59.48	4.39	9.90	62.05	24.96	4.98	29.10	14.37	12.55
34088	F-14	2.80	22.59	23.25	-12.72	13.30	69.38	22.33	8.51	27.90	12.85	5.87
34089	F-15	3.00	26.26	20.00	-8.16	9.10	70.42	22.00	2.21	22.90	12.66	-1.83
34090	F-16	5.00	29.62	17.73	-3.62	11.30	71.22	21.75	5.11	25.70	12.52	1.74
34091	F-17	6.70	43.19	12.16	-1.98	11.00	73.59	21.05	4.19	25.40	12.12	0.17
34092	F-18	5.80	38.36	13.69	-3.04	10.80	72.84	21.26	4.07	25.10	12.24	0.11
34093	F-19	5.40	23.00	22.83	0.73	11.30	69.51	22.28	5.43	25.50	12.83	2.34

Removable Contamination Final Report

Wipe Date	Analysis Date	Report Date	Analyst
23-Jun-2005	24-Jun-2005	15 July 2005	Don Jordan

Location	H-3 Counting Window	C-14 Window	Wide Open Window
Rose-Hulman Institute of Technology Utility out-building Terre Haute, IN 47803	Counting window automatically adjusted for quench. Background 11.34 dpm	Counting window automatically adjusted for quench. Background 10.67 dpm	Assume C-14 Efficiency Background 34.35 dpm

Assay No.	Sample Description	H-3 Raw Count cpm	H-3 Efficiency %	H-3 MDA dpm	H-3 Activity dpm	C-14 Raw Count cpm	C-14 Efficiency %	C-14 MDA dpm	C-14 Activity dpm	Wide Open Raw Count cpm	Wide Open MDA dpm	Wide Open Activity dpm
34094	F-20	7.60	37.11	14.15	1.65	11.50	72.63	21.33	5.03	28.10	12.28	4.34
34095	N-1	5.80	39.98	13.14	-2.58	9.50	73.10	21.19	2.24	23.30	12.20	-2.47
34096	N-2	6.80	34.98	15.01	2.12	8.70	72.27	21.43	1.22	26.20	12.34	1.91
34097	N-3	6.40	38.50	13.64	-2.14	11.80	72.86	21.26	5.43	28.40	12.24	4.63
34098	N-4	6.80	39.16	13.41	-0.08	9.90	72.97	21.23	2.78	26.20	12.22	1.56
34099	N-5	6.60	44.78	11.73	-1.76	9.60	73.83	20.98	2.24	27.90	12.08	3.44
34100	N-6	6.40	37.22	14.11	-1.36	11.10	72.65	21.32	4.50	26.50	12.28	2.13
34101	N-7	8.20	55.23	9.51	-0.23	8.70	75.44	20.53	0.76	25.70	11.82	-0.28
34102	N-8	5.70	41.23	12.74	-3.44	10.10	73.29	21.13	3.03	24.00	12.17	-1.60
34103	S-1	4.80	33.85	15.51	-4.31	10.00	72.06	21.49	3.13	24.50	12.38	-0.35
34104	S-2	5.40	34.96	15.02	-2.04	8.90	72.26	21.44	1.55	24.10	12.34	-1.00
34105	S-3	3.40	29.98	17.52	-7.55	9.40	71.29	21.73	2.47	22.70	12.51	-2.51
34106	S-4	7.50	50.72	10.35	-1.79	11.10	74.73	20.73	4.09	27.30	11.93	2.18
34107	S-5	6.60	46.58	11.27	-1.66	8.70	74.10	20.90	0.98	24.60	12.03	-1.15
34108	S-6	8.20	51.19	10.26	0.82	8.30	74.80	20.71	0.31	23.00	11.92	-3.60
34109	S-7	7.00	43.83	11.98	-0.98	10.20	73.69	21.02	3.07	25.50	12.10	0.26
34110	S-8	6.10	40.84	12.86	-4.36	13.40	73.23	21.15	7.56	28.20	12.18	4.16
34111	W-1	7.40	40.15	13.08	0.84	10.40	73.13	21.18	3.43	26.90	12.19	2.44
34112	W-2	8.80	49.91	10.52	1.89	9.20	74.61	20.76	1.54	27.40	11.95	2.38

Removable Contamination Final Report

Wipe Date	Analysis Date	Report Date	Analyst
23-Jun-2005	24-Jun-2005	15 July 2005	Don Jordan

Location
Rose-Hulman Institute of Technology
Utility out-building
Terre Haute, IN 47803

