LIGAND®

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July 29, 2009

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

03033542

RE: Request to Amend Materials License # 29-30152-01 by:
1) releasing portions of 3000 Eastpark Blvd, Cranbury, NJ for unrestricted use, and
2) providing expedited review and action by NRC

Dear Sir/Madam:

Ligand Pharmaceuticals is hereby requesting the NRC release for unrestricted use portions of 3000 Eastpark Blvd that have been duly decommissioned and currently are no longer use for research and development activities as described in the enclosed report. Moreover, we request for the NRC to provide expeditious review and action to our request. Ligand is interested in subleasing the property for which we are requesting the release to ameliorate the financial impact to its current operations and sustaining operations in the State.

Ligand continues to operate a small start-up research and development company and will continue its use of radioactive materials. All elements of the license will continue to be adhered to.

Modifications to the building in preparation to receive a subtenant will include physical separation from Ligand's operations and security measures, as required by the license.

Inquiries about operations should be addressed to either Rob Swanson, Ph.D, RSO at 3000 Eastpark Blvd. (609-452-3711) or Vilmarie Rodríguez,, CIH, CPEA, ARSO (858-550-7274).

Sincerely,

John P. Sharp
VP Finance and Chief Finance Officer

Enclosure 1 – *Decommissioning Survey for Ligand Pharmaceuticals (prepared by Scott Dennerlein and Associates, LLC)*

143966
NMSS/RGN1 MATERIALS-002

* 10275 Science Center Drive * San Diego, CA 92121-1117 * p:(858) 550-7500 * f: (858) 550-1825

Decommissioning Survey
for
Ligand Pharmaceuticals

NRC License # 29-30152-01

Conducted April 13-May 1, 2009

Prepared by
Scott Dennerlein & Associates, LLC

Table of Contents

Executive Summary

Ligand Pharmaceuticals is licensed by the Nuclear Regulatory Commission (NRC) to possess and use radioactive material at 3000 Eastpark Blvd., Cranbury, NJ. Company management decided to vacate and sublet the East wing of the building. An outside consulting firm, Scott Dennerlein & Associates, LLC, was retained to conduct a decommissioning survey of those areas formerly utilized for research involving radioactive material. The survey was conducted according to the methods prescribed in NRC guidance documents.

The instrumentation used was appropriate and sensitive enough to detect contamination well below the NRC release limits. Measurements for both removable and fixed contamination were conducted. The areas behind baffles and in sink traps were evaluated. The entire floor surface was scanned, as well as all bench tops and inside every cabinet. The results of the survey indicate the total absence of radioactive contamination in all surveyed areas.

All radioactive waste and material has been removed from the east wing of the building. All scanning and static measurements for beta and gamma-emitters were below the limiting DCGL. The limiting DCGL for this project would deliver a Total Effective Dose Equivalent (TEDE) of less than 3 millirem per year, although the allowable limit in Subpart E - Radiological Criteria for License Termination, Title 10 of the Code of Federal Regulations, Part 20.1402 is 25 millirem per year. All wipe survey measurements were below the sensitivity of the measurement equipment.

This space is suitable for release for unrestricted use. This report must be retained for the duration of the NRC license, and should be included in any amendment request.

Scott Dennerlein

Introduction

From April 13TH through May 1st, 2009, Scott Dennerlein & Associates, LLC, conducted a decommissioning survey for Ligand Pharmaceuticals in their facility at 3000 Eastpark Blvd., Cranbury, New Jersey. The intent of the survey was to document the final radiological conditions in one wing of the building, formerly utilized for research involving radioactive material. That wing of the facility will be vacated, and released for unrestricted use. The existing Nuclear Regulatory Commission license will remain in effect for the remaining occupied areas of the building. A floor plan is included as Appendix A

This survey was planned and conducted according to the methods presented in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). MARSSIM provides guidance on determining the number of data points required in each survey unit, the interpretation of survey results, choice of instrumentation, and data reduction. Values for contamination-to-dose conversions are obtained from the "Regulatory Guide on Release Criteria for Decommissioning" (NUREG-1500).

Site Description and History

This leased space is situated in a research park comprised of several buildings along a commercial stretch of Route 130. The NRC license #29-30152-01 is a specific license, limited to any form of H-3, C-14, P-32, P-33, S-35, and Ca-45, as well as non-volatile I-125. The license was most recently renewed in 2004, and is included in Appendix B. Licensed material was handled and stored in the laboratories on the east side of the East wing, and several center rooms in that wing.

