CES

December 23, 2008

Br. 2

RECEIVED
2008 DEC 29 PM 2:32

Licensing Assistant Section
Nuclear Materials Safety Branch
U.S. Nuclear Regulatory Commission, Region I
475 Allendale Road
King of Prussia, PA 19406-1415

RE: License # 29-31105-01 03037092
Novo Nordisk, Inc.
685 U.S. Highway 1
N. Brunswick, NJ 08902

Dear Sir/Madam,

Please terminate the above-referenced radioactive materials license. There is no licensed radioactive material or radioactive waste remaining at the site. The final radiological survey indicated no residual contamination.

Enclosed please find a completed NRC Form 314 and a copy of the final survey.

If you have any questions, contact the undersigned at (609) 462-9996 or by email to Bob@CES-EHS.com.

Sincerely,
CORPORATE ENVIRONMENTAL SERVICES, INC.

Robert W. Conley, CEA
Senior Associate

Attachments

143130
NMSS/RGN1 MATERIALS-002

Corporate Environmental Services Inc.
127 West Franklin Avenue, Pennington, NJ 08534
Phone: (609) 730-0040 **Fax: (609) 730-1711** **Web: www.ces-ehs.com**

NRC FORM 314 (4-2008)
10 CFR 30.36(j)(1); 40.42(j)(1); 70.38(j)(1); and 72.54(k)(5)(1)(1)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0028 EXPIRES: 08/31/2010

Estimated burden per response to comply with this mandatory collection request: 30 minutes. This submittal is used by NRC as part of the basis for its determination that the facility is released for unrestricted use. Send comments regarding burden estimate to the Records and FOIA/Privacy Services Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0028), 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.

CERTIFICATE OF DISPOSITION OF MATERIALS

LICENSEE NAME AND ADDRESS	LICENSE NUMBER	DOCKET NUMBER
Novo Nordisk, Inc. 685 Highway Route 1 North Brunswick, New Jersey 08902	29-31105-01	03037092
	LICENSE EXPIRATION DATE 12/31/2015	

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:

☑ 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.

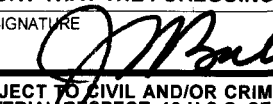
The person to be contacted regarding the information provided on this form:

NAME	TITLE	TELEPHONE *(Include Area Code)*	E-MAIL ADDRESS
Robert Conley	Consultant	(609) 730-0040	BOB@CES-EHS.COM

Mail all future correspondence regarding this license to:
Ted Bielicky, Facility Manager, Novo Nordisk Inc., 100 College Road West, Princeton, NJ 08540

C. CERTIFYING OFFICIAL

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

PRINTED NAME AND TITLE	SIGNATURE	DATE
J.T. BIELICKY, DIRECTOR OF FACILITIES		12/23/08

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.

Decommissioning Survey
Novo Nordisk Research

685 U.S. Highway 1
N. Brunswick, New Jersey 08902

NRC License # 29-31105-01

December 2008

Prepared by

Scott Dennerlein & Associates, LLC
32 Mayetta Landing Road
West Creek, NJ 09092

Decommissioning Survey Report
Novo Nordisk Research Center

Table of Contents

I. Introduction

On September 7, 2008, Scott Dennerlein & Associates, LLC, conducted a decommissioning survey (survey) for Novo Nordisk Inc. in their Research Center located at 685 Highway Route 1, North Brunswick, New Jersey (facility). The intent of the survey was to document the final radiological conditions in a laboratory, formerly utilized for radioactive material research. This laboratory and the entire facility will be vacated and a request to terminate the existing Nuclear Regulatory Commission license accompanies this survey report.

This survey was planned and conducted according to the methods presented in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). MARSSIM provides guidance on determining the number of data points required in each survey unit; the interpretation of survey results; choice of instrumentation; and data reduction. Values for contamination-to-dose conversions are obtained from the "Regulatory Guide on Release Criteria for Decommissioning" (NUREG-1500). Much of the Quality Assurance plan is developed based on an EPA document, "Guidance for the Data Quality Objectives Process". (EPA /600/R-96)

II. Site Description and History

This facility is leased space situated in a research park comprised of several buildings along a commercial stretch of south-bound U.S. Highway 1. The NRC license (29-31105-01) is a specific license, limited to non-volatile forms, and was issued in November, 2005. The first shipment of radioactive material was received approximately two years later. Licensed material in any form (i.e. stock vials and waste) was handled and stored exclusively in Laboratory 267. During operations, a single cart was dedicated to transport packages of licensed material from the loading dock to the laboratory. A spreadsheet showing the dates and activity for the total of four radioactive material shipments received for the duration of the license is included as Appendix A. The four shipments were utilized in several projects over a one year period from the fall of 2007 to the fall of 2008. No waste was shipped offsite during that time, as it was being held for decay. The manifest for the single waste shipment conducted at the completion of the this survey is included in Appendix B. Routine monthly surveys during active use did not revealed any contamination in the lab. The licensee has no other State of New Jersey radioactive material license.

III. Radio-nuclides of Concern

Although three isotopes are listed on the license, I-125 was the only isotope received and handled at this facility. In the year prior to the survey, all radiological work was limited to millicurie amounts of Iodine 125. Samples were prepared in a fume hood in Laboratory 267 and placed into beta plates which were sealed prior to removal and counting on a reader in Laboratory 267.

IV. Release Criteria

A Total Effective Dose Equivalent (TEDE) of 25 millirem per year has been set in Subpart E - Radiological Criteria for License Termination, Title 10 of the Code of Federal Regulations, Part 20.1402. However, that regulation also invokes the ALARA principle. That is "...the NRC will consider that the licensee has complied with the ALARA requirement if the licensee can demonstrate that the TEDE to the average member of the critical group does not exceed 3 millirem per year".

This facility was decontaminated such that, at a maximum, the highest Total TEDE received by an individual occupying the facility after release would be 3 millirem. For comparison, the typical range of TEDE in the United States is 200 – 400 millirem per year. This hypothetical dose is based on the building occupancy scenario/model of NUREG/CR5512, which, in turn, is used to calculate the surface contamination limits presented in Table B-1 of NUREG 1500. That value for I-125 is presented in Table 1, below.

Table 1

Surface Contamination Values which Deliver 3 mrem/y Using the Building Occupancy Scenario.

Radionuclide	**Surface Contamination** ($dpm/100cm^2$)
^{125}I	32,000

V. Residual Radioactivity Limits

Residual radioactivity limits are called Derived Concentration Guideline Levels (DCGL) in MARSSIM. Since the detection of surface contamination with current field instrumentation is essentially a "gross beta/gamma" measurement which cannot distinguish specific radio-nuclides, the most restrictive value of the listed radio-nuclides would normally be selected as the DCGL. However, the footnote to Table B-1 of MARSSIM states "For most radio-nuclides, based on the ALARA principle and best industry practice, it is not necessary to leave contamination in excess of 5,000 dpm/100cm^2 ". Therefore, the DCGL for this project will be 5,000 dpm/100cm^2, with the knowledge that this value would deliver a TEDE far less than 3 mrem/y.

