Washington
Hospital Center

MedStar Health

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April 16, 2010

Janice E. Nguyen
Health Physicist
US NRC, Region 1
475 Allendale Road
King of Prussia, PA 19406-1415

Sub: Removal of Old Nuclear Medicine Facility at the Washington Hospital Center from the NRC License

Ref: NRC License Number: 08-03604-03, Docket Number: 03001325

Dear Ms. Nguyen:

Please accept this letter as a request for amendment to our Broadscope License that is referenced above.

Our Nuclear Medicine Department has moved recently to a new facility. The old facility has been decommissioned by the RSO, Inc., a professional company that is experienced in decommissioning commercial and medical facilities. A copy of the decommissioning report is attached for your reference. The results of surveys demonstrate that the levels of residual activity in the facility are below the limits set by the NRC and are acceptable. Please note that this process has been reviewed and approved by our Radiation Safety Committee.

I would truly appreciate your help with expediting the approval process. If you need additional information please feel free to contact Dr. Shashadhar Mohapatra at 202-877-2906 (email: shashadhar.m.mohapatra@medstar.net).

Thank you in advance for your consideration.

Sincerely,

Catherine L. Monge

Catherine L. Monge
Senior Vice President, Operations

144625

NMSS/RGN1 MATERIALS-002

Washington Hospital Center
Irving Street, Washington, DC

FORMER
NUCLEAR MEDICINE DEPARTMENT

RADIOLOGICAL
FINAL SURVEY REPORT

Prepared For:
Radiation Safety Office
Washington Hospital Center

February 2010

Report Prepared By: Gregory D. Smith

Gregory D. Smith, CHP

RSO, Inc.
Laurel, MD

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1.0 INTRODUCTION AND BACKGROUND

1.1 Introduction

Washington Hospital Center (WHC), relocated the Nuclear Medicine (NM) Department to another part of the hospital building at 110 Irving Street, NW, Washington, DC. The former NM Dept. included multiple camera rooms, a patient waiting room, areas/rooms used for injections and a "Hot Lab" for storage and preparation of the "unit" doses for patients in a suite located on the basement floor of the hospital. A 2nd "Hot Lab" and camera were on the 1st floor.

WHC is licensed by the Nuclear Regulatory Commission (NRC) (08-03604-03) as a broad scope medical use licensee.

The former Nuclear Medicine Department has moved to another location in the hospital and this laboratory space requires a final radiological survey to allow the release for unrestricted use. This survey was performed to show the area is in a suitable condition for unrestricted use.

1.2 Background and Historical Use

The radioactive material used in the former NM department was as unsealed radioactive material in medical use or sealed sources for calibration of gamma cameras or radiation counting equipment.

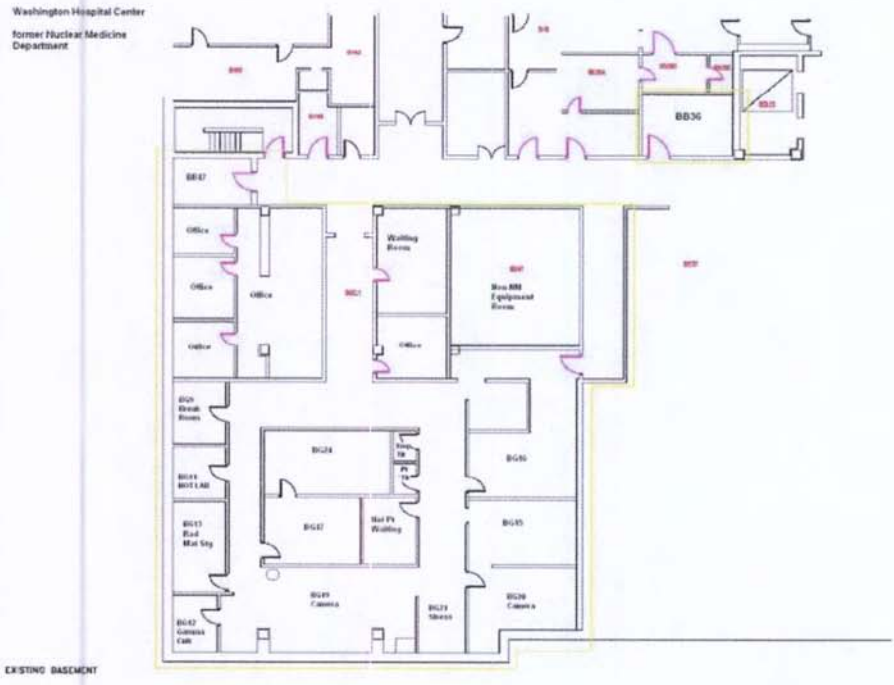


Fig 1. Former NM Dept. basement area lab floor plan.

The primary potential contaminate was identified to be I-131.

Radionuclide	Half Life	Decay Mode	Useful Radiation (MeV)
I-131	8.05d	β-	β- 0.606 (82%) γ 0.364

Only unsealed radioactive material used with half-lives of less than 120 days were used. The last use of any unsealed radioactive material with a half-life greater than that of I-131 (8 days) was over 10 years ago.

Use of radioactive material in the last few years was in standard nuclear medicine procedures. Most uses were unit does prepared by an off-site radio-pharmacy and few procedures with the potential for airborne radioactivity. There was known I-131 contamination of the Hot Lab floor from a spill that occurred a few weeks prior to the recent move to the new NM Department.

1.3 Lab Close Out and Decontamination Actions

All remaining radioactive material (such as sealed sources, unused unit doses, and radioactive waste) was moved to the new Nuclear Medicine Department suite.

During the first phase of the Final Survey the contamination of the floor of the Hot Lab (Rm BG11) was confirmed, in addition 3 small areas of contamination were found. These were: continuation of the contamination of the Hot Lab floor in the corridor just outside the door, a 2nd small area in the corridor near the Hot Lab (< 100 sq cm), a small area in the Pt. Toilet (< 100 sq cm), and a small area (< 100 sq cm) in Rm BB36 (former camera room).

The results for direct measurement in areas where contamination was found is shown in the following table taken from the results shown in Appendix 3.

Area Survey Results			**Wipe Test Results**			**β Direct Measurements**		
Sample Number	Description	Surface	Instru-ment		Actvity dpm/100 cm^2 (beta)	Survey Meter #	Gross (cpm)	Activity dpm/100 cm^2
23	Patient Tlt Floor	vinyl tile over concrete	*LSC*		<200	*#4*	1050	2129
24	Pt Tlt Toilet	ceramic	*LSC*		<200	*#4*	424	473
25	Patient Tlt Sink	ceramic	*LSC*		<200	*#4*	526	743
39	Corridor Floor	vinyl tile over concrete	*LSC*		<200	*#4*	3314	8119
56	BB36 Floor	vinyl tile over concrete	*LSC*		<200	*#4*	8628	22177
89	Hot Lab Floor	Contamin-ated area	*LSC*		<200	*#4*	406	425
90	Hot Lab Floor	Contamin-ated area	*LSC*		<200	*#4*	432	494
91	Hot Lab Floor	Contamin-ated area	*LSC*		2129	*#4*	82768	218314
92	Hot Lab Floor	Contamin-ated area	*LSC*		161	*#4*	57368	151119
93	Hot Lab Floor	Contamin-ated area	*LSC*		<200	*#4*	40990	107790

The top surface of the painted concrete floor in the Hot Lab was removed to decontaminate the floor in the Hot Lab (see Fig. 3 and 4) the floor tiles were removed to eliminate the contamination in the corridor and toilet, and the small area in Rm BB36 was cleaned.

Fig. 2. WHC former NM basement Hot Lab.

Fig. 3. Rm BG11 floor after decon.

Fig. 4. Corridor floor at BG11 with tiles removed.

Fig. 5. View from inside BG11 in to corridor.

An excerpt of the Final Survey results of the decontaminated areas is shown in the following table:

Area Survey Results			Wipe Test Results			β Direct Measurements		
Sample Number	Description	Surface	Instrument		Actvity dpm/100 cm^2 (beta)	Survey Meter #	Gross (cpm)	Activity dpm/100 cm^2
1	BB36 Floor	vinyl tile over concrete	*LSC*		<200	*#7*	36	162
2	BB36 Floor	vinyl tile over concrete	*LSC*		<200	*#7*	50	1495
3	BB36 Floor	vinyl tile over concrete	*LSC*		<200	*#7*	43	829
4	BB36 Floor	vinyl tile over concrete	*LSC*		<200	*#7*	43	829
5	BB36 Floor	vinyl tile over concrete	*LSC*		<200	*#7*	43	829
6	Emp Tlt	vinyl tile over concrete	*LSC*		<200	*#7*	49	1400
7	Emp Tlt	vinyl tile over concrete	*LSC*		<200	*#7*	53	1781
8	Pt Tlt	tile removed concrete	*LSC*		<200	*#7*	36	162
9	Pt Tlt	tile removed concrete	*LSC*		<200	*#7*	50	1495
10	Pt Tlt	tile removed concrete	*LSC*		<200	*#7*	45	1019
1	Hot Lab Floor	painted concrete	*LSC*		<200	*#1*	288	-383
2	Hot Lab Floor	painted concrete	*LSC*		<200	*#1*	287	-389
3	Hot Lab Floor	painted concrete	*LSC*		<200	*#1*	327	-170
4	Hot Lab Floor	painted concrete	*LSC*		<200	*#1*	314	-241
5	Hot Lab Floor	deconed concrete	*LSC*		<200	*#1*	321	-203
6	Hot Lab Floor	deconed concrete	*LSC*		<200	*#1*	341	-93
7	Hot Lab Floor	deconed concrete	*LSC*		<200	*#1*	374	88
8	Hot Lab Floor	deconed concrete	*LSC*		<200	*#1*	554	1073

9	Hot Lab Floor	deconed concrete	*LSC*		<200	*#1*	421	345
10	Hot Lab Floor	deconed concrete	*LSC*		<200	*#1*	406	263
11	Hot Lab Floor	deconed concrete	*LSC*		<200	*#1*	491	728
12	Hot Lab Floor	deconed concrete	*LSC*		<200	*#1*	317	-224
13	Hot Lab Floor	deconed concrete	*LSC*		<200	*#1*	314	-241
14	Corridor floor	tile removed	*LSC*		<200	*#1*	294	-350
15	Corridor floor	vinyl tile over concrete	*LSC*		<200	*#1*	276	-449
16	Corridor floor	vinyl tile over concrete	*LSC*		<200	*#1*	247	-608
17	Corridor floor	vinyl tile over concrete	*LSC*		<200	*#1*	250	-591
18	hot lab bench top	synthetic	*LSC*		<200	*#1*	242	-635
19	hot lab bench top	synthetic	*LSC*		<200	*#1*	235	-673
20	sink	stainless steel	*LSC*		<200	*#1*	241	-640

2.0 FINAL SURVEY APPROACH

2.1 Free Release Criteria

The values from Table R9 from NUREG 1556 Vol 9 Program Specific Guidance About Medical Use Licenses were used as the radiological criteria for unrestricted use.

APPENDIX R

Table R.3 Surface Contamination Levels in Unrestricted Areas (dpm/100 cm^2)

Nuclide[1]	Average[2,3,6]	Maximum[2,4,6]	Removable[2,5,6]
I-125, I-126, I-131, I-133, Sr-90	1000	3000	200
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5000	15000	1000

1 Where surface contamination by multiple nuclides exists, the limits established for each nuclide should apply independently.

2 As used in this table, dpm means the rate of emission by radioactive material, as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

3 Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

4 The maximum contamination level applies to an area of not more than 100 cm^2.

5 The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

6 The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 millirad/hour at 1 centimeter and 1.0 millirad/hour at 1 centimeter, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

2.2 Conducting Radiological Surveys

The radiological 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.

2.3 Area Classification

Areas were classified for the purposes of this survey using the guidance in MARSSIM.

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 Final Status Survey (FSS) radiation surveys do not need to be conducted in non-impacted areas.

The impacted area was determined to be limited to the Nuclear Medicine Department ("Hot Lab", camera, injection, waiting rooms, etc.) including the Ambulatory Care "Hot Lab" and camera room. There were no other impacted areas.

Classes

Impacted areas were classified into one of the three classes, listed below, based on the expected 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 release criteria (used in place of the $DCGL_W$ as 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 release criteria;
- Class 3 Areas are impacted areas that have a low probability of containing residual radioactivity.

The Hot Lab was treated as a Class 1 area with the expectation that there would be no surfaces with residual contamination except on the floor. All other areas were considered Class 3 areas. It was recognized that there was some possibility of residual contamination in these areas but expected to be much less than the levels in the release criteria.

2.4 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 about 20.

The former Nuclear Medicine Department was estimated to be about 5000 sq ft. (< 500 m^2). MARSSIM suggests a range for the size of survey units of 100 to 1000 m^2. For the purposes of determining the number of survey locations, the NM Dept (area of about 5,000 sq ft with out the Hot Lab), was divided into 1250 sq. ft. survey units plus the Hot Lab resulting in 5 survey units or approximately 100 survey points. Including the initial final

survey, and post decontamination survey over 100 sample locations were used.