		H-3 Counting Window Counting window automatically adjusted for quench. Background 11.34 dpm				C-14 Window Counting window automatically adjusted for quench. Background 10.67 dpm				Wide Open Window Assume C-14 Efficiency Background 34.35 dpm		
Assay No.	Sample Description	Raw Count cpm	Efficiency %	MDA dpm	Activity dpm	Raw Count cpm	Efficiency %	MDA dpm	Activity dpm	Raw Count cpm	MDA dpm	Activity dpm
34113	W-3	6.70	45.44	11.56	-1.68	9.60	73.93	20.95	2.22	25.60	12.06	0.28
34114	W-4	4.60	45.90	11.44	-6.63	10.10	74.00	20.93	2.93	24.60	12.05	-1.10
34115	W-5	6.40	32.37	16.22	-0.66	12.20	71.78	21.58	6.21	27.80	12.42	4.38
34116	W-6	6.80	29.78	17.64	3.16	10.40	71.25	21.74	3.76	27.20	12.52	3.83
34117	W-7	6.70	39.53	13.29	-0.07	9.30	73.03	21.21	1.95	27.30	12.21	3.03
34118	W-8	6.90	41.65	12.61	-0.92	10.60	73.36	21.11	3.68	26.10	12.16	1.23
34119	W-9	6.90	41.97	12.51	0.11	8.70	73.41	21.10	1.07	24.40	12.15	-1.11
34120	W-10	5.70	37.50	14.00	-2.01	9.10	72.70	21.31	1.75	23.80	12.27	-1.61
34121	E-1	5.60	40.75	12.89	-3.60	10.10	73.22	21.15	3.05	25.50	12.18	0.48
34122	E-2	9.70	47.20	11.13	4.20	9.90	74.20	20.87	2.53	28.10	12.02	3.52
34123	E-3	8.30	38.39	13.68	3.56	10.70	72.84	21.26	3.87	27.70	12.24	3.68
34124	E-4	3.50	29.72	17.67	-6.84	9.00	71.24	21.74	1.91	20.80	12.52	-5.15
34125	E-5	8.30	45.44	11.56	1.64	10.00	73.93	20.95	2.73	29.20	12.06	5.15
34126	E-6	5.10	41.11	12.77	-4.71	9.80	73.28	21.14	2.64	22.60	12.17	-3.51
34127	E-7	7.10	38.99	13.47	0.43	10.40	72.94	21.24	3.47	27.30	12.23	3.08
34128	E-8	7.20	38.03	13.81	2.28	8.40	72.79	21.28	0.73	25.30	12.25	0.41
34129	E-9	6.50	40.68	12.91	-1.36	10.10	73.21	21.16	3.03	25.90	12.18	1.03
34130	E-10	5.60	33.45	15.70	-2.03	10.30	71.99	21.52	3.54	25.40	12.39	0.93
34131	Roof vent, northwest	0.00	16.12	32.58	-25.53	10.30	66.88	23.16	4.94	21.10	13.33	-2.80

Removable Contamination Final Report

Wipe Date	Analysis Date	Report Date	Analyst
23-Jun-2005	24-Jun-2005	15 July 2005	Don Jordan

Location
Rose-Hulman Institute of Technology
Terre Haute, IN 47803

		H-3 Counting Window Counting window automatically adjusted for quench. Background 11.34 dpm				C-14 Window Counting window automatically adjusted for quench. Background 10.67 dpm				Wide Open Window Assume C-14 Efficiency *Background 34.35 dpm*		
Assay No.	Sample Description	Raw Count cpm	Efficiency %	MDA dpm	Activity dpm	Raw Count cpm	Efficiency %	MDA dpm	Activity dpm	Raw Count cpm	MDA dpm	Activity dpm
34132	Roof vent	3.90	16.90	31.08	-2.15	10.70	67.24	23.04	5.10	28.10	13.26	7.44
34133	Wooden cover, northeast corner	4.90	41.55	12.64	-5.08	9.50	73.34	21.12	2.22	23.90	12.16	-1.76
34134	Wooden rad. Labeled box, northeast corner	5.80	40.25	13.05	-2.21	8.80	73.14	21.18	1.27	25.00	12.19	-0.17

Table 3. Rose Hulman Source Storage Building Radiation Survey.

