



DuPont Facilities Services and Real Estate
DuPont Experimental Station E322
200 Powder Mill Road
PO Box 8352
Wilmington, DE 19803

RECRG10812'14AM07:02

Docket No. 03020681
Control No. 584013

License No. 07-13441-02

U.S. Nuclear Regulatory Commission
USNRC – Region I
2100 Renaissance Blvd, Suite 100
King of Prussia, PA 19406-2713

J6
03020681

August 8, 2014

RE: E.I. du Pont de Nemours and Company, Inc., Request for Additional Information Concerning Application for a License Amendment, Control 584013

Dear Mr. Dennis Lawyer,

This is in reference to your letter dated July 9, 2014, requesting additional information related to the amendment to the Nuclear Regulatory Commission License No. 07-13441-02, Docket No. 03020681. The additional information you requested is provided here in order to address and clarify each of the five (5) points/concerns that you have raised. This additional information is intended to supplement the documentation you have already received in the, *Addendum: Documentation for the Materials Decommissioning Process for the Glasgow Site (DuPont, 2014)* in hopes of providing further clarity with respect to our request for the Amendment to US NRC Radioactive Material License Number 07-13441-02 (DuPont, 2014). Specifically, the additional information is provided through an amendment to the original *Addendum: Documentation for the Materials Decommissioning Process for the Glasgow Site (DuPont, 2014)* and identified through the addition of Appendix A9 to the aforementioned Addendum, (please see; *Appendix A9: Site Final Status Survey Report (FSS) Revised August 8, 2014* (revisions are highlighted with red text).

If you have any questions pursuant to this request, Mr. John M. Brisbin, DuPont Radiation Safety Officer, may be contacted for any additional information at (302) 695-6896, cell (302) 420-2233, facsimile (302) 695-4032, or by E-mail at JOHN.M.BRISBIN@dupont.com.

Sincerely,

John M. Brisbin
DuPont Radiation Safety Officer

Experimental Station, E249/207
200 Powder Mill Road
PO Box 8352
Wilmington, DE 19803

For the US NRC Radioactive Material License Number 07-13441-02
C/o E.I. du Pont de Nemours and Company, Inc.
Stine-Haskell Research Center
P.O. Box 30
Newark, DE 19714-0030

584013
NMSS/RGN1 MATERIALS-002



Appendix A9: Site Final Status Survey Report (FSS) Revised August 8, 2014

Addendum: Documentation for the Materials Decommissioning Process for the Glasgow Site

Appendix A: Decommission Documentation and Records

A9: Glasgow Site Final Status Survey Report (FSS) Revised August 8, 2014

2309 Sunset Lake Road, Newark, Delaware

US NRC Radioactive Material License Number 07-13441-02

DuPont Radiation Safety Office:

John M. Brisbin, DuPont Radiation Safety Officer

Appendix A: Decommission Documentation and Records:

A1: NRC Notification and Correspondence Related to the Glasgow Site

A2: Glasgow Site Maps and Areas of Radiological Concern

A3: Glasgow Site Final Status Survey Report (FSS)

A4: Glasgow Site Sealed Source Leak Test Results

A5: Glasgow Site Radiation Safety Program Decommissioning Documentation

A6: Glasgow Site Radiation Safety Program Area Semi-Annual Audit Documentation

A7: Glasgow Site Radiation Safety Program Area Wipe Test Logbook Documentation

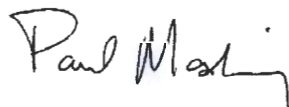
A8: Form 314 – Certificate of Disposition of Materials

A9: Glasgow Site Final Status Survey Report (FSS) Revised August 8, 2014

**DuPont
Glasgow Facility**

FINAL STATUS SURVEY

January 2014

A handwritten signature in black ink, appearing to read "Paul Madaury".

Report Prepared By: _____
Paul Madaury, HP

**RSO, Inc.
Laurel, MD**

THIS PAGE BLANK

1.0 INTRODUCTION AND BACKGROUND

1.1 Introduction

DuPont has used and stored unsealed radioactive material in laboratory rooms at the Glasgow facility in Newark, Delaware under NRC Radioactive Materials License #07-13441-02. The use of radioactive material at this location is terminating and a final status survey was commissioned to allow the release of the laboratory rooms/areas for unrestricted use. All radioactive materials and radioactive waste were disposed in accordance with NRC regulations at licensed disposal facilities (records are available upon request). A Radiological Final Status Survey based on the guidance in NUREG 1757 (Consolidated Decommissioning Guidance), and NUREG 1575 (MARSSIM) is required to remove the building from the radioactive materials license.

The survey approaches are described below and reveal that the facilities in question meet the requirements for decommissioning.

2.0 FINAL STATUS SURVEY APPROACH

2.1 Survey Design Basis

This Final Status Survey was designed in consideration of the guidance provided by the Nuclear Regulatory Commission (NRC) regarding Final Radiological Surveys. In particular the guidance provided by the NRC in NUREG 1757 (Consolidated Decommissioning Guidance) and NUREG 1575 (MARSSIM). Using NUREG 1757, this facility meets the requirements for what is termed Group 2 facilities (see following excerpt). Group 2 includes facilities that “would not have contaminated work areas at the levels above the decommissioning screening criteria”.

From NUREG 1757 v1 Chapter 7:

Group 2 facilities may have residual radiological contamination present in building surfaces and soils. However, licensees are able to demonstrate that their facilities meet the provisions of 10 CFR 20.1402 (“Radiological Criteria for Unrestricted Use”) by applying the screening approach dose analysis described in Chapter 6.

Additionally, licensees in Group 2 typically possess historical records of material receipt, use, and disposal, such that quantifying past radiological material possession and use may be developed with a high degree of confidence. Furthermore, these licensees have radiological survey records that characterize the residual radiological contamination levels present within the facilities and at their sites. That is, they are able to demonstrate residual radiological contamination levels without more sophisticated survey procedures (greater than those used for operational surveys) or dose modeling. These licensees do not need to use site-specific parameters or establish site-specific DCGLs in order to demonstrate acceptability for release of their sites.”

Derived Concentration Guideline Levels (DCGL's) are radionuclide-specific concentration limits used by the licensee during decommissioning to achieve the regulatory dose standard that permits the release of the property and termination of the license. The DCGL applicable

to the average concentration over a survey unit is called the $DCGL_W$. The DCGL applicable to limited areas of elevated concentrations within a survey unit is called the $DCGL_{EMC}$.

2.2 Decommissioning Criteria

The Radiological Criteria for Unrestricted Use for NRC regulations 10 CFR Part 20:

“A (The) site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a TEDE to an average member of the critical group that does not exceed 25 mrem per year, including that from ground water sources of drinking water, and that the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA).”

2.3 Potential Radionuclide Contaminates and Screening Values

The use of unsealed radioactive material in the subject rooms/areas was limited to H-3 and C-14. However, it is noted that the instruments and techniques used for this survey, respond to the presence of all beta/gamma emitting radionuclides (with varying sensitivity).

The NRC has established Screening Values derived using scenarios and default values for assumptions that result in a Derived Concentration Guideline Limit (DCGL). These values have been derived for common beta-gamma emitting radionuclides for building surface contamination as published in the Federal Register (63 FR 64132, November 18, 1998) and also shown in Appendix B Table B.1 of NUREG 1757 and is a $DCGL_W$. These are values, which can also be derived using the default parameters and the computer code DandD, for the concentration (dpm/100 cm²) equivalent to 25 mrem/y.

For beta-gamma emitters the $DCGL_W$ is often higher than the facility operational contamination limits. The DCGL for H-3 and C-14 are shown in Table 2.

Table 2. $DCGL_W$ for licensed radionuclides with half-life greater than 120 days.

Radionuclide	Surface Contamination (dpm/100 cm ²)
H-3	1.2×10^8
C-14	3.7×10^6

2.4 Performance of Radiological Surveys

The final status surveys were conducted using guidance provided by the NRC in NUREG-1575, EPA 402-R-97-016, Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM): Revision 1, August 2000.

2.5 Survey Design: Area Classification

Impacted Areas

- Impacted areas are areas that may have residual radioactivity from the licensed activities.
- Non-impacted areas are areas without residual radioactivity from licensed activities.
- NRC guidance provides that non-impacted areas do not require radiological surveys.

The impacted areas at DuPont Glasgow were determined to be limited to four laboratories;

Rooms 117, 162, 162A, 177/178, 182, and 184. There is also an outdoor shed for Radioactive Waste Storage.

Area Classes

Impacted areas can be classified into one of the three classes, listed below, based on levels of residual radioactivity.

- Class 1 Areas are impacted areas that, prior to remediation, are expected to have concentrations of residual radioactivity that exceed the DCGL_w (DCGL_w is defined in Section 2.2 of MARSSIM);
- Class 2 Areas are impacted areas that, prior to remediation, are not likely to have concentrations of residual radioactivity that exceed the DCGL_w;
- Class 3 Areas are impacted areas that have a low probability of containing residual radioactivity.

Laboratory rooms and the radioactive waste storage shed were treated as a Class 2 areas where no or very limited areas of residual contamination are expected. The corridors connecting the above mentioned laboratories were surveyed as Class 3 areas.

2.6 Survey Number of Samples

MARSSIM's guidance for determination of the number of samples needed for a survey unit when the DCGL is large, the relative shift is large (>2.5), using equal values of 0.05 for Type I and Type II errors, results in a number of data points needed of 12.

Each survey other than the Radioactive Waste Storage Shed used a rectangular grid with a random start point and additional sample locations selected by the survey team. The formula used for the grid spacing was as follows (From MARSSIM Chapter 5):

$$L = \sqrt{\frac{A}{n}}$$

L = Rectangular Grid Spacing

A – Survey Area

N = Number of Samples Required

For some laboratories the random start point and grid would not yield 12 locations within the survey unit using the formulas provided by MARSSIM. Additional biased locations were used in all of these laboratories to ensure that the survey unit was thoroughly surveyed and the Data Quality Objectives were achieved.

The Radioactive Waste Storage Shed layout was restrictive for gridding, and only biased sample locations were used. Again an increase in the number of sample locations from 12 to 25 was used to ensure that the Data Quality Objectives were achieved.

A scan (floor monitor or hand-held survey meter), direct (static) measurement, wipe test, and exposure rate measurement was performed at each survey location except where noted. Additional sample locations were chosen by the discretion of the surveyor in each class 2 area including floors, bench tops, doors, and sinks to provide a detailed survey of the area.

2.7 Data Quality Objectives (MARSSIM)

Survey planning uses the *Data Quality Objectives (DQO) Process* to ensure that the survey results are of sufficient quality and quantity to support the final decision. The use of the DQO Process assures that the type, quantity, and quality of environmental data used in decision making will be appropriate for the intended application. The DQO Process consists of seven steps, as shown below. The output from each step influences the choices that will be made later in the Process.

1. State the problem. Radioactive materials (H-3 and C-14) in the form of liquids and powders were used in this facility. It was possible that the use of radioactive materials caused residual contamination on structures at levels exceeding the NRC-approved activity DCGL (Derived Concentration Guideline) for H-3 and C-14.
2. Identify the decision. Determine if residual radioactivity on structure surfaces of the laboratories and other areas where H-3 and C-14 were used with site-specific surface activity DCGLs derived as unrestricted release criteria to comply with dose limits prescribed in 10 CFR 20, Subpart E.
3. Identify inputs to the decision. Radiological survey data was collected for impacted structure surfaces.
4. Define the study boundaries. Historical analysis had identified Rooms 162, 177/178, 182, 184 and a shed for Radioactive Waste Storage as the impacted use areas. Rooms 117, and 162A were added in August of 2014 after an NRC review.
5. Develop a decision rule. Given that sufficient data has been collected, if the mean concentration in the Glasgow facility is less than the DCGL, then the facility is determined to be in compliance with the release criterion. Compliance with applicable DCGLs is demonstrated using the Sign and/or Wilcoxon Rank Sum (WRS) Tests to disprove the null hypothesis that the SU being evaluated exhibits contamination at concentrations exceeding the applicable DCGL.
6. Specify limits on decision errors. MARSSIM's guidance for determination of the number of samples needed for a survey unit when the DCGL is large, the relative shift is large (>2.5), using equal values of 0.05 for Type I and Type II errors, results in a number of data points needed of 12.
7. Optimize the design for collecting data. Since H-3 and C-14 are both low energy beta emitters, survey equipment and sampling techniques were appropriately chosen to optimize efficiency for these two isotopes.

3.0 SURVEY METHODS AND INSTRUMENTS

3.1 Survey Instruments

Exposure Rate Measurements

Gamma exposure rates were measured, at waist level, using a Victoreen 450P survey meter (internal pressurized ion chamber) in all of the laboratory areas.

Beta Scan Survey

Surface scanning speeds were 2 detector widths per second. To optimize detection of elevated radiation levels (1.5 to 3 times background) during scanning, audible speakers were used in addition to noting the fluctuations in the analog meter reading. Floor scans were completed using a Ludlum Model 2221 with a Ludlum 43-37 probe (gas proportional detector, thin window of 0.8 mg/cm² with an area of 584 cm²). All other scans were completed using a Ludlum Model 2221 with a Ludlum 43-68 probe (gas proportional detector, thin window of 0.8 mg/cm² with an area of 126 cm²).

Class 2 Areas.

Laboratory floors, bench tops, tabletops, walls (up to 2 m), and hoods were all scanned 100% for accessible surfaces. Cabinets and drawers were 25% scanned for applicable laboratories.

The Radioactive Waste Shed floor, subfloor, and walls up to 2 meters were 100% scanned.

Class 3 Areas.

Floors of the hallways for connecting laboratories were 100% scanned.

Static (Direct) Measurements of Surfaces

Static radiation measurements for beta/gamma surface contamination were performed at random and biased locations using a Ludlum Model 2221 with a Ludlum 43-68 probe (gas proportional detector, thin window of 0.8 mg/cm² with an area of 126 cm²). Measurements were conducted by integrating a 1-minute count time with the probe in direct contact with the surface.

Removable Contamination

A wipe test for removable contamination was performed at each survey location. The wipe test consisted of wiping 100 cm² of the surface with a dry paper, using moderate pressure, and measuring the amount of radioactive material on the test material using a liquid scintillation counter. Wipe tests were placed into liquid scintillation vials with fluid immediately to ensure accurate tritium (H3) results.

Quality Assurance

Survey meters used to perform the Final Status Survey had been calibrated within 12 months of their use using radioactive standards traceable to NIST. Also, performance checks were completed on each survey meter at the beginning of the survey.

The laboratory instruments used by RSO, Inc. to analyze the wipe tests were maintained under RSO's laboratory quality assurance program which includes a service agreement with the manufacturer, daily quality control performance charts and background and standard samples counted with every sample batch.

3.2 Survey Personnel and Resources

Personnel Qualifications

All personnel had levels of training and experience commensurate with their assigned tasks. For those individuals involved in taking radiological measurements and samples, special

instruction was provided when necessary on equipment, special techniques, and practices relating to survey activities.

Laboratory Services

Wipes or swabs were screened for gross gamma activity and further were analyzed for gross beta/gamma activity. All wipes for the final survey were analyzed by RSO, Inc.

4.0 SURVEY RESULTS

4.1 Results

Attachment A contains the survey results by survey points, scan results, exposure rate measurements, and raw and reduced data for the direct measurements.

Attachment B contains the wipe test analysis data print-out.

Attachment C contains the survey meter calibration reports.

4.2 Exposure Rates-Summary

The exposure rates measured indoors in various areas of the facility were consistent with normal background. The typical background exposure rates in and near the facility ranged from 10 to 20 $\mu\text{R/h}$ as measured in the corridors and unaffected laboratories. Exposure rates were comparable to background of 15 $\mu\text{R/h}$.

4.3 Beta Scans-Summary

No areas of elevated residual activity, above detection limits for the survey were found during the beta scans.

4.4 Direct Measurements-Summary

No areas of elevated residual activity, above the statistical Minimum Detectable Concentration (MDC) for the survey, were found during the beta direct measurements. Please see the Survey Meter section of the individual surveys for the calculation method and values of the MDC for each survey.

4.5 Removable Contamination-Summary

Attachment B includes results of the removable surface activity from the wipe surveys. No removable contamination was detected, above the detection limits for the analysis, on any of the wipe test samples collected for the final status survey.

5.0 CONCLUSIONS

The radiological survey of the laboratory rooms at the DuPont Glasgow Facility demonstrates that the laboratory surfaces were far less than the DCGL_w (25 mrem) for both fixed and removable surface contamination.

The DuPont Glasgow Facility has met the requirements of 10 CFR 20 for unrestricted use.

6.0 REFERENCES

- 6.1 USNRC, Regulatory Guide 1.86., Termination of Operating Licenses for Nuclear Reactors, June 1974.
- 6.2 USNRC, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unaffected Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material", May 1987.
- 6.3 NUREG 1757, USNRC, "Decommissioning Process for Materials Licensees", Final September 2003.
- 6.4 NUREG-1575, EPA 402-R-97-016, Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM): Final, August 2000.

7.0 ATTACHMENTS

Attachment A	Radiological Surveys
Attachment B	Wipe Test Analysis Data Print-Out
Attachment C	Survey Meter Calibration Reports

Attachment A

Radiological Survey Results

Site: Dupont
 Start Date: 07/28/14
 Surveyor: Paul Madairy

Building: Glasgow Lab/Room: 117
 Finish Date: 07/28/14
 Surveyor: Bo Bland

Area Survey Results		Wipe Tests		Direct Measurements			β Scan Measurements				Dose Rate	
Wipe Number	Description	3H (dpm/100 cm ²)	14C (dpm/100 cm ²)	Survey Meter #	Gross (cpm)	dpm/100 cm ² (C14)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	β dpm/100 cm ² (C14)	Survey Meter #	Gross (μRem/ hr)
1	Floor	<100	<100	1	238	106	1	262	230	42	5	15
2	Floor	<100	<100	1	201	-188	1	225	200	-196	5	15
3	Floor	<100	<100	1	253	225	1	268	235	82	5	15
4	Floor	<100	<100	1	227	18	1	274	250	201	5	15
5	Floor	<100	<100	1	221	-29	1	279	250	201	5	15
6	Table Top	<100	<100	1	195	-236	1	236	210	-117	5	15
7	Table Top	<100	<100	1	203	-172	1	250	210	-117	5	15
8	Table Top	<100	<100	1	214	-85	1	205	185	-315	5	15
9	Floor	<100	<100	1	237	98	1	256	225	2	5	15
10	Floor	<100	<100	1	229	34	1	252	230	42	5	15
11	Floor	<100	<100	1	227	18	1	225	210	-117	5	15
12	Floor	<100	<100	1	204	-164	1	288	250	201	5	15
13	Wall	<100	<100	1	162	-498	1	208	190	-275	5	15
14	Cabinet	<100	<100	1	178	-371	1	178	150	-593	5	15
15	Wall	<100	<100	1	195	-236	1	249	215	-77	5	15
16	Wall	<100	<100	1	177	-379	1	190	190	-275	5	15
17	Table Top	<100	<100	1	201	-188	1	228	210	-117	5	15
18	Table Top	<100	<100	1	189	-283	1	227	200	-196	5	15
19	Table Top	<100	<100	1	217	-61	1	249	210	-117	5	15
20	Table Top	<100	<100	1	199	-204	1	218	200	-196	5	15
21	Table Top	<100	<100	1	202	-180	1	240	210	-117	5	15
22	Table Top	<100	<100	1	212	-101	1	233	210	-117	5	15
23	Floor	<100	<100	1	234	74	1	245	230	42	5	15
24	Floor	<100	<100	1	205	-156	1	239	205	-156	5	15
25	Table Top	<100	<100	1	198	-212	1	223	200	-196	5	15
26	Table Top	<100	<100	1	190	-275	1	188	170	-434	5	15
27	Floor	<100	<100	1	201	-188	1	235	205	-156	5	15

Site: Dupont
 Start Date: 07/28/14
 Surveyor: Paul Madairy

Building: Glasgow Lab/Room: 117
 Finish Date: 07/28/14
 Surveyor: Bo Bland

Area Survey Results		Wipe Tests		Direct Measurements			β Scan Measurements				Dose Rate	
Wipe Number	Description	3H (dpm/100 cm ²)	14C (dpm/100 cm ²)	Survey Meter #	Gross (cpm)	dpm/100 cm ² (C14)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	β dpm/100 cm ² (C14)	Survey Meter #	Gross (μRem/ hr)
28	Floor	<100	<100	1	213	-93	1	295	263	304	5	15
29	Floor	<100	<100	1	245	161	1	232	215	-77	5	15
30	Floor	<100	<100	1	249	193	1	241	220	-37	5	15
31	Floor	<100	<100	1	269	352	1	242	210	-117	5	15
32	Floor	<100	<100	1	229	34	1	269	245	161	5	15
33	Floor	<100	<100	1	243	145	1	225	210	-117	5	15
34	Floor	<100	<100	1	247	177	1	270	235	82	5	15
35	Floor	<100	<100	1	239	113	1	285	240	121	5	15
36	Sink	<100	<100	1	196	-228	1	245	220	-37	5	15
37	Sink Drain Swab	<100	<100									
38	Floor	<100	<100	1	210	-117	1	242	220	-37	5	15
39	Wall	<100	<100	1	165	-474	1	206	180	-355	5	15
40	Wall	<100	<100	1	183	-331	1	222	205	-156	5	15
41	Wall	<100	<100	1	179	-363	1	207	195	-236	5	15
42	Wall	<100	<100	1	186	-307	1	200	175	-394	5	15
43	Wall	<100	<100	1	236	90	1	244	210	-117	5	15
44	Wall	<100	<100	1	189	-283	1	218	200	-196	5	15
45	Wall	<100	<100	1	215	-77	1	237	210	-117	5	15
46	Wall	<100	<100	1	192	-260	1	232	210	-117	5	15
47	Wall	<100	<100	1	210	-117	1	249	225	2	5	15
48	Floor	<100	<100	1	245	161	1	271	245	161	5	15
49	Wall	<100	<100	1	211	-109	1	235	215	-77	5	15
50	Wall	<100	<100	1	169	-442	1	217	200	-196	5	15
51	Wall	<100	<100	1	148	-609	1	195	155	-553	5	15
52	Wall	<100	<100	1	160	-513	1	205	170	-434	5	15
53	Wall	<100	<100	1	167	-458	1	198	165	-474	5	15
54	Wall	<100	<100	1	144	-640	1	195	150	-593	5	15