The survey locations included floors, bench tops, and sink basins. A scan (floor monitor or hand-held survey meter), direct (static) measurement, and wipe test was performed at each survey location except where noted.

2.5 Survey Area

The area surveyed included the basement level former Nuclear Medicine Department and the first floor Ambulatory Care Hot Lab/Camera room.

NM Department									
Rm#	Description	Area (sq ft)		Wipe Test	Direct (0.5 minute cnt)	Floor Scan	Wall/Benches Scan (up to 2 m)	Gamma Scan	Exp Rate
BG11	Hot Lab	83.71		20	20	100%	100%	Walk Thru	1
BG13	Storage Rm	386.8		5	5	25%	0%	Walk Thru	0
BG12	Gamma Ctr	84.17		3	3	50%	5%	Walk Thru	1
BG19	Camera	495		3	3	50%	5%	Walk Thru	1
BG17	Camera	155.4		3	3	50%	5%	Walk Thru	1
BG24	Camera	227.2		3	3	50%	5%	Walk Thru	1
	Pt Restroom	20	est	5	5	100%	100%	Walk Thru	1
	Emp Restroom	20	est	1	1	25%	0%	Walk Thru	1
	Hot Pt Waiting	20	est	5	5	100%	100%	Walk Thru	0
BG20	Camera	256		3	3	50%	5%	Walk Thru	1
BG15	Camera	210.5		3	3	50%	5%	Walk Thru	1
BG16	Camera	300	est	3	3	50%	5%	Walk Thru	1
BB47	Camera	350		3	3	50%	5%	Walk Thru	1
	Dept Corridor	1200	est	10	10	25%	0%	Walk Thru	0
	Entry Corridor	300	est	2	2	25%	0%	Walk Thru	0
	Corridor - BB47	300	est	2	2	25%	0%	Walk Thru	0
BB36	Camera	350		3	3	50%	5%	Walk Thru	1
Ambulatory Care									
C1122A	Hot Lab	100	est	10	10	50%	5%	Walk Thru	1
C1222	Camera	400	est	3	3	50%	5%	Walk Thru	0
	Corridor Adjacent	300	est	2	2	25%	0%	Walk Thru	0
	Totals	5209		93	93				12

There were over 100 survey locations that included floors, bench tops, sink basins, floor drains and large equipment. A scan (hand-held survey meter), direct (static) measurement, and wipe test was performed at each survey location except where noted.

2.6 Survey Methods

Exposure Rate Measurements and Gamma Scans

Gamma exposure rates were measured, at waist level, using a Bicron, "MicroRem" survey meter (internal plastic gamma scintillation detector). The gamma scan was conducted using a Ludlum Model 2221 survey meter coupled to a Ludlum Model 44-10 NaI gamma scintillation detector.

Beta Scan Survey

A cart mounted survey meter with a large area proportional detector was used to scan the floor and hand-held large area proportional detector was used to scan bench tops, cabinets and vertical surfaces. Scanning speeds were 2 detector widths per second. To optimize detection of elevated radiation levels (1.5 to 2 times background) during scanning, audible speakers were used in addition to noting the fluctuations in the analog meter and "digital rate" displays.

Static (Direct) Measurements of Surfaces

Static radiation measurements for beta/gamma surface contamination were performed at random and biased locations. Measurements were conducted by integrating over a 0.5-minute count time with the detector 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 cm^2 of the surface with a dry paper, using moderate pressure and assessing the amount of radioactive material on the test material using both NaI scintillation detector and liquid scintillation counting techniques.

Quality Assurance

Survey meters used to perform the Final 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 each survey day.

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.

2.7 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 analyzed for gross gamma/beta activity. All wipes for the final survey were analyzed at RSO's laboratory.

3.0 SURVEY INSTRUMENTATION

3.1 Description of Field Instrumentation

Field Instrument Used –

Ludlum Floor Monitor – Ludlum Model 2221 with a Ludlum 43-37 probe (gas proportional detector, thin window of 0.8 mg/cm^2 with an area of 584 cm^2).

Ludlum Model 2221 with a Ludlum 43-68 probe (gas proportional detector, thin window of 0.8 mg/cm^2 with an area of 126 cm^2).

Ludlum Model 2221 with a Ludlum 44-9 probe (GM detector, thin window of 1.4 mg/cm^2 with an area of 15 cm^2).

Ludlum Model 2221 with a Ludlum 44-10 probe (NaI scintillation detector, 2" x 2").

Bicron Model "microRem" with an internal probe (plastic scintillation detector, 1" x 1").

3.2 Field Instrumentation Sensitivity for Beta Surface Contamination

The detection sensitivity or Minimum Detectable Concentration (dpm per unit area) for the instruments used for beta surface activity scanning and direct measurements was estimated using the formulas suggested by MARSSIM. For example the MDC for a direct (static) measurement was estimated to be less than 500 dpm per 100 cm^2 for a 0.5-minute count time, 1-minute background count, an efficiency of 0.3 cpm/dpm and a 250 count per minute background.

Make/Mdl/Detector	Active Area (cm^2)	Back-ground (cpm)	% Efficiency (cpm/dpm)	Count time (min)	MDC Direct (Static) (dpm/100 cm^2)	MDC Scanning (dpm/100 cm^2)
Floor Monitor Ludlum Model 2221 with a Ludlum 43-37	584	750	I-131 * 30%	Scan	N/A	<500
Ludlum Model 2221 with a Ludlum 43-68	126	250	I-131 * 30%	0.5	<500	<2,500
Ludlum Model 2221 with a Ludlum 44-9	15	35	I-131 ** 14%%	1	<1,100	<5,000

* determined using Cs-137 beta source, ** determined using Tc99m beta source

3.2 Description of Laboratory Instrumentation

Laboratory Instrument Used –

Packard Tricarb 3100 liquid scintillation counter. The minimum detectable activity for I-131 on a wipe test was estimated to be less than 25 dpm for a 1-minute count time, 1-minute background count time, efficiency of 0.9 cpm/dpm and a 25 counts per minute (cpm) background.

Packard Cobra automatic gamma scintillation (NaI) counter. The minimum detectable activity for I-131 on a wipe test was estimated to be less than 100 dpm for a 1-minute count time, 1-minute background count time, efficiency of 0.8 cpm/dpm and a 220 counts per minute (cpm) background.

4.0 FINAL SURVEY RESULTS

During the first phase of the Final Survey the entire former WHC Nuclear Medicine Department was surveyed. Contamination in the Hot Lab floor was confirmed and characterized. Additional small areas of contamination were found. These areas and the Hot Lab floor were subsequently decontaminated and re-surveyed as part of the Final Survey.

4.1 Results

Attachment A contains the plan view drawing of the laboratory.

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

Attachment C contains the wipe test analysis data print-out(s).

Attachment D contains the survey meter calibration reports.

4.2 Exposure Rates

The exposure rates measured indoors in various locations of the survey area were consistent with normal background except where noted.

The typical background exposure rates in and near the facility ranged from 3 to 8 μR/h as measured in the corridors, lobby and the parking lot. Exposure rates inside of the building ranged from 2 to 8 μR/h which is typical of background exposure rates. All exposure rates (after remediation) were within typical guideline levels of 5 μR/h above background.

4.3 Beta Scans

No areas of residual activity above the detection limits for the Final Survey.

4.4 Direct Measurements

No areas of residual activity above the detection limits for the survey the beta direct measurements, except for a small area of residual contamination (0.5 sq meter) approximately 200 to 500 dpm/100 cm^2) in the decontaminated floor area of the former Hot Lab.

4.5 Removable Contamination

Attachment B includes results of the removable surface activity as determined by the wipe

surveys. No removable contamination was detected during the final survey.

4.6 Summary

- Gamma exposure rates in all areas were consistent with normal natural background level.
- Scans using gamma/beta sensitive survey meters showed no residual contamination on floor surfaces in excess of the guideline values or above the detection limits for the survey technique.
- Direct measurements showed no areas in excess of the guideline values or above the detection limit for the survey technique.
- Wipe tests for removable contamination inside the laboratories were all less than 200 dpm/100 cm^2.

5.0 CONCLUSIONS

Decommissioning activities for this facility included disposition of all radioactive material and a Final Survey of the room performed to show that floor, bench and sink basin surfaces were free of residual contamination.

The release criteria chosen were the values from NUREG 1556 Vol 9 for I-131 and ALARA considerations.

The Final Survey results showed that no residual radioactivity above the release limits in the areas surveyed and the area was in a condition suitable for unrestricted release.

6.0 REFERENCES

6.1 USNRC, NUREG 1556 Vol 9., Program Specific Guidance About Medical Use Licenses.

6.2 NUREG-1575, EPA 402-R-97-016, Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM): Final, August 2000.

7.0 ATTACHMENTS

Attachment A	Plan View Detail Drawing
Attachment B	Radiological Survey Results
Attachment C	Wipe Test Analysis Data Print-Out
Attachment D	Survey Meter Calibration Reports