Grid Location	Raw Alpha Count cpm	Alpha MDA DPM	Alpha Activity DPM / 100 cm^2	Raw Beta Count cpm	Beta MDA DPM	Beta Activity DPM / 100 cm^2	Gamma Radiation µRem/hr
F-1	3	26.0	0.2	189	165.5	38.0	9
F-2	3	26.0	0.2	239	165.5	166.6	10
F-3	3	26.0	0.2	384	165.5	539.3	8
F-4	1	26.0	-4.5	178	165.5	9.8	9
F-5	0	26.0	-6.9	233	165.5	151.2	9
F-6	4	26.0	2.6	201	165.5	68.9	9
F-7	3	26.0	0.2	182	165.5	20.1	9
F-8	1	26.0	-4.5	163	165.5	-28.8	9
F-9	1	26.0	-4.5	143	165.5	-80.2	9
F-10	0	26.0	-6.9	162	165.5	-31.4	8
F-11	0	26.0	-6.9	185	165.5	27.8	8
F-12	1	26.0	-4.5	156	165.5	-46.8	9
F-13	1	26.0	-4.5	175	165.5	2.1	8
F-14	1	26.0	-4.5	188	165.5	35.5	9
F-15	0	26.0	-6.9	181	165.5	17.5	8
F-16	1	26.0	-4.5	145	165.5	-75.1	9
F-17	1	26.0	-4.5	156	165.5	-46.8	8
F-18	1	26.0	-4.5	159	165.5	-39.1	8
F-19	0	26.0	-6.9	133	165.5	-105.9	7
F-20	2	26.0	-2.1	112	165.5	-159.9	9
N-1	2	23.9	-0.7	157	156.3	6.2	9
N-2	2	23.9	-0.7	145	156.3	-24.7	8

Table 3. Rose Hulman Source Storage Building Radiation Survey.

Grid Location	Raw Alpha Count cpm	Alpha MDA DPM	Alpha Activity DPM / 100 cm^2	Raw Beta Count cpm	Beta MDA DPM	Beta Activity DPM / 100 cm^2	Gamma Radiation µRem/hr
N-3	3	23.9	1.7	169	156.3	37.0	9
N-4	4	23.9	4.0	156	156.3	3.6	7
N-5	2	23.9	-0.7	158	156.3	8.7	8
N-6	3	23.9	1.7	142	156.3	-32.4	7
N-7	4	23.9	4.0	143	156.3	-29.8	8
N-8	3	23.9	1.7	172	156.3	44.7	8
E-1	4	23.9	4.0	136	156.3	-47.8	8
E-2	6	23.9	8.8	159	156.3	11.3	8
E-3	1	23.9	-3.1	140	156.3	-37.5	7
E-4	2	23.9	-0.7	166	156.3	29.3	7
E-5	4	23.9	4.0	157	156.3	6.2	7
E-6	1	23.9	-3.1	135	156.3	-50.4	8
E-7	3	23.9	1.7	146	156.3	-22.1	8
E-8	7	23.9	11.2	151	156.3	-9.3	7
E-9	4	23.9	4.0	156	156.3	3.6	8
E-10	4	23.9	4.0	160	156.3	13.9	8
S-1	6	23.9	8.8	146	156.3	-22.1	7
S-2	4	23.9	4.0	134	156.3	-53.0	8
S-3	1	23.9	-3.1	136	156.3	-47.8	7
S-4	1	23.9	-3.1	141	156.3	-35.0	7
S-5	2	23.9	-0.7	151	156.3	-9.3	7
S-6	4	23.9	4.0	141	156.3	-35.0	8

Table 3. Rose Hulman Source Storage Building Radiation Survey.

Grid Location	Raw Alpha Count cpm	Alpha MDA DPM	Alpha Activity DPM / 100 cm^2	Raw Beta Count cpm	Beta MDA DPM	Beta Activity DPM / 100 cm^2	Gamma Radiation µRem/hr
S-7	2	23.9	-0.7	137	156.3	-45.2	8
S-8	2	23.9	-0.7	143	156.3	-29.8	8
W-1	1	23.9	-3.1	188	156.3	85.9	8
W-2	2	23.9	-0.7	135	156.3	-50.4	8
W-3	3	23.9	1.7	152	156.3	-6.7	8
W-4	1	23.9	-3.1	152	156.3	-6.7	9
W-5	3	23.9	1.7	150	156.3	-11.8	8
W-6	1	23.9	-3.1	149	156.3	-14.4	7
W-7	0	23.9	-5.5	109	156.3	-117.2	8
W-8	0	23.9	-5.5	96	156.3	-150.6	7
W-9	2	23.9	-0.7	137	156.3	-45.2	7
W-10	2	23.9	-0.7	151	156.3	-9.3	7

Designer and Manufacturer of Scientific and Industrial Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-46
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER RAM SERVICES INC ORDER NO. 239119/293495