VI. Survey Units

The facility was surveyed as a Class 1 survey unit according to the MARSSIM classification scheme. Class 1 areas are rooms where unsealed forms of radioactive materials were used until the close of research activities, and/or material used in the past with half-lives greater than 65 days, and/or material with half-lives less than 65 days were used within two years of the decommissioning. The use of ^{125}I in this facility falls in this category.

Class 1 areas are surveyed by scanning 100% of all horizontal surfaces, and vertical surfaces to a height of two meters. Stationary, time integrated measurements of surface activity and wipe sampling for removable contamination are conducted at random and selected locations in each survey unit. The number of measurements required in each unit is determined as specified below.

VII. Survey Design

The number of data points necessary for a given survey unit in this survey plan is based on the one sample Sign test for analysis of the data. This statistical test is appropriate when the contaminant is not present in background, or is present at such a small fraction of the DCGL as to be insignificant. Iodine 125 falls into this category of radio-nuclides. In terms of data reduction, this means the survey units are not compared to a reference (i.e. background) area, but

are compared directly to the DCGL. The equation below is then used to determine the number of data points in each survey unit as follows:

$$N = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{4(\text{sign } p - 0.5)^2}$$

We define each "data point" as a measurement location for both an integrated surface activity count and wipe sample. These are in addition to the scanning surveys conducted in each survey unit. The contamination limits for this decommissioning project are less than 5,000 dpm/100 cm^2 for total (fixed and removable) radioactivity. The first step in determining the number of samples is to define the gray region. The gray region is the range of values where the consequences of making a decision error are minor. Typically the lower boundary of the gray region (LBGR) is one half of the DCGL, therefore the shift or delta (Δ) is equal to DCGL-LBGR. For this project:

$$\Delta = 5{,}000 \text{ dpm}/100\text{cm}^2 - 2{,}500 \text{ dpm}/100\text{cm}^2$$

The next step is to estimate the standard deviation of the measurements of the contaminants. If results from characterization surveys are not available, it is reasonable to assume a relative standard deviation of 30%. The DCGL and LBGR are then expressed in counts per minute (i.e. the "raw" data) based on 13% efficiency for the detection of I-125 and a 5 cm^2 probe. This would make the gray region from 33 cpm to 17 cpm. Thirty percent of the DCGL would give a standard deviation of 10. The relative shift would then be;

$$\Delta/\sigma = (33-17)/10 = 1.6$$

The value of Sign p as obtained from Table 5.4 in the MARSSIM manual for a relative shift of 1.6 is 0.945201.

The acceptable error rates for this project are 0.10 for a Type I error and 0.05 for a Type II error. That is, there is a 5% chance of releasing a survey unit that, in reality does not meet the release criteria (Type I). Conversely, there is a 90% chance of not releasing a survey unit that truly does meet the release criteria. The percentiles, $Z_{1-\alpha}$ and $Z_{1-\beta}$ represented by these decision errors are 1.645 and 2.326.

Substituting all the values determined into the above equation gives the number of data points, N as;

$$N = \frac{(1.645 + 2.326)^2}{4\,(0.945201-0.5)^2} = 20$$

The number of data points is increased by 20% to account for missing or unusable data, making

$$N = 20 \times 1.2 = 24$$

As a check on this calculation, the number of data points necessary based on the error rates and relative shift was also determined using Table 5.5 in MARSSIM. That value is 24 data points. Therefore, at least 24 data points were collected in the facility.

In the typical laboratory setting, any contamination encountered is most likely isolated spots. In Section 5.5.2.4 of MARSSIM, it states that the preceding statistical tests are appropriate for uniformly distributed contamination, and operational procedures must be employed to address "hotspots". Specifically, "systematic measurements and sampling, in conjunction with surface scanning, are used to obtain an adequate assurance level that small areas of elevated radioactivity will satisfy the release criterion." The method employed for this survey includes enough randomly located data points to satisfy the statistical test, as well as 100% survey coverage of bench tops, hood interiors, sinks, and floors in front of bench tops to detect small areas of elevated activity.

VIII. Equipment and Techniques

The type of detector used for both the scanning and fixed location measurements was a recently calibrated (See Appendix D) thin crystal sodium iodide probe (Ludlum model 44-3) connected to a scaler/ratemeter. To scan areas the probe was moved at a speed of one probe width per second at a height of approximately ¼ inch, utilizing the audio output to locate hotspots. There was 100% coverage of all horizontal surfaces, inside drawers, hoods, and the walls. After the scanning survey, fixed location measurements were obtained with the same probe and a five minute integrated count at twenty four locations. These locations were chosen at random, and correspond to some of the areas where wipe samples were obtained.

Approximately sixty areas were selected to collect wipe samples for removable contamination by wiping a one-inch dry filter paper over a two hundred square centimeter area. A floor plan and photo documentation of the surveyed area is provided in Appendix E, indicating the measurement locations. Table 2 lists the field detector, laboratory equipment and their associated parameters.

Table 2

Detection Sensitivities for Survey Instrumentation

Detector	Probe area (cm^2)	Background (cpm)	Efficiency (cpm/dpm) 4π	Approximate Sensitivity L_c counts	L_D counts	MDC dpm/100 cm^2
44-3	5	147	0.11 (^{129}I)	28	59	2,159
Packard LSC 0-70 keV	N/A	42	0.50 (^{125}I)	15	33	66

Where ;

$L_c = 2.33\sqrt{B}$ $\quad L_D = 3 + 4.65\sqrt{B}$ $\quad MDC = \frac{3 + 4.65\sqrt{B}}{T\,\varepsilon_T A}$

*where T = integrated count time
ε_T = total efficiency
A = area of probe / 100 cm^2
B = background countrate

IX. Statistical Test of Measurement Results

The statistical test is simply, how many data points exceed the release criteria (represented by a value of -1) versus the number that are below the release criteria (represented by a value of 1). The critical value for twenty-four measurements is seventeen must be positive (i.e. below the release criteria). The "ceiling value" for hot spots is three times the release criteria (i.e. no single spot regardless of size can exceed 15,000 dpm/100 $cm^{2)}$.

The values used in Table 3 are from the static meter readings. The wipe samples were used to assess removable contamination, and those results, all below the instruments MDC, were not included in this statistical test. (Wipe number 19, was the maximum gross count 94 cpm minus 42 cpm background, 50% efficiency and 200 cm^2 area wiped corrected to 100 cm^2 equals 52 dpm/ 100 cm^2). Raw data from the wipe sample analysis is presented in Appendix C.

X. Results/Findings

There is no residual contamination at this site and it is suitable for release for unrestricted use.