Attachment A

Plan View Drawings

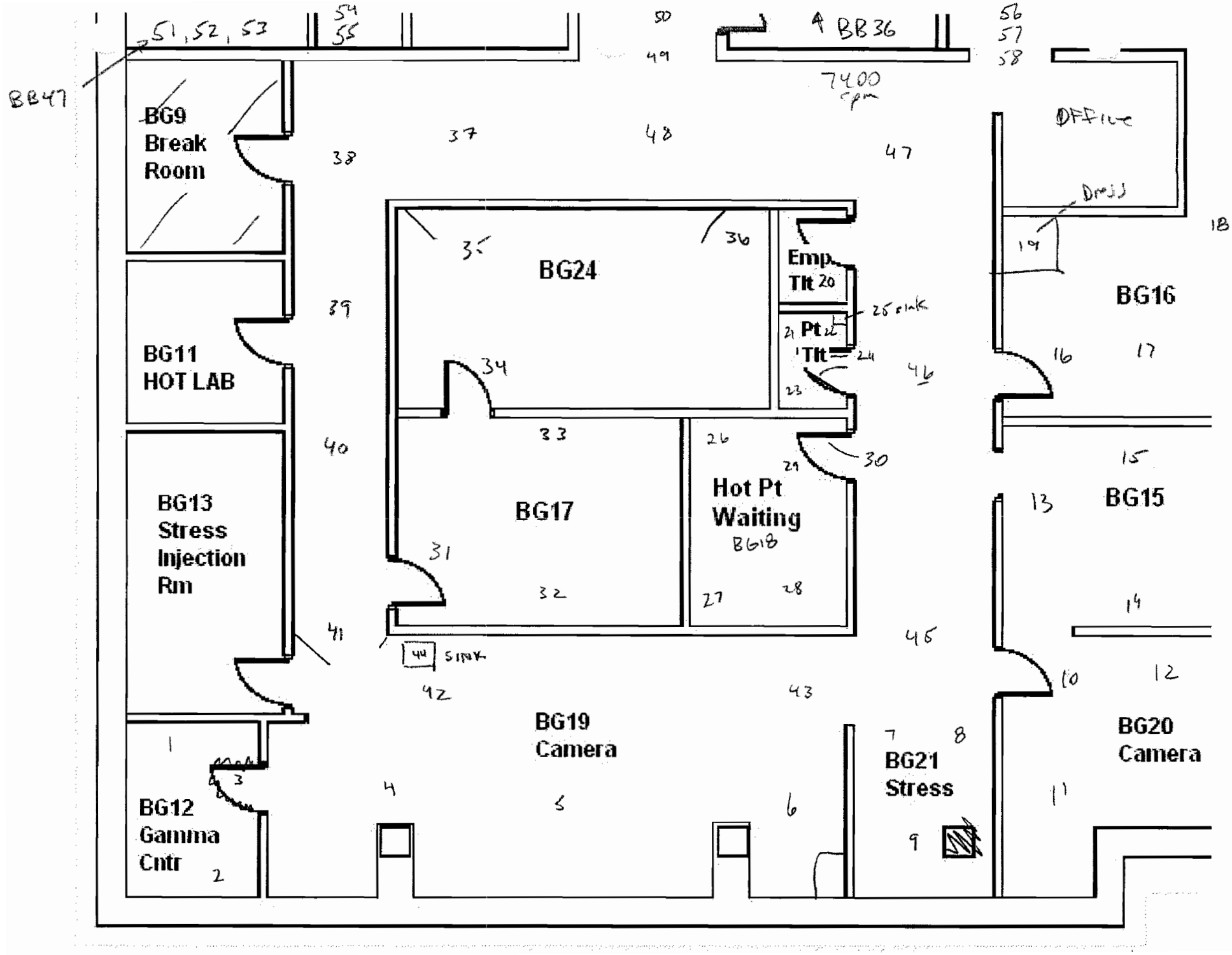
Washington Hospital Center

former Nuclear Medicine Department

EXISTING BASEMENT

Attachment B

Radiological Survey Results


BB47
51, 52, 53
54
55
50
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BB36
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7400 cpm
BG9
Break
Room
37
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38
OFFICE
Door
18
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35
BG24
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Tlt 20
BG16
25 sink
21
Pt
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BG11
HOT LAB
33
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29
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15
BG13
Stress
Injection
Rm
BG17
Hot Pt
Waiting
BG18
BG15
13
31
32
27
28
14
41
44 SINK
45
10
12
42
43
BG19
Camera
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Stress
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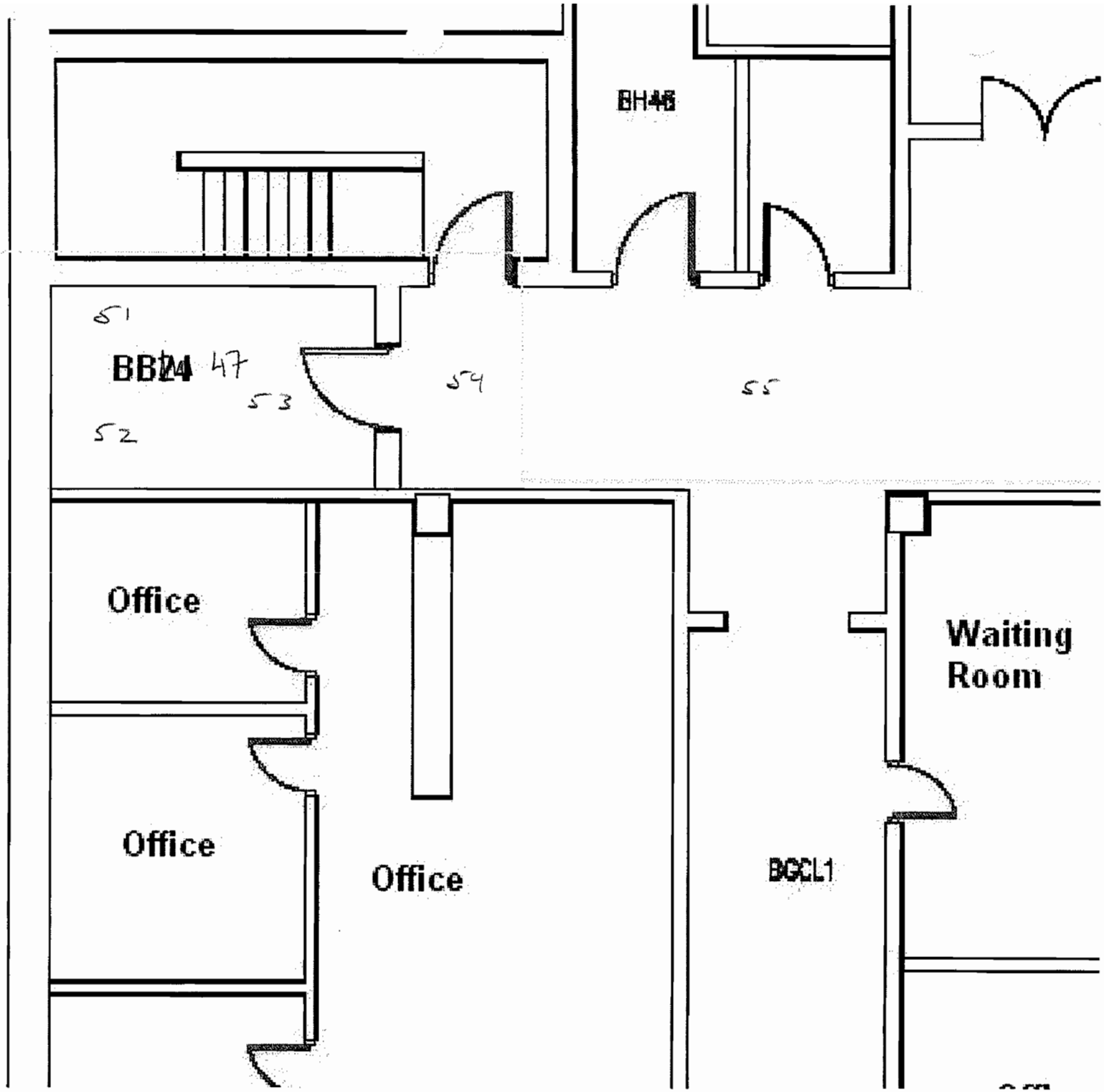
BH46
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BB24
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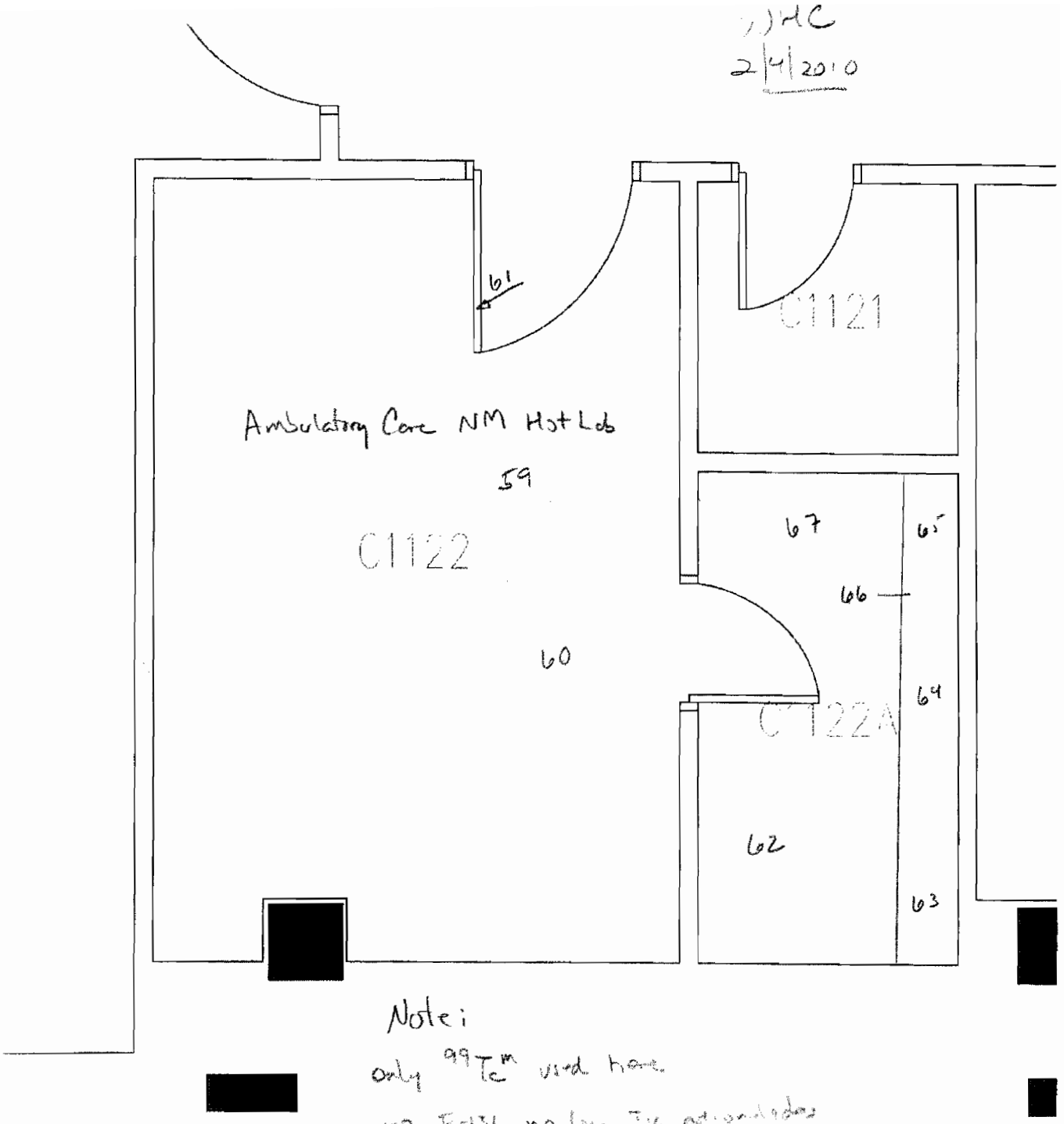
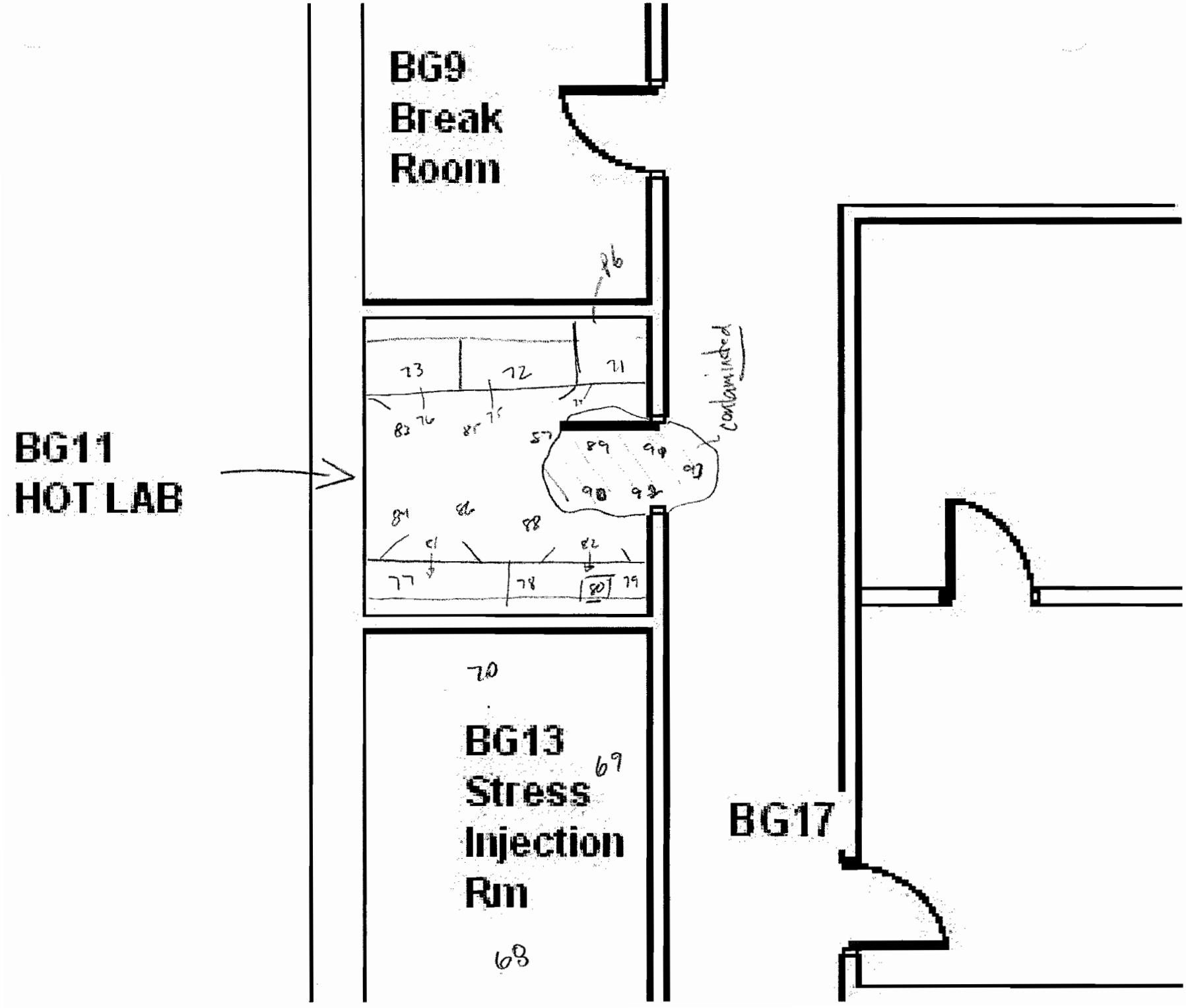
Office
Office
Office
Waiting Room
BGCL1


JHC
2/4/2010
61
C1121
Ambulatory Care NM Hot Lab
59
C1122
67
65
66
60
64
C122A
62
63
Note:
only 99Tcm used here.
no I-131 no long T½ radionuclides


BG9
Break
Room
BG11
HOT LAB
BG13
Stress
Injection
Rm
BG17
Contaminated

Survey Meter Information

Site: Washington Hospital Center Building: Former Nuclear Medicine Dept Lab/Room: Former Nuclear Medicine I