Mfg. Ludlum Measurements, Inc. Model 2224 Serial No. 170346

Mfg. Ludlum Measurements, Inc. Model 43-89 Serial No. PR 182428

Cal. Date 18-Jul-05 Cal Due Date 18-Jul-06 Cal. Interval 1 Year Meterface 202-694

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 74 °F RH 43 % Alt 702.8 mm H

☐ New Instrument Instrument Received ☑ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☐ F/S Resp. ck ☑ Reset ck. ☐ Window Operation ☐ Geotropism
☑ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 2.2 VDC
☑ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☐ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 8.50 V Input Sens. Common mV Det. Oper. 8.50 V at Common mV Threshold Dial Ratio =

☑ HV Readout (2 points) Ref./Inst. 500 / 495 V Ref./Inst. 1500 / 1490 V

COMMENTS:

Alpha threshold: 120mV
Beta threshold: 3.5mV
Beta window: 30mV
Cs-137 eff: 38.9% (2π)
Pu-239 eff: 42% (2π)

Calibrated w/6ft cable Firmware: 340063
operational check source reads ≈ 100cpm @ x100 (10kcpm)
with screen side of probe centered on source.
overload set to simulate light leak

Source Count: 1,508 cpm - 111cpm background
÷ 3,588cpm Source Count Size

Source Count: 6,726cpm - 0cpm background
÷ 15,900 cpm Source Size

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
x1000	400kcpm	400	400
x1000	100kcpm	100	100
x100	40kcpm	400	400
x100	10kcpm	100	100
x10	4kcpm	400	400
x10	1kcpm	100	100
x1	400cpm	400	400
x1	100cpm	100	100

*Uncertainty within ± 10% C.F. within ± 20%

All Range(s) Calibrated Electronically

Digital Readout	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
	400kcpm	401989	401989
	40kcpm	40139	40139
	4kcpm	4015	4015
	400cpm	402	402
	40cpm	41	41

Log Scale	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities o other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration technique The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-19

Reference Instruments and/or Sources:

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☐ M565 ☐ S105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-3

☑ Alpha S/N 5283-04 ☑ Beta S/N Tc-99 5279-04 ☑ Other Cs-137 168-112 Sm-90 5281-04

☑ m 500 S/N 57881 ☐ Oscilloscope S/N ☑ Multimeter S/N 80040300

Calibrated By: Michael J Thomas Date 18-July-05

Reviewed By: Date

AC Inst. ☐ Passed Dielectric (Hi-Pot) and Continuity Test

Designer and Manufacturer
of
Scientific and Industrial
Instruments

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-46
SWEETWATER, TEXAS 79556, U.S.A.

Bench Test Data For Detector

Detector 43-89 Serial No. PR 182428
Customer RAM SERVICES INC
Counter 2224 Serial No. 170346
Count Time 1Minute
Other

Order #. 239119/293495
Alpha Input Sensitivity 120 mV
Beta Input Sensitivity 3.5 mV
Beta Window 30 mV
Distance Source to Detector Surface

High Voltage	Background Alpha	Background Beta	Isotope Tc-99 Size 18,000cpm Alpha	Tc-99 Beta	Isotope SrY-90 Size 83,496cpm Alpha	SrY-90 Beta	Isotope Pu-239 Size 15,900cpm Alpha	Pu-239 Beta
825	0	76	13	3,351	0	27,112	5,968	368
→ 850	0	111	8	5,074	0	35,409	6,726	399
875	1	150	13	5,863	3	42,085	6,806	477
900	0	196	4	6,858	2	44,310	6,904	782

☐ Gas Proportional detector count rate decreased ≤ 10% after 15 hour static test using 39" cable.
☐ Gas proportional detector count rate decreased ≤ 10% after 5 hour static test using 39" cable and alpha/beta counter.

Signature Michael J Thomas Date 18-July-05

FORM C48 04/09/2003

• *Serving The Nuclear Industry Since 1962* •

Designer and Manufacturer of Scientific and Industrial Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556 U.S.A.