During operations a single cart was dedicated to transport packages of licensed material from the loading dock to the waste room, where they were held prior to survey.

Routine waste generation was approximately 8-10 30 gallon fiber boards of dry waste annually. However, eleven 30-gallon fiberboard containers of dry waste were generated as part of this decommissioning project. The waste was absorbent pads, tubing, and plastic and glass containers which could not be properly surveyed for release. The manifest for that waste shipment is included in Appendix C.

Liquid waste was disposed no more than once each year for the past three years, via the sink in Laboratory 150. Annual disposal volumes were less than 10 liters.

Routine monthly surveys reviewed for the past three years did not reveal any contamination in the laboratories. The licensee has no other (i.e, State of New Jersey) radioactive material license.

Radio-nuclides of Concern

Although there are seven isotopes listed on the license, the isotopes used in the last three years have been I-125, H-3, S-35, and P-33. Radioactive material was handled in the surveyed areas up to one month prior to the survey. All of these isotopes are readily detected via liquid scintillation counting, which will be the method of wipe sample analysis. Fixed location measurements will be conducted with both a low level beta detector for C-14, P-32, P-33, S-35 and a gamma probe for detecting I-125 contamination.

Release Criteria

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

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

Radionuclide	Surface Contamination (dpm/100cm^2)
^{14}C	1.58E+5
^{3}H	5.29E+6
^{125}I	3.20E+4
^{33}P	3.49E+6
^{35}S	1.34E+6

Table 1. Surface contamination values which deliver 3 mrem/yr under the building occupancy scenario.

Residual Radioactivity Limits

Residual radioactivity limits are called Derived Concentration Guideline Levels (DCGL) in MARSSIM. Since the detection of surface contamination with current field instrumentation is essentially a "gross beta/gamma" measurement which cannot distinguish specific radionuclides, the most restrictive value of the listed radionuclides would normally be selected as the DCGL for this project. However, the footnote to Table B-1 states "For most radionuclides, based on the ALARA principle and best industry practice, it is not necessary to leave contamination in excess of 5,000 dpm/100cm^2 ". Therefore the DCGL for this project will be 5,000 dpm/100cm^2, with the knowledge that this value would deliver a TEDE far below 3 mrem/y. Our goal for this project is to leave no residual contamination.

Survey Units

The affected laboratories were surveyed as Class 1 survey units according to the MARSSIM classification scheme. Class 1 areas are rooms where unsealed forms of radioactive materials were used until the close of research activities, and/or material used in the past with

half-lives greater than 65 days, and/or material with half-lives less than 65 days were used within two years of the decommissioning. The use of all isotopes in this area fall into this category.

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

Survey Design

The number of data points necessary for a given survey unit in this survey plan is based on the one sample Sign test for analysis of the data. This statistical test is appropriate when the contaminant is not present in background, or is present at such a small fraction of the DCGL as to be insignificant. All isotopes of concern fall into this category of radionuclides. In terms of data reduction, this means the survey units are not compared to a reference (i.e. background) area, but are compared directly to the DCGL. The equation below is then used to determine the number of data points in each survey unit as follows;

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

We define each "data point" as a measurement location for both an integrated surface activity count and wipe sample. These are in addition to the scanning surveys conducted in each survey unit. The contamination limits for this decommissioning project are less than 5,000 dpm/100 cm^2 for total (fixed and removable) radioactivity.

The first step in determining the number of samples is to define the gray region. The gray region is the range of values where the consequences of making a decision error are minor. Typically the lower boundary of the gray region (LBGR) is one half of the DCGL, therefore the shift or delta (Δ) is equal to DCGL-LBGR. For this project;

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

The next step is to estimate the standard deviation of the measurements of the contaminants. If results from characterization surveys are not available, it is reasonable to assume a relative standard deviation of 30%.

The DCGL and LBGR are then expressed in counts per minute (i.e. the "raw" data) based on 16% efficiency for the detection of I-125 and a 5 cm^2 probe. This would make the gray region from 33 cpm to 17 cpm. Thirty percent of the DCGL would give a standard deviation of 10. The relative shift would then be;

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

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

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

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

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

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

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

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

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

Equipment and Techniques

During the month prior to the decommissioning surveys, the 'clean-out" of the affected laboratories began. Bench-top equipment with the potential for contamination was surveyed and released if clean or disposed if contaminated. All absorbent pads, tubing, and spill trays were disposed with no attempt to survey or decontaminate. Once cleared the laboratories and East wing hallways (see Appendix A) were surveyed as described below.