Table 3
Sign Test of Lab 267 Survey Measurements

Location	Gross Counts	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
6	742	1	255	4745	1
7	717	-4	-655	4345	1
8	728	-1	-255	4745	1
9	703	-6	-1164	3836	1
10	698	-7	-1345	3655	1
15	741	1	218	4782	1
18	744	2	327	4673	1
20	728	-1	-255	4745	1
22	758	5	836	4164	1
24	722	-3	-473	4527	1
26	759	5	873	4127	1
33	749	3	509	4491	1
34	762	5	982	4018	1
35	767	6	1164	3836	1
38	711	-5	-873	4127	1
40	688	-9	-1709	3291	1
42	709	-5	-945	4055	1
43	754	4	691	4309	1
44	763	6	1018	3982	1
floor	731	-1	-145	4855	1
fllor	732	-1	-109	4891	1
floor	718	-3	-618	4382	1
floor	750	3	545	4455	1
sink	734	0	-36	4964	1
Number of Positive Differences					24

Notes:

- Background (147 cpm); Efficiency (0.11); Probe Area/100cm2 (0.05); Count Time (5)
- The number of positive values exceeds the critical value of 17, (obtained from Table I.3 in MARSSIM) so the null hypothesis ("The residual radioactivity in the survey unit exceeds the release criterion") is rejected and it is concluded that the survey unit meets the release criterion.
- The numbers in the location column reference the numbered locations shown in the decommissioning survey photographs.

XI. References

U.S. Nuclear Regulatory Commission (NRC), NUREG/CR-5849, *Manual for Conducting Radiological Surveys in Support of License Termination.* Draft Report for Comment, June 1992

U.S. Nuclear Regulatory Commission (NRC), NUREG-1500 *Working Draft Regulatory Guide on Release Criteria for Decommissioning.*. Draft Report for Comment, August 1994

U.S. Nuclear Regulatory Commission (NRC), NUREG-1505 *A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys*. Draft Report for Comment, August 1995

U.S. Nuclear Regulatory Commission (NRC), NUREG-1506 *Measurement Methods for Radiological Surveys in Support of New Decommissioning Criteria*. Draft Report for Comment, August 1995

U.S. Nuclear Regulatory Commission (NRC), NUREG-1507 *Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions*. Draft Report for Comment, August 1995

U.S. Nuclear Regulatory Commission (NRC) *Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material.*, Policy and Guidance Directive FC 83-23. November1983

Environmental Protection Agency (EPA) EPA 540/G-93/071 *Data Quality Objectives Process for Superfund.* Washington, DC 1994

Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)

Appendix A
Radioactive Material Inventory

I-125 Inventory as of 10/10/2008		
Initial activity (μCi)	Ref. Date	Elapsed # of Days	Current activity (μCi)
30	11/10/07	329.0	0.67712
20	01/07/08	272.0	2.314115
8900	04/02/08	187.0	2020.443
25	07/29/08	70.0	14.35131
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
		Total	2037.785 μCi

License Limit 20,000 μCi **Percent of license limit** 10%

Appendix B
Waste Disposal Manifest

VEOLIA
ENVIRONMENTAL SERVICES

SHIPPING DOCUMENT	1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Shipping Document Tracking Number
	N J R 0 0 0 0 5 4 4 6 2	1	(877) 918-0087	ZZ 00104162

5. Generator's Name and Mailing Address: NOVO NORDISK INC, 800 US HWY 1, NORTH BRUNSWICK, NJ 08902
Generator's Site Address (if different than mailing address): SAME
Generator's Phone: 732 214-2428

6. Transporter 1 Company Name: DART TRUCKING COMPANY, INC. — U.S. EPA ID Number: O H D 0 9 8 6 3 2 5
7. Transporter 2 Company Name — U.S. EPA ID Number:
8. Designated Facility Name and Site Address: DURATEK, INC., 1560 BEAR CREEK ROAD, OAK RIDGE, TN 37830 — U.S. EPA ID Number:
Facility's Phone: 865 481-0222 — N G T R E Q 1 8 0

9a. HM	9b. U.S. DOT Description (Including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Codes		
X	1 UN2910, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE-LIMITED QUANTITY OF MATERIAL, 7	0 0 1	DM	00040	P	NONE		
X	2 UN2910, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE-LIMITED QUANTITY OF MATERIAL, 7	0 0 1	D F	00040	P	NONE		
	3.							
	4.							

14. Special Handling Instructions and Additional Information: 1) DRY ACTIVE WASTE WI-125 2) NON-HAZARDOUS LIQUID SCINTILLATION VIALS
WI-125 -I- ER Service Contracted by VESTS

16. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator's/Offeror's Printed/Typed Name: Eva H. N. Olsen — Signature: Eva H. N. Olsen — Month 1 0 Day 0 8 Year

INT'L
16. International Shipments: ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit: Date leaving U.S.:
Transporter signature (for exports only):

TRANSPORTER
17. Transporter Acknowledgment of Receipt of Shipment
Transporter 1 Printed/Typed Name: CARL CHILSON — Signature: — Month 1 0 Day 0 8 Year
Transporter 2 Printed/Typed Name — Signature — Month Day Year

DESIGNATED FACILITY
18. Discrepancy
18a. Discrepancy Indication Space: ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Shipping Document Tracking Number:
18b. Alternate Facility (or Generator) — U.S. EPA ID Number
Facility's Phone:
18c. Signature of Alternate Facility (or Generator) — Month Day Year
19. Report Management Method Codes (i.e., codes for treatment, disposal, and recycling systems)
1. 2. 3. 4.
20. Designated Facility Owner or Operator: Certification of receipt of shipment except as noted in Item 18a
Printed/Typed Name — Signature — Month Day Year

TRANSPORTER 2 OR BROKER COPY

Appendix C
Raw Data from Liquid Scintillation Counter

Liquid Scintillation Counter
Wipe Identification

Counter: Packard QuantaSmart Serial # 433172

Loaded By: S. Dennerlein Count Date 10/7/2008

Sample Type: Wipes

Sample	Description
1-16	View A wipes 1-16
17-24	View B wipes 17-24
25-28	View C wipes 25-28
29-32	View D wipes 29-32
33-36	View E wipes 33-36
37-44	Air Handling system wipes 37-44
45	Fisher vortex ID#266
46	Fisher mini centrifuge ID#267
47	Fisher oven ID#268
48	Refrigerator ID#270
49-52	Rad package transport cart
53	Floor outside lab 267
54	Floor in hallway
55	Floor in hallway
56-60	Background wipes

Comments: Decommissioning Survey Lab 267,

Assay Definition-

Assay Description:

Assay Type: CPM
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\Default\125I Wipe test\20081007_1723
Raw Results Path: C:\Packard\Tricarb\Results\Default\125I Wipe test\20081007_1723\20081007_1723.results
Comma-Delimited File Name: C:\Packard\Tricarb\Results\Default\125I Wipe test\20081007_1723\Report1.csv
Assay File Name: C:\Packard\TriCarb\Assays\125I Wipe test.lsa

Count Conditions-

Nuclide: 125I
Quench Indicator: SIS
External Std Terminator (sec): n/a
Pre-Count Delay (min): 0.00
Quench Set: n/a
Count Time (min): 1.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