CUSTOMER RAM SERVICES INC ORDER NO. 226568/286870

M. Micron Model MICRO ANALYS Serial No. B863H

M. Model Serial No.

Cal. Date 7-Dec-04 Cal Due Date 7-Dec-05 Cal. Interval 1 Year Meterface 0-5

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 31 % Alt 700.8 mm Hg

☐ New Instrument Instrument Received ☐ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☑ Other-See comments

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☑ F/S Resp. ck ☐ Reset ck. ☑ Window Operation ☑ Geotropism
☑ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) _____VDC
☐ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☑ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 807 V Input Sens. 310 mV Det. Oper. _____ V at _____ mV Threshold Dial Ratio _____ = _____ mV

☑ HV Readout (2 points) Ref./Inst. 400 / _____ V Ref./Inst. 1600 / _____ V

COMMENTS:

No as-founds (Loss of high voltage)

Operational check performed by Jim Pluyt on 6/11/2004

RED Cs-137, SN: READS 2650 uR/hr BATTERY READS 3.6
ORANGE Co-137, SN: READS 3400 uR/hr
DELAWARE Ra-226 WATER READS 450 uR/hr

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
X 1000	4000 uR/hr	N/A	4
X 1000	1000 uR/hr		1
X 100	400 uR/hr= 7100cpm		4
X 100	100 uR/hr		1
X 10	7100 cpm		4
X 10	1770 cpm		1
X 1	710 cpm		4
X 1	177 cpm		1

*Uncertainty within ± 10% C.F. within ± 20% X 10, X 1 Range(s) Calibrated Electronically

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*		REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout				Log Scale			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources:

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☐ M565 ☐ 5106 ☐ T1008 ☑ T879 ☐ E552 ☐ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N _____ ☐ Beta S/N _____ ☐ Other _____

m 500 S/N 50800 ☐ Oscilloscope S/N _____ ☑ Multimeter S/N 83990502

Calibrated By: Charles Lisk Date 7 Dec 04

Reviewed By: [signature] Date 7 Dec 04

FORM CERA 11/20/2003

AC Inst. Only ☐ Passed Dielectric (Hi-Pot) and Continuity Test ☐ Failed:

FORM 540 — ADCO SERVICES, INC.

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

SHIPPING PAPER

1. EMERGENCY TELEPHONE NUMBER (Include Area Code): 812-877-8124

ORGANIZATION: ROSE HULMAN

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

3. TOTAL NUMBER OF PACKAGES IDENTIFIED ON THIS MANIFEST ===> 4

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

EPA MANIFEST NUMBER: NONE REQUIRED

5. SHIPPER – NAME AND FACILITY
ROSE HULMANFOR THE ACCOUNT OF
ADCO SERVICES, INC.
5400 WABASH AVENUE
TERRE HAUTE, IN 47803

SC PERMIT: NA
SHIPMENT NUMBER: 05-0307 L

CONTACT: MICHAEL R. HOWARD

6. CARRIER – Name and Address
ADCOM EXPRESS, INC.
17650 DUVAN DRIVE
TINLEY PARK, IL 60477

CONTACT: BOB BASSETT

SIGNATURE – Authorized carrier acknowledging waste receipt

SHIPMENT I.D. NUMBER: 60542
[ ] COLLECTOR
[ ] PROCESSOR
[X] GENERATOR TYPE (Specify): A

TELEPHONE NUMBER (Include Area Code): 812-877-8124

EPA I.D. NUMBER: ILD 047367864

SHIPPING DATE: 8/17/05

TELEPHONE NUMBER (Include Area Code): 708-429-3013

DATE

7. FORM 540 AND 540A — PAGE 1 OF 1 PAGE(S)
FORM 541 AND 541A — 1 PAGE(S)
FORM 542 AND 542A — None PAGE(S)
ADDITIONAL INFORMATION — None PAGE(S)

9. CONSIGNEE - Name and Facility Address
ADCO SERVICES, INC.
17650 DUVAN DRIVE
TINLEY PARK, IL 60477

SIGNATURE – Authorized consignee acknowledging waste receipt

8. MANIFEST NUMBER (Use this number on all continuation pages): 05-0307 L

CONTACT: LEN WARBIANY/FACILITY MGR

TELEPHONE NUMBER (Include Area Code): 708-429-1660

DATE

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 are in proper condition for transportation and disposal as described in accordance with the requirements of 10 CFR Parts 20 and 61, or equivalent state regulations.

AUTHORIZED SIGNATURE | TITLE | DATE

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
Radioactive material, excepted package-limited quantity of material, 7, UN2910	NA	NA	Solid METAL PARTS	Cs-137		7.4000E-01	2.0000E-02	NA	113. LBS; 7.5 FT3	05-0307-01
Radioactive material, excepted package-limited quantity of material, 7, UN2910	NA	NA	Solid PAPER PLASTIC GLASS	Cs-137		3.7000E-01	1.0000E-02	NA	199. LBS; 7.5 FT3	05-0307-02
Radioactive material, excepted package-limited quantity of material, 7, UN2910	NA	NA	Solid PAPER PLASTIC GLASS	Cs-137		1.8500E-01	5.0000E-03	NA	65. LBS; 1.4 FT3	05-0307-03
Radioactive material, excepted package-limited quantity of material, 7, UN2910	NA	NA	Solid CINDER BLOCKS	Cs-137		1.8500E+00	5.0000E-02	NA	1809. LBS; 32. FT3	05-0307-04

FOR CONSIGNEE USE ONLY

20. Check appropriate items:

___ Customer represents and warrants that all data set forth in this Uniform Low-Level Radioactive Manifest is true and correct in all respects.