The type of detector used for both the scanning and fixed location gamma measurements was a thin crystal sodium iodide probe (Ludlum model 44-3) optimized for the detection of I-125. The meter used was a Ludlum model 3 with the factory installed scaler option. To scan areas the probe was moved at a speed of one probe width per second at a height of approximately ¼ inch, utilizing the audio output to locate hotspots. There was 100% coverage of all horizontal surfaces, inside drawers, hoods, and the accessible walls up to six feet. After the scanning survey, fixed location measurements were obtained with the same probe and a two minute integrated count at twenty four locations. These locations were chosen with a bias towards areas with a higher contamination potential, such as hoods, sinks, and floors in front of hoods.

The type of detector used for both the scanning and fixed location beta measurements was a xenon filled gas proportional (Ludlum model 44-92) connected to a scaler / ratemeter. The

scanning and fixed location measurements were similar to those for the gamma measurements but the fixed location count time was one minute.

In the same locations as the stationary detector counts, wipe samples were collected to assess removable contamination. The samples were obtained by wiping a ¼" inch dry filter paper over a 100 hundred square centimeter area. Each sample was placed into a single well in a 24 well disposable beta plate. After the addition of cocktail, samples were counted for one minute in a single "wide open" channel. The printout provides "corrected" counts per minute, having subtracted background. A floor plan indicating measurement locations in each laboratory is provided on the page prior to the measurement results.

Finally, a floor monitor (Ludlum model FLM) was used to scan all accessible floor surfaces in the surveyed laboratories and hallways.

Table 2 lists the field detectors, laboratory equipment, and their associated parameters.

Detector	Probe area (cm^2)	Background (cpm)	Efficiency (cpm/dpm) 4π	MDC dpm/100 cm^2
44-3 # 104729	5	167	0.16 (I-129)	3,966
44-92 #178541	140	343	0.08 (C-14)	794
Wallac microbeta	100 wiped	36 (typ.)	0.44 (^3H)	72

Table 2. Detection Sensitivities for Survey Instrumentation

Minimum Detectable Concentration in radioactive disintegrations per minute (dpm)

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

where T = integrated count time A = area of probe / 100 cm^2

ε_T = total efficiency B = background countrate

Statistical Test of Measurement Data

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

The values used in Table 3 are from the static meter readings only. The wipe samples were used to assess removable contamination, and those results were not included in this statistical test.

Results

There is no residual radioactive contamination in the areas surveyed and they are suitable to be released for unrestricted use, as specified under the Nuclear Regulatory Commissions regulations in 10CFR20. All surveys were conducted according to procedures in MARSSIM, and detected no areas of contamination. No static meter readings exceeded the project release limit of 5,000 dpm/100cm^2 , which is itself, far below the most restrictive site licensed isotope (I-125) limit of 32,000 dpm/100cm^2

The results of all wipe samples collected were below 200 dpm/100 cm^2.