Background Subtract: Off
Low CPM Threshold: Off
2 Sigma % Terminator: Off

Regions	LL	UL
A	0.0	70.0
B	6.0	70.0
C	0.0	0.0

Count Corrections-

Static Controller: On Luminescence Correction: Off
Colored Samples: n/a Heterogeneity Monitor: n/a
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time
A				
B				
C				

Instrument Block Data
Machine=Tri-Carb 2900TR
Version=2.06
433172
MODEL=Tri-Carb 2900TR
VERSION=2.06
SERIAL=433172

Cycle 1 Results

S#	CPMA	CPMB	SIS	MESSAGES
1	59	20	27.56	
2	43	15	40.72	
3	40	14	31.98	
4	42	16	27.34	

5	43	18	32.06
6	66	11	16.24
7	68	18	11.88
8	42	15	35.50
9	44	15	25.35
10	50	12	21.38
11	34	6	16.52
12	37	13	28.62
13	32	11	31.00
14	84	11	10.63
15	49	17	24.81
16	17	14	15.96
17	46	12	19.64
18	36	17	45.52
19	94	30	24.89
20	43	37	19.37
21	30	16	37.72
22	24	12	42.67
23	28	10	37.60
24	16	8	51.26
25	32	11	32.05
26	25	10	28.42
27	26	15	32.53
28	31	12	34.94
29	37	15	32.15
30	24	8	34.04
31	45	13	23.95
32	35	18	45.01
33	54	13	20.91
34	24	8	35.64
35	46	18	8.20
36	28	15	46.89
37	30	14	39.88
38	34	16	32.86
39	40	11	7.57
40	91	12	13.07
41	19	10	9.78
42	20	8	31.94
43	29	16	41.37
44	32	13	30.60
45	19	10	47.85
46	13	6	39.94
47	28	15	46.20
48	37	16	32.37
49	36	10	25.79
50	25	8	24.49
51	38	11	26.05
52	26	15	52.78
53	26	8	22.44
54	33	15	38.06
55	30	12	30.66
56	26	15	35.74
57	81	11	12.54
58	30	16	40.71
59	30	8	22.79
60	44	24	14.51

Appendix D
Hand Held Meter Certificate of Calibration

Certificate of Calibration

Calibrated For: **Scott Dennerlein & Associates, LLC**

Meter: **Ludlum model 3 # 82362** Probe: **44-3 #0104729**

Voltage Setting: 900v **Background: 147 cpm**

Linearity Test

Scale/Range	Calibration Point	As Found	As Calibrated	Calibration Point	As Found	As Calibrated
0-500	100	100	100	400	400	400
0-5k	1,000	1,000	1,000	4,000	4,000	4,000
0-50k	10,000	10,000	10,000	40,000	40,000	40,000
0-500k	100,000	100,000	100,000	400,000	400,000	400,000

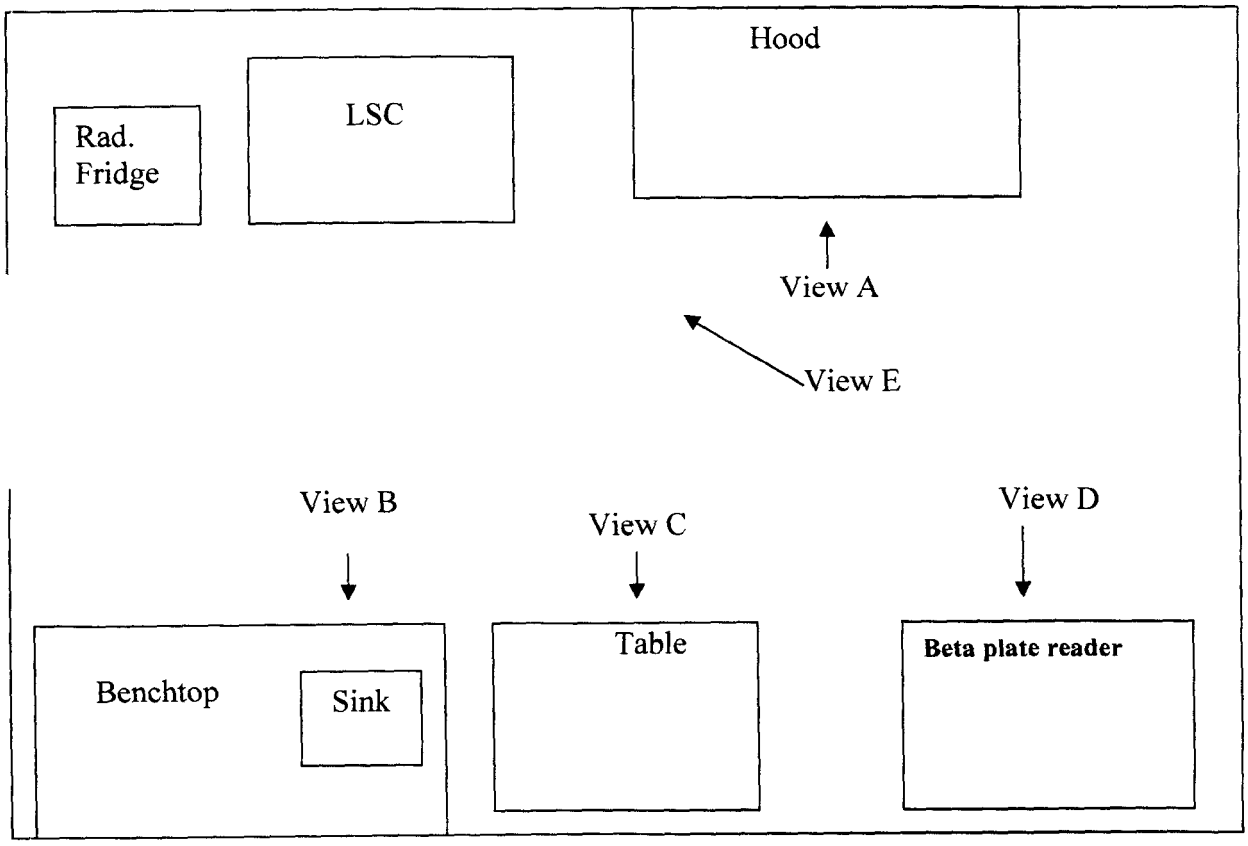
Beta Efficiency Determination

Isotope / serial#	NIST Activity	Net Counts	cpm/dpm 4π
C-14 841-31-3	224,442	N/A	
Pm-147 841-36-2	21,674	N/A	
Tc-99 841-32-1	23,510	N/A	
Cl-36 841-33-2	22,289	N/A	
Sr/Y-90 841-35-2	22,711	N/A	