Site: Dupont
 Start Date: 07/28/14
 Surveyor: Paul Madairy

Building: Glasgow Lab/Room: 117
 Finish Date: 07/28/14
 Surveyor: Bo Bland

Area Survey Results		Wipe Tests		Direct Measurements			β Scan Measurements				Dose Rate	
Wipe Number	Description	3H (dpm/100 cm ²)	14C (dpm/100 cm ²)	Survey Meter #	Gross (cpm)	dpm/100 cm ² (C14)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	β dpm/100 cm ² (C14)	Survey Meter #	Gross (μRem/ hr)
55	Floor	<100	<100	1	251	209	1	287	250	201	5	15
56	Floor	<100	<100	1	210	-117	1	237	210	-117	5	15
57	Floor	<100	<100	1	235	82	1	271	245	161	5	15
58	Table Top	<100	<100	1	193	-252	1	223	200	-196	5	15
59	Table Top	<100	<100	1	205	-156	1	230	205	-156	5	15
60	Floor	<100	<100	1	252	217	1	255	215	-77	5	15
61	Floor	<100	<100	1	240	121	1	275	235	82	5	15
62	Floor	<100	<100	1	236	90	1	556	220	-37	5	15
63	Floor	<100	<100	1	173	-410	1	189	165	-474	5	15
64	Sink	<100	<100	1	203	-172	1	225	190	-275	5	15
65	Table Top	<100	<100	1	194	-244	1	250	230	42	5	15
66	Flex Duct	<100	<100	1	203	-172	1	221	200	-196	5	15
67	Flex Duct	<100	<100	1	190	-275	1	261	210	-117	5	15
Hood												
1	Benchtop	<100	<100	1	195	-236	1	203	160	-513	5	15
2	Benchtop	<100	<100	1	168	-450	1	215	185	-315	5	15
3	Left Wall	<100	<100	1	190	-275	1	216	180	-355	5	15
4	Right Wall	<100	<100	1	204	-164	1	227	210	-117	5	15
5	Inside Back	<100	<100	1	210	-117	1	236	210	-117	5	15
6	Inside Back	<100	<100	1	194	-244	1	201	180	-355	5	15
7	Inside Back	<100	<100	1	181	-347	1	206	185	-315	5	15
8	Foil	<100	<100	1	183	-331	1	203	170	-434	5	15
9	Sash	<100	<100	1	210	-117	1	217	205	-156	5	15
10	Base	<100	<100	1	192	-260	1	221	205	-156	5	15

Survey Meter Information

Site: Dupont

Building: Glasgow

Lab/Room: 117

	Meter 1		Meter 2		Meter 3		Meter 4		Meter 5	
Date:	7/28/2014		7/28/2014		7/28/2014		7/28/2014		7/28/2014	
Make:	Ludlum		Ludlum		Ludlum		Ludlum		Voctoreen	
Model:	2221		2221		2221		2221		450P	
SN:	161591		89650		161591		89650		2550	
Probe Make:	Ludlum		Ludlum		Ludlum		Ludlum		N/A	
Probe Model:	43-68		43-37		43-68		43-37		N/A	
Probe SN:	118227		124943		118227		124943		N/A	
Probe Area (cm ²):	126		584		126		584		N/A	
Next Cal. Date:	10/28/2014		6/11/2015		10/28/2014		6/11/2015		10/15/2014	
Background Surface Material	Air		Air		Ceramic Tile		Ceramic Tile		Air	
Background(c) - Time(Min):	2247	10	7961	10	5187	10	17489	10	15	μRem/hr
CS Isotope - Activity(μCi):	C-14	0.159	C-14	0.159	C-14	0.159	C-14	0.159	Cs-137	
CS Source(cpm)	9000		8223		9000		8223		OK	
L _c , L _d (Counts)	35	73	66	134	53	109	97	197	NA	NA
Direct MDC, Scan MDC (dpm/100cm ²)	577	1798	219	696	864	2732	322	1031	NA	NA
MDCR, MDC Count Rate	385	282	1098	869	762	605	2196	1857	NA	NA
Total Efficiency, Isotope:	10.0%	C-14	10.5%	C-14	10.0%		10.5%	C-14	N/A	
Source Efficiency	0.25		0.25		0.25		0.25		NA	

Please See MARSSIM Chapter 6 for a more detailed explanation of equations.

L_c= Critical Detection Level

L_d= a priori Detection limit

MDC= Minimum Detectable Concentration

MDCR= Minimum Detectable Count Rate

$$\text{Direct MDC} = \frac{3+4.65*\text{SQRT}(B)}{T*\epsilon_i*A*C}$$

$$\text{Scan MDC} = \frac{\text{MDCR}}{\text{SQRT}(E_{hf})*\epsilon_i*\epsilon_s*A*C}$$

$$\text{MDCR} = s_i * (60/i)$$

B = Background Counts

T = Counting Time In Minutes

ε_i = Total Detector Efficiency in Counts/Disintegration


A = Physical Probe Area in cm²

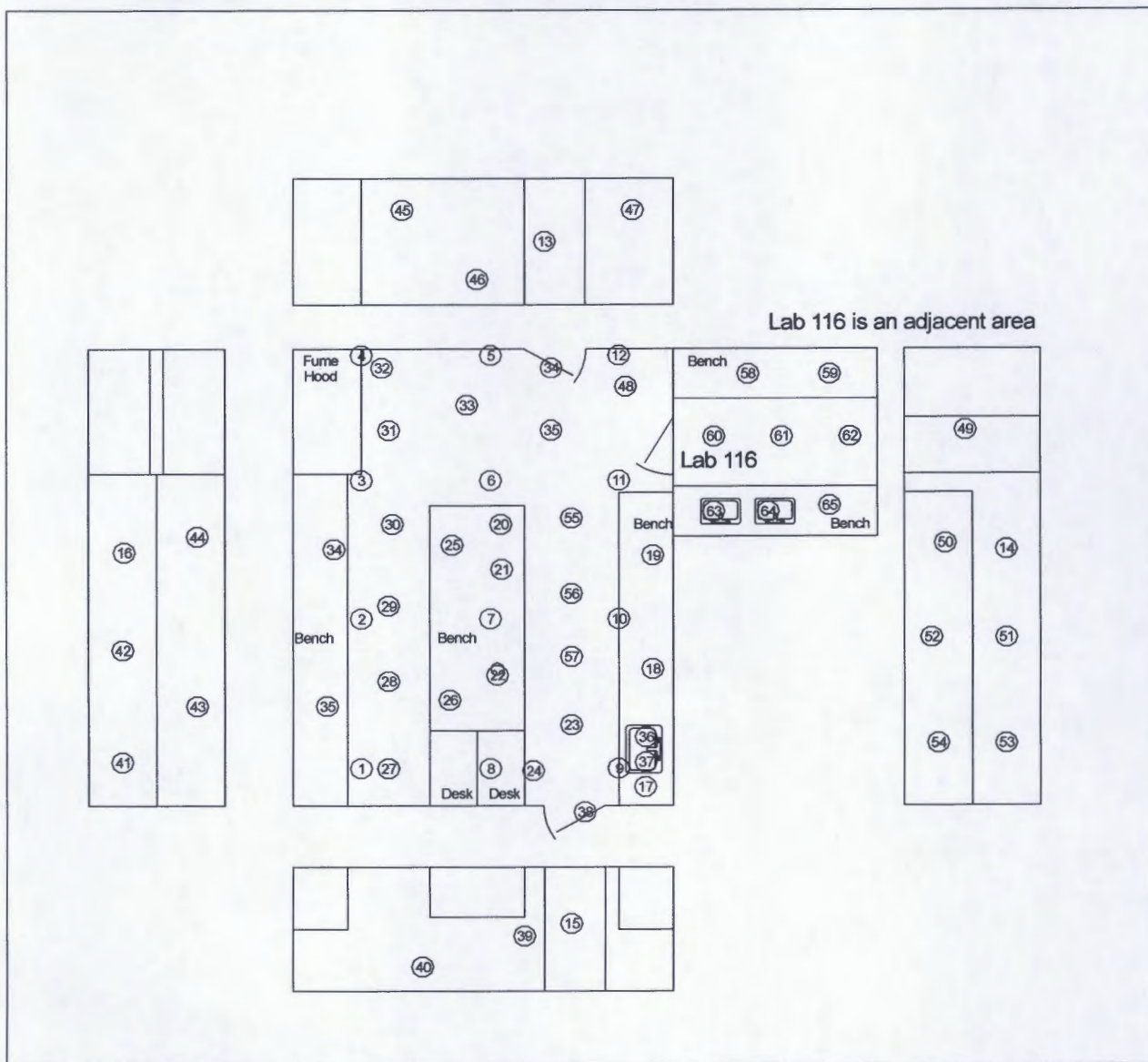
C = Other Constants and Factors When Needed

E_{hf} = Human Factor Efficiency


ε_s = Source Efficiency s_i = 1.38*SQRT(B_i)

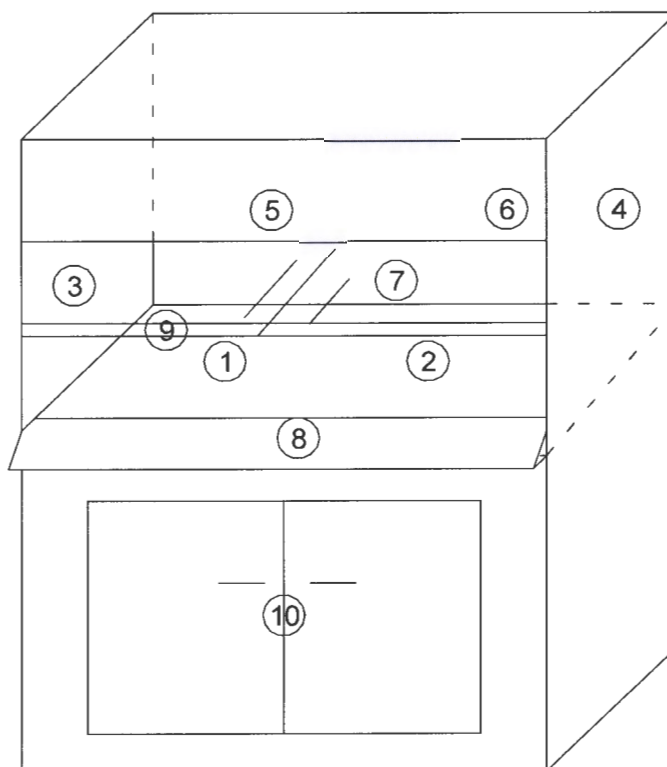
i = Counting Interval

Radiological Survey	Dupont			
	2309 Sunset Lake Rd, Newark, DE 19702		Building Glasgow	Room 117
Surveyors	Name: Paul Madaury	Name: Bo Bland	Date: 7/28/2014	
Contact	Name: John Brisbin	Phone No. 302-366-5062		



Remarks:

Radiological Decommissioning Survey		Dupont			
		Glasgow		Building Glasgow	Room 117
Surveyors	Name: Paul Madairy	Name Bo Bland	Date 7/28/2014		
Contact	Name: John Brisbin	Phone No. 302-366-5062	Fume Hood ID		



Signature:

Remarks:

Site: Dupont
 Start Date: 01/24/14
 Surveyor: Matt Mueller

Building: Glasgow Lab/Room: 162
 Finish Date: 01/24/14
 Surveyor: Bo Bland

Area Survey Results		Wipe Tests		Direct Measurements			β Scan Measurements				Dose Rate	
Wipe Number	Description	3H (dpm/100 cm ²)	14C (dpm/100 cm ²)	Survey Meter #	Gross (cpm)	dpm/100 cm ² (C14)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	β dpm/100 cm ² (C14)	Survey Meter #	Gross (μRem/ hr)
1	Floor	<100	<100	6	159	-174	4	1150	1050	-103	10	12
2	Floor	<100	<100	6	202	167	4	1150	1050	-103	10	12
3	Floor	<100	<100	6	228	374	4	1150	1050	-103	10	12
4	Benchtop	<100	<100	6	207	207	6	225	200	152	10	12
5	Floor	<100	<100	6	181	1	4	1150	1050	-103	10	12
6	Floor	<100	<100	6	200	152	4	1150	1050	-103	10	12
7	Floor	<100	<100	6	179	-15	4	1150	1050	-103	10	12
8	Floor	<100	<100	6	173	-63	4	1150	1050	-103	10	12
9	Benchtop	<100	<100	6	185	33	4	1150	1050	-103	10	12
10	Floor	<100	<100	6	211	239	4	1150	1050	-103	10	12
11	Floor	<100	<100	6	187	48	4	1150	1050	-103	10	12
12	Floor	<100	<100	6	187	48	4	1150	1050	-103	10	12
13	Wall	<100	<100	6	200	152	6	250	220	310	10	12
14	Wall	<100	<100	6	172	-71	6	190	170	-87	10	12
15	Door	<100	<100	6	175	-47	6	212	180	-7	10	12
16	Wall	<100	<100	6	211	239	6	251	220	310	10	12
17	Benchtop	<100	<100	6	178	-23	6	225	200	152	10	12
18	Benchtop	<100	<100	6	216	279	6	225	200	152	10	12
19	Benchtop	<100	<100	6	198	136	6	225	200	152	10	12
20	Ductwork	<100	<100	6	212	247	6	205	185	33	10	12
21	Ductwork	<100	<100	6	184	25	6	205	185	33	10	12
22	Benchtop	<100	<100	6	207	207	6	225	200	152	10	12
23	Benchtop	<100	<100	6	202	167	6	225	200	152	10	12
24	Benchtop	<100	<100	6	188	56	6	225	200	152	10	12
25	Benchtop	<100	<100	6	186	40	6	225	200	152	10	12
26	Benchtop	<100	<100	7	203	-347	4	1150	1050	-103	10	12
27	Benchtop	<100	<100	7	205	-330	4	1150	1050	-103	10	12

Site: Dupont
 Start Date: 01/24/14
 Surveyor: Matt Mueller

Building: Glasgow Lab/Room: 162
 Finish Date: 01/24/14
 Surveyor: Bo Bland

Area Survey Results		Wipe Tests		Direct Measurements			β Scan Measurements				Dose Rate	
Wipe Number	Description	3H (dpm/100 cm ²)	14C (dpm/100 cm ²)	Survey Meter #	Gross (cpm)	dpm/100 cm ² (C14)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	β dpm/100 cm ² (C14)	Survey Meter #	Gross (μRem/ hr)
28	Benchtop	<100	<100	7	231	-113	4	1150	1050	-103	10	12
29	Benchtop	<100	<100	7	219	-213	4	1150	1050	-103	10	12
30	Benchtop	<100	<100	7	200	-372	4	1150	1050	-103	10	12
31	Benchtop	<100	<100	7	228	-138	4	1150	1050	-103	10	12
32	Floor	<100	<100	7	211	-280	4	1150	1050	-103	10	12
33	Floor	<100	<100	7	240	-38	4	1150	1050	-103	10	12
34	Floor	<100	<100	7	183	-514	4	1150	1050	-103	10	12
35	Floor	<100	<100	7	209	-297	4	1150	1050	-103	10	12
36	Floor	<100	<100	7	217	-230	4	1150	1050	-103	10	12
37	Floor	<100	<100	7	198	-388	4	1150	1050	-103	10	12
38	Door	<100	<100	7	219	-213	7	250	210	-288	10	12
39	Door	<100	<100	7	250	46	7	250	210	-288	10	12
40	Shelf	<100	<100	7	255	88	7	300	260	129	10	12
41	Wall	<100	<100	6	205	191	6	212	195	112	10	12
42	Shelf	<100	<100	6	210	231	6	190	165	-126	10	12
43	Shelf	<100	<100	6	214	263	6	190	165	-126	10	12
44	Wall	<100	<100	6	206	199	6	237	215	271	10	12
45	Drawers	<100	<100	6	205	191	6	220	190	72	10	12
46	Drawers	<100	<100	6	207	207	6	220	190	72	10	12
47	Drawers	<100	<100	6	182	9	6	232	185	33	10	12
48	Drawers	<100	<100	6	224	342	6	226	185	33	10	12
49	Drawers	<100	<100	6	194	104	6	226	185	33	10	12
50	Sink	<100	<100	6	191	80	6	217	185	33	10	12
51	Sink Drain	<100	<100	6	164	-134	6	217	180	-7	10	12
Fume Hood												
1	Benchtop	<100	<100	7	261	138	7	236	220	-205	10	10
2	Benchtop	<100	<100	7	229	-129	7	236	220	-205	10	10

Surveyor: Bo Bland

Survey Meter Information

Site: Dupont

Building: Glasgow

Lab/Room: 162

	Meter 1		Meter 2		Meter 3		Meter 4		Meter 5	
Date:	1/23/2014		1/23/2014		1/23/2014		1/24/2014		1/23/2014	
Make:	Ludlum		Ludlum		Ludlum		Ludlum		Voctoreen	
Model:	2221		2221		2221		2221		450P	
SN:	161591		157013		89650		89650		2550	
Probe Make:	Ludlum		Ludlum		Ludlum		Ludlum		N/A	
Probe Model:	43-68		43-68		43-37		43-37		N/A	
Probe SN:	118227		178512		124943		124943		N/A	
Probe Area (cm ²):	126		126		584		584		N/A	
Next Cal. Date:	10/28/2014		10/4/2014		7/26/2014		7/26/2014		10/15/2014	
Background Surface Material	air		Air		Air		Air		Air	
Background(c) - Time(Min):	1838	10	2008	10	11862	10	11131	10	20	μRem/hr
CS Isotope - Activity(μCi):	C-14	0.159	C-14	0.159	C-14	0.159	C-14	0.159	Cs-137	
CS Source(cpm)	8324		9094		6823		7334		OK	
L _c , L _d (Counts)	32	66	33	69	80	163	78	158	NA	NA
Direct MDC, Scan MDC (dpm/100cm ²)	524	1627	576	1790	266	849	258	822	NA	NA
MDCR, MDC Count Rate	329	236	352	255	1554	1214	1470	1140	NA	NA
Total Efficiency, Isotope:	10.0%	C-14	9.5%	C-14	10.5%	C-14	10.5%	C-14	N/A	
Source Efficiency	0.25		0.25		0.25		0.25		NA	

Please See MARSSIM Chapter 6 for a more detailed explanation of equations.

L_c= Critical Detection Level

L_d= a priori Detection limit

MDC= Minimum Detectable Concentration

MDCR= Minimum Detectable Count Rate

$$\text{Direct MDC} = \frac{3 + 4.65 \cdot \text{SQRT}(B)}{T \cdot \epsilon_t \cdot A \cdot C}$$

$$\text{Scan MDC} = \frac{\text{MDCR}}{\text{SQRT}(E_{hf}) \cdot \epsilon_t \cdot \epsilon_s \cdot A \cdot C}$$

$$\text{MDCR} = s_i \cdot (60/i)$$

B = Background Counts

T = Counting Time In Minutes

ε_t = Total Detector Efficiency in Counts/Disintegration

A = Physical Probe Area in cm²

C = Other Constants and Factors When Needed

E_{hf} = Human Factor Efficiency

ε_s = Source Efficiency s_i = 1.38 * SQRT(B_r)

i = Counting Interval

Survey Meter Information

Site: Dupont

Building: Glasgow

Lab/Room: 162

	Meter 6		Meter 7		Meter 8	Meter 9	Meter 10	
Date:	1/24/2014		1/24/2014		Not In Service	Not In Service	1/24/2014	
Make:	Ludlum		Ludlum				Voctoreen	
Model:	2221		2221				450P	
SN:	161591		157013				2550	
Probe Make:	Ludlum		Ludlum				N/A	
Probe Model:	43-68		43-68				N/A	
Probe SN:	118227		178512				N/A	
Probe Area (cm ²):	126		126				N/A	
Next Cal. Date:	10/28/2014		10/4/2014				41927	
Background Surface Material	air		Air				Air	
Background(c) - Time(Min):	1809	10	2445	10			20	1
CS Isotope - Activity(μCi):	C-14	0.159	C-14	0			Cs-137	
CS Source(cpm)	8564		8603				OK	
L _c , L _d (Counts)	31	66	36	76			NA	NA
Direct MDC, Scan MDC (dpm/100cm ²)	520	1614	632	1975			NA	NA
MDCR, MDC Count Rate	325	233	412	305			NA	NA
Total Efficiency, Isotope:	10.0%	C-14	9.5%	C-14			N/A	
Source Efficiency	0.25		0.25				NA	

Please See MARSSIM Chapter 6 for a more detailed explanation of equations.