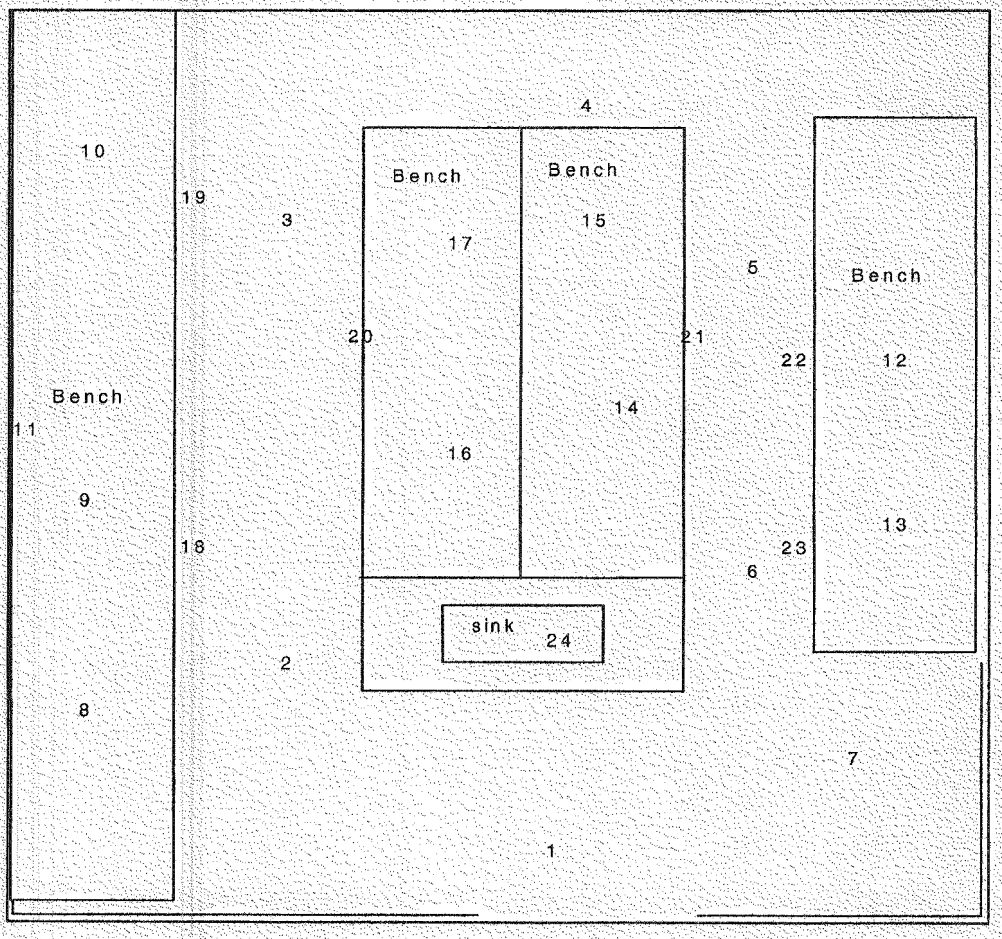
This report must be maintained onsite for review by regulatory agencies, until the radioactive material license has been terminated.

Location	Survey Type	N	S+	Critical Value	Meets Release Criteria?
Lab 110	Total β	24	24	17	YES
Lab 110	Total γ	24	24	17	YES
Lab 120	Total β	24	24	17	YES
Lab 120	Total γ	24	24	17	YES
Lab 130	Total β	24	24	17	YES
Lab 130	Total γ	24	24	17	YES
Lab 140	Total β	24	24	17	YES
Lab 140	Total γ	24	24	17	YES
Lab 150	Total β	24	24	17	YES
Lab 150	Total γ	24	24	17	YES
Lab 175	Total β	24	24	17	YES
Lab 175	Total γ	24	24	17	YES
Lab 177	Total β	24	24	17	YES
Lab 177	Total γ	24	24	17	YES
Lab 185	Total β	24	24	17	YES
Lab 185	Total γ	24	24	17	YES
Lab 187	Total β	24	24	17	YES
Lab 187	Total γ	24	24	17	YES
Waste Room	Total β	24	24	17	YES
Waste Room	Total γ	24	24	17	YES
Hallways	Total β	24	24	17	YES
Hallways	Total γ	24	24	17	YES

Table 3 - Summary of Statistical Tests

If the number of positive values exceeds the critical value, (obtained from Table I.3 in MARSSIM) then the null hypothesis ("The residual radioactivity in the survey unit exceeds the release criterion") is rejected and it is concluded that the survey unit meets the release criterion.

Lab 110



Wipe #	
11	wall cabinet
18 - 23	base cabinets
24	Sink*

All cabinet wipe samples included the outside, handles, and interior surfaces.

*This data (fixed and removable) is from the bottom of the sink. A swab inside the trap was obtained and the results reported in Appendix D.

Location	Gross Counts	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	337	2	188	4813	1
2	325	-5	-563	4438	1
3	337	2	188	4813	1
4	332	-1	-125	4875	1
5	325	-5	-563	4438	1
6	340	3	375	4625	1
7	331	-2	-188	4813	1
8	332	-1	-125	4875	1
9	342	4	500	4500	1
10	339	3	313	4688	1
11	337	2	188	4813	1
12	335	1	63	4938	1
13	338	2	250	4750	1
14	331	-2	-188	4813	1
15	336	1	125	4875	1
16	330	-2	-250	4750	1
17	347	7	813	4188	1
18	334	0	0	5000	1
19	340	3	375	4625	1
20	326	-4	-500	4500	1
21	332	-1	-125	4875	1
22	342	4	500	4500	1
23	340	3	375	4625	1
24	330	-2	-125	4875	1
Number of Positive Differences					24