___ Packages listed as "Limited Quantity of Radioactive Material" on this manifest conform to the conditions and limitations specified in 49 CFR 173.421 for radioactive material, excepted package-limited quantity of material UN2910

___ Packages listed as "NON-REGULATED MATERIAL" on this manifest are classified in accordance with 49 CFR 173.403 (Definition of Radioactive Material). These Materials must still be disposed of at a licensed facility

FORM 540 (10-95)

FORM 541 — ADCO SERVICES, 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
4	m3 1.3705 / ft3 48.4000	kg 991.5530 / lb 2186.0000	NP	NP	NP	NP

ACTIVITY	ALL NUCLIDES	TRITIUM	C-14	Tc-99	I-129	SOURCE	
MBq	3.1450E+00	NP	NP	NP	NP	(kgs)	NA
mCi	8.5000E-02	NP	NP	NP	NP	(lbs)	NA

2. MANIFEST NUMBER: 05-0307 L

3. PAGE 1 OF 1 PAGE(S)

4. SHIPPER NAME: ROSE HULMAN/FOR THE ACCO

SHIPMENT ID NUMBER: 60542

DISPOSAL CONTAINER DESCRIPTION							WASTE DESCRIPTION FOR EACH WASTE TYPE IN CONTAINER								
							PHYSICAL DESCRIPTION			14. CHEMICAL DESCRIPTION		15 RADIOLOGICAL DESCRIPTION			
5. CONTAINER IDENTIFICATION NUMBER / SC PERMIT	6. CONTAINER DESCRIPTION (See Note 1 & Note 1A)	7. VOLUME (m3) (ft3)	8. WASTE AND CONTAINER WEIGHT (kg) (lb)	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 (m3) (FT3)	13. SOLIDIFICATION OR STABILIZATION MEDIA (See Note 3 & Note 3A)	CHEMICAL FORM/ CHELATING AGENT	WEIGHT % CHELATING AGENT IF>0 1%	INDIVIDUAL RADIONUCLIDES AND ACTIVITY (MBq) AND CONTAINER TOTAL; OR CONTAINER TOTAL ACTIVITY AND RADIONUCLIDE PERCENT RADIONUCLIDES	MBq	mCi	16. WASTE CLASSIFICATION AS-Class A Stable AU-Class A Unstable B-Class B C-Class C
06-0307-01/NA 5500 WABASH AVENUE TERRE HAUTE, IN 47803	4	0.2124	51.2588	3.0000E-04	NP	NP	39-H	0.2124	100	METAL PARTS/NP	0.00	Cs-137	7.4000E-01	2.0000E-02	AU
		7.5000	113.0800	3.0000E-02	NP	NP		7.5000				Subtotal	7.4000E-01	2.0000E-02	
												Total	7.4000E-01	2.0000E-02	
06-0307-02/NA 5500 WABASH AVENUE TERRE HAUTE, IN 47803	4	0.2124	90.2648	3.0000E-04	NP	NP	56-VERIFICATION AND TRANSLOAD-H	0.2124	100	PAPER PLASTIC GLASS/NP	0.00	Cs-137	3.7000E-01	1.0000E-02	AU
		7.5000	199.0000	3.0000E-02	NP	NP		7.5000				Subtotal	3.7000E-01	1.0000E-02	
												Total	3.7000E-01	1.0000E-02	
06-0307-03/NA 5500 WABASH AVENUE TERRE HAUTE, IN 47803	4	0.0396	28.4935	3.0000E-04	NP	NP	56-VERIFICATION AND TRANSLOAD-H	0.0396	100	PAPER PLASTIC GLASS/NP	0.00	Cs-137	1.8500E-01	5.0000E-03	AU
		1.4000	66.0000	3.0000E-02	NP	NP		1.4000				Subtotal	1.8500E-01	5.0000E-03	
												Total	1.8500E-01	5.0000E-03	
06-0307-04/NA 5500 WABASH AVENUE TERRE HAUTE, IN 47803	1	0.9061	620.5487	3.0000E-04	NP	NP	29-H	0.9061	100	CINDER BLOCKS/NP	0.00	Cs-137	1.8500E+00	5.0000E-02	AU
		32.0000	1000.0000	3.0000E-02	NP	NP		32.0000				Subtotal	1.8500E+00	5.0000E-02	
												Total	1.8500E+00	5.0000E-02	
Shipment Totals		1.3705	991.5530										3.1450E+00	8.5000E-02	
		48.4000	2186.0000												

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. Polyethlene Tank or Liner
8. Fiberglass Tank or Liner
9. Demineralizer
10. Gas Cylinder
11. Bulk, Unpackaged Waste
12. Unpackaged Components
13. High Integrity Container
19. Other. Describe in Item 6, or additional page.