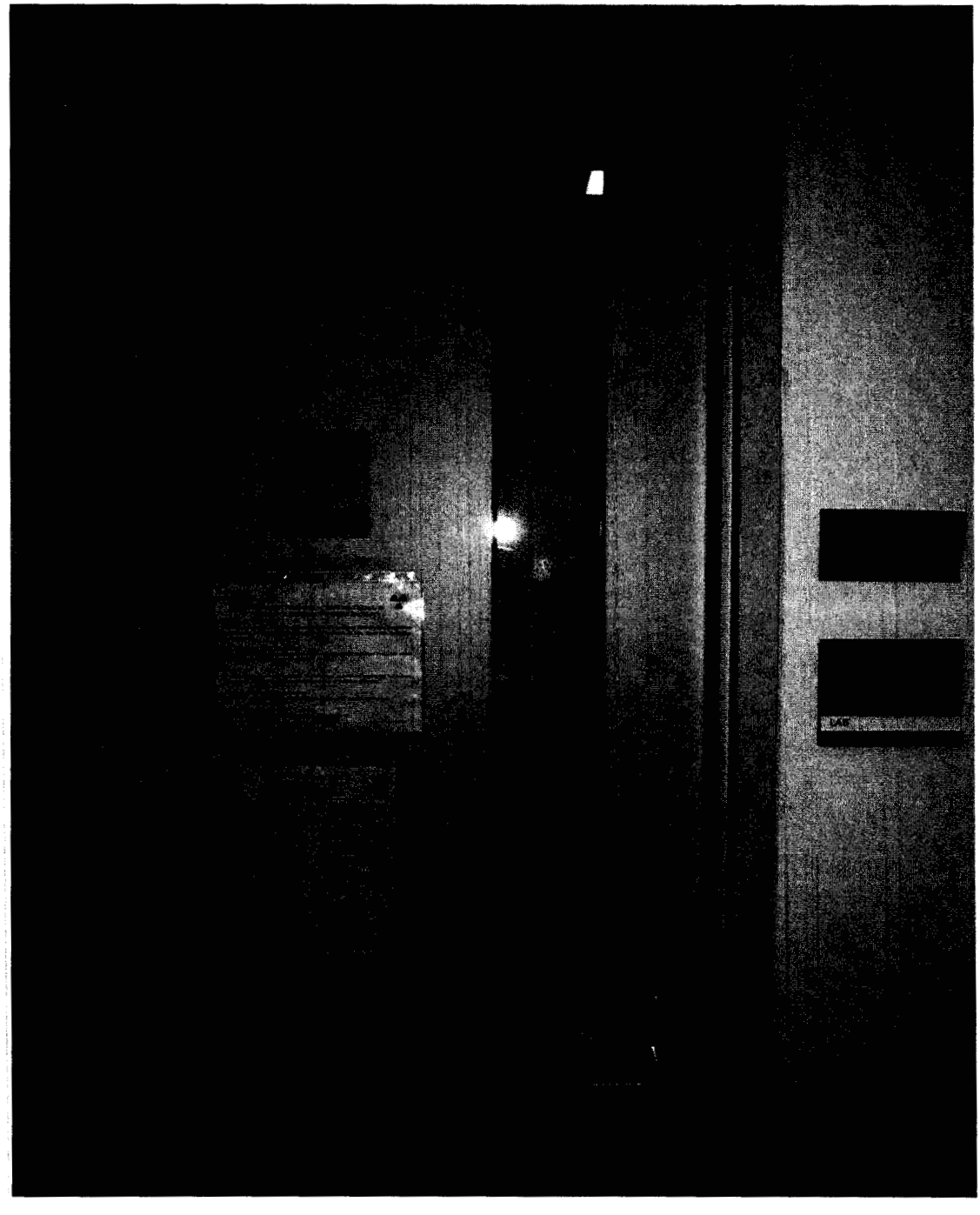
Comments: Efficiency to I-129 source 11%