	Meter 1		Meter 2		Meter 3		Meter 4		Meter 5	
Date:	2/4/2010		2/4/2010		2/4/2010		2/4/2010		2/4/2010	
Make:	Ludlum		Ludlum		Ludlum		Ludlum		Bicron	
Model:	2221		2221		2221		2221		microrem	
SN:	174947		174947		161591		161951		C139F	
Probe Make:	Ludlum		Ludlum		Ludlum		Ludlum		Bicron	
Probe Model:	43-37		43-68		43-37		43-68		Plastic NaI	
Probe SN:	074069		079572		124945		178512		N/A	
Probe Area (cm^2):	584		126		584		126		1	
Next Cal. Date:	2/3/2011		2/3/2011		2/3/2011		40577		1/22/2011	
Background Surface Materia	Floor		Floor		Floor		Floor		Air	
Background(c) - Time(Min)):	7087	10	2480	10	7632	10	2452	10	2	µRem/hr
Sample Count Time (min)	0.5		0.5		0.5		0.5		N/A	
CS Isotope - Activity(µCi):	C-14	0.149	C-14	0.149	C-14	0.149	C-14	0.149	Cs-137	
CS Source(cpm)	39964		41022		44845		42739		600	µRem/hr
L_c, L_d (Counts)	62	127	37	76	64	131	36	76	NA	NA
Direct MDC, Scan MDC (dpm/100cm^2)	106	230	307	2052	118	3729	295	1973	NA	NA
MDCR , MDC Count Rate	993	740	168	337	295	796	167	334	NA	NA
Instrumen 4π Eff, Isotope:	0.30	Cs-137	0.29	Cs-137	0.28	Cs-137	0.30	Cs-137		
E_s Surface Effciency:	50.0%	Concrete	50.0%	Concrete	50.0%	Concrete	50.0%	Concrete		
E, Total Effciency:	30.0%	Cs-137	29.0%	Cs-137	28.0%	Cs-137	30.0%	Cs-137	N/A	N/A

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

Lc= Critical Detection Leve
Ld= a priori Detection limi
MDC= Minimum Detectable Concentration
MDCR= Minimum Detectable Count Rate

$$\text{Direct MDC} = \frac{3+3.29*\text{SQRT}(B/T(1+T_{S+B}/T_B)}{K * T_{S+B}}$$

Beta

$$\text{Scan MDC} = \frac{\text{MDCR}}{\text{SQRT}(p)*E*E_s*K}$$

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

B = Background Counts
T_B = BKG Counting Time In Minutes
T_{S+B} = Sample-Bkg Counting Time In Minutes
E = Total Detector Efficiency in Counts/Disintegratio
A = Physical Probe Area in cm^2
K = Other Constants and Factors When Needed
p = Surveyor Efficiency
E_s = Surface Efficiency $s_i = 1.38*\text{SQRT}(B_r)$
i = Counting Interva

Survey Meter Information

Site: Washington Hospital Center Building: Former Nuclear Medicine Dept Lab/Room: Former Nuclear Medicine I

	Meter 6		Meter 7	Meter 8	Meter 9	Meter 10
Date:	2/4/2010		Not In Service	Not In Service	Not In Service	Not In Service
Make:	Ludlum					
Model:	2221					
SN:	157013					
Probe Make:	Ludlum					
Probe Model:	44-10					
Probe SN:	178512					
Probe Area (cm^2):	100					
Next Cal. Date:	2/3/2011					
Background Surface Materia	Floor					
Background(c) - Time(Min)):	25880	10				
Sample Count Time (min)	1.0					
CS Isotope - Activity(μCi):	Cs-137	1.000				
CS Source(cpm)	200297					
L_c, L_d (Counts)	119	240				
Direct MDC, Scan MDC ($dpm/100cm^2$)	1843	5916				
MDCR , MDC Count Rate	3132	2828				
Efficiency, Isotope:	13.0%	Cs-137				

Site: Washington Hospital Center Building: Former Nuclear Medicine Dept

Start Date: 02/04/10 Lab/Room: Former Nuclear Medicine Dept

Surveyor: Gregory D. Smith Surveyor: James Dean

Area Survey Results			Wipe Test Results			β Direct Measurements			Gamma Scan and Dose Rate					β Scan			
Sample Number	Description	Surface	Instru-ment		Actvity dpm/100 cm^2 (beta)	Survey Meter #	Gross (cpm)	Activity dpm/100 cm^2	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	Survey Meter #	Gamma Dose Rate (uRem/h)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	Activity β dpm/100 cm^2
1	BG12 Floor	vinyl tile over concrete	LSC		<200	#4	210	-93	#6	3000	2200	#5	3	#1	850	700	-10
2	BG12 Floor	vinyl tile over concrete	LSC		<200	#4	246	2	#6	3000	2200	#5	3	#1	850	700	-10
3	BG12 Door	wood	LSC		<200	#4	344	261	#6	3000	2200	#5	3	#2	300	200	-131
4	BG19 Floor	vinyl tile over concrete	LSC		<200	#4	274	76	#6	3000	2200	#5	3	#1	850	700	-10
5	BG19 Floor	vinyl tile over concrete	LSC		<200	#4	236	-24	#6	3000	2200	#5	3	#1	850	700	-10
6	BG19 Floor	vinyl tile over concrete	LSC		<200	#4	222	-61	#6	3000	2200	#5	3	#1	850	700	-10
7	BG21 Floor	vinyl tile over concrete	LSC		<200	#4	214	-83	#6	3000	2200	#5	3	#1	850	700	-10
8	BG21 Floor	vinyl tile over concrete	LSC		<200	#4	196	-130	#6	3000	2200	#5	3	#1	850	700	-10
9	BG21 Floor	vinyl tile over concrete	LSC		<200	#4	208	-98	#6	3000	2200	#5	3	#1	850	700	-10
10	BG20 Floor	vinyl tile over concrete	LSC		<200	#4	222	-61	#6	3000	2200	#5	3	#1	850	700	-10
11	BG20 Floor	vinyl tile over concrete	LSC		<200	#4	214	-83	#6	3000	2200	#5	3	#1	850	700	-10
12	BG20 Floor	vinyl tile over concrete	LSC		<200	#4	214	-83	#6	3000	2200	#5	3	#1	850	700	-10
13	BG15 Floor	vinyl tile over concrete	LSC		<200	#4	244	-3	#6	3000	2200	#5	3	#1	850	700	-10
14	BG15 Floor	vinyl tile over concrete	LSC		<200	#4	210	-93	#6	3000	2200	#5	3	#1	850	700	-10
15	BG15 Floor	vinyl tile over concrete	LSC		<200	#4	196	-130	#6	3000	2200	#5	3	#1	850	700	-10
16	BG16 Floor	vinyl tile over concrete	LSC		<200	#4	202	-114	#6	5000	3800	#5	3	#1	850	700	-10
17	BG16 Floor	vinyl tile over concrete	LSC		<200	#4	182	-167	#6	3000	2200	#5	3	#1	850	700	-10
18	BG16 Floor	vinyl tile over concrete	LSC		<200	#4	182	-167	#6	3000	2200	#5	3	#1	850	700	-10
19	BG16 Dress. Rm Floor	vinyl tile over concrete	LSC		<200	#4	196	-130	#6	3000	2200	#5	3	#1	850	700	-10
20	Emp Tlt Floor	vinyl tile over concrete	LSC		<200	#4	286	108	#6	3000	2200	#5	3	#1	850	700	-10
21	Emp Tlt Floor	vinyl tile over concrete	LSC		<200	#4	220	-67	#6	3000	2200	#5	3	#1	850	700	-10
22	Patient Tlt Floor	vinyl tile over concrete	LSC		<200	#4	162	-220	#6	3000	2200	#5	3	#1	850	700	-10
23	Patient Tlt Floor	vinyl tile over concrete	LSC		<200	#4	1050	2129	#6	3000	2200	#5	3	#1	850	700	-10
24	Pt Tlt Toilet	ceramic	LSC		<200	#4	424	473	#6	3000	2200	#5	3	#2	300	200	-131
25	Patient Tlt Sink	ceramic	LSC		<200	#4	526	743	#6	3000	2200	#5	3	#1	600	500	-238
26	Hot Pt Wait Rm	vinyl floor over concrete	LSC		<200	#4	128	-310	#6	3000	2200	#5	3	#1	850	700	-10
27	Hot Pt Wait Rm	vinyl floor over concrete	LSC		<200	#4	126	-315	#6	3000	2200	#5	3	#1	850	700	-10
28	Hot Pt Wait Rm	vinyl floor over concrete	LSC		<200	#4	308	166	#6	3000	2200	#5	3	#1	850	700	-10
29	Hot Pt Wait Rm	vinyl floor over concrete	LSC		<200	#4	132	-299	#6	3000	2200	#5	3	#1	850	700	-10
30	Hot Pt Wait Door	wood	LSC		<200	#4	278	87	#6	3000	2200	#5	3	#4	300	200	-120

Site: Washington Hospital Center Building: Former Nuclear Medicine Dept

Start Date: 02/04/10 Lab/Room: Former Nuclear Medicine Dept

Surveyor: Gregory D. Smith Surveyor: James Dean

Area Survey Results			Wipe Test Results			β Direct Measurements			Gamma Scan and Dose Rate					β Scan			
Sample Number	Description	Surface	Instru-ment		Actvity dpm/100 cm^2 (beta)	Survey Meter #	Gross (cpm)	Activity dpm/100 cm^2	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	Survey Meter #	Gamma Dose Rate (uRem/h)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	Activity β dpm/100 cm^2
31	BG17 Floor	vinyl tile over concrete	LSC		<200	#4	310	171	#6	3000	2200	#5	3	#1	850	700	-10
32	BG17 Floor	vinyl tile over concrete	LSC		<200	#4	300	145	#6	3000	2200	#5	3	#1	850	700	-10
33	BG17 Floor	vinyl tile over concrete	LSC		<200	#4	304	156	#6	3000	2200	#5	3	#1	850	700	-10
34	BG24 Floor	vinyl tile over concrete	LSC		<200	#4	300	145	#6	3000	2200	#5	3	#1	850	700	-10
35	BG24 Floor	vinyl tile over concrete	LSC		<200	#4	244	-3	#6	3000	2200	#5	3	#1	850	700	-10
36	BG24 Floor	vinyl tile over concrete	LSC		<200	#4	272	71	#6	3000	2200	#5	3	#1	850	700	-10
37	Corridor Floor	vinyl tile over concrete	LSC		<200	#4	310	171	#6	3000	2200	#5	3	#1	850	700	-10
38	Corridor Floor	vinyl tile over concrete	LSC		<200	#4	278	87	#6	3000	2200	#5	3	#1	850	700	-10
39	Corridor Floor	vinyl tile over concrete	LSC		<200	#4	3314	8119	#6	3000	2200	#5	3	#1	850	700	-10
40	Corridor Floor	vinyl tile over concrete	LSC		<200	#4	222	-61	#6	3000	2200	#5	3	#1	850	700	-10
41	Corridor Floor	vinyl tile over concrete	LSC		<200	#4	294	129	#6	3000	2200	#5	3	#1	850	700	-10
42	Corridor Floor	vinyl tile over concrete	LSC		<200	#4	260	39	#6	3000	2200	#5	3	#1	850	700	-10
43	Corridor Floor	vinyl tile over concrete	LSC		<200	#4	272	71	#6	3000	2200	#5	3	#1	850	700	-10
44	Corridor Floor	vinyl tile over concrete	LSC		<200	#4	728	1277	#6	3000	2200	#5	3	#1	850	700	-10
45	Corridor Floor	vinyl tile over concrete	LSC		<200	#4	216	-77	#6	3000	2200	#5	3	#1	850	700	-10
46	Corridor Floor	vinyl tile over concrete	LSC		<200	#4	222	-61	#6	3000	2200	#5	3	#1	850	700	-10
47	Corridor Floor	vinyl tile over concrete	LSC		<200	#4	210	-93	#6	3000	2200	#5	3	#1	850	700	-10
48	Corridor Floor	vinyl tile over concrete	LSC		<200	#4	274	76	#6	3000	2200	#5	3	#1	850	700	-10
49	Corridor Floor	vinyl tile over concrete	LSC		<200	#4	238	-19	#6	3000	2200	#5	3	#1	850	700	-10
50	Corridor Floor	vinyl tile over concrete	LSC		<200	#4	270	66	#6	3000	2200	#5	3	#1	850	700	-10
51	BB74	vinyl tile over concrete	LSC		<200	#4	214	-83	#6	3000	2200	#5	3	#1	850	700	-10
52	BB74	vinyl tile over concrete	LSC		<200	#4	232	-35	#6	3000	2200	#5	3	#1	850	700	-10
53	BB74	vinyl tile over concrete	LSC		<200	#4	207	-101	#6	3000	2200	#5	3	#1	850	700	-10
54	Corridor Floor	vinyl tile over concrete	LSC		<200	#4	204	-109	#6	3000	2200	#5	3	#1	850	700	-10
55	Corridor Floor	vinyl tile over concrete	LSC		<200	#4	221	-64	#6	3000	2200	#5	3	#1	850	700	-10
56	BB36 Floor	vinyl tile over concrete	LSC		<200	#4	8628	22177	#6	7436	3000	#5	3	#1	850	700	-10
57	BB36 Floor	vinyl tile over concrete	LSC		<200	#4	205	-106	#6	3000	2200	#5	3	#1	850	700	-10
58	BB36 Floor	vinyl tile over concrete	LSC		<200	#4	216	-77	#6	3000	2200	#5	3	#1	850	700	-10
59	C1122 Amb Hot Lab Floor	vinyl tile over concrete	LSC		<200	#4	218	-72	#6	3000	2200	#5	3	#1	850	700	-10
60	C1122 Amb Hot Lab Floor	vinyl tile over concrete	LSC		<200	#4	210	-93	#6	3000	2200	#5	3	#1	850	700	-10