L_c= Critical Detection Level

L_d= a priori Detection limit

MDC= Minimum Detectable Concentration

MDCR= Minimum Detectable Count Rate

$$\text{Direct MDC} = \frac{3 + 4.65 \cdot \text{SQRT}(B)}{T \cdot \epsilon_t \cdot A \cdot C}$$

$$\text{Scan MDC} = \frac{\text{MDCR}}{\text{SQRT}(E_{hf}) \cdot \epsilon_t \cdot \epsilon_s \cdot A \cdot C}$$

$$\text{MDCR} = s_i \cdot (60/i)$$

B = Background Counts

T = Counting Time In Minutes

ε_t = Total Detector Efficiency in Counts/Disintegration


A = Physical Probe Area in cm²

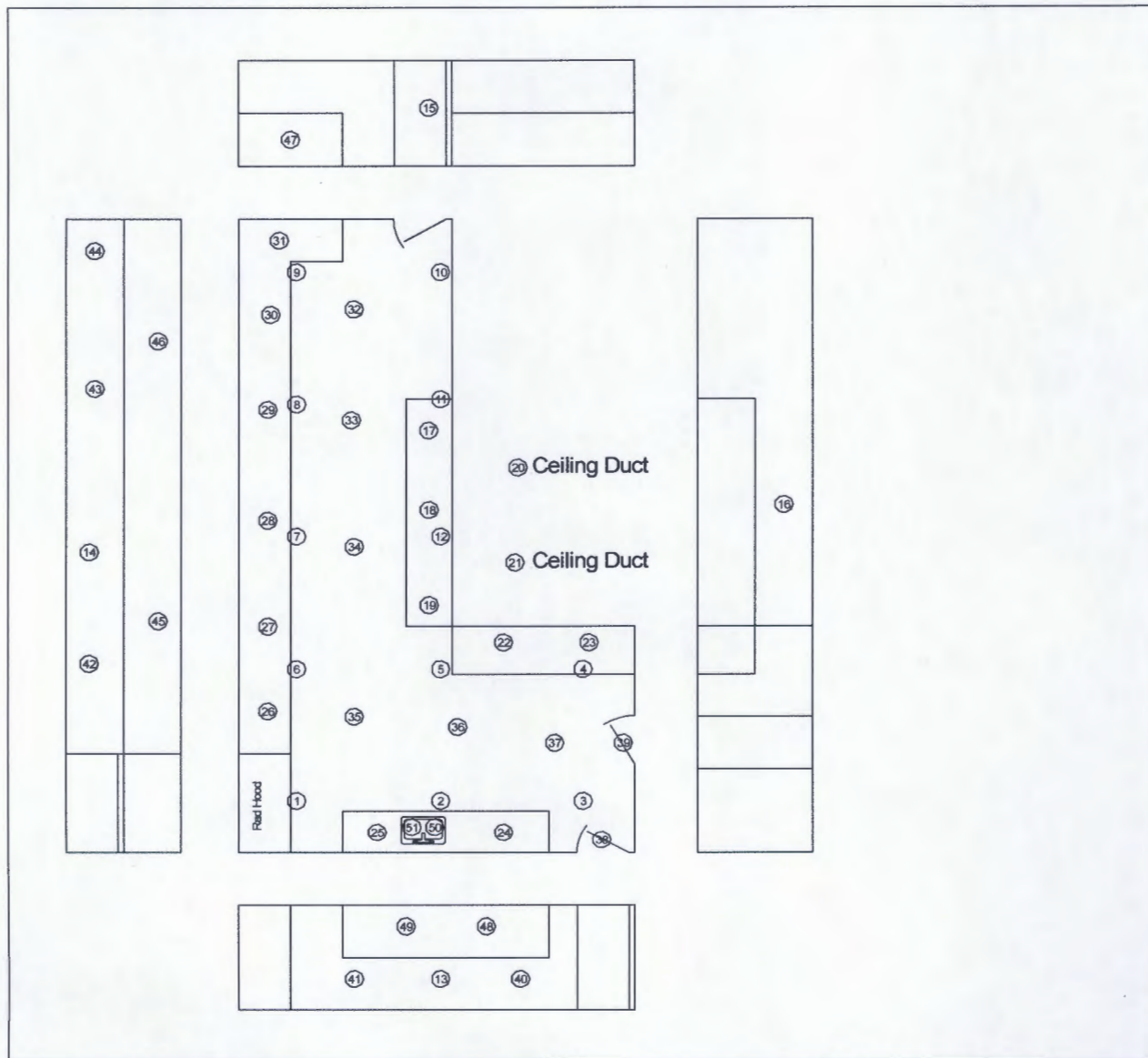
C = Other Constants and Factors When Needed

E_{hf} = Human Factor Efficiency


ε_s = Source Efficiency s_i = 1.38 * SQRT(B_i)

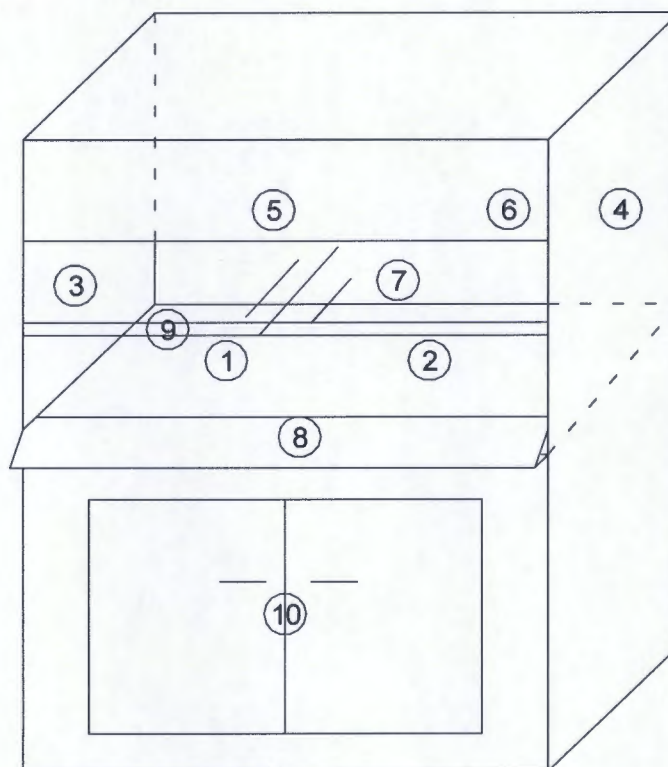
i = Counting Interval

Radiological Survey	Dupont 2309 Sunset Lake Rd, Newark, DE 19702			
			Building Glasgow	Room 162
Surveyors	Name: Matt Mueller	Name: Bo Bland	Date: 1/24/2014	
Contact	Name: Aaron Chen	Phone No. 302-366-5062		



Remarks:

Radiological Decommissioning Survey	Dupont Glasgow			
			Building Glasgow	Room 162
Surveyors	Name: Matt Mueller	Name Bo Bland	Date 1/24/2014	
Contact	Name: Aaron Chen	Phone No. 302-366-5062	Fume Hood ID Center	



Signature:

Remarks:

Survey Meter Information

Site: Dupont

Building: Glasgow

Lab/Room: 162A

	Meter 1		Meter 2		Meter 3		Meter 4		Meter 5	
Date:	7/28/2014		7/28/2014		7/28/2014		7/28/2014		7/28/2014	
Make:	Ludlum		Ludlum		Ludlum		Ludlum		Voctoreen	
Model:	2221		2221		2221		2221		450P	
SN:	161591		89650		161591		89650		2550	
Probe Make:	Ludlum		Ludlum		Ludlum		Ludlum		N/A	
Probe Model:	43-68		43-37		43-68		43-37		N/A	
Probe SN:	118227		124943		118227		124943		N/A	
Probe Area (cm ²):	126		584		126		584		N/A	
Next Cal. Date:	10/28/2014		6/11/2015		10/28/2014		6/11/2015		10/15/2014	
Background Surface Material	Air		Air		Ceramic Tile		Ceramic Tile		Air	
Background(c) - Time(Min):	2247	10	7961	10	5187	10	17489	10	15	μRem/hr
CS Isotope - Activity(μCi):	C-14	0.159	C-14	0.159	C-14	0.159	C-14	0.159	Cs-137	
CS Source(cpm)	9000		8223		9000		8223		OK	
L _c , L _d (Counts)	35	73	66	134	53	109	97	197	NA	NA
Direct MDC, Scan MDC (dpm/100cm ²)	577	1798	219	696	864	2732	322	1031	NA	NA
MDCR, MDC Count Rate	385	282	1098	819	762	605	2196	1783	NA	NA
Total Efficiency, Isotope:	10.0%	C-14	10.5%	C-14	10.0%		10.5%	C-14	N/A	
Source Efficiency	0.25		0.25		0.25		0.25		NA	

Please See MARSSIM Chapter 6 for a more detailed explanation of equations.

L_c= Critical Detection Level

L_d= a priori Detection limit

MDC= Minimum Detectable Concentration

MDCR= Minimum Detectable Count Rate

$$\text{Direct MDC} = \frac{3+4.65*\text{SQRT}(B)}{T*\epsilon_t*A*C}$$

$$\text{Scan MDC} = \frac{\text{MDCR}}{\text{SQRT}(E_{hf})*\epsilon_t*\epsilon_s*A*C}$$

$$\text{MDCR} = s_i * (60/i)$$

B = Background Counts

T = Counting Time In Minutes

ε_t = Total Detector Efficiency in Counts/Disintegration


A = Physical Probe Area in cm²

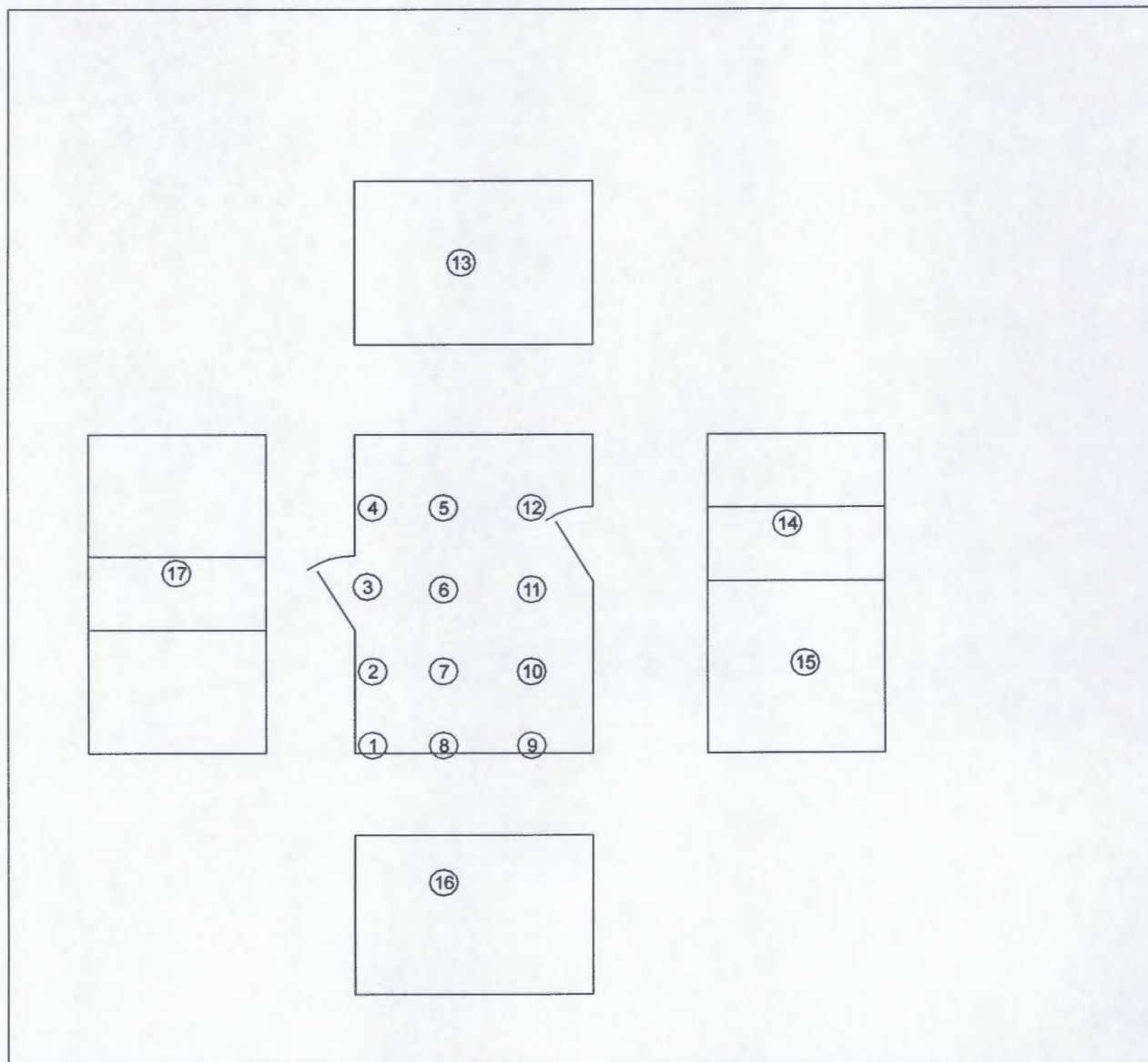
C = Other Constants and Factors When Needed

E_{hf} = Human Factor Efficiency

ε_s = Source Efficiency s_i = 1.38*SQRT(B_r)

i = Counting Interval

Radiological Survey	Dupont 2309 Sunset Lake Rd, Newark, DE 19702			
			Building Glasgow	Room 162A
Surveyors	Name: Paul Madairy	Name Bo Bland	Date 7/28/2014	
Contact	Name: John Brisbin	Phone No. 302-366-5062		



Remarks:

Site: Dupont
 Start Date: 01/23/14
 Surveyor: Matt Mueller

Building: Glasgow Lab/Room: 177, 178
 Finish Date: 01/23/14
 Surveyor: Dave Frazier

Area Survey Results		Wipe Tests		Direct Measurements			β Scan Measurements				Dose Rate	
Wipe Number	Description	3H (dpm/100 cm ²)	14C (dpm/100 cm ²)	Survey Meter #	Gross (cpm)	dpm/100 cm ² (C14)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	β dpm/100 cm ² (C14)	Survey Meter #	Gross (μRem/ hr)
1	Benchtop	<100	<100	1	228	188	1	295	240	283	5	15
2	Floor	<100	<100	1	259	434	3	1200	1165	90	5	15
3	Floor	<100	<100	1	208	29	3	1200	1165	90	5	15
4	Floor	<100	<100	1	231	212	3	1200	1165	90	5	15
5	Floor	<100	<100	1	234	236	3	1200	1165	90	5	15
6	Benchtop	<100	<100	1	230	204	1	260	240	283	5	15
7	Floor	<100	<100	1	248	347	3	1200	1165	90	5	15
8	Floor	<100	<100	1	243	307	3	1200	1165	90	5	15
9	Benchtop	<100	<100	2	285	406	1	330	310	839	5	15
10	Floor	<100	<100	1	235	244	3	1200	1165	90	5	15
11	Floor	<100	<100	1	250	363	3	1200	1165	90	5	15
12	Floor	<100	<100	1	235	244	3	1200	1165	90	5	15
13	Floor	<100	<100	1	210	45	3	1200	1165	90	5	15
14	Benchtop	<100	<100	1	245	323	1	250	240	283	5	15
15	Floor	<100	<100	1	230	204	3	1200	1165	90	5	15
23	Benchtop	<100	<100	2	206	-191	2	255	245	104	5	15
24	Benchtop	<100	<100	2	210	-161	2	255	245	104	5	15
25	Benchtop	<100	<100	1	242	299	1	255	245	323	5	15
26	Benchtop	<100	<100	1	224	156	1	255	245	323	5	15
27	Floor	<100	<100	1	238	267	3	1200	1165	90	5	15
28	Floor	<100	<100	1	225	164	3	1200	1165	90	5	15
29	Floor	<100	<100	1	243	307	3	1200	1165	90	5	15
30	Benchtop	<100	<100	1	213	69	1	230	225	164	5	15
31	Benchtop	<100	<100	1	240	283	1	245	230	204	5	15
32	Benchtop	<100	<100	1	228	188	1	250	240	283	5	15
33	Benchtop	<100	<100	1	246	331	1	250	240	283	5	15
34	Benchtop	<100	<100	1	228	188	1	250	240	283	5	15

Site: Dupont
 Start Date: 01/23/14
 Surveyor: Matt Mueller

Building: Glasgow Lab/Room: 177, 178
 Finish Date: 01/23/14
 Surveyor: Dave Frazier

Area Survey Results		Wipe Tests		Direct Measurements			β Scan Measurements				Dose Rate	
Wipe Number	Description	3H (dpm/100 cm ²)	14C (dpm/100 cm ²)	Survey Meter #	Gross (cpm)	dpm/100 cm ² (C14)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	β dpm/100 cm ² (C14)	Survey Meter #	Gross (μRem/ hr)
35	Benchtop	<100	<100	1	261	450	1	250	240	283	5	15
36	Floor	<100	<100	1	223	148	3	1200	1165	90	5	15
37	Floor	<100	<100	1	232	220	3	1200	1165	90	5	15
38	Cabinet	<100	<100	2	238	51	2	250	235	28	5	15
39	Cabinet	<100	<100	2	238	51	2	250	235	28	5	15
40	Wall	<100	<100	2	232	5	2	250	215	-123	5	15
41	Wall	<100	<100	2	239	58	2	250	215	-123	5	15
42	Wall	<100	<100	1	223	148	3	1200	1165	90	5	15
43	Floor	<100	<100	1	244	315	3	1200	1165	90	5	15
44	Floor	<100	<100	1	267	498	3	1200	1165	90	5	15
45	Floor	<100	<100	1	257	418	3	1200	1165	90	5	15
46	Floor	<100	<100	1	231	212	3	1200	1165	90	5	15
47	Floor	<100	<100	1	228	188	3	1200	1165	90	5	15
48	Floor	<100	<100	1	235	244	3	1200	1165	90	5	15
49	Floor	<100	<100	2	237	43	3	1200	1165	90	5	15
50	Floor	<100	<100	1	252	379	3	1200	1165	90	5	15
51	Floor	<100	<100	1	212	61	3	1200	1165	90	5	15
52	Floor	<100	<100	1	259	434	3	1200	1165	90	5	15
53	Floor	<100	<100	1	214	77	3	1200	1165	90	5	15
54	Floor	<100	<100	1	236	252	3	1200	1165	90	5	15
55	Wall	<100	<100	2	226	-40	1	300	280	601	5	15
56	Cabinet	<100	<100	1	273	545	1	280	275	561	5	15
57	Wall	<100	<100	1	237	260	1	240	235	244	5	15
58	Wall	<100	<100	1	251	371	1	260	245	323	5	15
59	Sink	<100	<100	2	207	-184	2	230	200	-237	5	15
60	Sink Drain	<100	<100	2	204	-206	2	230	200	-237	5	15

Site: Dupont
 Start Date: 01/23/14
 Surveyor: Matt Mueller

Building: Glasgow Lab/Room: 177, 178
 Finish Date: 01/23/14
 Surveyor: Dave Frazier

Area Survey Results		Wipe Tests		Direct Measurements			β Scan Measurements				Dose Rate	
Wipe Number	Description	3H (dpm/100 cm ²)	14C (dpm/100 cm ²)	Survey Meter #	Gross (cpm)	dpm/100 cm ² (C14)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	β dpm/100 cm ² (C14)	Survey Meter #	Gross (μRem/ hr)
Center Hood												
61	Bottom	<100	<100	4	180	-30	4	251	190	49	5	16
62	Bottom	<100	<100	4	168	-125	4	251	190	49	5	16
63	Bottom	<100	<100	4	235	406	4	251	190	49	5	16
64	Left Wall	<100	<100	4	167	-133	4	251	190	49	5	16
65	Left Wall	<100	<100	4	170	-110	4	251	190	49	5	16
66	Right Wall	<100	<100	4	155	-229	4	251	190	49	5	16
67	Right Wall	<100	<100	4	186	17	4	251	190	49	5	16
68	Bottom	<100	<100	4	221	295	4	251	190	49	5	16
69	Bottom	<100	<100	4	225	327	4	251	190	49	5	16
70	Bottom	<100	<100	4	247	502	4	251	190	49	5	16
71	Top	<100	<100	4	219	279	4	251	190	49	5	16
72	Top	<100	<100	4	189	41	4	251	190	49	5	16
73	Top	<100	<100	4	208	192	4	251	190	49	5	16
74	Top	<100	<100	4	210	208	4	251	190	49	5	16
75	Top	<100	<100	4	201	137	4	251	190	49	5	16
76	Top	<100	<100	4	229	359	4	251	190	49	5	16
77	Sash	<100	<100	4	190	49	4	251	190	49	5	16
78	Sash	<100	<100	4	181	-22	4	251	190	49	5	16
79	Exterior Left	<100	<100	4	171	-102	4	251	190	49	5	16
80	Exterior Right	<100	<100	4	195	89	4	251	190	49	5	16

Survey Meter Information

Site: Dupont

Building: Glasgow

Lab/Room: 177, 178

	Meter 1		Meter 2		Meter 3		Meter 4		Meter 5	
Date:	3/19/2014		3/19/2014		3/19/2014		1/23/2014		3/19/2014	
Make:	Ludlum		Ludlum		Ludlum		Ludlum		Voctoreen	
Model:	2221		2221		2221		2221		450P	
SN:	161591		157013		89650		161591		2550	
Probe Make:	Ludlum		Ludlum		Ludlum		Ludlum		N/A	
Probe Model:	43-68		43-68		43-37		43-68		N/A	
Probe SN:	118227		178512		124943		118227		N/A	
Probe Area (cm ²):	126		126		584		126		N/A	
Next Cal. Date:	10/28/2014		10/4/2014		7/26/2014		10/28/2014		10/15/2014	
Background Surface Material	air		Air		Air		air		Air	
Background(c) - Time(Min):	2043	10	2313	10	11101	10	1838	10		μRem/hr
CS Isotope - Activity(μCi):	C-14	0.159	C-14	0.159	C-14	0.159	C-14	0.159	Cs-137	
CS Source(cpm)	8121		8789		9568		8324		OK	
L _c , L _d (Counts)	33	69	35	74	78	158	32	66	NA	NA
Direct MDC, Scan MDC (dpm/100cm ²)	551	1715	557	1738	258	821	524	1627	NA	NA
MDCR, MDC Count Rate	357	259	394	290	1466	1137	329	236	NA	NA
Total Efficiency, Isotope:	10.0%	C-14	10.5%	C-14	10.5%	C-14	10.0%	C-14	N/A	
Source Efficiency	0.25		0.25		0.25		0.25		NA	

Please See MARSSIM Chapter 6 for a more detailed explanation of equations.