NRC Calibration License # 29-30366-01 **Date:** 6/3/2008

Appendix E
Survey Measurement Locations and Photographs

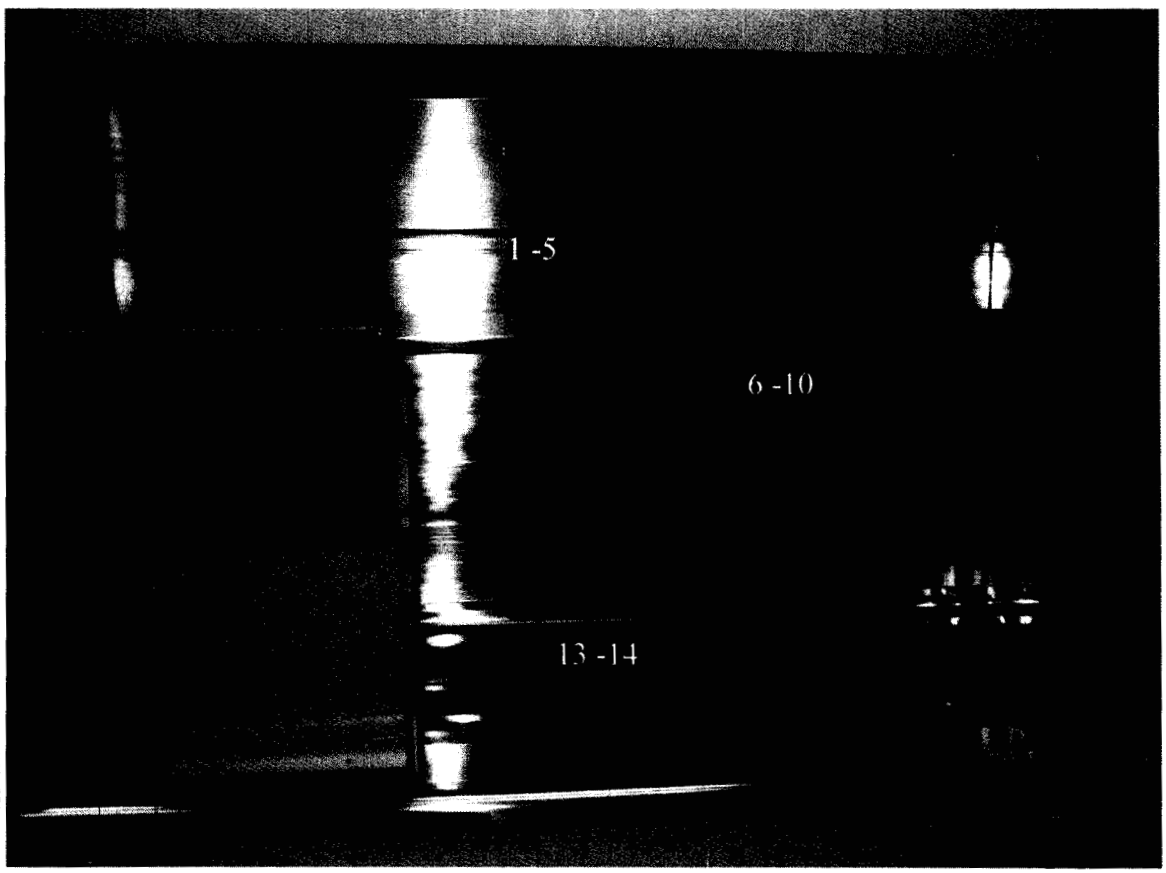


Layout of Laboratory 267



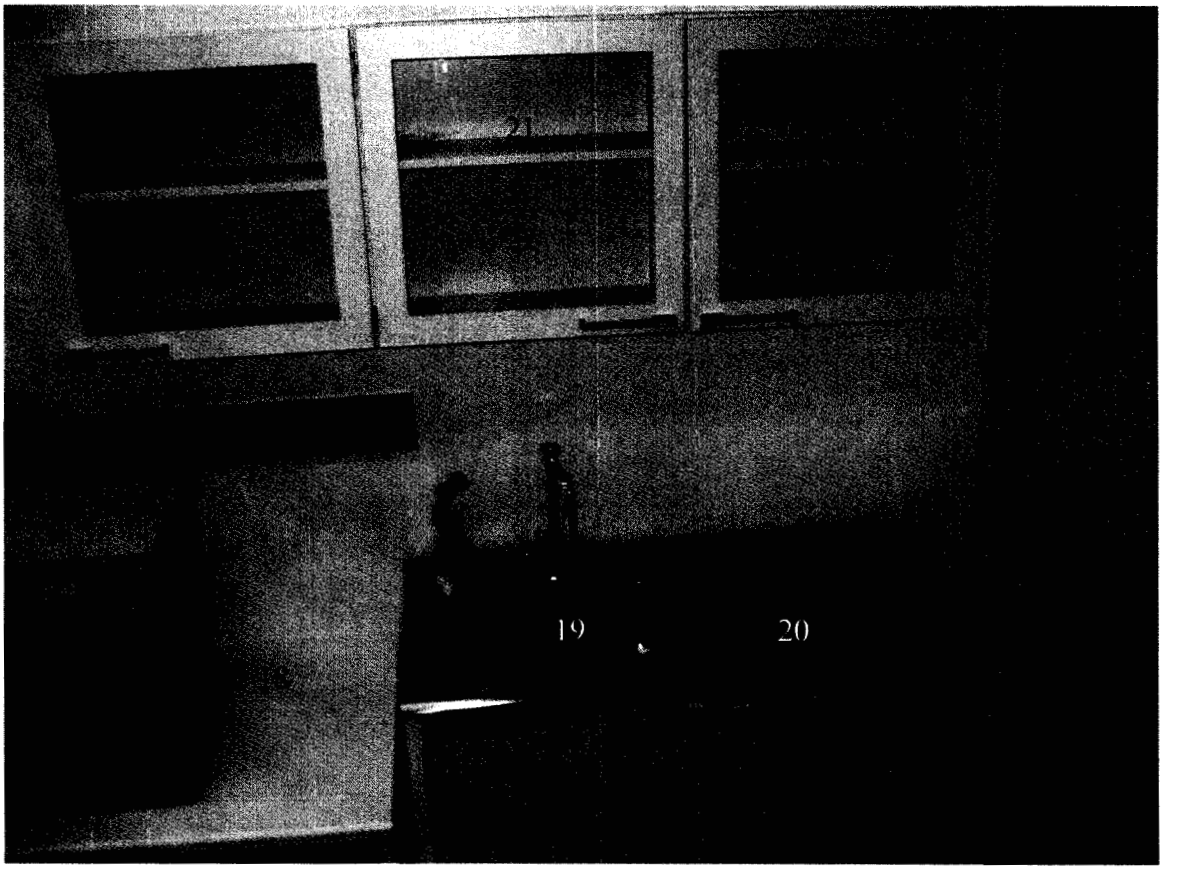
Entrance to Laboratory 267

This laboratory was the only location of radioactive material use and storage for the entire history of the radioactive materials license.



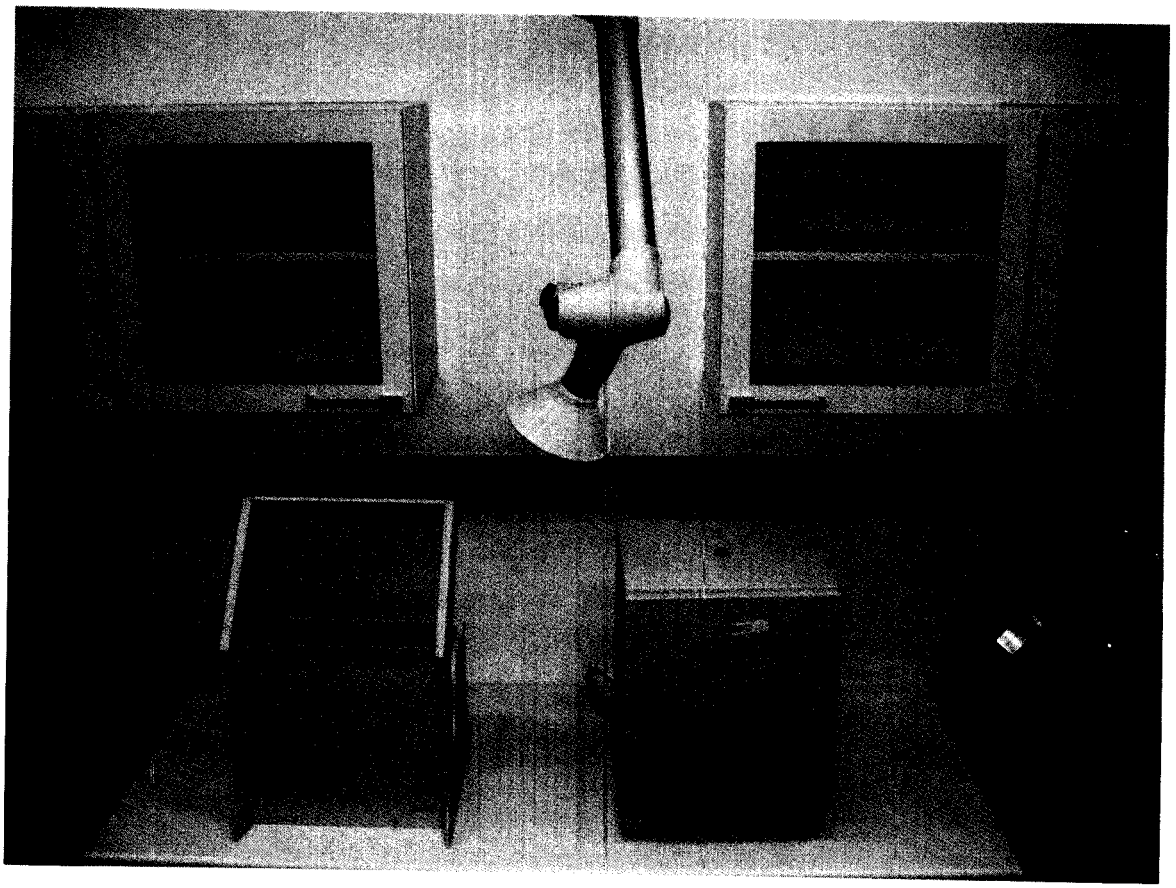
View A

Hood sample locations are 1-5, behind the rear baffle top and bottom, 6 – 10 the top, bottom, left, right, and sash inside. 11 and 12 are the shield, 13-14 behind baffle, 15 – 16 on the floor in front of the hood.