Site: Washington Hospital Center Building: Former Nuclear Medicine Dept

Start Date: 02/04/10 Lab/Room: Former Nuclear Medicine Dept

Surveyor: Gregory D. Smith Surveyor: James Dean

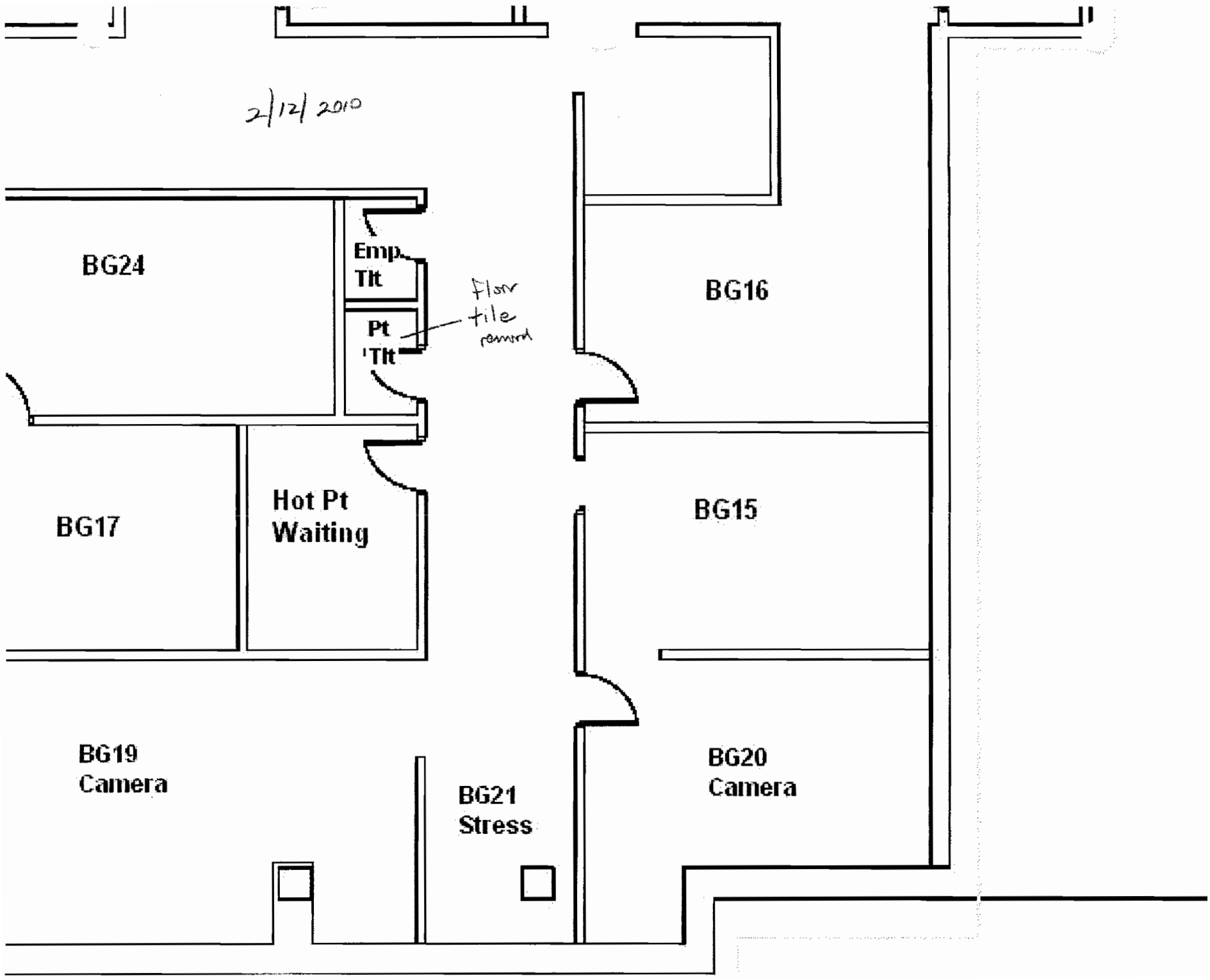
Area Survey Results			Wipe Test Results			β Direct Measurements			Gamma Scan and Dose Rate					β Scan			
Sample Number	Description	Surface	Instru-ment		Actvity dpm/100 cm^2 (beta)	Survey Meter #	Gross (cpm)	Activity dpm/100 cm^2	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	Survey Meter #	Gamma Dose Rate (uRem/h)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	Activity β dpm/100 cm^2
61	C1122AAmb Hot Lab Door	vinyl over concrete	LSC		<200	#4	223	-59	#6	3000	2200	#5	3	#1	850	700	-10
62	C1122A Amb Hot Lab Floor	vinyl over concrete	LSC		<200	#4	203	-112	#6	3000	2200	#5	3	#1	850	700	-10
63	C1122A Amb Hot Lab Bench	synthetic bench top	LSC		<200	#4	232	-35	#6	3000	2200	#5	3	#1	850	700	-10
64	C1122A Amb Hot Lab Bench	synthetic bench top	LSC		<200	#4	201	-117	#6	3000	2200	#5	3	#2	400	250	5
65	C1122A Amb Hot Lab Bench	synthetic bench top	LSC		<200	#4	234	-30	#6	3000	2200	#5	3	#2	400	250	5
66	C1122A Amb Hot Lab Cabinet	painted metal	LSC		<200	#4	238	-19	#6	3000	2200	#5	3	#2	400	250	5
67	C1122A Amb Hot Lab Floor	vinyl tile over concrete	LSC		<200	#4	213	-85	#6	3000	2200	#5	3	#2	400	250	5
68	BG13 Floor	vinyl tile over concrete	LSC		<200	#4	254	23	#6	3000	2200	#5	3	#1	850	700	-10
69	BG13 Floor	vinyl tile over concrete	LSC		<200	#4	222	-61	#6	3000	2200	#5	3	#1	850	700	-10
70	BG13 Floor	vinyl tile over concrete	LSC		<200	#4	231	-38	#6	3000	2200	#5	3	#1	850	700	-10
71	Hot Lab Bench	synthetic bench top	LSC		<200	#4	266	55	#6	3000	2200	#5	3	#1	850	700	-10
72	Hot Lab Bench	synthetic bench top	LSC		<200	#4	232	-35	#6	3000	2200	#5	3	#1	850	700	-10
73	Hot Lab Bench	synthetic bench top	LSC		<200	#4	226	-51	#6	3000	2200	#5	3	#1	850	700	-10
74	Hot Lab Bench Cabinet	painted metal	LSC		<200	#4	222	-61	#6	3000	2200	#5	3	#1	850	700	-10
75	Hot Lab Bench Cabinet	painted metal	LSC		<200	#4	234	-30	#6	3000	2200	#5	3	#1	850	700	-10
76	Hot Lab Bench Cabinet	painted metal	LSC		<200	#4	224	-56	#6	3000	2200	#5	3	#1	850	700	-10
77	Hot Lab Bench	synthetic bench top	LSC		<200	#4	212	-88	#6	3000	2200	#5	3	#1	850	700	-10
78	Hot Lab Bench	synthetic bench top	LSC		<200	#4	208	-98	#6	3000	2200	#5	3	#1	850	700	-10
79	Hot Lab Bench	synthetic bench top	LSC		<200	#4	256	29	#6	3000	2200	#5	3	#1	850	700	-10
80	Sink	stainless steel	LSC		<200	#4	258	34	#6	3000	2200	#5	3	#1	850	700	-10
81	Hot Lab Bench Cabinet	painted metal	LSC		<200	#4	314	182	#6	3000	2200	#5	3	#1	850	700	-10
82	Hot Lab Bench Cabinet	painted metal	LSC		<200	#4	202	-114	#6	3000	2200	#5	3	#1	850	700	-10
83	Hot Lab Floor	painted concrete	LSC		<200	#4	266	55	#6	3000	2200	#5	3	#1	850	700	-10
84	Hot Lab Floor	painted concrete	LSC		<200	#4	214	-83	#6	3000	2200	#5	3	#1	850	700	-10
85	Hot Lab Floor	painted concrete	LSC		<200	#4	318	193	#6	3000	2200	#5	3	#1	850	700	-10
86	Hot Lab Floor	painted concrete	LSC		<200	#4	312	177	#6	3000	2200	#5	3	#1	850	700	-10
87	Hot Lab Floor	painted concrete	LSC		<200	#4	250	13	#6	3000	2200	#5	3	#1	850	700	-10
88	Hot Lab Floor	painted concrete	LSC		<200	#4	276	81	#6	3000	2200	#5	3	#1	850	700	-10
89	Hot Lab Floor	contaminated area	LSC		<200	#4	406	425	#6	5000	4000	#5	10	#1	850	700	-10
90	Hot Lab Floor	contaminated area	LSC		<200	#4	432	494	#6	5000	4000	#5	10	#1	850	700	-10

Site: Washington Hospital Center Building: Former Nuclear Medicine Dept

Start Date: 02/04/10 Lab/Room: Former Nuclear Medicine Dept

Surveyor: Gregory D. Smith Surveyor: James Dean

Area Survey Results			Wipe Test Results			β Direct Measurements			Gamma Scan and Dose Rate					β Scan			
Sample Number	Description	Surface	Instru-ment		Actvity dpm/100 cm^2 (beta)	Survey Meter #	Gross (cpm)	Activity dpm/100 cm^2	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	Survey Meter #	Gamma Dose Rate (uRem/h)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	Activity β dpm/100 cm^2
91	Hot Lab Floor	contaminated area	*LSC*		2129	*#4*	82768	218314	*#6*	500000	400000	*#5*	150	*#1*	500000	400000	455812
92	Hot Lab Floor	contaminated area	*LSC*		161	*#4*	57368	151119	*#6*	200000	300000	*#5*	150	*#1*	100000	200000	227501
93	Hot Lab Floor	contaminated area	*LSC*		<200	*#4*	40990	107790	*#6*	50000	50000	*#5*	150	*#1*	100000	200000	227501


2/12/2010
BG24
Emp
Tlt
Pt
Tlt
floor tile removed
BG16
BG17
Hot Pt
Waiting
BG15
BG19
Camera
BG21
Stress
BG20
Camera

Survey Meter Information

Site: Washington Hospital Center Building: Former Nuclear Medicine Dept Lab/Room: Former Nuclear Medicine I

	Meter 1		Meter 2		Meter 3		Meter 4		Meter 5	
Date:	2/12/2010			Not In Service		Not In Service		Not In Service	2/12/2010	
Make:	Ludlum								Bicron	
Model:	2221								microrem	
SN:	49138								C139F	
Probe Make:	RSO								Bicron	
Probe Model:	ASM-7								Plastic NaI	
Probe SN:	074069								N/A	
Probe Area (cm^2):	15								1	
Next Cal. Date:	10/13/2010								1/22/2011	
Background Surface Materia	Floor								Air	
Background(c) - Time(Min)):	343	10							2	µRem/hr
Sample Count Time (min)	1.0		0.5		0.5		0.5		N/A	
CS Isotope - Activity(µCi):	C-14	0.149							Cs-137	
CS Source(cpm)	25698								600	µRem/hr
L_c, L_d (Counts)	14	30							NA	NA
Direct MDC, Scan MDC (dpm/100cm^2)	1105	4216							NA	NA
MDCR , MDC Count Rate	97	189							NA	NA
Instrumen 4π Eff, Isotope:	0.14	Tc-99								
E_s Surface Effciency:	50.0%	Concrete	50.0%	Concrete	50.0%	Concrete	50.0%	Concrete		
E, Total Effciency:	14.0%	Tc-99							N/A	N/A

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

Lc= Critical Detection Leve
Ld= a priori Detection limi
MDC= Minimum Detectable Concentration
MDCR= Minimum Detectable Count Rate

Direct MDC= $\frac{3+3.29*SQRT(B/T(1+T_{S+B}/T_B)}{K * T_{S+B}}$

Beta
Scan MDC= $\frac{MDCR}{SQRT(p)*E*E_s*K}$

MDCR= $s_i * (60/i)$

B = Background Counts
T_B = BKG Counting Time In Minutes
T_{S+B} = Sample-Bkg Counting Time In Minutes
E = Total Detector Efficiency in Counts/Disintegratio
A = Physical Probe Area in cm^2
K = Other Constants and Factors When Needed
p = Surveyor Efficiency
E_s = Surface Efficiency $s_i = 1.38*SQRT(B_r)$
i = Counting Interva

Survey Meter Information

Site: Washington Hospital Center Building: Former Nuclear Medicine Dept Lab/Room: Former Nuclear Medicine I