Note 1A: Barnwell Specific Container Description Codes. (Choose one code as may be applicable.)

A. High Integrity Container - Poly
B. High Integrity Container - Poly with Steel Shell
C. High Integrity Drum Overpack - Poly
D. High Integrity Container - Stainless Steel
E. High Integrity Container - Fiberglass
F. Liner - Steel

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: Barnwell Specific Waste Descriptor Codes (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.) If waste meeting disposal site structural 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

Note 3A: Barnwell Specific Solidification and Stabilization Media Codes (Choose this code if applicable)

M. Wax Binder

FORM 541 (10-96)

FORM 540 — Envirocare of Utah, Inc.

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

SHIPPING PAPER

1. EMERGENCY TELEPHONE NUMBER (Include Area Code): [illegible]
ORGANIZATION: CHEMTREC

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

3. TOTAL NUMBER OF PACKAGES IDENTIFIED ON THIS MANIFEST ====> 1

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

5. SHIPPER – NAME AND FACILITY: Philotechnics, Ltd., [illegible] Road, Oak Ridge, TN 37830
USER PERMIT NUMBER: [illegible]
SHIPMENT NUMBER: 0866-01-0012
CONTACT: Don Hartje

6. CARRIER – Name and Address: Tri State Motor Transit, [illegible] East 7th Street, Joplin, MO 64[illegible]
CONTACT: Mark Gooch
SIGNATURE – Authorized carrier acknowledging waste receipt: [signature] TSMT

SHIPMENT ID NUMBER: 0866-01-0012
[X] COLLECTOR
[ ] PROCESSOR
GENERATOR TYPE (Specify)
TELEPHONE NUMBER (Include Area Code): [illegible]
EPA I.D. NUMBER: [illegible]
SHIPPING DATE: [illegible]
TELEPHONE NUMBER (Include Area Code): [illegible]
DATE: 8/18/05

7. FORM 540 AND 540A — PAGE 1 OF 1 PAGE(S)
FORM 541 AND 541A — 1 PAGE(S)
FORM 542 AND 542A — 1 PAGE(S)
ADDITIONAL INFORMATION — None PAGE(S)

8. MANIFEST NUMBER (Use this number on all continuation pages): 0866-01-0012

9. CONSIGNEE – Name and Facility Address: Envirocare of Utah, Inc., Clive Disposal Site, Interstate 80, Exit 49, Clive, UT 84029 "Treatment Facility"
SIGNATURE – Authorized consignee acknowledging waste receipt:
CONTACT: Shipping and Receiving
TELEPHONE NUMBER (Include Area Code): [illegible]
DATE:

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 are in proper condition for transportation and disposal as described in accordance with the requirements of 10 CFR Parts 20 and 61, or equivalent state regulations.

AUTHORIZED SIGNATURE: [signatures] | TITLE: Philotechnics Shipper; Mgr - EHS | DATE: 08-18-05; 08-18-05

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. USASCO CLASS	18. TOTAL WEIGHT OR VOLUME (Use appropriate units)	19. IDENTIFICATION NUMBER OF PACKAGE
Hazardous Waste Solid, N.O.S., 9, NA3077 PGIII (Contains Lead, Non-Radioactive per DOT)	NA	NA	Solid Metal Oxides	Cs-137		4.4115E-01	1.1[illegible]E-02	NA	4271 LBS; 38.4 FT3	[illegible]-1

FOR CONSIGNEE USE ONLY

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

20. TERMS AND CONDITION

A. HAZARDOUS MATERIALS. Generator represents & warrants that Waste Material _✓_ is (or) _____ is not a 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.[illegible]

B. TITLE. Upon acceptance at the disposal site by Envirocare of Utah, Inc., and all appropriate regulatory authorities, title to the Waste Material which conforms to Generator's representations herein shall transfer from Generator and be vested in Envirocare of Utah, 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, regulations and Envirocare of Utah, Inc.'s facility license.