Background (cpm)	167
Efficency	0.16
Probe Area/100 cm2	0.05
Count time	2

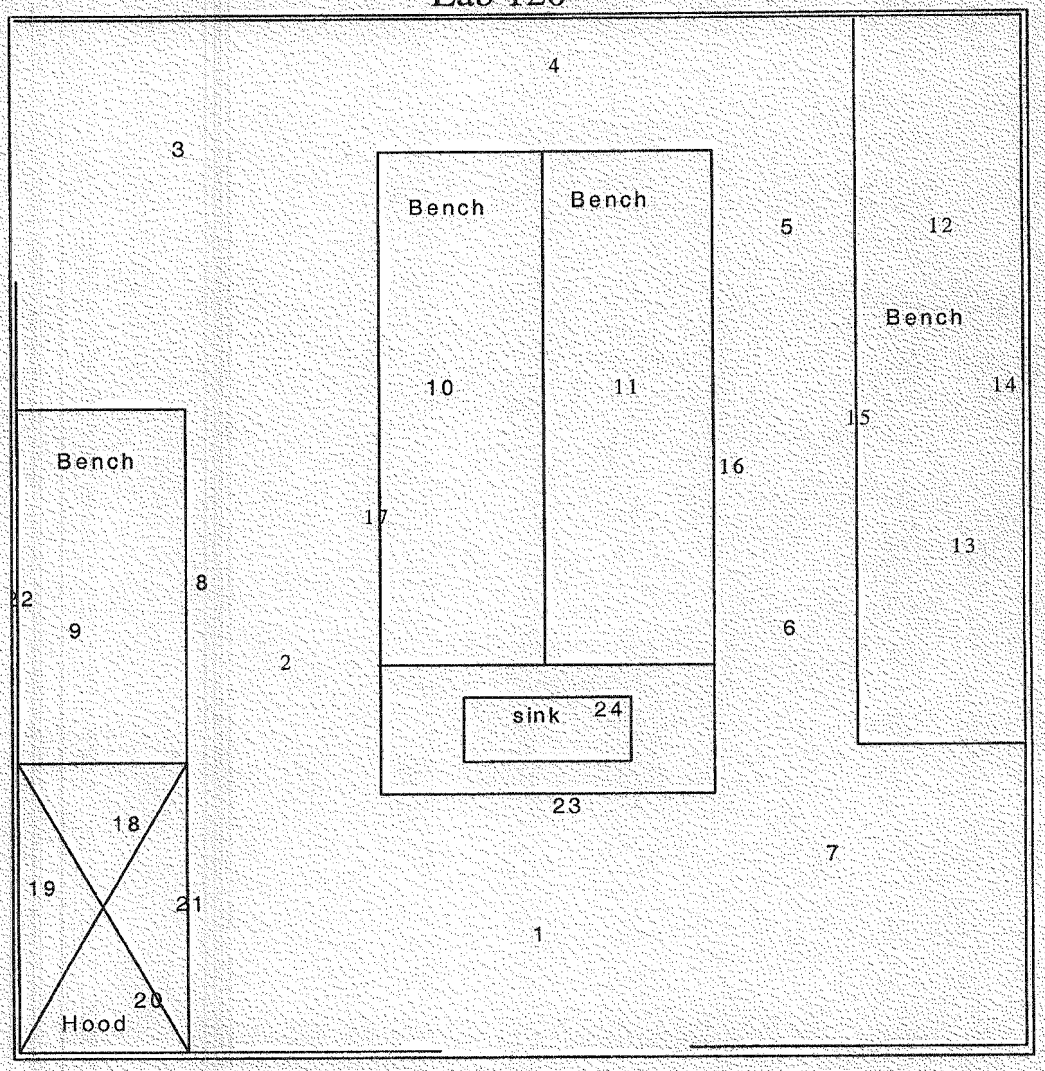
Sign Test of Lab 110 gamma survey measurements

Location	Gross cpm	Net cpm	dpm/ 100 cm2	DCGL- data	Sign
1	346	3	27	4973	1
2	337	-6	-54	4946	1
3	336	-7	-63	4938	1
4	325	-18	-161	4839	1
5	339	-4	-36	4964	1
6	336	-7	-63	4938	1
7	332	-11	-98	4902	1
8	337	-6	-54	4946	1
9	340	-3	-27	4973	1
10	337	-6	-54	4946	1
11	335	-8	-71	4929	1
12	344	1	9	4991	1
13	333	-10	-89	4911	1
14	343	0	0	5000	1
15	332	-11	-98	4902	1
16	331	-12	-107	4893	1
17	338	-5	-45	4955	1
18	333	-10	-89	4911	1
19	338	-5	-45	4955	1
20	337	-6	-54	4946	1
21	335	-8	-71	4929	1
22	334	-9	-80	4920	1
23	339	-4	-36	4964	1
24	343	0	0	5000	1
Number of Positive Differences					24

Background (cpm)	343
Efficency	0.08
Probe Area/100 cm2	1.4
Count time	1

Sign Test of Lab 110 beta survey measurements

Lab 120



Wipe #	
14, 22	wall cabinet
8,15-17, 21, 23	base cabinets
24	Sink*
18-20	hood

All cabinet wipe samples included the outside, handles, and interior surfaces.