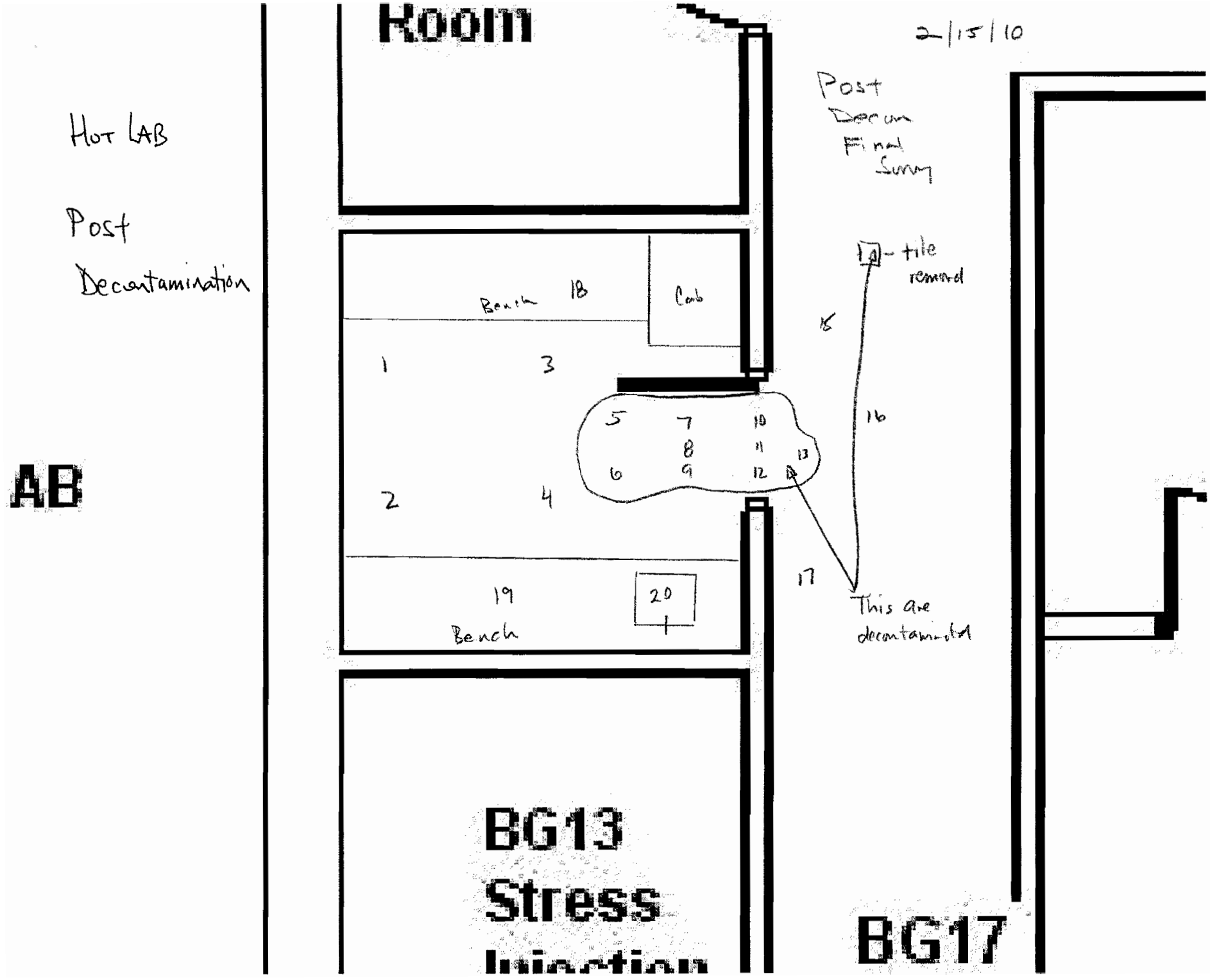
	Meter 6		Meter 7		Meter 8	Meter 9	Meter 10
Date:	2/4/2010		2/12/2010		Not In Service	Not In Service	Not In Service
Make:	Ludlum		Ludlum				
Model:	2221		2221				
SN:	157013		49138				
Probe Make:	Ludlum		RSO				
Probe Model:	44-10		ASM-7				
Probe SN:	178512		074069				
Probe Area (cm^2):	100		15				
Next Cal. Date:	2/3/2011		10/13/2010				
Background Surface Materia	Floor		Floor				
Background(c) - Time(Min)):	25880	10	343	10			
Sample Count Time (min)	1.0						
CS Isotope - Activity(μCi):	Cs-137	1.000	C-14	0			
CS Source(cpm)	200297		25698				
L_c, L_d (Counts)	119	240	14	30			
Direct MDC, Scan MDC ($dpm/100cm^2$)	1843	5916	1440	4216			
MDCR , MDC Count Rate	3132	2828	97	236			
Efficiency, Isotope:	13.0%	Cs-137	14.0%	Tc-99			

Site: Washington Hospital Center Building: Former Nuclear Medicine Dept

Start Date: 02/04/10 Lab/Room: Former Nuclear Medicine Dept

Surveyor: Gregory D. Smith Surveyor: James Dean

Area Survey Results			Wipe Test Results			β Direct Measurements			Gamma Scan and Dose Rate					β Scan			
Sample Number	Description	Surface	Instru-ment		Actvity dpm/100 cm^2 (beta)	Survey Meter #	Gross (cpm)	Activity dpm/100 cm^2	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	Survey Meter #	Gamma Dose Rate (uRem/h)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	Activity β dpm/100 cm^2
1	BB36 Floor	vinyl tile over concrete	LSC		<200	#7	36	81	#6	3000	2200	#5	3	#7	10	50	748
2	BB36 Floor	vinyl tile over concrete	LSC		<200	#7	50	748	#6	3000	2200	#5	3	#7	10	50	748
3	BB36 Floor	vinyl tile over concrete	LSC		<200	#7	43	414	#6	3000	2200	#5	3	#7	10	50	748
4	BB36 Floor	vinyl tile over concrete	LSC		<200	#7	43	414	#6	3000	2200	#5	3	#7	10	50	748
5	BB36 Floor	vinyl tile over concrete	LSC		<200	#7	43	414	#6	3000	2200	#5	3	#7	10	50	748
6	Emp Tlt	vinyl tile over concrete	LSC		<200	#7	49	700	#6	3000	2200	#5	3	#7	10	50	748
7	Emp Tlt	vinyl tile over concrete	LSC		<200	#7	53	890	#6	3000	2200	#5	3	#7	10	50	748
8	Pt Tlt	tile removed concrete	LSC		<200	#7	36	81	#6	3000	2200	#5	3	#7	10	50	748
9	Pt Tlt	tile removed concrete	LSC		<200	#7	50	748	#6	3000	2200	#5	3	#7	10	50	748
10	Pt Tlt	tile removed concrete	LSC		<200	#7	45	510	#6	3000	2200	#5	3	#7	10	50	748


Room
2/15/10
Hot LAB
Post
Decontamination
AB
Post
Decon
Final
Survey
Bench
18
Cab
1
3
5
7
10
8
11
13
6
9
12
2
4
19
20
Bench
15
16
17
tile
removed
This are
decontaminated
BG13
Stress
BG17

Survey Meter Information

Site: Washington Hospital Center Building: Former Nuclear Medicine Dept Lab/Room: Former Nuclear Medicine I

	Meter 1		Meter 2		Meter 3		Meter 4		Meter 5	
Date:	2/15/2010			Not In Service		Not In Service		Not In Service	2/15/2010	
Make:	Ludlum								Bicron	
Model:	2221								microrem	
SN:	174947								C139F	
Probe Make:	Ludlum								Bicron	
Probe Model:	43-68								Plastic NaI	
Probe SN:	079572								N/A	
Probe Area (cm^2):	126								1	
Next Cal. Date:	2/3/2011								1/22/2011	
Background Surface Materia	Floor								Air	
Background(c) - Time(Min)):	3580	10							2	µRem/hr
Sample Count Time (min)	1.0								N/A	
CS Isotope - Activity(µCi):	C-14	0.149							Cs-137	
CS Source(cpm)	51191								600	µRem/hr
L_c, L_d (Counts)	44	91							NA	NA
Direct MDC, Scan MDC ($dpm/100cm^2$)	187	783							NA	NA
MDCR , MDC Count Rate	560	412	#VALUE!		#VALUE!		#VALUE!		NA	NA
Instrumen 4π Eff, Isotope:	0.29	Cs-137								
E_s Surface Effciency:	50.0%	Concrete	50.0%	Concrete	50.0%	Concrete	50.0%	Concrete		
E, Total Effciency:	29.0%	Cs-137							N/A	N/A

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

Lc= Critical Detection Leve
Ld= a priori Detection limi
MDC= Minimum Detectable Concentration
MDCR= Minimum Detectable Count Rate

Direct MDC= $\frac{3+3.29*SQRT(B/T(1+T_{S+B}/T_B)}{K * T_{S+B}}$

Beta
Scan MDC= $\frac{MDCR}{SQRT(p)*E*E_s*K}$

MDCR= $s_i * (60/i)$

B = Background Counts
T_B = BKG Counting Time In Minutes
T_{S+B} = Sample-Bkg Counting Time In Minutes
E = Total Detector Efficiency in Counts/Disintegratio
A = Physical Probe Area in cm^2
K = Other Constants and Factors When Needed
p = Surveyor Efficiency
E_s = Surface Efficiency $s_i = 1.38*SQRT(B_r)$
i = Counting Interva

Survey Meter Information

Site: Washington Hospital Center Building: Former Nuclear Medicine Dept Lab/Room: Former Nuclear Medicine I

	Meter 6		Meter 7	Meter 8	Meter 9	Meter 10
Date:	2/4/2010		Not In Service	Not In Service	Not In Service	Not In Service
Make:	Ludlum					
Model:	2221					
SN:	157013					
Probe Make:	Ludlum					
Probe Model:	44-10					
Probe SN:	178512					
Probe Area (cm^2):	100					
Next Cal. Date:	2/3/2011					
Background Surface Materia	Floor					
Background(c) - Time(Min)):	25880	10				
Sample Count Time (min)	1.0					
CS Isotope - Activity(μCi):	Cs-137	1.000				
CS Source(cpm)	200297					
L_c, L_d (Counts)	119	240				
Direct MDC, Scan MDC ($dpm/100cm^2$)	1843	5916				
MDCR , MDC Count Rate	3132	2828				
Efficiency, Isotope:	13.0%	Cs-137				

Site: Washington Hospital Center Building: Former Nuclear Medicine Dept

Start Date: 02/04/10 Lab/Room: Former Nuclear Medicine Dept

Surveyor: Gregory D. Smith Surveyor: James Dean

Area Survey Results			Wipe Test Results			β Direct Measurements			Gamma Scan and Dose Rate					β Scan			
Sample Number	Description	Surface	Instru-ment		Actvity dpm/100 cm^2 (beta)	Survey Meter #	Gross (cpm)	Activity dpm/100 cm^2	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	Survey Meter #	Gamma Dose Rate (uRem/h)	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	Activity β dpm/100 cm^2
1	Floor	painted concrete	*LSC*		<200	*#1*	288	-383	*#6*	3000	2200	*#5*	3	*#1*	500	350	-44
2	Floor	painted concrete	*LSC*		<200	*#1*	287	-389	*#6*	3000	2200	*#5*	3	*#1*	500	350	-44
3	Floor	painted concrete	*LSC*		<200	*#1*	327	-170	*#6*	3000	2200	*#5*	3	*#1*	500	350	-44
4	Floor	painted concrete	*LSC*		<200	*#1*	314	-241	*#6*	3000	2200	*#5*	3	*#1*	500	350	-44
5	Floor	deconed ptd concrete	*LSC*		<200	*#1*	321	-203	*#6*	3000	2200	*#5*	3	*#1*	500	350	-44
6	Floor	deconed ptd concrete	*LSC*		<200	*#1*	341	-93	*#6*	3000	2200	*#5*	3	*#1*	500	350	-44
7	Floor	deconed ptd concrete	*LSC*		<200	*#1*	374	88	*#6*	3000	2200	*#5*	3	*#1*	500	350	-44
8	Floor	deconed ptd concrete	*LSC*		<200	*#1*	554	1073	*#6*	3000	2200	*#5*	3	*#1*	500	350	-44
9	Floor	deconed ptd concrete	*LSC*		<200	*#1*	421	345	*#6*	3000	2200	*#5*	3	*#1*	500	350	-44
10	Floor	deconed ptd concrete	*LSC*		<200	*#1*	406	263	*#6*	3000	2200	*#5*	3	*#1*	500	350	-44

Attachment C

Wipe Test Analysis Data Print-Out

WASHINGTON HOSPITAL CENTER
Count Time(minutes): 1.00
Assay Type: CPM
Background Subtract : IPA Bkg
Outlier: 5.0 FLAG
%Spillup: 0.00
%Spilldown: 0.00
Screening: OFF

	Window A		Window B		Window C	
Nuclide:	MAN	650 - 670 keV	Co-57	75 - 165 keV	MAN	15 - 2000 keV
Bkg:	2.22		27.3		217	
Sigma:	0.00		0.00		2.00	
LCR:	0		0		0	
Half Life(hours):	0.00		0.00			
Multiplier:	1.0000					
%CV Flag Limit:	0.00		0.00			