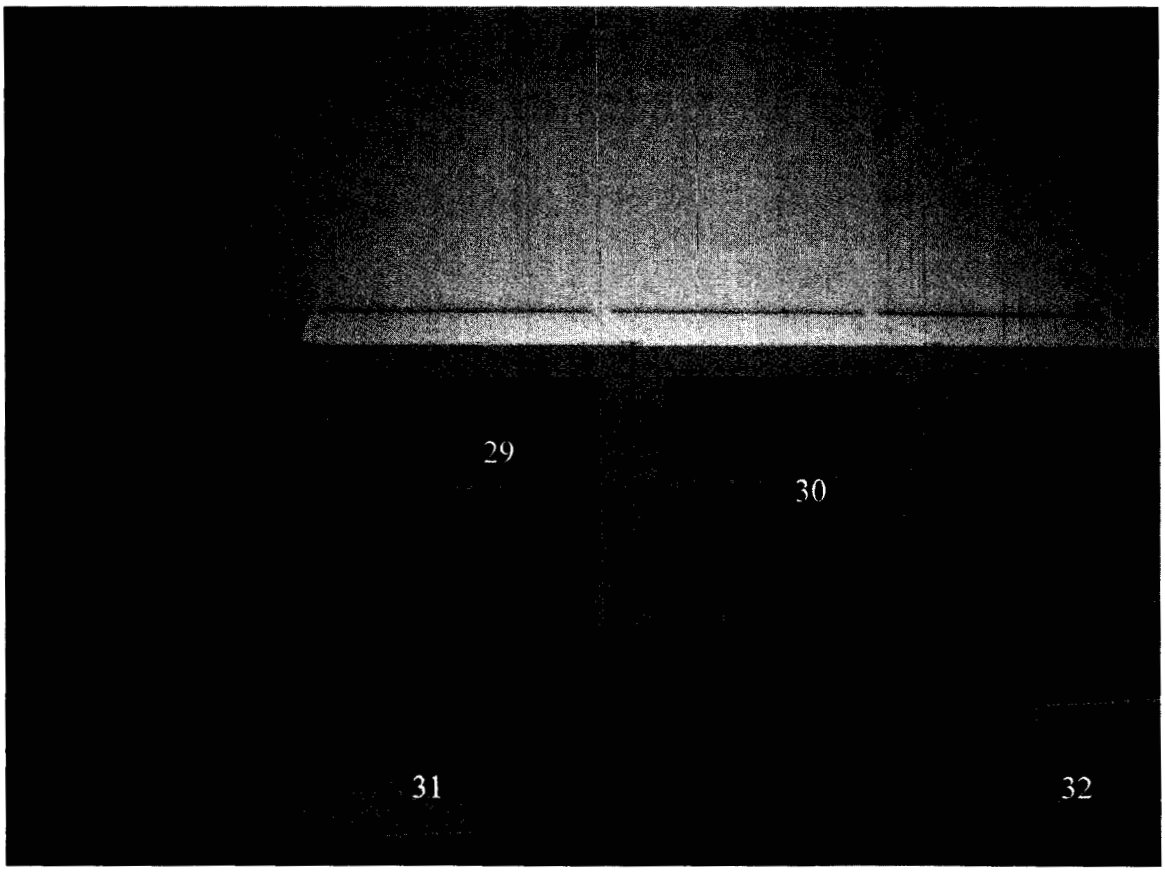
View B

On the cabinets the odd numbered sample locations are on the outside and even numbered sample locations are on the inside. Number 17 was the inside of the oven.



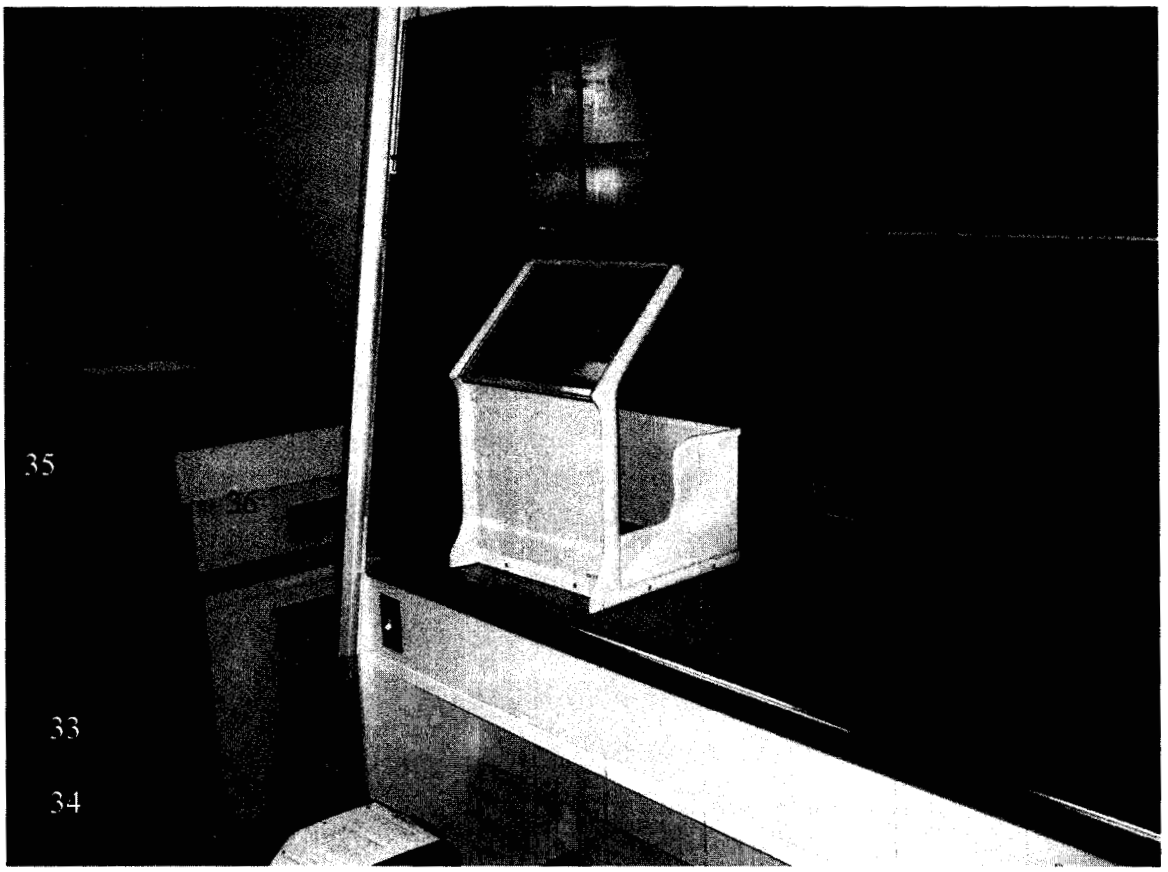
View C

Locations 25 – 28 were the cabinets. Sample location number for the lead shield is shown in View D.