Rear hood wall sample includes the front and back of the baffle.

*This data (fixed and removable) is from the bottom of the sink. A swab inside the trap was obtained and the results reported in Appendix D.

Location	Gross Counts	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	324	-5	-625	4375	1
2	335	1	63	4938	1
3	324	-5	-625	4375	1
4	335	1	63	4938	1
5	332	-1	-125	4875	1
6	345	6	688	4313	1
7	327	-4	-438	4563	1
8	341	4	438	4563	1
9	338	2	250	4750	1
10	339	3	313	4688	1
11	338	2	250	4750	1
12	327	-4	-438	4563	1
13	328	-3	-375	4625	1
14	333	-1	-63	4938	1
15	340	3	375	4625	1
16	321	-7	-813	4188	1
17	344	5	625	4375	1
18	341	4	438	4563	1
19	341	4	438	4563	1
20	341	4	438	4563	1
21	330	-2	-250	4750	1
22	345	6	688	4313	1
23	337	2	188	4813	1
24	332	-1	-63	4938	1
Number of Positive Differences					24

Background (cpm)	167
Efficency	0.16
Probe Area/100 cm2	0.05
Count time	2

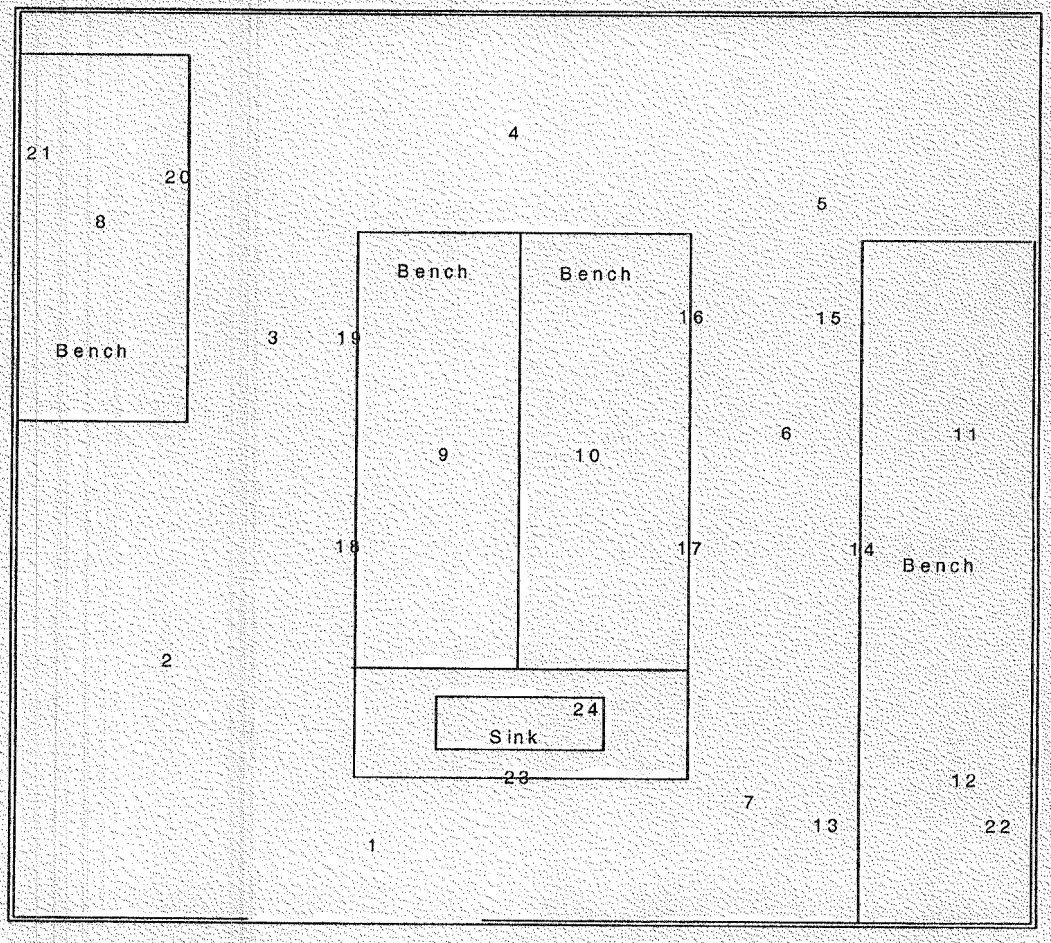
Sign Test of Lab 120 gamma survey measurements