S#	A:CPM	A:%SIG	B:CPM	B:%SIG	C:CPM	C:%SIG
1	15.8	25.2	157.7	7.96	1673.5	2.44
2	7.8	35.9	12.7	28.0	171.5	7.64
3	0.8	113	0.0		12.5	28.3
4	0.0		0.0		0.0	
5	0.0		0.7	118	0.0	
6	2.8	60.0	0.0		0.0	
7	0.0		5.7	41.8	4.5	47.0
8	1.8	75.0	0.7	118	25.5	19.8
9	0.0		0.0		27.5	19.1
10	0.0		0.7	118	5.5	42.6

EDITDATA.D05 Archived to C:\ARCH\ARCH05D.911
C:\DATA\P5DATA Copied to C:\DATA\ARCH05A.911

05 Feb 10 06:25:19 Packard Model 5003 COBRA SN: 424559

PROTOCOL # 5
Nucmed Leak Test
WASHINGTON HOSPITAL CENTER
COUNT TIME 1.00 Minutes

Window A		Window B		Window C	
LLD:	650 keV	LLD:	75 keV	LLD:	15 keV
ULD:	670 keV	ULD:	165 keV	ULD:	2000 keV
EFF:	57 %	EFF:	85 %	EFF:	80 %

Sample #	A:CPM	A:DPM	B:CPM	B:DPM	C:CPM	C:DPM
1	16	28	158	186	1674	2092
2	8	14	13	15	172	214
3	1	1	0	0	13	16
4	0	0	0	0	0	0
5	0	0	1	1	0	0
6	3	5	0	0	0	0
7	0	0	6	7	5	6
8	2	3	1	1	26	32
9	0	0	0	0	28	34
10	0	0	1	1	6	7

count of individual Sample (from "10 packs")

WASHINGTON HOSPITAL CENTER
Count Time(minutes): 1.00
Assay Type: CPM
Background Subtract : IPA Bkg
Outlier: 5.0 FLAG
%Spillup: 0.00
%Spilldown: 0.00
Screening: OFF

	Window A		Window B		Window C	
Nuclide:	MAN	650 - 670 keV	Co-57	75 - 165 keV	MAN	15 - 2000 keV
Bkg:	2.20		26.0		222	
Sigma:	0.00		0.00		2.00	
LCR:	0		0		0	
Half Life(hours):	0.00		0.00			
Multiplier:	1.0000					
%CV Flag Limit:	0.00		0.00			

S#	A:CPM	A:%SIG	B:CPM	B:%SIG	C:CPM	C:%SIG
1	1.8	74.5	0.0		29.2	18.5
2	1.8	74.5	0.0		0.0	
3	0.0		5.0	44.9	7.2	37.4
4	0.0		0.0		0.0	
5	0.0		5.0	44.9	2.2	68.0
6	0.0		0.0		2.2	68.0
7	2.8	59.8	0.0		3.2	56.3
8	0.8	112	6.0	41.0	0.0	
9	0.8	112	2.0	71.4	16.2	24.9
10	15.8	25.2	184.0	7.37	1959.2	2.26

EDITDATA.D05 Archived to C:\ARCH\ARCH05D.910
C:\DATA\P5DATA Copied to C:\DATA\ARCH05A.910

04 Feb 10 14:48:32 Packard Model 5003 COBRA SN: 424559

PROTOCOL # 5
Nucmed Leak Test
WASHINGTON HOSPITAL CENTER
COUNT TIME 1.00 Minutes

Window A		Window B		Window C	
LLD:	650 keV	LLD:	75 keV	LLD:	15 keV
ULD:	670 keV	ULD:	165 keV	ULD:	2000 keV
EFF:	57 %	EFF:	85 %	EFF:	80 %

Sample #	A:CPM	A:DPM	B:CPM	B:DPM	C:CPM	C:DPM
1	2	3	0	0	29	37
2	2	3	0	0	0	0
3	0	0	5	6	7	9
4	0	0	0	0	0	0
5	0	0	5	6	2	3
6	0	0	0	0	2	3
7	3	5	0	0	3	4
8	1	1	6	7	0	0
9	1	1	2	2	16	20
10	16	28	184	216	1959	2449

groups of 10 wipe tests

WASHINGTON HOSPITAL CENTER
Count Time(minutes): 1.00
Assay Type: CPM
Background Subtract : IPA Bkg
Outlier: 5.0 FLAG
%Spillup: 0.00
%Spilldown: 0.00
Screening: OFF

	Window A		Window B		Window C	
Nuclide:	I-131	260 - 470 keV	Fe-59	940 - 1400 keV	MAN	15 - 2000 keV
Bkg:	43.3		27.5		217	
Sigma:	0.00		0.00		2.00	
LCR:	0		0		0	
Half Life(hours):	0.00		0.00			
Multiplier:	1.0000					
%CV Flag Limit:	0.00		0.00			

S#	A:CPM	A:%SIG	B:CPM	B:%SIG	C:CPM	C:%SIG
1	1210.7	2.87	0.5	144	1699.5	2.43

EDITDATA.D03 Archived to C:\ARCH\ARCH03D.167
C:\DATA\P3DATA Copied to C:\DATA\ARCH03A.167

05 Feb 10 07:01:02 Packard Model 5003 COBRA SN: 424559

PROTOCOL # 3
NIH 10-Pk Breakdown
WASHINGTON HOSPITAL CENTER
COUNT TIME 1.00 Minutes

Window A		Window B		Window C	
LLD:	260 keV	LLD:	940 keV	LLD:	15 keV
ULD:	470 keV	ULD:	1400 keV	ULD:	2000 keV
EFF:	50 %	EFF:	70 %	EFF:	79 %

Sample #	A:CPM	A:DPM	B:CPM	B:DPM	C:CPM	C:DPM
1	1211	2421	1	1	1700	2151

Assay Definition-

Assay Description:
WASHINGTON HOSPITAL CENTER

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\20100205_0814.results
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 TOL 2392009
  Mid Energy: 14C-TOL-07-17-06
  High Energy: 32P-UG-02-28-05
Count Time (min): 1.00
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	Eff	Nucl In A	LUM
1	10.00	8	12	8	0	0	0	580		0.0	0
2	1.00	-1	-1	-3	-3	0	-4	574		41.7	0
3	1.00	-1	-8	-2	-0	-9	-3	575		41.8	0
4	1.00	1	13	15	-1	12	18	545		40.4	0
5	1.00	2	-5	-1	6	-6	-1	555		40.9	0
6	1.00	-1	-4	-2	-2	-4	-3	548		40.5	0
7	1.00	-3	-4	5	-7	-5	6	539		40.1	0
8	1.00	-3	-6	-1	-6	-6	-1	507		38.7	0

9	1.00	-5	-3	-1	-13	-2	-1	520	39.3	0
10	1.00	-5	-7	-1	-11	-7	-1	558	41.0	0
11	1.00	2	-1	-2	5	-1	-3	488	37.8	0
12	1.00	-0	3	3	-1	3	3	530	39.7	0
13	1.00	-5	-3	-1	-13	-2	-1	500	38.3	0
14	1.00	1	-4	-4	3	-4	-5	509	38.8	0
15	1.00	-5	-1	-4	-13	1	-5	537	40.0	0
16	1.00	2	1	-6	4	2	-7	519	39.2	0
17	1.00	-6	0	-1	-16	1	-1	518	39.2	0
18	1.00	-4	-5	1	-8	-6	1	552	40.7	0
19	1.00	-3	-4	-2	-7	-4	-3	522	39.3	0
20	1.00	-1	-1	6	-2	-2	7	560	41.1	0
21	1.00	-6	-4	-0	-15	-4	-0	535	39.9	0
22	1.00	-5	1	-1	-14	2	-1	527	39.6	0
23	1.00	-3	-2	-2	-7	-1	-3	548	40.6	0
24	1.00	-7	1	-1	-18	3	-1	561	41.1	0
25	1.00	-5	-4	-3	-11	-3	-4	593	42.6	0
26	1.00	-6	1	3	-16	2	3	543	40.3	0
27	1.00	-4	-5	-6	-9	-4	-7	570	41.5	0
28	1.00	0	-2	0	1	-2	0	507	38.7	0
29	1.00	1	-4	2	5	-5	2	525	39.5	0
30	1.00	-3	3	1	-9	4	1	533	39.8	0
31	1.00	-4	-5	-3	-9	-5	-4	578	41.9	0
32	1.00	-2	-6	-4	-3	-6	-5	639	44.6	0
33	1.00	1	-6	1	4	-8	1	591	42.5	0
34	1.00	-2	-6	-0	-3	-7	-0	555	40.9	0
35	1.00	-2	-7	-1	-3	-8	-1	633	44.4	0
36	1.00	-5	-3	-1	-12	-2	-1	543	40.3	0
37	1.00	1	2	-2	1	3	-3	500	38.3	0
38	1.00	-3	-8	2	-5	-10	2	633	44.4	0
39	1.00	-1	1	1	-2	2	1	525	39.5	0
40	1.00	-5	0	-0	-13	1	-0	532	39.8	0
41	1.00	-6	1	-3	-17	3	-4	491	37.9	0
42	1.00	-7	0	-4	-19	2	-5	508	38.7	0
43	1.00	-1	2	-4	-4	4	-5	506	38.6	0
44	1.00	-4	-2	-1	-11	-2	-1	456	35.8	0
45	1.00	-3	-6	-2	-6	-6	-3	565	41.3	0
46	1.00	-5	2	1	-15	3	1	450	35.5	0
47	1.00	-6	-2	-1	-16	-1	-1	506	38.6	0
48	1.00	-3	-5	-4	-7	-5	-5	516	39.1	0
49	1.00	-1	-6	-3	0	-6	-4	569	41.5	0
50	1.00	-3	-2	-1	-7	-2	-1	553	40.8	0
51	1.00	-2	-5	-7	-4	-4	-9	517	39.1	0
52	1.00	-6	-2	-6	-14	-0	-7	595	42.7	0
53	1.00	-2	-1	-4	-5	0	-5	552	40.7	0
54	1.00	-4	0	5	-10	-0	6	589	42.4	0
55	1.00	-4	-7	-0	-8	-8	-0	572	41.6	0
56	1.00	-2	-1	-6	-5	1	-7	575	41.8	0
57	1.00	-4	-2	-5	-10	-0	-6	530	39.7	0
58	1.00	-6	-2	-3	-16	-0	-4	532	39.8	0
59	1.00	-5	0	-4	-13	2	-5	565	41.3	0
60	1.00	-3	-7	-3	-5	-8	-4	551	40.7	0
61	1.00	-1	-2	-2	-2	-2	-3	579	42.0	0
62	1.00	-4	-6	-2	-9	-6	-3	583	42.1	0
63	1.00	-3	-4	-0	-6	-5	-0	552	40.7	0
64	1.00	-2	3	-2	-7	5	-3	547	40.5	0
65	1.00	-4	-7	-0	-8	-8	-0	599	42.9	0
66	1.00	-3	3	1	-8	4	1	615	43.6	0
67	1.00	1	-2	-5	2	-1	-6	599	42.8	0
68	1.00	-3	0	-0	-8	1	-0	595	42.7	0
69	1.00	-1	-3	1	-2	-4	1	564	41.3	0
70	1.00	-3	-2	2	-7	-2	2	558	41.0	0

71	1.00	-3	-2	-3	-7	-1	-4	546	40.4	0
72	1.00	-4	-7	-1	-9	-7	-1	575	41.8	0
73	1.00	-5	-7	-2	-10	-7	-3	603	43.0	0
74	1.00	-3	-4	-3	-6	-4	-4	615	43.6	0
75	1.00	-4	-2	-4	-8	-0	-5	568	41.5	0
76	1.00	-4	-2	2	-9	-2	2	615	43.6	0
77	1.00	-4	-5	-1	-9	-5	-1	592	42.5	0
78	1.00	-3	1	-2	-8	2	-3	588	42.3	0
79	1.00	-7	-4	-4	-17	-3	-5	528	39.6	0
80	1.00	-6	-4	-3	-15	-3	-4	523	39.4	0
81	1.00	-4	-9	5	-7	-11	6	593	42.6	0
82	1.00	-3	-7	-3	-5	-7	-4	632	44.4	0
83	1.00	-2	-2	-1	-5	-2	-1	526	39.5	0
84	1.00	-4	-5	-5	-9	-4	-6	557	40.9	0
85	1.00	-5	-5	2	-11	-6	2	541	40.2	0
86	1.00	-3	-1	-1	-8	-0	-1	570	41.6	0
87	1.00	-5	-3	3	-11	-3	3	653	45.2	0
88	1.00	-1	-7	-1	-1	-8	-1	612	43.5	0
89	1.00	-6	-3	-1	-15	-2	-1	536	40.0	0
90	1.00	-0	-1	-2	-0	-1	-3	602	43.0	0
91	1.00	-6	-3	-3	-14	-2	-4	606	43.2	0
92	1.00	158	1244	648	14	1348	767	574	41.7	0
93	1.00	8	92	53	-7	99	62	562	41.2	0
94	1.00	-1	6	-4	-4	9	-5	524	39.4	0
95	1.00	1	-3	-0	3	-4	-0	614	43.5	0
96	1.00	-5	1	1	-13	2	1	607	43.2	0
97	1.00	-5	-5	-5	-11	-4	-6	604	43.1	0
98	1.00	-3	-7	1	-5	-8	1	647	44.9	0
99	1.00	-4	-1	3	-9	-1	3	611	43.4	0
100	1.00	-6	-5	-1	-13	-5	-1	608	43.3	0
101	1.00	-5	-1	2	-12	-1	2	601	42.9	0