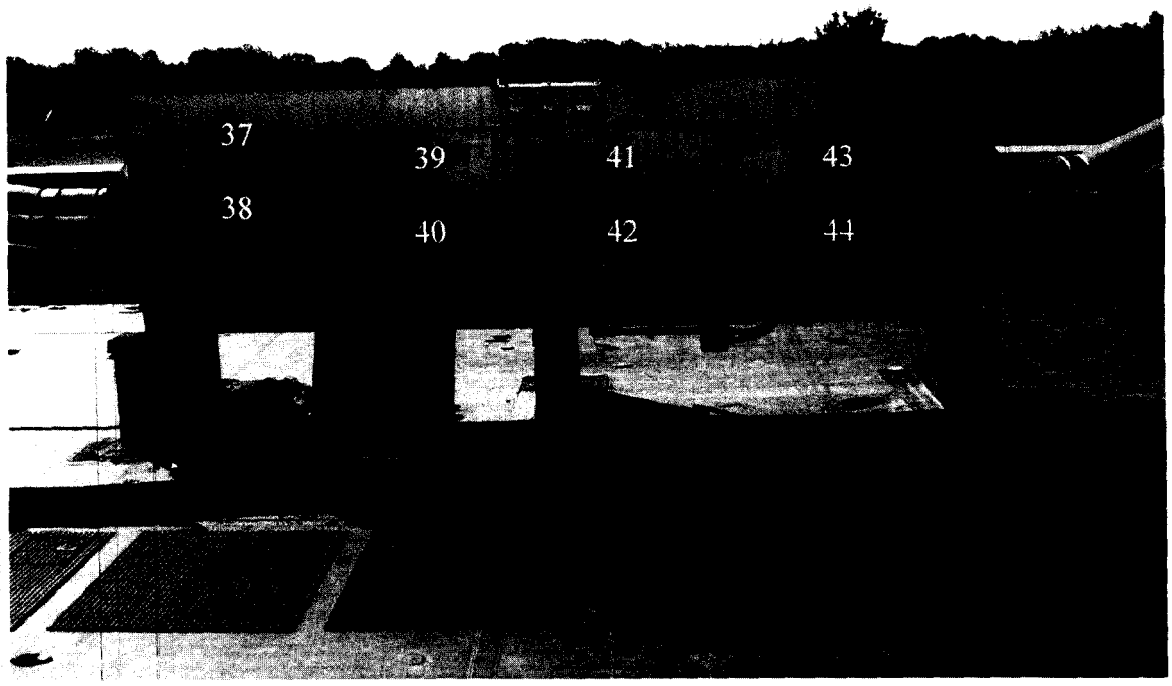
View D

Location 31 was the loading area of the beta plate reader.



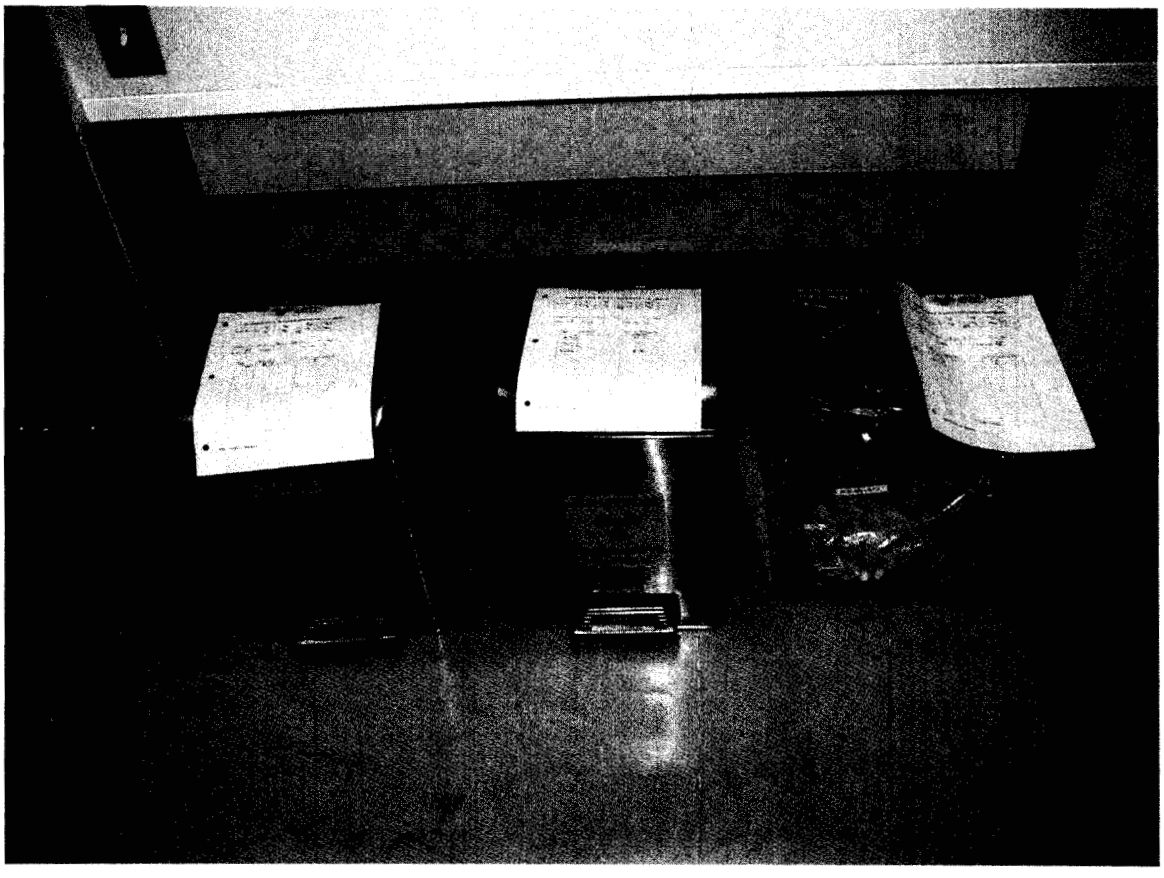
View E

Locations 33 and 34 were on the floor. Location 35 was the small refrigerator and location 36 was the LSC.



Roof Top Air Handling System

The air handling system is solely dedicated to Laboratory 267. From the right, the effluent air passed through a roughing filter, a HEPA filter and finally a charcoal filter. All filters were removed, surveyed and replaced. The entire inside of the housing was also surveyed. All the wipe locations indicated were inside the system. The direct survey and the results from the wipe samples indicated no contamination.



Waste Containers

This photograph illustrates the total volume of waste for the entire history of radioactive material use at this facility. The outside of the containers were surveyed to ensure the absence of contamination and then placed just outside the laboratory during the survey. The scintillation vials from the decommissioning survey were added to the existing containers of vials prior to the waste being shipped offsite for disposal.

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