L_c= Critical Detection Level

L_d= a priori Detection limit

MDC= Minimum Detectable Concentration

MDCR= Minimum Detectable Count Rate

$$\text{Direct MDC} = \frac{3 + 4.65 \cdot \text{SQRT}(B)}{T \cdot \epsilon_t \cdot A \cdot C}$$

$$\text{Scan MDC} = \frac{\text{MDCR}}{\text{SQRT}(E_{hf}) \cdot \epsilon_t \cdot \epsilon_s \cdot A \cdot C}$$

$$\text{MDCR} = s_i \cdot (60/i)$$

B = Background Counts

T = Counting Time In Minutes

ε_t = Total Detector Efficiency in Counts/Disintegration


A = Physical Probe Area in cm²

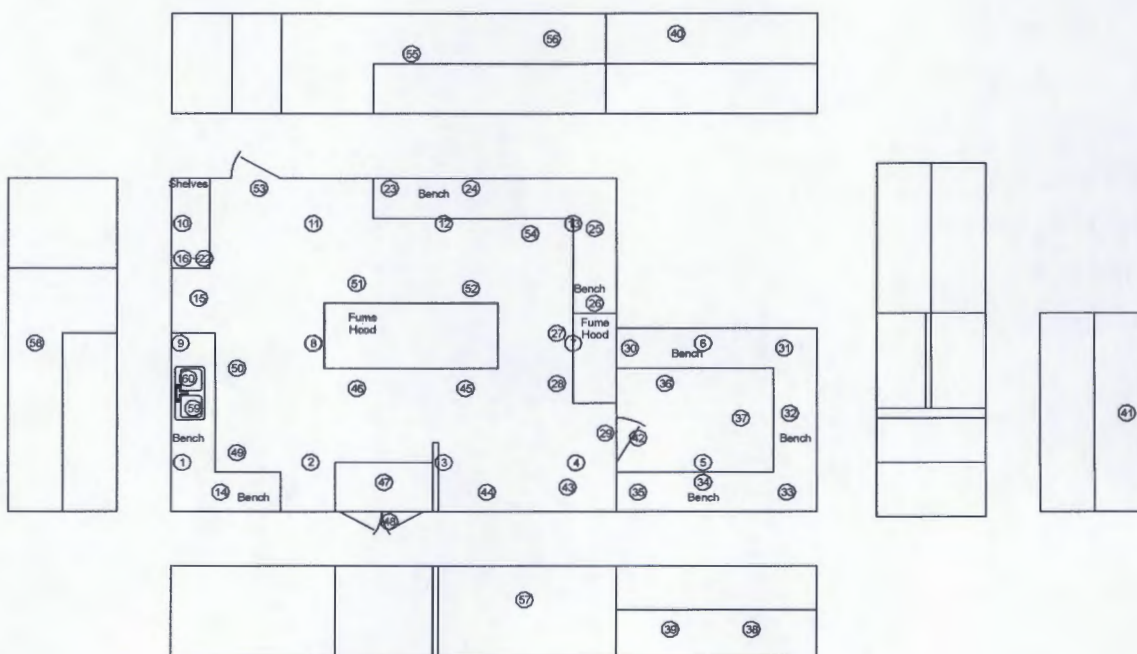
C = Other Constants and Factors When Needed

E_{hf} = Human Factor Efficiency


ε_s = Source Efficiency s_i = 1.38 * SQRT(B_i)

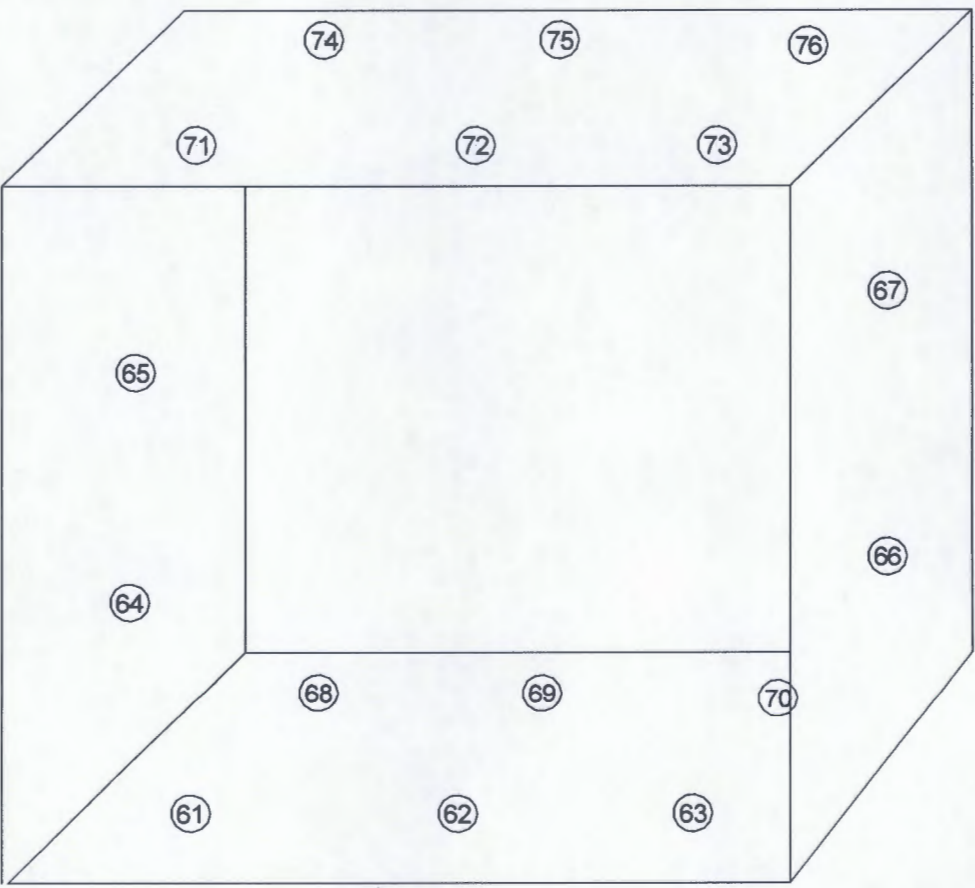
i = Counting Interval

Radiological Survey	Dupont 2309 Sunset Lake Rd, Newark, DE 19702				
			Building Glasgow	Room 177, 178	Lab Type
Surveyors	Name: Matt Mueller	Name: Dave Frazier	Date 1/23/2014		
Contact	Name: Aaron Chen	Phone No. 302-366-5062			



Remarks:

Radiological Decommissioning Survey		Dupont Glasgow			
		Building Glasgow	Room 177, 178	Lab Type	
Surveyors	Name: Matt Mueller		Name: Dave Frazier		Date 1/23/2014
Contact	Name: Aaron Chen		Phone No. 302-366-5062		Fume Hood ID Center



Signature:
Remarks:

Site: Dupont
 Start Date: 01/24/14
 Surveyor: Matt Mueller

Building: Glasgow
 Finish Date: 01/24/14

Lab/Room: 182

Surveyor: Bo Bland

Area Survey Results		Wipe Tests		Direct Measurements			β Scan Measurements				Dose Rate	
Wipe Number	Description	3H (dpm/100 cm ²)	14C (dpm/100 cm ²)	Survey Meter #	Gross (cpm)	dpm/100 cm ² (C14)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	β dpm/100 cm ² (C14)	Survey Meter #	Gross (μRem/ hr)
1	Floor	<100	<100	6	195	112	4	1298	1160	76	10	12
2	Floor	<100	<100	6	191	80	4	1298	1160	76	10	12
3	Floor	<100	<100	6	200	152	4	1298	1160	76	10	12
4	Floor	<100	<100	6	164	-134	4	1298	1160	76	10	12
5	Floor	<100	<100	6	161	-158	4	1298	1160	76	10	12
6	Floor	<100	<100	6	217	287	4	1298	1160	76	10	12
7	Benchtop	<100	<100	6	192	88	6	225	170	-87	10	12
8	Floor	<100	<100	6	157	-190	4	1298	1160	76	10	12
9	Floor	<100	<100	6	209	223	4	1298	1160	76	10	12
10	Floor	<100	<100	6	205	191	4	1298	1160	76	10	12
11	Benchtop	<100	<100	6	191	80	6	225	170	-87	10	12
12	Benchtop	<100	<100	6	190	72	6	225	170	-87	10	12
13	Benchtop	<100	<100	6	168	-102	6	225	170	-87	10	12
14	Benchtop	<100	<100	6	178	-23	6	225	170	-87	10	12
15	Floor	<100	<100	6	207	207	4	1298	1160	76	10	12
16	Floor	<100	<100	6	183	17	4	1298	1160	76	10	12
17	Floor	<100	<100	6	194	104	4	1298	1160	76	10	12
18	Floor	<100	<100	6	189	64	4	1298	1160	76	10	12
19	Benchtop	<100	<100	6	190	72	6	225	170	-87	10	12
20	Benchtop	<100	<100	6	240	469	6	225	170	-87	10	12
21	Benchtop	<100	<100	6	181	1	6	225	170	-87	10	12
22	Table Top	<100	<100	7	240	-38	6	215	165	-126	10	12
23	Table Top	<100	<100	7	251	54	6	215	165	-126	10	12
24	Table Top	<100	<100	7	236	-71	6	215	165	-126	10	12
25	Floor	<100	<100	7	277	272	4	1298	1160	76	10	12
26	Floor	<100	<100	7	251	54	4	1298	1160	76	10	12
27	Floor	<100	<100	6	198	136	4	1298	1160	76	10	12

Site: Dupont
 Start Date: 01/24/14
 Surveyor: Matt Mueller

Building: Glasgow
 Finish Date: 01/24/14

Lab/Room: 182
 Surveyor: Bo Bland

Area Survey Results		Wipe Tests		Direct Measurements			β Scan Measurements				Dose Rate	
Wipe Number	Description	3H (dpm/100 cm ²)	14C (dpm/100 cm ²)	Survey Meter #	Gross (cpm)	dpm/100 cm ² (C14)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	β dpm/100 cm ² (C14)	Survey Meter #	Gross (μRem/ hr)
28	Floor	<100	<100	6	191	80	4	1298	1160	76	10	12
29	Floor	<100	<100	7	236	-71	4	1298	1160	76	10	12
30	Floor	<100	<100	7	193	-430	4	1298	1160	76	10	12
31	Floor	<100	<100	7	213	-263	4	1298	1160	76	10	12
32	Floor	<100	<100	7	229	-129	4	1298	1160	76	10	12
33	Floor	<100	<100	6	160	-166	4	1298	1160	76	10	12
34	Floor	<100	<100	6	174	-55	4	1298	1160	76	10	12
35	Floor	<100	<100	6	195	112	4	1298	1160	76	10	12
36	Benchtop	<100	<100	6	213	255	6	225	170	-87	10	12
37	Benchtop	<100	<100	6	176	-39	6	225	170	-87	10	12
38	Benchtop	<100	<100	6	176	-39	6	225	170	-87	10	12
39	Benchtop	<100	<100	6	185	33	6	225	170	-87	10	12
40	Benchtop	<100	<100	6	177	-31	6	225	170	-87	10	12
41	Floor	<100	<100	6	183	17	4	1298	1160	76	10	12
42	Floor	<100	<100	6	186	40	4	1298	1160	76	10	12
43	Floor	<100	<100	6	171	-79	4	1298	1160	76	10	12
44	Floor	<100	<100	7	240	-38	4	1298	1160	76	10	12
45	Floor	<100	<100	7	256	96	4	1298	1160	76	10	12
46	Floor	<100	<100	7	235	-79	4	1298	1160	76	10	12
47	Benchtop	<100	<100	7	234	-88	6	225	170	-87	10	12
48	Benchtop	<100	<100	7	235	-79	6	225	170	-87	10	12
49	Benchtop	<100	<100	7	214	-255	6	225	170	-87	10	12
50	Benchtop	<100	<100	7	235	-79	6	225	170	-87	10	12
51	Cabinet	<100	<100	7	267	188	6	200	150	-245	10	12
52	Cabinet	<100	<100	7	267	188	6	200	150	-245	10	12
53	Cabinet	<100	<100	7	282	313	6	200	150	-245	10	12
54	Wall	<100	<100	6	198	136	6	220	185	33	10	12

Site: Dupont
 Start Date: 01/24/14
 Surveyor: Matt Mueller

Building: Glasgow Lab/Room: 182
 Finish Date: 01/24/14
 Surveyor: Bo Bland

Area Survey Results		Wipe Tests		Direct Measurements			β Scan Measurements				Dose Rate	
Wipe Number	Description	3H (dpm/100 cm ²)	14C (dpm/100 cm ²)	Survey Meter #	Gross (cpm)	dpm/100 cm ² (C14)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	β dpm/100 cm ² (C14)	Survey Meter #	Gross (μRem/ hr)
55	Wall	<100	<100	6	212	247	6	285	250	548	10	12
56	Door	<100	<100	6	178	-23	6	200	150	-245	10	12
57	Benchtop	<100	<100	7	215	-246	6	225	170	-87	10	12
58	Benchtop	<100	<100	7	220	-205	6	225	170	-87	10	12
59	Sink	<100	<100	6	190	72	6	225	170	-87	10	12
60	Sink Drain	<100	<100	6	212	247	6	225	170	-87	10	12
Fume Hood 1												
1	Benchtop	<100	<100	6	172	-71	6	225	170	-87	10	12
2	Benchtop	<100	<100	6	163	-142	6	225	170	-87	10	12
3	Left Wall	<100	<100	6	159	-174	6	215	165	-126	10	12
4	Right Wall	<100	<100	6	158	-182	6	215	165	-126	10	12
5	Inside Back	<100	<100	6	154	-213	6	215	165	-126	10	12
6	Inside Back	<100	<100	6	140	-325	6	215	165	-126	10	12
7	Inside Back	<100	<100	6	172	-71	6	163	150	-245	10	12
8	Foil	<100	<100	6	167	-110	6	215	165	-126	10	12
9	Sash	<100	<100	6	155	-206	6	215	165	-126	10	12
10	Base	<100	<100	6	145	-285	6	215	165	-126	10	12
Fume Hood 2												
1	Benchtop	<100	<100	7	236	-71	6	215	180	-7	10	12
2	Benchtop	<100	<100	7	248	29	6	215	180	-7	10	12
3	Left Wall	<100	<100	7	243	-13	6	215	180	-7	10	12
4	Right Wall	<100	<100	7	240	-38	6	215	180	-7	10	12
5	Inside Back	<100	<100	7	234	-88	6	215	180	-7	10	12
6	Inside Back	<100	<100	7	233	-96	6	215	180	-7	10	12
7	Inside Back	<100	<100	7	215	-246	6	175	160	-166	10	12
8	Foil	<100	<100	7	302	480	6	215	180	-7	10	12

Survey Meter Information

Site: Dupont

Building: Glasgow

Lab/Room: 182

	Meter 1		Meter 2		Meter 3		Meter 4		Meter 5	
Date:	1/23/2014		1/23/2014		1/23/2014		1/24/2014		1/23/2014	
Make:	Ludlum		Ludlum		Ludlum		Ludlum		Voctoreen	
Model:	2221		2221		2221		2221		450P	
SN:	161591		157013		89650		89650		2550	
Probe Make:	Ludlum		Ludlum		Ludlum		Ludlum		N/A	
Probe Model:	43-68		43-68		43-37		43-37		N/A	
Probe SN:	118227		178512		124943		124943		N/A	
Probe Area (cm ²):	126		126		584		584		N/A	
Next Cal. Date:	10/28/2014		10/4/2014		7/26/2014		7/26/2014		10/15/2014	
Background Surface Material	air		Air		Air		Air		Air	
Background(c) - Time(Min):	1838	10	2008	10	11862	10	11131	10	20	μRem/hr
CS Isotope - Activity(μCi):	C-14	0.159	C-14	0.159	C-14	0.159	C-14	0.159	Cs-137	
CS Source(cpm)	8324		9094		6823		7334		OK	
L _c , L _d (Counts)	32	66	33	69	80	163	78	158	NA	NA
Direct MDC, Scan MDC (dpm/100cm ²)	524	1627	576	1790	266	849	258	822	NA	NA
MDCR, MDC Count Rate	329	236	352	255	1554	1214	1470	1140	NA	NA
Total Efficiency, Isotope:	10.0%	C-14	9.5%	C-14	10.5%	C-14	10.5%	C-14	N/A	
Source Efficiency	0.25		0.25		0.25		0.25		NA	

Please See MARSSIM Chapter 6 for a more detailed explanation of equations.

L_c= Critical Detection Level

L_d= a priori Detection limit

MDC= Minimum Detectable Concentration

MDCR= Minimum Detectable Count Rate

$$\text{Direct MDC} = \frac{3+4.65*\text{SQRT}(B)}{T*\epsilon_i*A*C}$$

$$\text{Scan MDC} = \frac{\text{MDCR}}{\text{SQRT}(E_{hf})*\epsilon_i*\epsilon_s*A*C}$$

$$\text{MDCR} = s_i * (60/i)$$

B = Background Counts

T = Counting Time In Minutes

ε_i = Total Detector Efficiency in Counts/Disintegration

A = Physical Probe Area in cm²

C = Other Constants and Factors When Needed

E_{hf} = Human Factor Efficiency

ε_s = Source Efficiency s_i = 1.38*SQRT(B_i)

i = Counting Interval

Survey Meter Information

Site: Dupont

Building: Glasgow

Lab/Room: 182

	Meter 6		Meter 7		Meter 8	Meter 9	Meter 10	
Date:	1/24/2014		1/24/2014		Not In Service	Not In Service	1/24/2014	
Make:	Ludlum		Ludlum				Voctoreen	
Model:	2221		2221				450P	
SN:	161591		157013				2550	
Probe Make:	Ludlum		Ludlum				N/A	
Probe Model:	43-68		43-68				N/A	
Probe SN:	118227		178512				N/A	
Probe Area (cm ²):	126		126				N/A	
Next Cal. Date:	10/28/2014		10/4/2014				41927	
Background Surface Material	air		Air				Air	
Background(c) - Time(Min):	1809	10	2445	10			20	1
CS Isotope - Activity(μCi):	C-14	0.159	C-14	0.159			Cs-137	
CS Source(cpm)	8564		8603				OK	
L _c , L _d (Counts)	31	66	36	76			NA	NA
Direct MDC, Scan MDC (dpm/100cm ²)	520	1614	632	1975			NA	NA
MDCR, MDC Count Rate	325	233	412	305			NA	NA
Total Efficiency, Isotope:	10.0%	C-14	9.5%	C-14			N/A	
Source Efficiency	0.25		0.25				NA	

Please See MARSSIM Chapter 6 for a more detailed explanation of equations.

L_c= Critical Detection Level

L_d= a priori Detection limit

MDC= Minimum Detectable Concentration

MDCR= Minimum Detectable Count Rate

$$\text{Direct MDC} = \frac{3 + 4.65 \cdot \text{SQRT}(B)}{T \cdot \epsilon_t \cdot A \cdot C}$$

$$\text{Scan MDC} = \frac{\text{MDCR}}{\text{SQRT}(E_{hf}) \cdot \epsilon_s \cdot \epsilon_t \cdot A \cdot C}$$

$$\text{MDCR} = s_i \cdot (60/i)$$

B = Background Counts

T = Counting Time In Minutes

ε_t = Total Detector Efficiency in Counts/Disintegration


A = Physical Probe Area in cm²

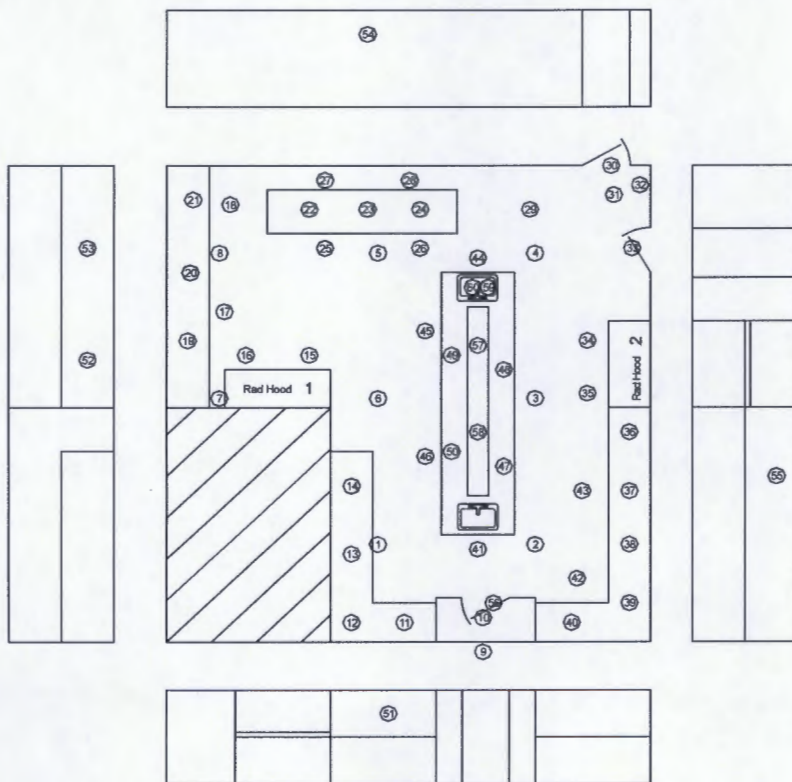
C = Other Constants and Factors When Needed

E_{hf} = Human Factor Efficiency


ε_s = Source Efficiency s_i = 1.38 * SQRT(B_r)

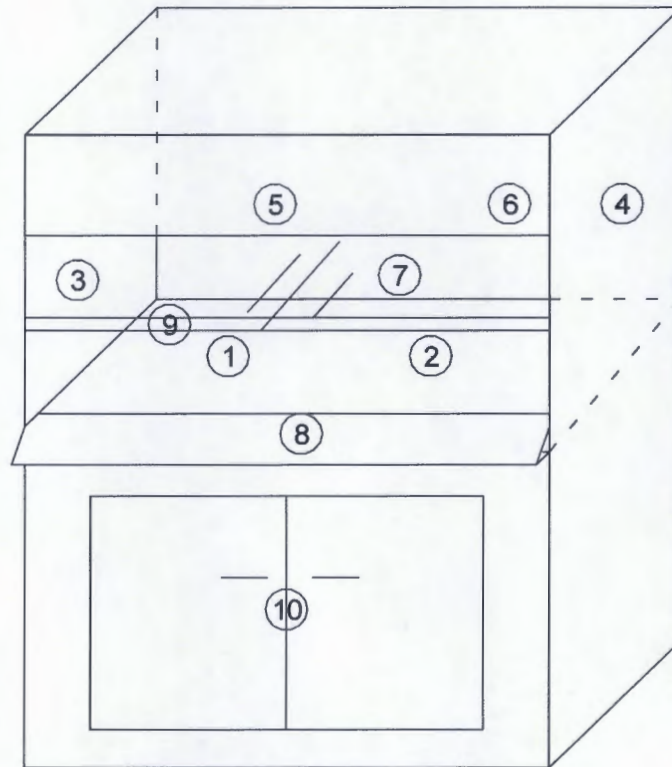
i = Counting Interval

Radiological Survey	Dupont 2309 Sunset Lake Rd, Newark, DE 19702				
			Building Glasgow	Room 182	Lab Type
Surveyors	Name: Matt Mueller	Name: Bo Bland	Date 1/24/2014		
Contact	Name: Aaron Chen	Phone No. 302-366-5062			




Remarks:

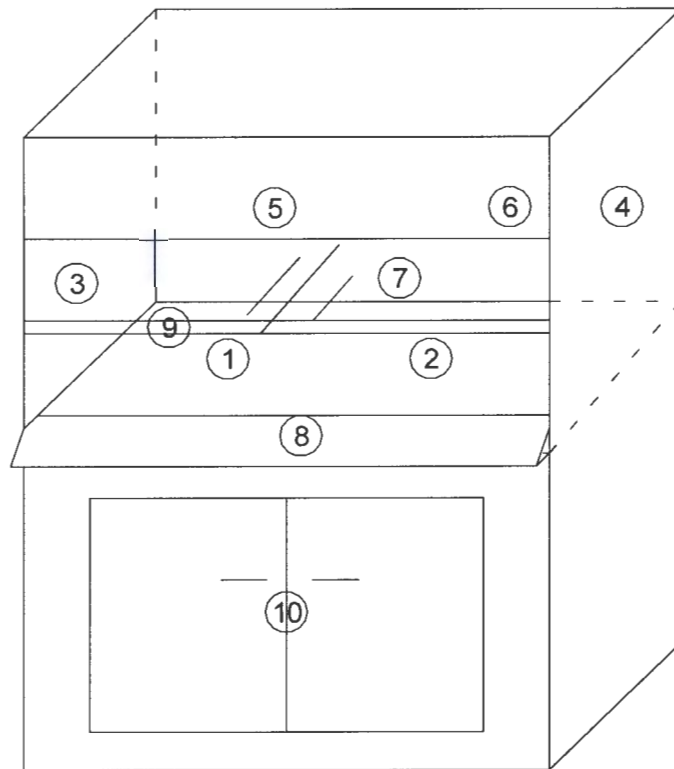
Radiological Decommissioning Survey	Dupont Glasgow			
			Building Glasgow	Room 182
Surveyors	Name: Matt Mueller	Name Bo Bland	Date 1/24/2014	
Contact	Name: Aaron Chen	Phone No. 302-366-5062	Fume Hood ID Rad Hood 1	