Assay Definition-

Assay Description:
WASHINGTON HOSPITAL CENTER

Assay Type: DPM (Triple)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\LEAK TESTS\1 LEAK TEST Triple Label DPM
Raw Results Path: C:\Packard\Tricarb\Results\LEAK TESTS\1 LEAK TEST Triple Label DPM\20100215_1731.results
Assay File Name: C:\Packard\TriCarb\Assays\1 LEAK TEST Triple Label 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 TOL 2392009
  Mid Energy: 14C-TOL-07-17-06
  High Energy: 32P-UG-02-28-05
Count Time (min): 1.00
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	SIS	tSIE	LUM
1	10.00	5	9	7	0	0	0	64.46	585.49	0
2	1.00	-2	1	-1	-4	2	-1	0.00	604.07	0
3	1.00	2	4	6	3	3	7	151.57	569.00	0
4	1.00	-2	-1	-3	-4	-0	-3	0.00	544.23	0
5	1.00	1	-0	0	1	-0	0	314.10	591.61	0
6	1.00	0	7	2	-1	8	3	149.87	608.20	0
7	1.00	-1	0	-1	-1	0	-1	0.00	566.96	0
8	1.00	1	-2	5	4	-4	6	0.00	635.96	0

9	1.00	3	-1	-2	8	-1	-2	27.51	625.78	0
10	1.00	6	-3	-4	15	-4	-4	97.38	653.03	0
11	1.00	2	1	-5	5	2	-6	0.00	618.83	0
12	1.00	1	-5	-4	5	-5	-4	0.00	558.63	0
13	1.00	-2	-1	2	-4	-1	3	0.00	583.40	0
14	1.00	2	4	-1	5	5	-1	72.56	583.45	0
15	1.00	-1	-1	-2	-1	-1	-2	0.00	604.93	0
16	1.00	-2	1	2	-4	1	3	0.00	621.62	0
17	1.00	8	7	-1	16	7	-1	73.37	641.83	0
18	1.00	0	-2	1	2	-3	2	0.00	622.86	0
19	1.00	-1	-6	-2	0	-7	-2	0.00	609.32	0
20	1.00	1	1	-5	3	2	-6	31.36	606.77	0
21	1.00	1	-5	3	5	-6	4	0.00	626.76	0
22	1.00	1	0	-2	2	1	-2	185.48	618.75	0
23	1.00	2	0	-3	6	0	-3	67.31	596.39	0
24	1.00	-3	1	0	-7	2	0	0.00	582.60	0
25	1.00	1	3	4	3	3	5	89.47	590.57	0
26	1.00	-1	-6	-5	0	-6	-6	0.00	560.13	0
27	1.00	-3	-1	-2	-6	-0	-2	0.00	596.27	0
28	1.00	-1	0	-2	-1	1	-2	0.00	601.10	0
29	1.00	3	1	-2	8	1	-2	8.51	535.39	0
30	1.00	2	0	-1	5	0	-1	150.77	579.22	0
31	1.00	1	-2	2	3	-3	3	0.00	576.16	0

WASHINGTON HOSPITAL CENTER
Count Time(minutes): 1.00
Assay Type: CPM
Background Subtract : IPA Bkg
Outlier: 5.0 FLAG
%Spillup: 0.00
%Spilldown: 0.00
Screening: OFF

	Window A		Window B		Window C	
Nuclide:	MAN	650 - 670 keV	Co-57	75 - 165 keV	MAN	15 - 2000 keV
Bkg:	1.98		25.5		212	
Sigma:	0.00		0.00		2.00	
LCR:	0		0		0	
Half Life(hours):	0.00		0.00			
Multiplier:	1.0000					
%CV Flag Limit:	0.00		0.00			

S#	A:CPM	A:%SIG	B:CPM	B:%SIG	C:CPM	C:%SIG
1	0.0	707	1.5	81.6	8.8	33.7
2	1.0	99.0	5.5	42.6	32.8	17.5
3	0.0		0.0		6.8	38.3

EDITDATA.D05 Archived to C:\ARCH\ARCH05D.914
C:\DATA\P5DATA Copied to C:\DATA\ARCH05A.914

15 Feb 10 14:11:55 Packard Model 5003 COBRA SN: 424559

PROTOCOL # 5
Nucmed Leak Test
WASHINGTON HOSPITAL CENTER
COUNT TIME 1.00 Minutes

Window A		Window B		Window C	
LLD:	650 keV	LLD:	75 keV	LLD:	15 keV
ULD:	670 keV	ULD:	165 keV	ULD:	2000 keV
EFF:	57 %	EFF:	85 %	EFF:	80 %

Sample #	A:CPM	A:DPM	B:CPM	B:DPM	C:CPM	C:DPM
1	0	0	2	2	9	11
2	1	2	6	6	33	41
3	0	0	0	0	7	9

10 pak of first sury
3 groups of 30 samples

Attachment D

Survey Meter Calibration Reports

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

RSO Job No. **R8780**

Certificate of Calibration

ISSUED TO: RSO, Inc.
5206 Minnick Road
Laurel, MD 20707
KIT-1
CONTACT: Greg Smith
PHONE: (888) 723-5463
PO NO:

INSTRUMENT: LUDLUM
MODEL: 2221
TYPE: SCALER/RATE MET
SN: 174947

RSO, Inc. certifies that on 02/03/2010 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.
X	1	100	100	cpm	1.00
		400	400	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: PROPORTIONAL Probe3:

MODEL	SER#	WINDOW	GEOMETRY	VOLT	ISOTOPE 1	EFF.(%)	ISOTOPE 2	EFF.(%)	ISOTOPE 3	EFF.(%)	ISOTOPE 4	EFF.(%)
43-68	PR079572	FIXED	CONTACT	1829	C14	20	Sr90	25	Tc99	21	Cs137	29
43-37	PR074069	FIXED	CONTACT	1829	C14	20	Sr90	29	Tc99	21	Cs137	30

Note: "As found" condition +/- 20% of expected values unless indicated.

INSTRUMENT CHECKS

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

ENVIRONMENTAL

TEMP: 23°C
PRESS: 758 mmHg
HUMID: 25 %

THE SUGGESTED RECALIBRATION DATE FOR THIS INSTRUMENT IS **02/03/2011**

Calibrated By: Dorsey Austin Reviewed By: Cal Date: 02/03/2010

Maryland License MD-33-021-01

9060

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

RSO Job No. **R8780**

Certificate of Calibration

ISSUED TO: RSO, Inc.
5206 Minnick Road
Laurel, MD 20707
KIT-1
CONTACT: Greg Smith
PHONE: (888) 723-5463 **PO NO:**

INSTRUMENT: LUDLUM
MODEL: 2221
TYPE: SCALER/RATE MET
SN: 161591

RSO, Inc. certifies that on 02/03/2010 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.
X	1	100	100	cpm	1.00
		400	400	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:** PROPORTIONAL **Probe3:**

MODEL	SER#	WINDOW	GEOMETRY	VOLT	ISOTOPE 1	EFF.(%)	ISOTOPE 2	EFF.(%)	ISOTOPE 3	EFF.(%)	ISOTOPE 4	EFF.(%)
43-68	PR178512	FIXED	CONTACT	1800	C14	22	Sr90	30	Tc99	22	Cs137	30
43-37	PR124945	FIXED	CONTACT	1800	C14	22	Sr90	29	Tc99	21	Cs137	28

Note: "As found" condition +/- 20% of expected values unless indicated.

INSTRUMENT CHECKS

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

ENVIRONMENTAL

TEMP: 23°C
PRESS: 758 mmHg
HUMID: 25 %

THE SUGGESTED RECALIBRATION DATE FOR THIS INSTRUMENT IS **02/03/2011**

Calibrated By: Dorsey Austin Reviewed By: Rae Cal Date: 02/03/2010

Maryland License MD-33-021-01

9061

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

RSO Job No. **R8627**

Certificate of Calibration

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

INSTRUMENT: LUDLUM
MODEL: 2221
TYPE: SCALER/RATE MET
SN: 99138

CONTACT: Jim Dean, Sr.
PHONE:

PO NO:RSO 370

RSO, Inc. certifies that on 10/13/2009 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.
X	1	100	100	cpm	1.00
		400	399	cpm	1.00
X	10	1000	1003	cpm	1.00
		4000	3994	cpm	1.00
X	100	10000	10020	cpm	1.00
		40000	39920	cpm	1.00
X	1000	100000	100380	cpm	1.00
		400000	398880	cpm	1.00
				C.F. AVERAGE	1.00

Hi Voltage dial = 892 D; Threshold Dial = 340 D; Window = "OUT".

Probe type(s) **Probe1:** EXTENDER PANGM **Probe2:** **Probe3:**

MODEL	SER#	WINDOW	GEOMETRY	VOLT	ISOTOPE 1	EFF.(%)	ISOTOPE 2	EFF.(%)	ISOTOPE 3	EFF.(%)	ISOTOPE 4	EFF.(%)
ASM-7	RSO427	FIXED	CONTACT	900	Th230	14	Tc99	14				

Note: "As found" condition +/- 20% of expected values unless indicated.

INSTRUMENT CHECKS

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

ENVIRONMENTAL

TEMP: 23°C
PRESS: 758 mmHg
HUMID: 39 %

THE SUGGESTED RECALIBRATION DATE FOR THIS INSTRUMENT IS 10/13/2010

Calibrated By: Dorsey Austin Reviewed By: ROE Cal Date: 10/13/2009

Maryland License MD-33-021-01

8597

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

RSO Job No. **R8476**

Certificate of Calibration

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

INSTRUMENT: LUDLUM
MODEL: 2221
TYPE: SCALER/RATE MET
SN: 157013

CONTACT: Greg Smith
PHONE: **PO NO:**

RSO, Inc. certifies that on 07/06/2009 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.
X	1	100	10	cpm	
		400	400	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:** SCINTILLATOR **Probe2:** **Probe3:**

MODEL	SER#	WINDOW	GEOMETRY	VOLT	ISOTOPE 1	EFF.(%)	ISOTOPE 2	EFF.(%)	ISOTOPE 3	EFF.(%)	ISOTOPE 4	EFF.(%)
44-10	029107	NONE	CONTACT	1065	Cs137	13						

INSTRUMENT CHECKS

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

ENVIRONMENTAL

TEMP: 24°C
PRESS: 751 mmHg
HUMID: 49 %

THE SUGGESTED RECALIBRATION DATE FOR THIS INSTRUMENT IS **07/06/2010**

Calibrated By: Dorsey Austin Reviewed By: Cal Date: 07/06/2009

Maryland License MD-33-021-01

8147

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

RSO Job No. **R8752**

Certificate of Calibration

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

CONTACT: Greg Smith
PHONE:

PO NO:

INSTRUMENT: BICRON
MODEL: MICRO REM LOW ENERGY
TYPE: SURVEY METER
SN: C139F

RSO, Inc. certifies that on 01/22/2010 the above described instrument was calibrated in a known radiation field using Cs-137 (662 keV) beam calibrator (J.L. Shepherd Model 28-6A, S/N 10056), RSO # 363 & RSO # Cs-7A Certified Cs137 check sources.

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

Calibration Data

	RANGE	EXPECTED	OBSERVED		C.F.
X	0.1	4	4	uR/hr	1.00
		16	16	uR/hr	1.00
X	1	40	40	uR/hr	1.00
		160	170	uR/hr	0.94
X	10	600	550	uR/hr	1.09
		1500	1550	uR/hr	0.97
X	100	5000	4800	uR/hr	1.04
		15000	15500	uR/hr	0.97
X	1000	50000	48000	uR/hr	1.04
		150000	156000	uR/hr	0.96
			C.F. AVERAGE		1.00

Probe type(s) Probe1: SCINTILLATOR Probe2: Probe3:

MODEL	SER#	WINDOW	GEOMETRY	VOLT	ISOTOPE 1	EFF.(%)	ISOTOPE 2	EFF.(%)	ISOTOPE 3	EFF.(%)	ISOTOPE 4	EFF.(%)
INTERNAL		FIXED	FRONT									

Note: "As found" condition +/- 20% of expected values unless indicated.

INSTRUMENT CHECKS

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

ENVIRONMENTAL

TEMP: 22°C
PRESS: 754 mmHg
HUMID: 34 %

THE SUGGESTED RECALIBRATION DATE FOR THIS INSTRUMENT IS 01/22/2011

Calibrated By: Richard Emmons Reviewed By: Cal Date: 01/22/2010

Maryland License MD-33-021-01

8977