D. INDEMNIFICATION. Generator agrees to indemnify Envirocare of Utah, 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 540 (10 98)

FORM 541 Envirocare of Utah, 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
1	m3	0.7476	kg	2165.9037	NP	NP	NP	NP
	ft3	26.4000	ton	2.3875				

ACTIVITY

	ALL NUCLIDES	TRITIUM	C-14	Tc-99	I-129	SOURCE	
MBq		NP	NP	NP	NP	(kgs)	NA
mCi		NP	NP	NP	NP	(tons)	NA

2. MANIFEST NUMBER 0866-01-0012

3. PAGE 1 OF 1 PAGE(S)

4. SHIPPER NAME Philotechnics, Ltd.

SHIPMENT ID NUMBER 0866-01-0012

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

5. CONTAINER IDENTIFICATION NUMBER / GENERATOR ID NUMBER(S)	6. CONTAINER DESCRIPTION (See Note 1 & Note 1A)	7. VOLUME (m3) (ft3)	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	PHYSICAL DESCRIPTION 11. WASTE DESCRIPTOR (See Note 2 & Note 2A)	12. APPROXIMATE WASTE VOLUME(S) IN CONTAINER m3 ft3	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 (MBq) AND CONTAINER TOTAL; OR CONTAINER TOTAL ACTIVITY AND RADIONUCLIDE PERCENT — RADIONUCLIDES	µCi/gm	MBq	mCi	16. WASTE CLASSIFICATION AS-Class A Stable AU-Class A Unstable B-Class B C-Class C
RHIT-VE0012	1	0.7476	2165.9037	1.0000E-04	<3.8740E-06	<3.8740E-05	SU-LEAD-H	0.7476	100	Metal Oxides/	0.00					NA
		26.4000	2.3875	1.0000E-02	<2.300E+02	<2.300E+03		26.4000	100	NA						AU
Shipment Totals		0.7476	2165.9033											0.0000E+00	0.0000E+00	
		26.4000	2.3875													

NOTE 1: Container Description Codes. For containment 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, Unpackaged 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 Sea-van

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 structural 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

FORM 541 (10 96)

FORM 542 — Envirocare of Utah, Inc.

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

MANIFEST INDEX AND REGIONAL COMPACT TABULATION

List all original "PROCESSED WASTE" generators (if any) before "COLLECTED WASTE" generators.

1. WASTE COLLECTOR/PROCESSOR

NAME: Philotechnics, Ltd.

IDENTIFICATION NUMBER: 0001

SHIPPING DATE: 8/18/05

SHIPPER USE ONLY

2. MANIFEST NUMBER: 0886-01-0012

3. PAGE 1 OF 1 PAGE(S)

4. GENERATOR IDENTIFICATION NUMBER	5. GENERATOR NAME AND TELEPHONE NUMBER	6. GENERATOR FACILITY ADDRESS	6A. WASTE DESCRIPTION (NOMENCLATURE)	7. PREPROCESSED WASTE (OR MATERIAL) VOLUME (m3)	(ft3)	8. MANIFEST NUMBER(S) UNDER WHICH WASTE (OR MATERIAL) RECEIVED AND DATE OF RECEIPT	9. WASTE CODE P = PROCESSED C = COLLECTED	10. ORIGINATING COMPACT REGION OR STATE	11. AS PROCESSED/COLLECTED TOTAL A. SOURCE MATERIAL (kg)	(lb)	B. SNM (g)	C. ACTIVITY (MBq)	(mCi)	D. VOLUME (m3)	(ft3)	E. WEIGHT (lbs)	F. MAXIMUM PACKAGE RADIATION LEVEL mrem/hr
E0012 Q	Rose-Hulman Inst. of Technology 812-877-8124	5500 Wabash Ave. CM-29 Terre Haute, IN 47803-3999	LEAD	0.7478	26.4000	0886-01-0012 (08/18/2005)	C	IN	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.7476	26.4000	2.3875	1.000E-02
TOTALS OF ALL PAGES (FORMS 542 AND 542A)									0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.7476	26.4000	2.3875	1.00E-02

Form 542 (10-95)

M.Syed: CM 173

ROSE-HULMAN
INSTITUTE OF TECHNOLOGY
5500 WABASH AVENUE
TERRE HAUTE, INDIANA 47803-3999

PLACE STICKER AT TOP OF ENVELOPE TO THE RIGHT OF THE RETURN ADDRESS, FOLD AT DOTTED LINE

CERTIFIED MAIL™

7004 2510 0000 1966 9077

Attn: Mr. Loren Hueter

USNRC, Region III

Licensing Section, Suite 210

2443 Warrenville Road

Lisle, Illinois

60532