Signature:

Remarks:

Radiological Decommissioning Survey		Dupont			
		Glasgow		Building Glasgow	Room 182
Surveyors		Name: Matt Mueller	Name Bo Bland	Date 1/24/2014	
Contact		Name: Aaron Chen	Phone No. 302-366-5062	Fume Hood ID Rad Hood 2	



Signature:

Remarks:

Site: Dupont
 Start Date: 01/24/14
 Surveyor: Matt Mueller

Building: Glasgow Lab/Room: 184
 Finish Date: 01/24/14
 Surveyor: Bo Bland

Area Survey Results		Wipe Tests		Direct Measurements			β Scan Measurements				Dose Rate	
Wipe Number	Description	3H (dpm/100 cm ²)	14C (dpm/100 cm ²)	Survey Meter #	Gross (cpm)	dpm/100 cm ² (C14)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	β dpm/100 cm ² (C14)	Survey Meter #	Gross (μRem/ hr)
1	Benchtop	<100	<100	6	168	-102	6	225	145	-285	10	17
2	Floor	<100	<100	6	185	33	4	1150	1050	-103	10	17
3	Floor	<100	<100	6	202	167	4	1150	1050	-103	10	17
4	Floor	<100	<100	6	188	56	4	1150	1050	-103	10	17
5	Benchtop	<100	<100	7	265	171	6	225	145	-285	10	17
6	Benchtop	<100	<100	7	306	514	6	225	145	-285	10	17
7	Floor	<100	<100	7	213	-263	4	1150	1050	-103	10	17
8	Floor	<100	<100	7	268	196	4	1150	1050	-103	10	17
9	Benchtop	<100	<100	7	248	29	6	225	145	-285	10	17
10	Wall	<100	<100	6	176	-39	6	286	250	548	10	17
11	Cabinet	<100	<100	7	235	-79	6	160	140	-325	10	17
12	Cabinet	<100	<100	7	238	-54	6	160	140	-325	10	17
13	Cabinet	<100	<100	7	249	38	6	160	140	-325	10	17
14	Cabinet	<100	<100	7	236	-71	6	160	140	-325	10	17
15	Door	<100	<100	7	218	-221	6	160	140	-325	10	17
16	Cabinet	<100	<100	6	186	40	6	160	140	-325	10	17
17	Floor	<100	<100	6	215	271	4	1150	1050	-103	10	17
18	Floor	<100	<100	6	195	112	4	1150	1050	-103	10	17
19	Floor	<100	<100	6	204	183	4	1150	1050	-103	10	17
20	Floor	<100	<100	6	221	318	4	1150	1050	-103	10	17
21	Floor	<100	<100	6	218	294	4	1150	1050	-103	10	17
22	Floor	<100	<100	7	215	-246	4	1150	1050	-103	10	17
23	Floor	<100	<100	7	206	-322	4	1150	1050	-103	10	17
24	Floor	<100	<100	7	199	-380	4	1150	1050	-103	10	17
25	Benchtop	<100	<100	7	179	-547	6	225	140	-325	10	17
26	Benchtop	<100	<100	6	181	1	6	225	145	-285	10	17
27	Benchtop	<100	<100	6	185	33	6	225	145	-285	10	17

Site: Dupont
 Start Date: 01/24/14
 Surveyor: Matt Mueller

Building: Glasgow
 Finish Date: 01/24/14

Lab/Room: 184
 Surveyor: Bo Bland

Area Survey Results		Wipe Tests		Direct Measurements			β Scan Measurements				Dose Rate	
Wipe Number	Description	3H (dpm/100 cm ²)	14C (dpm/100 cm ²)	Survey Meter #	Gross (cpm)	dpm/100 cm ² (C14)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	β dpm/100 cm ² (C14)	Survey Meter #	Gross (μRem/ hr)
28	Benchtop	<100	<100	6	192	88	6	225	145	-285	10	17
29	Cabinet	<100	<100	6	167	-110	6	160	140	-325	10	17
30	Floor	<100	<100	6	209	223	4	1150	1050	-103	10	17
31	Floor	<100	<100	6	199	144	4	1150	1050	-103	10	17
32	Floor	<100	<100	6	175	-47	4	1150	1050	-103	10	17
33	Benchtop	<100	<100	6	167	-110	6	225	145	-285	10	17
34	Benchtop	<100	<100	6	176	-39	6	225	145	-285	10	17
35	Floor	<100	<100	6	192	88	4	1150	1050	-103	10	17
36	Benchtop	<100	<100	6	203	175	6	225	145	-285	10	17
37	Benchtop	<100	<100	6	183	17	6	225	145	-285	10	17
38	Benchtop	<100	<100	6	177	-31	6	225	145	-285	10	17
39	Benchtop	<100	<100	6	152	-229	6	225	145	-285	10	17
40	Floor	<100	<100	6	175	-47	4	1150	1050	-103	10	17
41	Floor	<100	<100	6	200	152	4	1150	1050	-103	10	17
42	Floor	<100	<100	6	155	-206	4	1150	1050	-103	10	17
43	Floor	<100	<100	6	202	167	4	1150	1050	-103	10	17
44	Cabinet	<100	<100	6	171	-79	6	160	140	-325	10	17
45	Benchtop	<100	<100	7	238	-54	6	240	145	-285	10	17
46	Floor	<100	<100	7	256	96	4	1150	1050	-103	10	17
47	Benchtop	<100	<100	7	255	88	6	225	145	-285	10	17
48	Benchtop	<100	<100	7	257	104	6	225	145	-285	10	17
49	Floor	<100	<100	7	240	-38	4	1150	1050	-103	10	17
50	Floor	<100	<100	7	290	380	4	1150	1050	-103	10	17
51	Floor	<100	<100	7	240	-38	4	1150	1050	-103	10	17
52	Floor	<100	<100	7	235	-79	4	1150	1050	-103	10	17
53	Floor	<100	<100	7	247	21	4	1150	1050	-103	10	17
54	Floor	<100	<100	7	252	63	4	1150	1050	-103	10	17

Site: Dupont
 Start Date: 01/24/14
 Surveyor: Matt Mueller

Building: Glasgow Lab/Room: 184
 Finish Date: 01/24/14
 Surveyor: Bo Bland

Area Survey Results		Wipe Tests		Direct Measurements			β Scan Measurements				Dose Rate	
Wipe Number	Description	3H (dpm/100 cm ²)	14C (dpm/100 cm ²)	Survey Meter #	Gross (cpm)	dpm/100 cm ² (C14)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	β dpm/100 cm ² (C14)	Survey Meter #	Gross (μRem/ hr)
55	Floor	<100	<100	7	266	180	4	1150	1050	-103	10	17
56	Floor	<100	<100	7	247	21	4	1150	1050	-103	10	17
57	Benchtop	<100	<100	7	219	-213	6	225	140	-325	10	17
58	Benchtop	<100	<100	7	239	-46	6	225	140	-325	10	17
59	Benchtop	<100	<100	7	260	129	6	225	140	-325	10	17
60	Benchtop	<100	<100	7	310	547	6	225	140	-325	10	17
61	Benchtop	<100	<100	6	175	-47	6	225	140	-325	10	17
62	Benchtop	<100	<100	6	166	-118	6	225	140	-325	10	17
63	Sink	<100	<100	6	177	-31	6	225	140	-325	10	17
64	Sink Drain	<100	<100	6	169	-94	6	215	170	-87	10	17
Hood 1												
1	Benchtop	<100	<100	7	204	-338	7	301	250	46	10	17
2	Benchtop	<100	<100	7	221	-196	7	301	250	46	10	17
3	Left Wall	<100	<100	7	187	-480	7	301	250	46	10	17
4	Right Wall	<100	<100	7	204	-338	7	301	250	46	10	17
5	Inside Back	<100	<100	7	209	-297	7	301	250	46	10	17
6	Inside Back	<100	<100	7	218	-221	7	301	250	46	10	17
7	Inside Back	<100	<100	7	225	-163	7	301	250	46	10	17
8	Foil	<100	<100	7	258	113	7	301	250	46	10	17
9	Sash	<100	<100	7	210	-288	7	301	250	46	10	17
10	Base	<100	<100	7	216	-238	7	301	250	46	10	17
Hood 2												
1	Benchtop	<100	<100	6	145	-285	6	292	250	548	10	17
2	Benchtop	<100	<100	6	177	-31	6	292	250	548	10	17
3	Left Wall	<100	<100	6	178	-23	6	292	250	548	10	17
4	Right Wall	<100	<100	6	161	-158	6	292	250	548	10	17

Surveyor: Bo Bland

[illegible]

Survey Meter Information

Site: Dupont

Building: Glasgow

Lab/Room: 184

	Meter 1		Meter 2		Meter 3		Meter 4		Meter 5	
Date:	1/23/2014		1/23/2014		1/23/2014		1/24/2014		1/23/2014	
Make:	Ludlum		Ludlum		Ludlum		Ludlum		Voctoreen	
Model:	2221		2221		2221		2221		450P	
SN:	161591		157013		89650		89650		2550	
Probe Make:	Ludlum		Ludlum		Ludlum		Ludlum		N/A	
Probe Model:	43-68		43-68		43-37		43-37		N/A	
Probe SN:	118227		178512		124943		124943		N/A	
Probe Area (cm ²):	126		126		584		584		N/A	
Next Cal. Date:	10/28/2014		10/4/2014		7/26/2014		7/26/2014		10/15/2014	
Background Surface Material	air		Air		Air		Air		Air	
Background(c) - Time(Min):	1838	10	2008	10	11862	10	11131	10	20	μRem/hr
CS Isotope - Activity(μCi):	C-14	0.159	C-14	0.159	C-14	0.159	C-14	0.159	Cs-137	
CS Source(cpm)	8324		9094		6823		7334		OK	
L _c , L _d (Counts)	32	66	33	69	80	163	78	158	NA	NA
Direct MDC, Scan MDC (dpm/100cm ²)	524	1627	576	1790	266	849	258	822	NA	NA
MDCR, MDC Count Rate	329	236	352	255	1554	1214	1470	1140	NA	NA
Total Efficiency, Isotope:	10.0%	C-14	9.5%	C-14	10.5%	C-14	10.5%	C-14	N/A	
Source Efficiency	0.25		0.25		0.25		0.25		NA	

Please See MARSSIM Chapter 6 for a more detailed explanation of equations.

L_c= Critical Detection Level

L_d= a priori Detection limit

MDC= Minimum Detectable Concentration

MDCR= Minimum Detectable Count Rate

$$\text{Direct MDC} = \frac{3+4.65*\text{SQRT}(B)}{T*\epsilon_t*A*C}$$

$$\text{Scan MDC} = \frac{\text{MDCR}}{\text{SQRT}(E_{hf})*\epsilon_t*\epsilon_s*A*C}$$

$$\text{MDCR} = s_i * (60/i)$$

B = Background Counts

T = Counting Time In Minutes

ε_t = Total Detector Efficiency in Counts/Disintegration

A = Physical Probe Area in cm²

C = Other Constants and Factors When Needed

E_{hf} = Human Factor Efficiency

ε_s = Source Efficiency

$$s_i = 1.38*\text{SQRT}(B_i)$$

i = Counting Interval

Survey Meter Information

Site: Dupont

Building: Glasgow

Lab/Room: 184

	Meter 6	Meter 7	Meter 8	Meter 9	Meter 10
Date:	1/24/2014	1/24/2014	Not In Service	Not In Service	1/24/2014
Make:	Ludlum	Ludlum			Voctoreen
Model:	2221	2221			450P
SN:	161591	157013			2550
Probe Make:	Ludlum	Ludlum			N/A
Probe Model:	43-68	43-68			N/A
Probe SN:	118227	178512			N/A
Probe Area (cm ²):	126	126			N/A
Next Cal. Date:	10/28/2014	10/4/2014			41927
Background Surface Material	air	Air			Air
Background(c) - Time(Min):	1809	2445			20
CS Isotope - Activity(μCi):	C-14	C-14			Cs-137
CS Source(cpm)	8564	8603			OK
L _c , L _d (Counts)	31	36			NA
Direct MDC, Scan MDC (dpm/100cm ²)	520	632			NA
MDCR, MDC Count Rate	325	412			NA
Total Efficiency, Isotope:	10.0% C-14	9.5% C-14			N/A
Source Efficiency	0.25	0.25			NA

Please See MARSSIM Chapter 6 for a more detailed explanation of equations.

L_c= Critical Detection Level

L_d= a priori Detection limit

MDC= Minimum Detectable Concentration

MDCR= Minimum Detectable Count Rate

$$\text{Direct MDC} = \frac{3+4.65*\text{SQRT}(B)}{T*\epsilon_i*A*C}$$

$$\text{Scan MDC} = \frac{\text{MDCR}}{\text{SQRT}(E_{hf}*\epsilon_i*\epsilon_s*A*C)}$$

$$\text{MDCR} = s_i * (60/i)$$

B = Background Counts

T = Counting Time In Minutes

ε_i = Total Detector Efficiency in Counts/Disintegration


A = Physical Probe Area in cm²

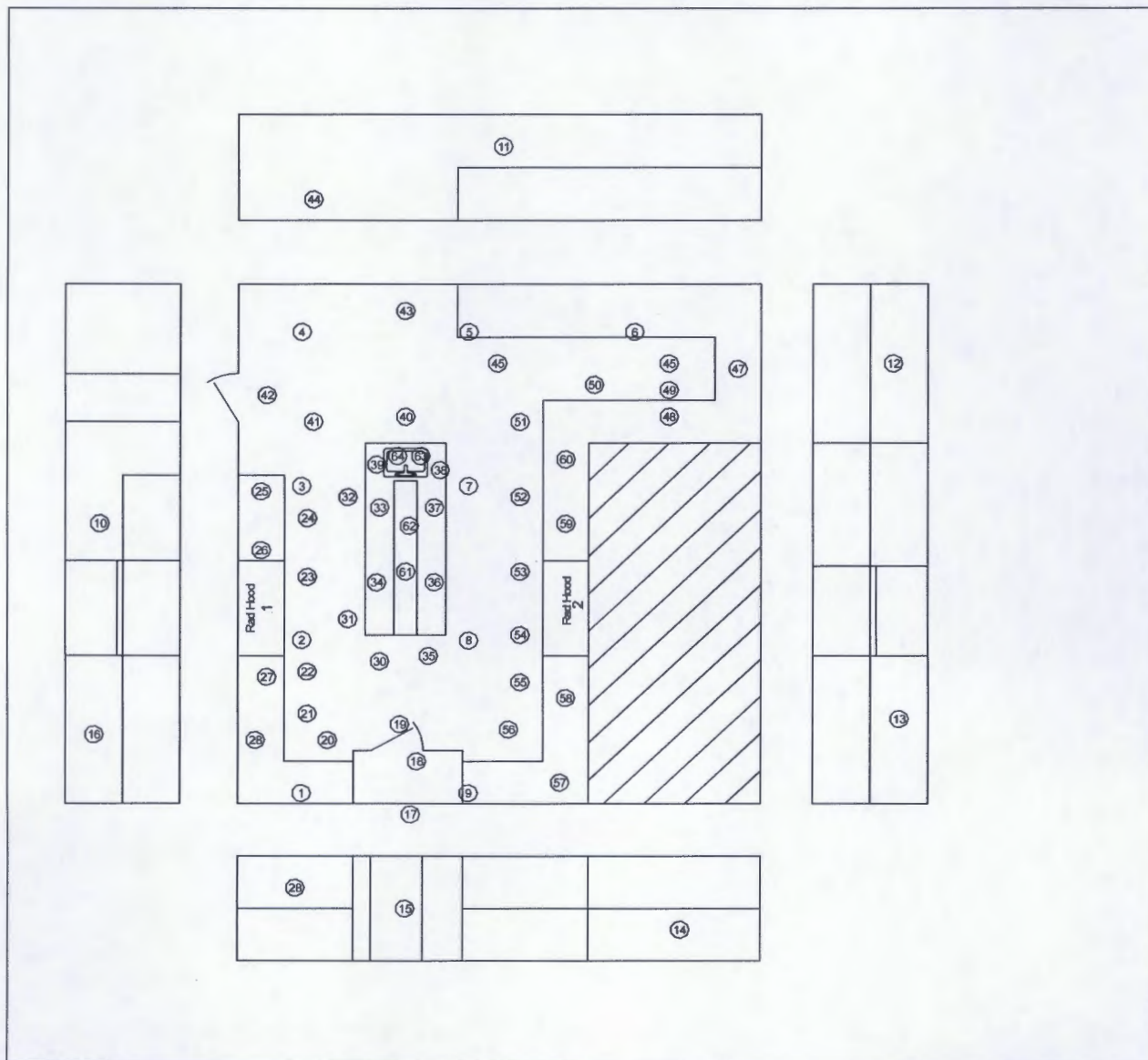
C = Other Constants and Factors When Needed

E_{hf} = Human Factor Efficiency


ε_s = Source Efficiency s_i = 1.38*SQRT(B_i)

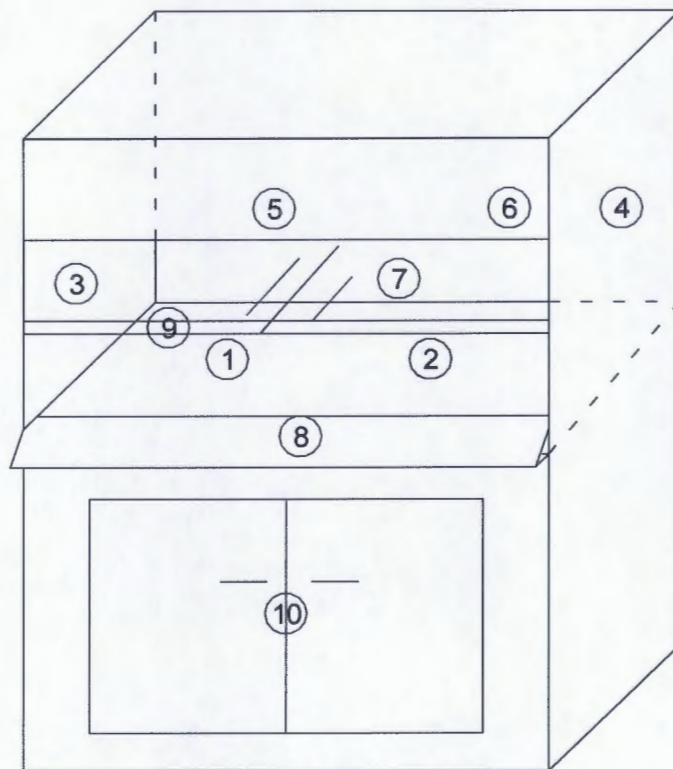
i = Counting Interval

Radiological Survey	Dupont 2309 Sunset Lake Rd, Newark, DE 19702			
			Building Glasgow	Room 184
Surveyors	Name: Matt Mueller	Name: Bo Bland	Date 1/24/2014	
Contact	Name: Aaron Chen	Phone No. 302-366-5062		




Remarks:

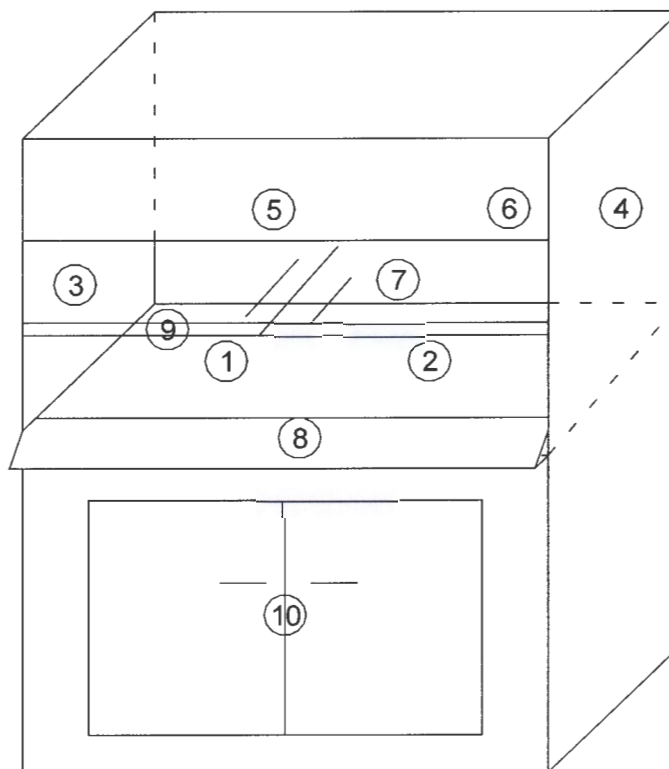
Radiological Decommissioning Survey		Dupont			
		Glasgow		Building Glasgow	Room 184
Surveyors		Name: Matt Mueller	Name: Bo Bland	Date 1/24/2014	
Contact		Name: Aaron Chen	Phone No. 302-366-5062	Fume Hood ID Hood 1	



Signature:

Remarks:

Radiological Decommissioning Survey		Dupont			
		Glasgow		Building Glasgow	Room 184
Surveyors	Name: Matt Mueller	Name Bo Bland	Date 1/24/2014		
Contact	Name: Aaron Chen	Phone No. 302-366-5062	Fume Hood ID Fume Hood 2		



Signature:

Remarks:

Site: Dupont
 Start Date: 01/24/14
 Surveyor: Matt Mueller

Building: Glasgow Lab/Room: RW Shed
 Finish Date: 01/24/14
 Surveyor: Bo Bland

Area Survey Results		Wipe Tests		Direct Measurements			β Scan Measurements				Dose Rate	
Wipe Number	Description	3H (dpm/100 cm ²)	14C (dpm/100 cm ²)	Survey Meter #	Gross (cpm)	dpm/100 cm ² (C14)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	β dpm/100 cm ² (C14)	Survey Meter #	Gross (μRem/ hr)
1	Floor	<100	<100	6	150	-245	4	1015	925	-307	10	12
2	Floor	<100	<100	6	156	-198	4	1015	925	-307	10	12
3	Floor	<100	<100	6	136	-356	4	1015	925	-307	10	12
4	Floor	<100	<100	6	156	-198	4	1015	925	-307	10	12
5	Floor	<100	<100	6	136	-356	4	1015	925	-307	10	12
6	Floor	<100	<100	6	138	-340	4	1015	925	-307	10	12
7	Floor	<100	<100	6	132	-388	4	1015	925	-307	10	12
8	Floor	<100	<100	6	138	-340	4	1015	925	-307	10	12
9	Floor	<100	<100	6	169	-94	4	1015	925	-307	10	12
10	Floor	<100	<100	6	150	-245	4	1015	925	-307	10	12
11	Wall	<100	<100	6	160	-166	6	160	140	-325	10	12
12	Wall	<100	<100	6	140	-325	6	160	140	-325	10	12
13	Wall	<100	<100	6	124	-452	6	160	140	-325	10	12
14	Wall	<100	<100	6	155	-206	6	160	140	-325	10	12
15	Wall	<100	<100	6	131	-396	6	160	140	-325	10	12
16	Wall	<100	<100	6	148	-261	6	160	140	-325	10	12
17	Wall	<100	<100	6	136	-356	6	160	140	-325	10	12
18	Wall	<100	<100	6	120	-483	6	160	140	-325	10	12
19	Wall	<100	<100	6	133	-380	6	160	140	-325	10	12
20	Wall	<100	<100	6	150	-245	6	160	140	-325	10	12
21	Pan Under FI	<100	<100	6	153	-221	6	142	130	-404	10	12
22	Pan Under FI	<100	<100	6	127	-428	6	156	120	-483	10	12
23	Pan Under FI	<100	<100	6	155	-206	6	157	140	-325	10	12
24	Pan Under FI	<100	<100	6	145	-285	6	160	140	-325	10	12
25	Pan Under FI	<100	<100	6	140	-325	6	160	140	-325	10	12

Survey Meter Information

Site: Dupont

Building: Glasgow

Lab/Room: RW Shed

	Meter 1		Meter 2		Meter 3		Meter 4		Meter 5	
Date:	1/23/2014		1/23/2014		1/23/2014		1/24/2014		1/23/2014	
Make:	Ludlum		Ludlum		Ludlum		Ludlum		Voctoreen	
Model:	2221		2221		2221		2221		450P	
SN:	161591		157013		89650		89650		2550	
Probe Make:	Ludlum		Ludlum		Ludlum		Ludlum		N/A	
Probe Model:	43-68		43-68		43-37		43-37		N/A	
Probe SN:	118227		178512		124943		124943		N/A	
Probe Area (cm ²):	126		126		584		584		N/A	
Next Cal. Date:	10/28/2014		10/4/2014		7/26/2014		7/26/2014		10/15/2014	
Background Surface Material	air		Air		Air		Air		Air	
Background(c) - Time(Min):	1838	10	2008	10	11862	10	11131	10	20	μRem/hr
CS Isotope - Activity(μCi):	C-14	0.159	C-14	0.159	C-14	0.159	C-14	0.159	Cs-137	
CS Source(cpm)	8324		9094		6823		7334		OK	
L _c , L _d (Counts)	32	66	33	69	80	163	78	158	NA	NA
Direct MDC, Scan MDC (dpm/100cm ²)	524	1627	576	1790	266	849	258	822	NA	NA
MDCR, MDC Count Rate	329	236	352	255	1554	1214	1470	1140	NA	NA
Total Efficiency, Isotope:	10.0%	C-14	9.5%	C-14	10.5%	C-14	10.5%	C-14	N/A	
Source Efficiency	0.25		0.25		0.25		0.25		NA	

Please See MARSSIM Chapter 6 for a more detailed explanation of equations.