Location	Gross cpm	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	333	-10	-89	4911	1
2	335	-8	-71	4929	1
3	337	-6	-54	4946	1
4	336	-7	-63	4938	1
5	333	-10	-89	4911	1
6	325	-18	-161	4839	1
7	325	-18	-161	4839	1
8	332	-11	-98	4902	1
9	344	1	9	4991	1
10	331	-12	-107	4893	1
11	332	-11	-98	4902	1
12	320	-23	-205	4795	1
13	330	-13	-116	4884	1
14	334	-9	-80	4920	1
15	331	-12	-107	4893	1
16	345	2	18	5018	-1
17	329	-14	-125	4875	1
18	332	-11	-98	4902	1
19	325	-18	-161	4839	1
20	336	-7	-63	4938	1
21	334	-9	-80	4920	1
22	335	-8	-71	4929	1
23	334	-9	-80	4920	1
24	337	-6	-54	4946	1
Number of Positive Differences					24

Background (cpm)	343
Efficency	0.08
Probe Area/100 cm2	1.4
Count time	1

Sign Test of Lab 120 beta survey measurements

Lab 130



Wipe #	
21, 22	wall cabinet
14, 16-20, 23	base cabinets
24	Sink*

All cabinet wipe samples included the outside, handles, and interior surfaces.

*This data (fixed and removable) is from the bottom of the sink. A swab inside the trap was obtained and the results reported in Appendix D.

Location	Gross Counts	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	329	-3	-313	4688	1
2	337	2	188	4813	1
3	339	3	313	4688	1
4	335	1	63	4938	1
5	349	8	938	4063	1
6	340	3	375	4625	1
7	347	7	813	4188	1
8	349	8	938	4063	1
9	323	-6	-688	4313	1
10	328	-3	-375	4625	1
11	324	-5	-625	4375	1
12	323	-6	-688	4313	1
13	328	-3	-375	4625	1
14	338	2	250	4750	1
15	327	-4	-438	4563	1
16	337	2	188	4813	1
17	333	-1	-63	4938	1
18	323	-6	-688	4313	1
19	331	-2	-188	4813	1
20	330	-2	-250	4750	1
21	331	-2	-188	4813	1
22	335	1	63	4938	1
23	340	3	375	4625	1
24	341	4	219	4781	1
Number of Positive Differences					24