L_c= Critical Detection Level

L_d= a priori Detection limit

MDC= Minimum Detectable Concentration

MDCR= Minimum Detectable Count Rate

$$\text{Direct MDC} = \frac{3 + 4.65 \cdot \text{SQRT}(B)}{T \cdot \epsilon_t \cdot A \cdot C}$$

$$\text{Scan MDC} = \frac{\text{MDCR}}{\text{SQRT}(E_{ht}) \cdot \epsilon_i \cdot \epsilon_s \cdot A \cdot C}$$

$$\text{MDCR} = s_i \cdot (60/i)$$

B = Background Counts

T = Counting Time In Minutes

ε_t = Total Detector Efficiency in Counts/Disintegration

A = Physical Probe Area in cm²

C = Other Constants and Factors When Needed

E_{ht} = Human Factor Efficiency

ε_s = Source Efficiency s_i = 1.38 * SQRT(B_r)

i = Counting Interval

Survey Meter Information

Site: Dupont

Building: Glasgow

Lab/Room: RW Shed

	Meter 6		Meter 7		Meter 8	Meter 9	Meter 10	
Date:	1/24/2014		1/24/2014		Not In Service	Not In Service	1/24/2014	
Make:	Ludlum		Ludlum				Voctoreen	
Model:	2221		2221				450P	
SN:	161591		157013				2550	
Probe Make:	Ludlum		Ludlum				N/A	
Probe Model:	43-68		43-68				N/A	
Probe SN:	118227		178512				N/A	
Probe Area (cm ²):	126		126				N/A	
Next Cal. Date:	10/28/2014		10/4/2014				41927	
Background Surface Material	air		Air				Air	
Background(c) - Time(Min):	1809	10	2445	10			20	1
CS Isotope - Activity(μCi):	C-14	0.159	C-14	0			Cs-137	
CS Source(cpm)	8564		8603				OK	
L _c , L _d (Counts)	31	66	36	76			NA	NA
Direct MDC, Scan MDC (dpm/100cm ²)	520	1614	632	1975			NA	NA
MDCR, MDC Count Rate	325	233	412	305			NA	NA
Total Efficiency, Isotope:	10.0%	C-14	9.5%	C-14			N/A	
Source Efficiency	0.25		0.25				NA	

Please See MARSSIM Chapter 6 for a more detailed explanation of equations.

L_c= Critical Detection Level

L_d= a priori Detection limit

MDC= Minimum Detectable Concentration

MDCR= Minimum Detectable Count Rate

$$\text{Direct MDC} = \frac{3 + 4.65 \cdot \text{SQRT}(B)}{T \cdot \epsilon_t \cdot A \cdot C}$$

$$\text{Scan MDC} = \frac{\text{MDCR}}{\text{SQRT}(E_{\text{hf}}) \cdot \epsilon_s \cdot \epsilon_i \cdot A \cdot C}$$

$$\text{MDCR} = s_i \cdot (60/i)$$

B = Background Counts

T = Counting Time In Minutes

ε_t = Total Detector Efficiency in Counts/Disintegration


A = Physical Probe Area in cm²

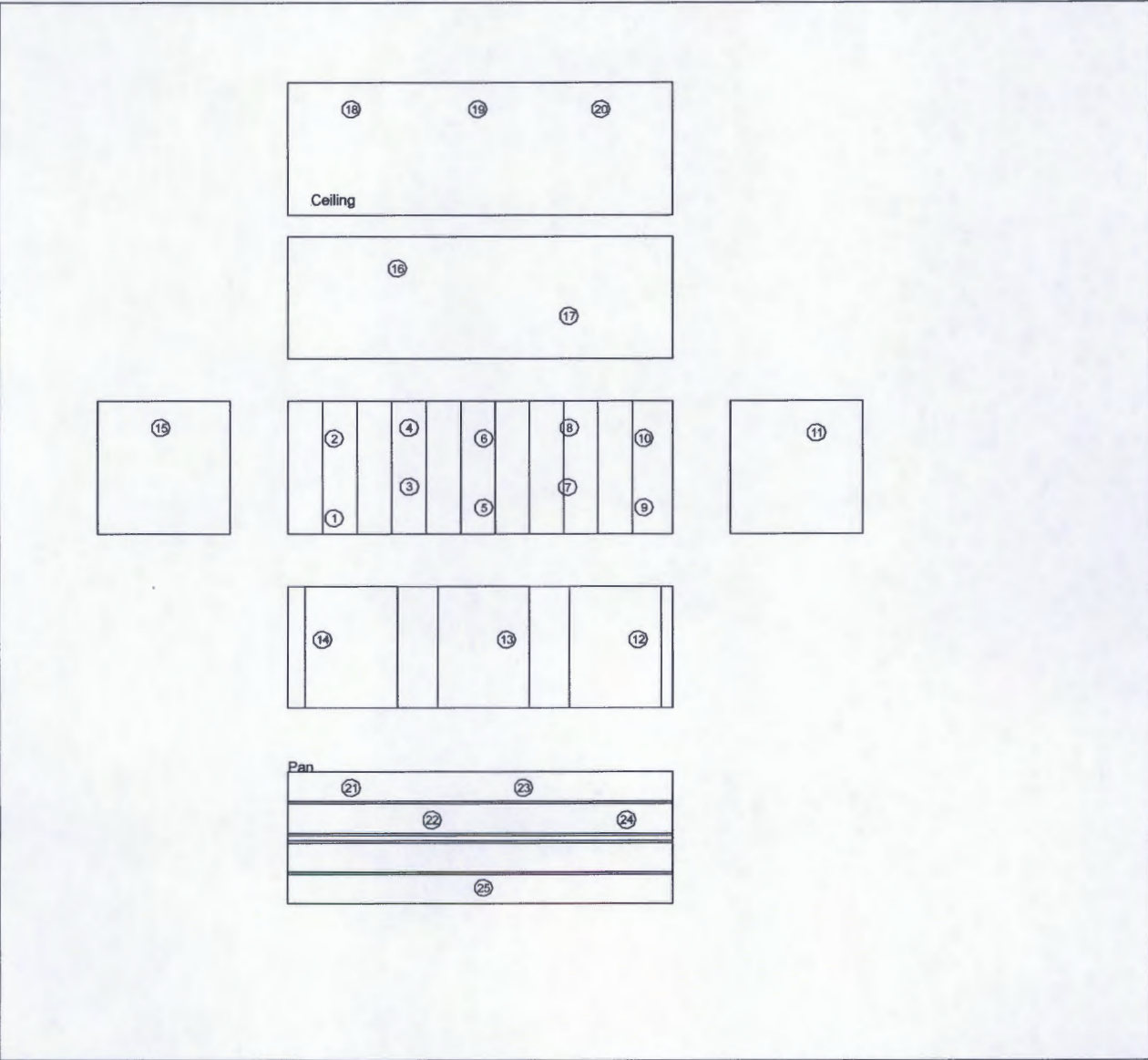
C = Other Constants and Factors When Needed

E_{hf} = Human Factor Efficiency

ε_s = Source Efficiency s_i = 1.38 * SQRT(B_t)

i = Counting Interval

Radiological Survey		Dupont 2309 Sunset Lake Rd, Newark, DE 19702			
				Building Glasgow	Room RW Shed
Surveyors	Name: Matt Mueller		Name: Bo Bland		Date: 1/24/2014
Contact	Name: Aaron Chen		Phone No. 302-366-5062		



The diagram shows a facility layout with various rooms and areas labeled with circled numbers 1 through 25. The layout includes a central corridor with rooms on both sides, a ceiling area at the top, and a pan area at the bottom. The rooms are labeled as follows: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25.

Remarks:

Lab/Room: Hallways

or: Bo Bland

[illegible]

Survey Meter Information

Site: Dupont

Building: Glasgow

Lab/Room: Hallways

	Meter 1		Meter 2		Meter 3		Meter 4		Meter 5	
Date:	1/23/2014		1/23/2014		1/23/2014		1/24/2014		1/23/2014	
Make:	Ludlum		Ludlum		Ludlum		Ludlum		Voctoreen	
Model:	2221		2221		2221		2221		450P	
SN:	161591		157013		89650		89650		2550	
Probe Make:	Ludlum		Ludlum		Ludlum		Ludlum		N/A	
Probe Model:	43-68		43-68		43-37		43-37		N/A	
Probe SN:	118227		178512		124943		124943		N/A	
Probe Area (cm ²):	126		126		584		584		N/A	
Next Cal. Date:	10/28/2014		10/4/2014		7/26/2014		7/26/2014		10/15/2014	
Background Surface Material	air		Air		Air		Air		Air	
Background(c) - Time(Min):	1838	10	2008	10	11862	10	11131	10	20	μRem/hr
CS Isotope - Activity(μCi):	C-14	0.159	C-14	0.159	C-14	0.159	C-14	0.159	Cs-137	
CS Source(cpm)	8324		9094		6823		7334		OK	
L _c , L _d (Counts)	32	66	33	69	80	163	78	158	NA	NA
Direct MDC, Scan MDC (dpm/100cm ²)	524	1627	576	1790	266	849	258	822	NA	NA
MDCR, MDC Count Rate	329	236	352	255	1554	1214	1470	1140	NA	NA
Total Efficiency, Isotope:	10.0%	C-14	9.5%	C-14	10.5%	C-14	10.5%	C-14	N/A	
Source Efficiency	0.25		0.25		0.25		0.25		NA	

Please See MARSSIM Chapter 6 for a more detailed explanation of equations.

L_c= Critical Detection Level

L_d= a priori Detection limit

MDC= Minimum Detectable Concentration

MDCR= Minimum Detectable Count Rate

$$\text{Direct MDC} = \frac{3+4.65*\text{SQRT}(B)}{T*\epsilon_t*A*C}$$

$$\text{Scan MDC} = \frac{\text{MDCR}}{\text{SQRT}(E_{\text{eff}})*\epsilon_t*\epsilon_s*A*C}$$

$$\text{MDCR} = s_i * (60/i)$$

B = Background Counts

T = Counting Time In Minutes

ε_t = Total Detector Efficiency in Counts/Disintegration

A = Physical Probe Area in cm²

C = Other Constants and Factors When Needed

E_{eff} = Human Factor Efficiency

ε_s = Source Efficiency s_i = 1.38*SQRT(B_t)

i = Counting Interval

Survey Meter Information

Site: Dupont

Building: Glasgow

Lab/Room: Hallways

	Meter 6		Meter 7		Meter 8	Meter 9	Meter 10	
Date:	1/24/2014		1/24/2014		Not In Service	Not In Service	1/24/2014	
Make:	Ludlum		Ludlum				Voctoreen	
Model:	2221		2221				450P	
SN:	161591		157013				2550	
Probe Make:	Ludlum		Ludlum				N/A	
Probe Model:	43-68		43-68				N/A	
Probe SN:	118227		178512				N/A	
Probe Area (cm ²):	126		126				N/A	
Next Cal. Date:	10/28/2014		10/4/2014				41927	
Background Surface Material	air		Air				Air	
Background(c) - Time(Min):	1809	10	2445	10			20	1
CS Isotope - Activity(μCi):	C-14	0.159	C-14	0			Cs-137	
CS Source(cpm)	8564		8603				OK	
L _c , L _d (Counts)	31	66	36	76			NA	NA
Direct MDC, Scan MDC (dpm/100cm ²)	520	1614	632	1975			NA	NA
MDCR, MDC Count Rate	325	233	412	305			NA	NA
Total Efficiency, Isotope:	10.0%	C-14	9.5%	C-14			N/A	
Source Efficiency	0.25		0.25				NA	

Please See MARSSIM Chapter 6 for a more detailed explanation of equations.

L_c= Critical Detection Level

L_d= a priori Detection limit

MDC= Minimum Detectable Concentration

MDCR= Minimum Detectable Count Rate

$$\text{Direct MDC} = \frac{3+4.65*\text{SQRT}(B)}{T*\epsilon_t*A*C}$$

$$\text{Scan MDC} = \frac{\text{MDCR}}{\text{SQRT}(E_{\text{eff}})*\epsilon_t*\epsilon_s*A*C}$$

$$\text{MDCR} = s_i * (60/i)$$

B = Background Counts

T = Counting Time In Minutes

ε_t = Total Detector Efficiency in Counts/Disintegration


A = Physical Probe Area in cm²

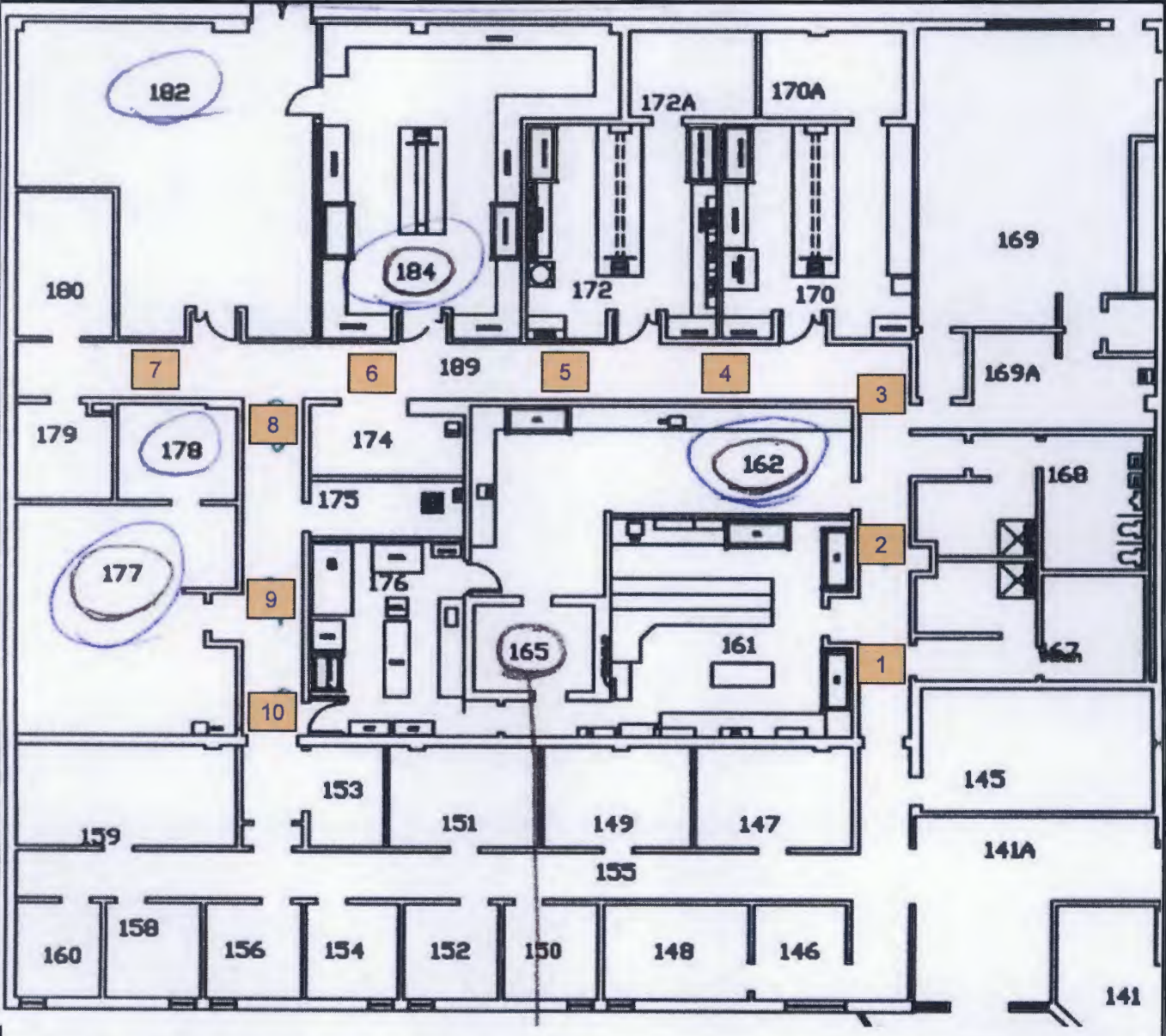
C = Other Constants and Factors When Needed

E_{eff} = Human Factor Efficiency

ε_s = Source Efficiency s_i = 1.38*SQRT(B_i)

i = Counting Interval

Radiological Survey		Dupont 2309 Sunset Lake Rd, Newark, DE 19702			
				Building Glasgow	Room Hallways
Surveyors	Name: Matt Mueller	Name: Bo Bland	Date 1/24/2014		
Contact	Name: Aaron Chen	Phone No. 302-366-5062			



Remarks:

Surveyor: Bo Bland

Survey Meter Information

Site: Dupont

Building: Glasgow

Lab/Room: 117 Hallway

	Meter 1		Meter 2		Meter 3		Meter 4		Meter 5	
Date:	7/28/2014		7/28/2014		7/28/2014		7/28/2014		7/28/2014	
Make:	Ludlum		Ludlum		Ludlum		Ludlum		Voctoreen	
Model:	2221		2221		2221		2221		450P	
SN:	161591		89650		161591		89650		2550	
Probe Make:	Ludlum		Ludlum		Ludlum		Ludlum		N/A	
Probe Model:	43-68		43-37		43-68		43-37		N/A	
Probe SN:	118227		124943		118227		124943		N/A	
Probe Area (cm ²):	126		584		126		584		N/A	
Next Cal. Date:	10/28/2014		6/11/2015		10/28/2014		6/11/2015		10/15/2014	
Background Surface Material	Air		Air		Ceramic Tile		Ceramic Tile		Air	
Background(c) - Time(Min):	2247	10	7961	10	5187	10	17489	10	15	μRem/hr
CS Isotope - Activity(μCi):	C-14	0.159	C-14	0.159	C-14	0.159	C-14	0.159	Cs-137	
CS Source(cpm)	9000		8223		9000		8223		OK	
L _c , L _d (Counts)	35	73	66	134	53	109	97	197	NA	NA
Direct MDC, Scan MDC (dpm/100cm ²)	577	1798	219	696	864	2732	322	1031	NA	NA
MDCR, MDC Count Rate	385	282	1098	819	762	605	2196	1783	NA	NA
Total Efficiency, Isotope:	10.0%	C-14	10.5%	C-14	10.0%		10.5%	C-14	N/A	
Source Efficiency	0.25		0.25		0.25		0.25		NA	

Please See MARSSIM Chapter 6 for a more detailed explanation of equations.

L_c= Critical Detection Level

L_d= a priori Detection limit

MDC= Minimum Detectable Concentration

MDCR= Minimum Detectable Count Rate

$$\text{Direct MDC} = \frac{3+4.65*\text{SQRT}(B)}{T*\epsilon_t*A*C}$$

$$\text{Scan MDC} = \frac{\text{MDCR}}{\text{SQRT}(E_{hf}*\epsilon_t*\epsilon_s*A*C)}$$

$$\text{MDCR} = s_i * (60/i)$$

B = Background Counts

T = Counting Time In Minutes

ε_t = Total Detector Efficiency in Counts/Disintegration

A = Physical Probe Area in cm²

C = Other Constants and Factors When Needed

E_{hf} = Human Factor Efficiency

ε_s = Source Efficiency s_i = 1.38*SQRT(B_i)

i = Counting Interval

[illegible]

Attachment B

Wipe Test Analysis Data Print-Out

Assay Definition-

Assay Description:
 RAD WASTE DEPT

Assay Type: DPM (Triple)
 Report Name: Report1
 Output Data Path: C:\Packard\Tricarb\Results\Default\Triple Lable DPM
 Raw Results Path: C:\Packard\Tricarb\Results\Default\Triple Lable
 DPM\20140127_1319.results
 Comma-Delimited File Name: C:\Packard\Tricarb\Results\Default\Triple Lable DPM\1410.csv
 Assay File Name: C:\Packard\TriCarb\Assays\Triple Lable DPM.lsa

Count Conditions-

Nuclide: Triple Label
 Quench Indicator: tSIE/AEC
 External Std Terminator (sec): 0.5 2s%
 Pre-Count Delay (min): 0.00
 Quench Sets:
 Low Energy: 3H-UG-062813
 Mid Energy: 14C-UG 41312
 High Energy: 32P-UG-02-28-05
 Count Time (min): 2.00
 Count Mode: Normal
 Assay Count Cycles: 1 Repeat Sample Count: 1
 #Vials/Sample: 1 Calculate % Reference: Off

Background Subtract: On - 1st Vial
 Low CPM Threshold: Off
 2 Sigma % Terminator: On - Any Region

Regions	LL	UL	Bkg Subtract	2Sigma % Terminator
A	0.0	12.0	1st Vial	0.00
B	12.0	156.0	1st Vial	0.00
C	156.0	2000.0	1st Vial	0.00

Count Corrections-

Static Controller: On Luminescence Correction: On
 Colored Samples: On 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				

Cycle 1 Results

S#	Time	CPMA	CPMB	CPMC	DPM1	DPM2	DPM3	tSIE	LUM
1	10.00	6	11	13	0	0	0	956	1
Missing vial 2.									
# i 3	2.00	1	-1	-3	2	-0	-3	584	3
4	2.00	1	4	-1	0	5	-1	589	0
5	2.00	-0	2	3	-1	2	4	579	3
6	2.00	-1	0	-0	-4	0	-0	542	0
7	2.00	-0	6	-3	-2	7	-4	562	2
8	2.00	-2	4	-0	-6	5	-0	578	3

9 2.00 -2 4 0 -6 5 0 605 3
10 2.00 -3 5 -2 -7 6 -2 582 3
11 2.00 0 2 -2 -1 2 -2 545 0
12 2.00 -1 -3 -3 -1 -3 -4 593 4
13 2.00 1 1 2 3 0 2 566 3
14 2.00 -1 2 -2 -3 3 -2 583 3
15 2.00 -3 7 2 -9 9 2 567 2
16 2.00 1 5 -1 1 6 -1 580 2
17 2.00 -1 0 2 -2 -0 3 563 3
18 2.00 -1 4 1 -3 4 1 588 3
19 2.00 -2 2 -5 -5 4 -6 594 3
20 2.00 -1 -1 4 -2 -2 5 570 0
21 2.00 -0 6 2 -2 6 2 554 2
22 2.00 -1 3 -1 -2 4 -1 566 3
23 2.00 -1 3 2 -3 4 2 631 3
24 2.00 1 3 3 0 3 3 579 5
25 2.00 -2 -2 1 -4 -2 2 573 0
26 2.00 -3 5 6 -7 5 8 529 0
27 2.00 0 -1 6 1 -3 7 579 0

Missing vial 28.

(26) 1 29 2.00 -3 2 6 -6 1 7 622 3
30 2.00 3 -3 -3 7 -3 -3 631 3
31 2.00 -1 2 3 -2 2 4 642 0
32 2.00 7 2 -4 14 2 -5 639 2
33 2.00 3 1 3 5 0 4 634 2
34 2.00 1 2 -2 0 3 -2 645 3
35 2.00 -3 2 -2 -6 3 -2 610 0
36 2.00 0 1 1 1 1 1 631 3
37 2.00 -2 3 1 -4 3 2 625 0
(35) 10 38 2.00 -0 6 0 -2 7 0 632 2

Missing vial 39.

1 40 2.00 -1 5 -1 -4 6 -1 597 2
41 2.00 -1 4 -2 -3 5 -2 602 3
42 2.00 2 1 -4 3 2 -5 596 3
43 2.00 -2 7 6 -5 7 7 605 2
44 2.00 -2 3 2 -5 3 2 588 3
45 2.00 -2 1 -5 -4 2 -6 591 3
46 2.00 -3 3 4 -8 3 5 577 3
47 2.00 -3 2 -5 -6 4 -6 577 3
48 2.00 2 -1 4 6 -3 5 569 3
49 2.00 -1 -0 0 -1 -0 0 557 3
50 2.00 -1 2 2 -4 2 3 601 3
51 2.00 -3 1 -2 -7 3 -3 564 3
52 2.00 -2 1 1 -6 1 2 595 3
53 2.00 -4 -1 4 -7 -1 5 646 4
54 2.00 0 3 -0 -1 3 -0 638 3
55 2.00 -1 -0 -0 -3 0 -0 660 3
56 2.00 -3 4 1 -7 5 1 620 3
57 2.00 -1 4 -1 -2 5 -1 651 0
58 2.00 0 1 1 -0 1 2 644 3
59 2.00 -2 -1 -1 -4 -0 -1 587 3
60 2.00 -1 2 2 -3 2 3 613 3
61 2.00 -1 1 3 -1 1 3 568 0
62 2.00 6 2 4 14 0 5 581 2
63 2.00 -4 -4 1 -7 -4 1 541 5
64 2.00 -2 4 -3 -5 6 -4 578 0
65 2.00 -0 1 2 -1 1 2 564 0
66 2.00 -1 2 1 -2 2 1 482 3
67 2.00 -0 1 -3 -0 2 -3 535 3
68 2.00 -2 5 0 -6 7 0 544 0
69 2.00 -1 1 0 -2 1 0 527 3
70 2.00 2 -0 2 3 -1 3 735 0

71	2.00	0	-1	-0	0	-1	-0	599	3
72	2.00	0	-3	1	1	-4	2	586	3
73	2.00	-2	2	1	-5	2	2	582	0
74	2.00	-0	3	-4	-1	4	-4	615	3
75	2.00	-1	2	0	-3	3	0	594	3
76	2.00	0	2	1	-1	2	1	610	3
77	2.00	-1	2	-5	-3	4	-6	599	3
78	2.00	-2	5	-1	-5	6	-1	620	2
79	2.00	-3	1	-1	-6	2	-1	558	3
80	2.00	-3	4	-1	-7	5	-1	617	3
81	2.00	-2	6	-3	-6	8	-3	561	2
82	2.00	-2	2	-1	-4	3	-1	576	0
83	2.00	-2	4	-1	-6	6	-1	627	0
84	2.00	1	3	-3	0	4	-3	644	2
85	2.00	-1	1	-5	-1	2	-6	647	0
86	2.00	1	6	4	1	6	4	649	2
87	2.00	-3	-2	0	-5	-2	0	617	4
88	2.00	-3	3	0	-6	4	0	626	3
89	2.00	2	3	-3	2	4	-3	601	0
90	2.00	-1	4	-1	-3	5	-1	559	0
(97) 52 91	2.00	0	3	-0	0	4	-0	627	2
Missing vial 92.									
93	2.00	-1	0	-3	-1	1	-4	588	6
94	2.00	0	2	3	0	1	4	572	3
95	2.00	-2	-2	2	-3	-3	2	618	0
96	2.00	-2	7	-2	-7	10	-2	606	0
97	2.00	0	6	2	-1	7	2	608	2
98	2.00	-2	5	-3	-5	7	-4	613	2
99	2.00	-3	1	2	-6	1	2	621	3
100	2.00	1	7	-1	-0	8	-1	559	2
101	2.00	-4	4	1	-10	6	2	607	0
(97) 10 102	2.00	-1	1	2	-2	1	2	590	3
Missing vial 103.									
104	2.00	-0	1	-3	-1	2	-3	572	3
(98) 1 105	2.00	0	-1	2	0	-2	3	559	3
106	2.00	-3	2	1	-8	2	2	556	0
107	2.00	-0	2	0	-1	3	0	520	3
108	2.00	-2	1	3	-6	1	3	559	0
109	2.00	-2	3	2	-6	3	3	550	0
110	2.00	-2	2	-1	-5	3	-1	551	3
111	2.00	2	1	2	4	1	3	591	2
112	2.00	-1	2	-3	-2	3	-4	559	3
113	2.00	-3	1	0	-7	1	0	561	0
114	2.00	1	-1	2	2	-2	2	526	0
115	2.00	4	3	0	9	3	0	533	0
116	2.00	-2	3	-2	-7	5	-3	545	0
117	2.00	-3	1	-1	-8	2	-1	475	0
118	2.00	1	2	0	1	2	0	607	3
119	2.00	-5	5	3	-13	6	3	549	0
120	2.00	-2	5	-1	-7	7	-1	592	3
121	2.00	1	4	2	0	5	2	597	0
122	2.00	-2	0	-1	-5	1	-1	575	0
123	2.00	-1	0	2	-2	-0	3	541	0
124	2.00	-2	3	-0	-5	4	-0	562	0
125	2.00	-1	5	-2	-4	7	-2	540	0
126	2.00	-3	1	-2	-7	2	-3	560	3
127	2.00	-3	2	-1	-8	3	-1	570	0
128	2.00	-4	1	3	-11	1	4	453	0
129	2.00	-5	2	3	-11	3	4	564	0
130	2.00	-2	1	1	-4	1	1	551	0
131	2.00	3	1	4	6	-1	5	632	2
132	2.00	3	4	3	5	4	4	623	0

133	2.00	-0	5	2	-2	6	2	624	0
134	2.00	15	3	2	36	0	2	539	1
135	2.00	-2	4	-1	-5	5	-1	562	0
136	2.00	1	-3	-3	2	-3	-4	559	0
137	2.00	-2	4	-4	-6	7	-4	559	0
138	2.00	-3	2	-1	-6	3	-1	551	0
139	2.00	-0	-0	2	-0	-1	3	563	0
140	2.00	-1	2	-1	-2	3	-1	562	0
141	2.00	-2	4	1	-4	4	2	587	0
142	2.00	-0	2	-2	-1	3	-2	585	0
143	2.00	2	2	-0	4	2	-0	547	0
144	2.00	-2	-1	-2	-4	-1	-3	574	0
145	2.00	-2	4	-1	-6	5	-1	573	3
146	2.00	-2	6	2	-7	7	2	536	0
147	2.00	-1	2	-2	-2	3	-3	580	0
148	2.00	-1	-0	1	-2	-1	2	553	0
149	2.00	-2	-4	1	-3	-5	2	519	0
150	2.00	-2	4	5	-6	4	6	566	0
151	2.00	1	-2	3	3	-3	3	560	0
152	2.00	-1	4	-1	-4	5	-1	550	0
153	2.00	-3	5	-0	-7	7	-0	562	0
154	2.00	-1	1	-2	-1	1	-2	559	0
155	2.00	-1	3	0	-4	3	0	506	0
156	2.00	-2	2	-1	-5	3	-1	524	0
157	2.00	0	5	3	-2	6	3	538	0
158	2.00	0	2	-2	-0	2	-3	556	0
159	2.00	-1	2	-2	-2	3	-2	547	0
160	2.00	0	0	0	-0	0	0	574	3
161	2.00	0	2	2	1	2	2	581	0
162	2.00	-2	-1	-2	-4	-1	-3	542	0
163	2.00	-2	-1	4	-4	-2	5	542	0
164	2.00	0	2	-3	-0	3	-3	607	3
165	2.00	-1	2	-0	-3	3	-0	567	0
166	2.00	0	1	6	-0	0	7	633	0
167	2.00	-1	-1	4	-1	-2	5	567	0
168	2.00	-1	-2	-2	-2	-2	-3	537	0
Missing vial 169.									
170	2.00	-4	2	0	-8	3	0	603	3
171	2.00	0	4	3	-0	4	4	615	2
172	2.00	3	1	-4	5	1	-4	629	0
173	2.00	-2	2	2	-4	2	3	631	0
174	2.00	-2	3	2	-5	4	2	611	0
175	2.00	2	4	0	3	4	0	610	0
176	2.00	-2	-1	-1	-4	-1	-1	642	0
177	2.00	-0	3	1	-2	4	2	625	0
178	2.00	3	2	1	5	1	2	614	0
179	2.00	-2	2	-1	-6	2	-1	601	3
Missing vial 180.									
181	2.00	-1	1	1	-2	1	1	621	0
182	2.00	-3	4	-2	-8	5	-3	575	0
183	2.00	-1	6	-3	-4	8	-4	624	0
184	2.00	1	2	-1	1	2	-1	622	0
185	2.00	-0	-0	-3	-1	0	-3	591	0
186	2.00	0	0	-1	-0	0	-1	627	0
187	2.00	3	3	-4	5	4	-4	663	0
188	2.00	-3	2	7	-6	1	8	601	0
189	2.00	-2	2	3	-4	2	3	606	0
190	2.00	4	3	1	7	2	2	642	0
Missing vial 191.									
192	2.00	-5	1	3	-12	2	4	579	0
193	2.00	-4	-1	-1	-8	-1	-1	578	0
194	2.00	0	4	5	-1	4	6	582	0

4

195	2.00	-1	5	4	-4	6	4	590	0
196	2.00	-1	3	-5	-2	5	-6	585	3
197	2.00	2	-0	1	5	-1	2	568	0
198	2.00	-3	3	-2	-7	4	-3	538	0
199	2.00	-1	3	3	-3	3	4	578	0
200	2.00	-2	4	3	-4	4	4	595	0
201	2.00	-2	-2	-3	-4	-1	-4	573	4
202	2.00	-2	0	3	-5	-0	4	583	0
203	2.00	-2	-0	3	-3	-1	4	565	0
204	2.00	-1	1	4	-3	1	5	589	0
205	2.00	-0	-1	-0	-1	-2	-0	591	0
206	2.00	0	0	-1	-0	1	-1	555	3
207	2.00	-1	6	2	-3	7	3	566	0
208	2.00	-2	4	1	-6	5	2	570	0
209	2.00	-2	6	5	-6	6	6	574	0
210	2.00	4	7	-2	6	9	-3	606	0
211	2.00	-1	3	0	-3	3	0	570	3
212	2.00	-0	-1	-4	-1	-1	-5	592	0
213	2.00	0	0	3	0	-1	4	604	0
214	2.00	-3	8	4	-8	9	4	572	2
215	2.00	1	-0	1	1	-1	2	581	0
216	2.00	-1	3	5	-3	3	6	576	0
217	2.00	2	-1	1	6	-1	2	574	0
218	2.00	-0	3	4	-1	3	5	581	0
219	2.00	-1	-1	-2	-2	-1	-2	501	0
220	2.00	3	-1	10	7	-4	12	564	0
221	2.00	-4	2	5	-10	1	6	605	0
222	2.00	2	1	-0	5	1	-0	605	0
223	2.00	-2	3	-2	-5	5	-3	567	0
224	2.00	-2	1	1	-5	1	1	554	0
225	2.00	-2	2	-3	-6	4	-3	563	0
226	2.00	0	1	2	-0	0	3	529	0
227	2.00	-1	5	5	-4	5	6	568	0
228	2.00	0	3	3	-0	3	4	601	0
229	2.00	0	0	-3	-0	1	-4	592	0
230	2.00	-2	8	1	-8	10	1	596	0
231	2.00	-1	-4	-0	0	-5	-0	583	0
232	2.00	-1	2	-1	-4	2	-1	594	0
233	2.00	-2	1	-2	-4	2	-3	574	0
234	2.00	-3	-2	-1	-7	-2	-1	570	0
235	2.00	-2	5	-2	-7	7	-2	571	0
236	2.00	-0	-0	7	0	-2	9	576	0
237	2.00	-2	0	1	-3	0	1	580	0
238	2.00	3	3	1	5	3	1	604	0
239	2.00	2	-1	-1	4	-1	-1	592	0
240	2.00	2	3	4	3	2	5	610	0
241	2.00	2	4	-1	2	4	-1	610	0
242	2.00	-1	-1	1	-2	-1	1	591	0
243	2.00	3	1	-1	6	1	-1	566	0
244	2.00	-2	2	2	-4	2	2	554	0
245	2.00	-3	1	8	-6	-1	10	609	3
246	2.00	-2	1	-2	-4	2	-2	607	0
247	2.00	2	0	3	3	-1	4	616	0
248	2.00	-2	4	-1	-6	6	-1	583	0
249	2.00	-2	6	-1	-6	8	-1	607	0
250	2.00	1	4	6	1	3	7	513	0
251	2.00	-3	2	5	-7	2	6	471	0
252	2.00	-1	-1	2	-2	-1	2	587	0
253	2.00	-3	5	-2	-8	6	-2	596	0
254	2.00	-2	3	2	-6	4	3	611	0
255	2.00	-2	3	-1	-5	4	-1	628	0
256	2.00	-4	5	-1	-10	7	-1	610	0

(262) ↓
80

257	2.00	0	2	-4	-1	3	-4	601	0
258	2.00	3	8	0	4	10	0	625	0
259	2.00	-1	2	5	-2	2	6	617	0
260	2.00	2	1	0	3	1	0	567	0
261	2.00	-2	4	3	-4	4	4	592	0
262	2.00	-1	-1	-0	-1	-1	-0	591	0
263	2.00	2	-1	-1	4	-2	-1	591	0
264	2.00	-1	3	1	-2	3	2	628	3
265	2.00	-3	3	-3	-6	4	-4	624	0
266	2.00	-3	2	2	-6	2	2	618	0
267	2.00	-1	5	1	-3	6	1	620	2
268	2.00	1	-1	-3	2	-1	-3	625	0
269	2.00	1	1	1	1	1	1	619	0
270	2.00	1	-0	2	2	-1	2	629	0
271	2.00	-2	-1	2	-3	-1	2	596	0
Missing vial 272.									
273	2.00	-2	-0	4	-4	-1	5	648	0
274	2.00	-1	3	7	-3	2	8	622	0
275	2.00	-2	8	-1	-6	10	-1	647	0
276	2.00	0	1	2	0	0	3	649	0
277	2.00	-1	2	4	-2	2	5	624	0
278	2.00	10	3	-1	21	2	-1	648	0
279	2.00	0	6	-0	-2	7	-0	645	2
280	2.00	-2	7	3	-5	8	4	618	0
281	2.00	1	0	3	2	-1	4	632	3
282	2.00	-4	3	0	-8	4	0	628	0
283	2.00	-2	6	-1	2	7	-1	636	0
284	2.00	-3	1	1	-6	2	1	651	0
285	2.00	1	6	-0	-1	7	-0	633	0
286	2.00	0	4	3	-1	4	3	644	0
287	2.00	0	3	-3	-0	5	-4	664	0
288	2.00	-2	1	-3	-5	2	-4	645	3
289	2.00	-1	6	-3	-4	8	-3	642	0
290	2.00	-2	-0	1	-4	-0	1	647	0
291	2.00	-2	0	-1	-3	1	-1	656	3
292	2.00	-3	-1	-1	-5	-0	-1	649	0
293	2.00	-1	2	0	-3	2	0	646	3
294	2.00	1	-0	-1	2	-0	-1	657	0
295	2.00	-0	2	3	-2	2	3	633	0
296	2.00	0	5	-0	-2	6	-0	633	0
297	2.00	-2	3	-3	-6	5	-4	640	0
298	2.00	9	7	-3	17	8	-4	654	0
299	2.00	-2	8	-1	-6	10	-1	642	0
300	2.00	-3	2	-2	-6	4	-3	654	0
301	2.00	-0	1	2	-1	1	2	633	0
302	2.00	-1	5	6	-2	4	7	602	0
303	2.00	0	6	3	-2	6	4	636	0
304	2.00	1	6	5	-0	6	6	630	0
305	2.00	-3	2	-0	-6	2	-0	662	0
306	2.00	-1	2	-2	-3	4	-3	657	3
307	2.00	1	6	2	1	6	3	659	0
308	2.00	-1	3	-2	-3	4	-3	630	0
309	2.00	1	-1	4	1	-2	5	635	0
310	2.00	2	4	3	2	4	4	629	0
311	2.00	-1	0	-0	-1	0	-0	657	0
312	2.00	-1	1	-2	-3	2	-3	657	0
313	2.00	-3	1	3	-6	1	4	661	0
314	2.00	1	-2	-2	2	-3	-3	645	0
315	2.00	2	4	-0	4	4	-0	640	0
316	2.00	-1	-1	1	-1	-1	2	612	0
317	2.00	1	4	2	-0	4	3	644	0
318	2.00	-2	3	-0	-5	4	-0	637	0

VOID

Assay Definition-

Assay Description:
DUPONT GLASSGOW

Assay Type: DPM (Triple)

Report Name: Report1

Output Data Path: C:\Packard\Tricarb\Results\Default\Triple Lable DPM

Raw Results Path: C:\Packard\Tricarb\Results\Default\Triple Lable

DPM\20140321_0905.results

Comma-Delimited File Name: C:\Packard\Tricarb\Results\Default\Triple Lable DPM\1410.csv

Assay File Name: C:\Packard\TriCarb\Assays\Triple Lable DPM.lsa

Count Conditions-

Nuclide: Triple Label

Quench Indicator: tSIE/AEC

External Std Terminator (sec): 0.5 2s%

Pre-Count Delay (min): 0.00

Quench Sets:

Low Energy: 3H-UG-03122014

Mid Energy: 14C-UG-020614

High Energy: 32P-UG-02-28-05

Count Time (min): 2.00

Count Mode: Normal

Assay Count Cycles: 1

Repeat Sample Count: 1

#Vials/Sample: 1

Calculate % Reference: Off

Background Subtract: On - 1st Vial

Low CPM Threshold: Off

2 Sigma % Terminator: On - Any Region

Regions	LL	UL	Bkg Subtract	2Sigma % Terminator
A	0.0	12.0	1st Vial	0.00
B	12.0	156.0	1st Vial	0.00
C	156.0	2000.0	1st Vial	0.00

Count Corrections-

Static Controller: On

Luminescence Correction: On

Colored Samples: On

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				

Cycle 1 Results

S#	Time	CPMA	CPMB	CPMC	DPM1	DPM2	DPM3	tSIE	LUM
1	10.00	5	16	15	0	0	0	618	1
2	2.00	0	2	-0	-0	3	-0	640	0
3	2.00	0	-3	-3	1	-3	-3	622	0
4	2.00	5	-2	-3	11	-2	-4	602	0
5	2.00	-3	-1	2	-6	-1	2	632	0
6	2.00	-1	-6	-1	-1	-6	-1	618	0
7	2.00	-2	-1	-4	-3	0	-5	586	0

8	2.00	1	-5	-2	4	-6	-3	634	0
9	2.00	2	0	-1	4	0	-2	649	0
10	2.00	1	-5	3	4	-7	4	591	0
11	2.00	1	-6	-5	5	-7	-6	543	0
12	2.00	0	-6	2	2	-7	2	625	0
13	2.00	2	-3	-0	6	-4	-0	634	0
14	2.00	1	-1	-2	2	-1	-2	622	0
15	2.00	2	-3	1	6	-4	1	614	0
16	2.00	1	-1	-2	1	-1	-2	625	0
17	2.00	-1	1	0	-4	1	0	594	0
18	2.00	1	-7	5	5	-10	6	617	0
19	2.00	2	-3	-3	6	-3	-4	614	0
20	2.00	6	-5	2	15	-7	3	650	0
21	2.00	0	1	-1	0	2	-2	627	0
22	2.00	0	-3	-1	2	-4	-1	617	0
23	2.00	1	-3	2	3	-4	2	622	0
24	2.00	3	-2	-3	8	-3	-4	586	0
25	2.00	-1	-2	1	-1	-2	1	589	0
26	2.00	5	-1	-1	11	-2	-1	616	0
27	2.00	-1	-0	1	-1	-1	1	626	0
28	2.00	1	-0	0	2	-1	0	625	0
29	2.00	-0	-2	1	1	-3	1	619	0
30	2.00	-3	-3	1	-6	-3	1	600	0
31	2.00	2	-0	-2	5	-0	-2	555	0
32	2.00	-4	-6	-2	-7	-6	-3	574	0
33	2.00	2	-2	0	6	-3	0	620	0
34	2.00	2	-1	-2	5	-2	-3	500	0
35	2.00	-1	-1	-2	-1	-1	-3	640	0
36	2.00	0	-0	6	1	-2	7	620	0
37	2.00	1	2	-0	3	2	-0	621	2
38	2.00	-0	0	-1	-1	1	-1	618	0
39	2.00	2	1	-2	4	1	-2	644	0
40	2.00	3	-1	0	7	-2	0	651	0
41	2.00	-1	5	2	-3	6	2	603	0
42	2.00	0	-0	-3	1	0	-3	648	0
43	2.00	1	-5	-3	4	-6	-3	628	0
44	2.00	0	-2	4	2	-4	4	629	0
45	2.00	0	-1	-1	1	-1	-2	628	0
46	2.00	1	-0	2	2	-1	3	645	0
47	2.00	2	-1	-0	5	-2	-0	657	0
48	2.00	1	1	-2	2	1	-3	632	0
49	2.00	4	-6	4	11	-9	5	629	0
50	2.00	4	1	-3	8	1	-3	621	0
51	2.00	-0	-5	-1	1	-6	-1	628	0
52	2.00	1	-5	-3	4	-5	-3	649	0
53	2.00	4	-2	3	9	-4	3	650	0
54	2.00	4	-1	-0	10	-2	-0	667	0
55	2.00	-1	3	1	-2	3	1	623	0
56	2.00	11	-0	-2	23	-1	-3	648	0
57	2.00	-0	1	2	-1	1	3	658	0
58	2.00	2	0	3	4	-0	3	660	2
59	2.00	-0	-1	1	0	-1	1	658	0
60	2.00	17	19	2	39	20	2	435	0
61	2.00	10	12	1	20	13	1	520	0
Missing vial 62.									
63	2.00	138610	13034	-4	215776	-2411	17	1006	0
64	2.00	14346	101261	537	1330	119814	-463	996	0
65	2.00	1303	22609	72649	-1678	10734	86428	534	0

Protocol# 1 - Triple Lable DPM.lsa

User: RSO INC

Assay Definition-

Assay Description:
DUPONT GLASGOW

Assay Type: DPM (Triple)

Report Name: Report1

Output Data Path: C:\Packard\Tricarb\Results\RSO INC\Triple Lable DPM

Raw Results Path: C:\Packard\Tricarb\Results\RSO INC\Triple Lable

DPM\20140729_0921.results

Comma-Delimited File Name: C:\Packard\Tricarb\Results\RSO INC\Triple Lable DPM\1410.csv

Assay File Name: C:\Packard\TriCarb\Assays\Triple Lable DPM.lsa

Count Conditions-

Nuclide: Triple Label

Quench Indicator: tSIE/AEC

External Std Terminator (sec): 0.5 2s

Pre-Count Delay (min): 0.00

Quench Sets:

Low Energy: 3H-UG-03122014

Mid Energy: 14C-UG-020614

High Energy: 32P-UG-02-28-05

Count Time (min): 2.00

Count Mode: Normal

Assay Count Cycles: 1

Repeat Sample Count: 1

#Vials/Sample: 1

Calculate % Reference: Off

Background Subtract: On - 1st Vial

Low CPM Threshold: Off

2 Sigma % Terminator: On - Any Region

Regions	LL	UL	Bkg Subtract	2Sigma % Terminator
A	0.0	12.0	1st Vial	0.00
B	12.0	156.0	1st Vial	0.00
C	156.0	2000.0	1st Vial	0.00

Count Corrections-

Static Controller: On

Luminescence Correction: On

Colored Samples: On

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				

Cycle 1 Results

S#	Time	CPMA	CPMB	CPMC	DPM1	DPM2	DPM3	tSIE	LUM
1	10.00	7	14	13	0	0	0	587	2
2	2.00	6	4	-0	12	4	-0	623	2
3	2.00	8	0	1	17	-1	2	624	2
4	2.00	2	-1	4	5	-2	5	622	2
5	2.00	5	-1	1	12	-3	1	613	2
6	2.00	7	6	4	14	5	4	612	1
7	2.00	7	1	-0	15	0	-0	614	2

8	2.00	1	1	4	1	-0	5	629	2
9	2.00	3	-1	2	7	-2	2	619	2
10	2.00	3	5	7	5	4	8	625	2
11	2.00	-3	5	3	-8	5	4	605	0
12	2.00	4	-2	2	9	-3	3	621	2
13	2.00	3	3	3	5	3	3	627	2
14	2.00	6	1	-1	12	0	-1	635	2
15	2.00	4	-3	-2	9	-4	-2	584	5
16	2.00	8	1	1	17	-0	2	641	3
17	2.00	3	-1	-2	7	-2	-3	639	2
18	2.00	2	4	4	2	3	5	633	2
19	2.00	4	1	-6	7	2	-7	624	2
20	2.00	10	-4	1	22	-7	2	631	4
21	2.00	6	2	1	13	1	1	603	2
22	2.00	3	-1	2	7	-3	3	633	2
23	2.00	6	5	2	11	4	2	585	2
24	2.00	-0	2	-1	-2	3	-1	612	2
25	2.00	-1	-1	4	-1	-2	5	611	3
26	2.00	7	-2	-0	16	-3	-0	640	2
27	2.00	9	-0	-3	19	-1	-4	616	2
28	2.00	4	2	1	9	2	1	602	2
29	2.00	2	0	-2	4	0	-2	633	2
30	2.00	3	-1	0	7	-1	0	613	2
31	2.00	2	6	4	3	6	5	605	3
32	2.00	1	-2	4	2	-3	5	612	3
33	2.00	2	1	2	5	1	3	616	2
34	2.00	3	-4	-2	7	-5	-3	611	5
35	2.00	4	-2	4	10	-4	5	621	2
36	2.00	1	4	6	1	3	7	605	2
37	2.00	4	3	2	8	2	3	587	2
38	2.00	2	-1	6	5	-3	7	513	2
39	2.00	5	-3	-1	11	-4	-1	638	2
40	2.00	1	2	0	2	2	0	637	2
41	2.00	4	1	0	7	1	0	634	4
42	2.00	0	1	-3	-0	2	-3	632	2
43	2.00	3	-1	1	6	-2	2	640	4
44	2.00	0	-1	5	1	-2	6	615	2
45	2.00	4	-1	-2	9	-1	-2	613	2
46	2.00	7	5	-1	14	6	-1	611	1
47	2.00	3	-1	9	7	-3	10	626	2
48	2.00	5	1	2	10	-0	2	636	2
49	2.00	4	-3	1	9	-5	2	606	2
50	2.00	4	1	1	8	1	2	636	2
51	2.00	3	-1	-1	7	-1	-1	625	2
52	2.00	2	-6	0	6	-7	0	616	3
53	2.00	5	-4	5	13	-7	6	611	4
54	2.00	1	1	-1	3	1	-1	527	2
55	2.00	3	3	2	5	3	2	624	2
56	2.00	8	3	-2	16	3	-2	610	2
57	2.00	4	4	0	8	4	0	612	2
58	2.00	3	-0	2	7	-1	3	628	4
59	2.00	2	-2	-0	4	-3	-0	616	5
60	2.00	5	3	4	9	2	5	609	2
61	2.00	1	0	-5	2	1	-6	597	2
62	2.00	2	-4	1	6	-5	2	616	3
63	2.00	4	3	1	9	3	2	618	2
64	2.00	6	2	-2	13	2	-3	552	3
65	2.00	3	2	-1	5	2	-1	596	2
66	2.00	5	3	1	10	2	1	624	2
67	2.00	-2	-2	2	-3	-3	2	531	3
68	2.00	4	1	1	10	0	1	525	0

Protocol# 1 - Triple Lable DPM.lsa

User: RSO INC

69	2.00	6	-1	1	12	-2	2	637	2
70	2.00	6	3	2	12	3	3	623	2
71	2.00	7	1	-1	14	0	-1	631	2
72	2.00	4	2	-2	9	2	-3	591	2
73	2.00	1	2	-2	1	2	-2	631	2
74	2.00	3	-3	4	7	-5	5	608	2
75	2.00	4	-4	-1	11	-5	-1	614	2
76	2.00	5	-1	2	11	-2	2	611	2
77	2.00	6	-3	-1	13	-4	-1	615	2
78	2.00	4	0	4	8	-1	5	612	2
79	2.00	5	2	7	11	-0	8	603	2
80	2.00	5	-4	1	12	-6	1	611	2
81	2.00	6	-2	1	14	-3	2	625	2
82	2.00	7	1	0	15	-0	0	611	3
83	2.00	2	-2	-4	6	-2	-4	604	2
84	2.00	4	1	2	9	0	3	621	2
85	2.00	6	-2	3	14	-4	4	628	2
86	2.00	4	2	-4	7	2	-4	618	2
87	2.00	1	-4	0	4	-5	0	614	3
88	2.00	5	1	1	10	1	1	613	4
89	2.00	2	1	1	3	1	1	613	2
90	2.00	2	-2	2	5	-3	2	616	2
91	2.00	6	-2	4	14	-4	5	618	2
92	2.00	2	2	5	5	1	6	618	2
93	2.00	6	2	3	12	1	4	622	2
94	2.00	3	-1	3	6	-2	3	621	2
95	2.00	0	-1	4	1	-2	5	625	3
96	2.00	5	-5	3	12	-7	3	592	2
97	2.00	3	-0	-1	6	-0	-1	585	2
98	2.00	5	2	0	10	2	0	609	2
99	2.00	2	-3	-3	5	-3	-3	618	5
100	2.00	7	-1	2	16	-3	3	614	2
101	2.00	5	1	-2	11	1	-3	616	2
102	2.00	3	1	-1	5	1	-1	580	0
103	2.00	-1	2	-2	-2	2	-2	592	2
104	2.00	8	0	7	16	-2	8	631	2
105	2.00	4	-2	6	10	-5	7	628	2
Missing vial 106.									
Missing vial 107.									
Missing vial 108.									
109	2.00	132878	12767	2	207698	-2018	21	999	0
110	2.00	14234	101128	570	1195	119651	-422	992	0
111	2.00	1290	22602	72476	-1691	10721	86230	518	0
112	2.00	55	126	101549	2910	-22748	120969	547	3

Attachment C

Survey Meter Calibration Reports

RSO, Inc.
P.O. Box 1450
Laurel, MD 20725
(301) 953-2482

RSO Job No. R10551

Certificate of Calibration

ISSUED TO: RSO, Inc.
5206 Minnick Road
Laurel, MD 20707

INSTRUMENT: LUDLUM
MODEL: 2221
TYPE: SCALER/RATE MET
SN: 89650

CONTACT: Greg Smith
PHONE: (301) 953-2482

PO NO:

RSO, Inc. certifies that on 07/26/2013 the above described instrument was calibrated using a radioactive source to determine the efficiency for a specific radionuclide(s) and using electronically generated pulse for the linearity. Pulsed using Ludlum 500-2, S/N 159110.

The results are tabulated below. Calibration is traceable to NIST.

<u>Calibration Data</u>					
<u>RANGE</u>		<u>EXPECTED</u>	<u>OBSERVED</u>		<u>C.F.</u>
X	1	100	100	cpm	1.00
		400	402	cpm	1.00
X	10	1000	1000	cpm	1.00
		4000	4000	cpm	1.00
X	100	10000	10000	cpm	1.00
		40000	40000	cpm	1.00
X	1000	100000	100000	cpm	1.00
		400000	400000	cpm	1.00
C.F. AVERAGE					1.00

Probe type(s)		Probe1: PROPORTIONAL		Probe2:		Probe3:		
MODEL	SER#	WINDOW	GEOMETRY	VOLT	ISOTOPE 1 EFF.(%)	ISOTOPE 2 EFF.(%)	ISOTOPE 3 EFF.(%)	ISOTOPE 4 EFF.(%)
43-37	PR124945	FIXED	CONTACT	1790	C14 19	Tc99 21	Sr90 28	

Note: "As Found" condition +/- 10% of Expected values unless indicated.

INSTRUMENT CHECKS

BATTERY CHECK: NORMAL
CHECK SOURCE 1: N/A READING:
CHECK SOURCE 2: N/A READING:

ENVIRONMENTAL

TEMP: 24 °C
PRESS: 765 mmHg
HUMID: 43 %

THE SUGGESTED RECALIBRATION DATE FOR THIS INSTRUMENT IS 07/26/2014

Calibrated By:

Dorrey Austin
Dorrey Austin

Reviewed By:

Rae

Cal Date: 07/26/2013

Maryland License MD-33-021-01

14174

RSO, Inc.
P.O. Box 1450
Laurel, MD 20725
(301) 953-2482

RSO Job No. R10659

Certificate of Calibration

ISSUED TO: RSO, Inc.
5206 Minnick Road
Laurel, MD 20707

INSTRUMENT: LUDLUM
MODEL: 2221
TYPE: RATEMETER
SN: 161591

CONTACT: Greg Smith
PHONE: (301) 953-2482

PO NO: POOL

RSO, Inc. certifies that on 10/28/2013 the above described instrument was calibrated using a radioactive source to determine the efficiency for a specific radionuclide(s) and using electronically generated pulse for the linearity. Pulsed using Ludlum 500-2, S/N 159110.

The results are tabulated below. Calibration is traceable to NIST.

Calibration Data					
RANGE		EXPECTED	OBSERVED		C.F.
ANALOG	DATA	100	100	cpm	1.00
		400	400	cpm	1.00
		1000	1000	cpm	1.00
		4000	4000	cpm	1.00
		10000	10000	cpm	1.00
		40000	40000	cpm	1.00
		100000	100000	cpm	1.00
		400000	400000	cpm	1.00
		100	101	cpm	0.99
		400	402	cpm	1.00
SCALER	DATA	1000	1005	cpm	1.00
		4000	3996	cpm	1.00
		10000	10000	cpm	1.00
		40000	39935	cpm	1.00
		100000	100174	cpm	1.00
		400000	399310	cpm	1.00
		C.F. AVERAGE			
					1.00

Probe type(s) Probe1: PROPORTIONAL Probe2: Probe3:
MODEL SER# WINDOW GEOMETRY VOLT ISOTOPE 1 EFF.(%) ISOTOPE 2 EFF.(%) ISOTOPE 3 EFF.(%) ISOTOPE 4 EFF.(%)
43-68 PR118227 FIXED CONTACT 1695 C14 20

Threshold set to 35D(3.5mV); Window set to "OUT".

Note: "As Found" condition +/- 10% of Expected values unless indicated.

INSTRUMENT CHECKS

BATTERY CHECK: NORMAL
CHECK SOURCE 1: C14 READING: 34700 cpm
CHECK SOURCE 2: N/A READING:

ENVIRONMENTAL

TEMP: 21 °C
PRESS: 768 mmHg
HUMID: 35 %

THE SUGGESTED RECALIBRATION DATE FOR THIS INSTRUMENT IS 10/28/2014

Calibrated By:

Dorsey Austin
Dorsey Austin

Reviewed By:

Rae

Cal Date: 10/28/2013

Maryland License MD-33-021-01

14474

GCL Calibration Certificate

Report No: AC-2550-24053

Calibration: As Calibrated

Results: In Tolerance

Fluke Biomedical: Pressurized Ion Chamber Survey Meter

Model: 450P

Serial No: 2550

Asset No: n/a

Customer:

RSO, INC.

5206 MINNICK ROAD

LAUREL, MD 20707

PO: 330100413

BO/SO: 297562

Date Received: 9-Oct-13

Date Calibrated: 15-Oct-13

Manufacturer's Recommended Due Date: 15-Oct-14

Temperature: 22.18 degrees Celsius

Pressure: 736.47 mmHg

Humidity: 32.5 % Relative Humidity

NOTES

This calibration is traceable to the National Institute of Standards and Technology. This report must not be used to claim product recertification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

The calibration is warranted to be within specified accuracy limits, at the time of calibration. In the event of a calibration error, our liability is limited to standard recalibration cost.

Proper function and reliability of the instrument described in this document are highly dependent upon handling and use. It is recommended the user establish a technique to monitor the constancy of the instrument response before and after its return to the manufacturer.

This certificate shall not be reproduced except in full, without the written approval of the calibration laboratory.

If there are any problems with the calibration of the instrument, please contact the Calibration Laboratory Director.

Measurement uncertainties expressed in this report are calculated in accordance with the methods described in ANSI/NCLZ 2540-2 1997, U.S Guide to the Expression of Uncertainty in Measurement and IEC Guide to the Expression of Uncertainty in Measurement, 1995 using a coverage factor of $k=2$, corresponding to a confidence level of approximately 95%.

Calibrated by: Kay, Rodger
Technician

Date: 15-Oct-13

Reviewed by:

Richard Abbott

Date: 15-Oct-13

Richard Abbott, Technical Services Manager

Report No: AC - 2550-24053

Check Source Reading	N/A
----------------------	-----

Rate Calibration							
Source	Distance (cm)	No. of Atten	UUT Range	Units	Reference Rate	UUT Rate	% Error
20 Ci Cs-137	929.87	5	0 to 500	uR/hr	180	179.3	-0.39 - Pass
20 Ci Cs-137	905.41	4	0 to 500	uR/hr	360	361	0.28 - Pass
20 Ci Cs-137	901.95	3	0 to 5	mR/hr	1.8	1.791	-0.50 - Pass
20 Ci Cs-137	881.36	2	0 to 5	mR/hr	3.6	3.607	0.19 - Pass
20 Ci Cs-137	891.56	1	0 to 50	mR/hr	18	17.89	-0.61 - Pass
20 Ci Cs-137	900.88	0	0 to 50	mR/hr	36	36.24	0.67 - Pass
2000 Ci Cs-137	774.15	3	0 to 500	mR/hr	180	181.3	0.72 - Pass
2000 Ci Cs-137	758.92	2	0 to 500	mR/hr	360	354.4	-1.56 - Pass
2000 Ci Cs-137	775.55	0	0 to 5	R/hr	3.6	3.596	-0.11 - Pass

Dose Calibration					
Integration Calibration Point	UUT Range	Units	Reference Exposure	UUT Exposure	% Error
2000 Ci Cs-137, 100 sec	0 to 50	mR	10	9.93	-0.70 - Pass

Calibration Procedure: CAL-450-451.pdf

Calibration Description: The 450P has an operating range of 0 to 5 R/hr. The unit is exposed through the side of the detector and calibrated on all ranges. All readings were corrected for background. The % Error was calculated using Equation 1.

Environmental Constraints: The 450P survey meter is designed to read accurately from -20 to 50C. The unit is pressurized, therefore, requires no air density corrections.

Calibration Uncertainty: 3.6% with 2.2% associated with the uncertainty of the source.

Accuracy Requirement: 10% of Reading

Equation 1:
$$\%Error = \frac{100 * (UUT - Reference)}{Reference}$$

RSO, Inc.
P.O. Box 1450
Laurel, MD 20725
(301) 953-2482

RSO Job No. R10942

Certificate of Calibration

ISSUED TO: RSO, Inc.
5204 Minnick Road
Laurel, MD 20707

INSTRUMENT: LUDLUM
MODEL: 2221
TYPE: RATEMETER
SN: 89650

CONTACT: Dave Wellner
PHONE: (301) 953-2482

PO NO: RSO 299

RSO, Inc. certifies that on 06/11/2014 the above described instrument was calibrated using a radioactive source to determine the efficiency for a specific radionuclide(s) and using electronically generated pulse for the linearity. Pulsed using Ludlum 500-2, S/N 159110.

The results are tabulated below. Calibration is traceable to NIST.

Calibration Data					
	RANGE	EXPECTED	OBSERVED	C.F.	NOTE
ANALOG	DATA	100	100 cpm	1.00	
		400	400 cpm	1.00	
		1000	1000 cpm	1.00	
		4000	4000 cpm	1.00	
		10000	10000 cpm	1.00	
		40000	40000 cpm	1.00	
		100000	100000 cpm	1.00	
		400000	400000 cpm	1.00	
		100	103 cpm	0.97	
		400	402 cpm	1.00	
SCALER	DATA	1000	1004 cpm	1.00	
		4000	4003 cpm	1.00	
		10000	10000 cpm	1.00	
		40000	40001 cpm	1.00	
		100000	100000 cpm	1.00	
		400000	400001 cpm	1.00	
		C.F. AVERAGE		1.00	

Notes

Probe type(s) Probe1: PROPORTIONAL Probe2: Probe3:
MODEL SER# WINDOW GEOMETRY VOLT ISOTOPE 1 EFF.(%) ISOTOPE 2 EFF.(%) ISOTOPE 3 EFF.(%) ISOTOPE 4 EFF.(%)
43-37 PR148928 FIXED CONTACT 1850 C14 18 Sr90 22 Tc99 18

Threshold set to 60D; Window set to "OUT".

Note: "As Found" condition +/- 10% of Expected values unless indicated.

INSTRUMENT CHECKS

BATTERY CHECK: NORMAL
CHECK SOURCE 1: N/A READING:
CHECK SOURCE 2: N/A READING:

ENVIRONMENTAL

TEMP: 25°C
PRESS: 737 mmHg
HUMID: 44 %

THE SUGGESTED RECALIBRATION DATE FOR THIS INSTRUMENT IS 06/11/2015

Calibrated By:

Dorey Austin
Dorey Austin

Reviewed By:

RAE

Cal Date: 06/11/2014

Maryland License MD-33-021-01

15361