Background (cpm)	167
Efficency	0.16
Probe Area/100 cm2	0.05
Count time	2

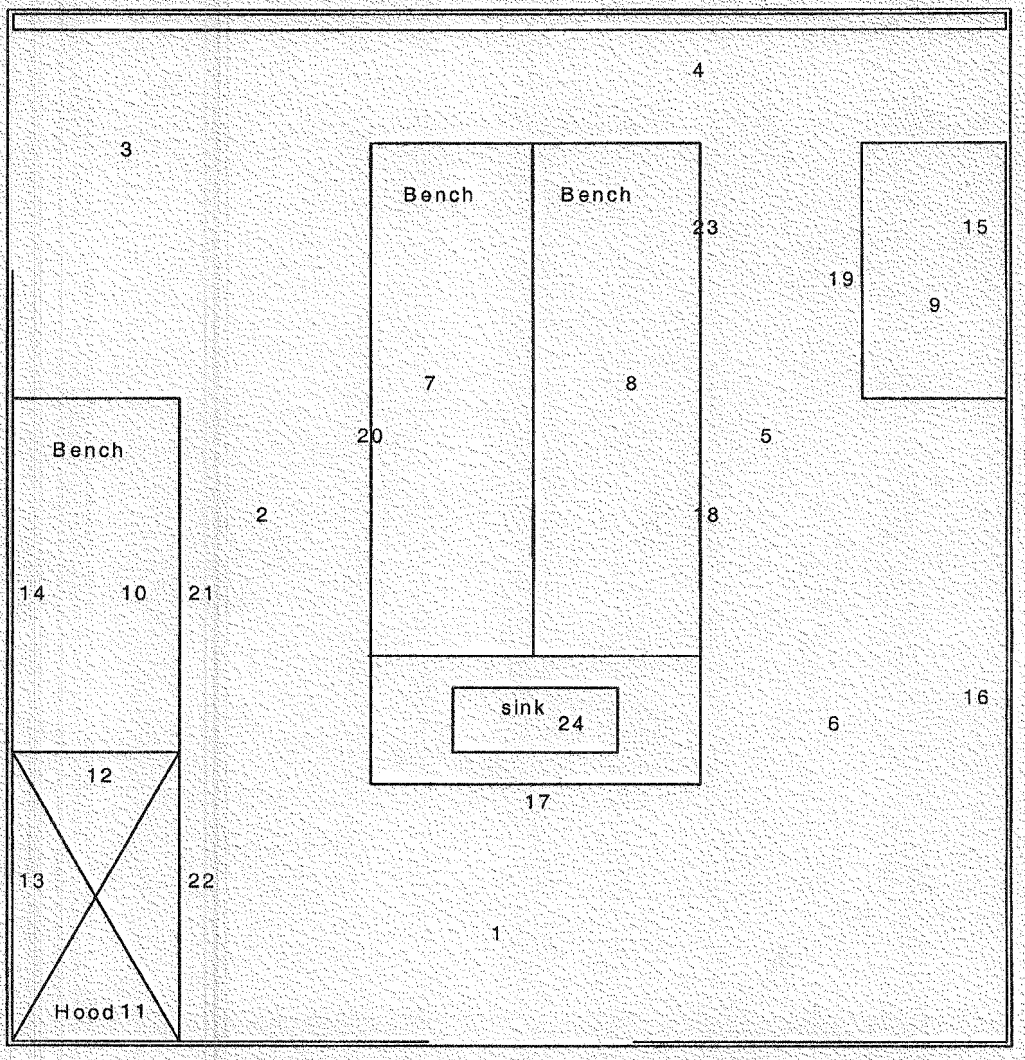
Sign Test of Lab 130 gamma survey measurements

Location	Gross cpm	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	346	3	27	4973	1
2	329	-14	-125	4875	1
3	338	-5	-45	4955	1
4	336	-7	-63	4938	1
5	325	-18	-161	4839	1
6	337	-6	-54	4946	1
7	334	-9	-80	4920	1
8	346	3	27	4973	1
9	336	-7	-63	4938	1
10	324	-19	-170	4830	1
11	324	-19	-170	4830	1
12	347	4	36	4964	1
13	335	-8	-71	4929	1
14	338	-5	-45	4955	1
15	335	-8	-71	4929	1
16	339	-4	-36	4964	1
17	335	-8	-71	4929	1
18	349	6	54	4946	1
19	343	0	0	5000	1
20	334	-9	-80	4920	1
21	326	-17	-152	4848	1
22	334	-9	-80	4920	1
23	335	-8	-71	4929	1
24	336	-7	-63	4938	1
Number of Positive Differences					24

Background (cpm)	343
Efficency	0.08
Probe Area/100 cm2	1.4
Count time	1

Sign Test of Lab 130 beta survey measurements

Lab 140



Wipe #	
14 -16	wall cabinet
17 - 23	base cabinets
24	Sink*
11-13	hood

All cabinet wipe samples included the outside, handles, and interior surfaces.

Rear hood wall sample includes the front and back of the baffle.

*This data (fixed and removable) is from the bottom of the sink. A swab inside the trap was obtained and the results reported in Appendix D.

Location	Gross Counts	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	337	2	188	4813	1
2	349	8	938	4063	1
3	337	2	188	4813	1
4	338	2	250	4750	1
5	325	-5	-563	4438	1
6	323	-6	-688	4313	1
7	335	1	63	4938	1
8	340	3	375	4625	1
9	336	1	125	4875	1
10	332	-1	-125	4875	1
11	321	-7	-813	4188	1
12	325	-5	-563	4438	1
13	327	-4	-438	4563	1
14	336	1	125	4875	1
15	324	-5	-625	4375	1
16	327	-4	-438	4563	1
17	321	-7	-813	4188	1
18	328	-3	-375	4625	1
19	326	-4	-500	4500	1
20	334	0	0	5000	1
21	329	-3	-313	4688	1
22	324	-5	-625	4375	1
23	324	-5	-625	4375	1
24	327	-4	-219	4781	1
Number of Positive Differences					24

Background (cpm)	167
Efficency	0.16
Probe Area/100 cm2	0.05
Count time	2

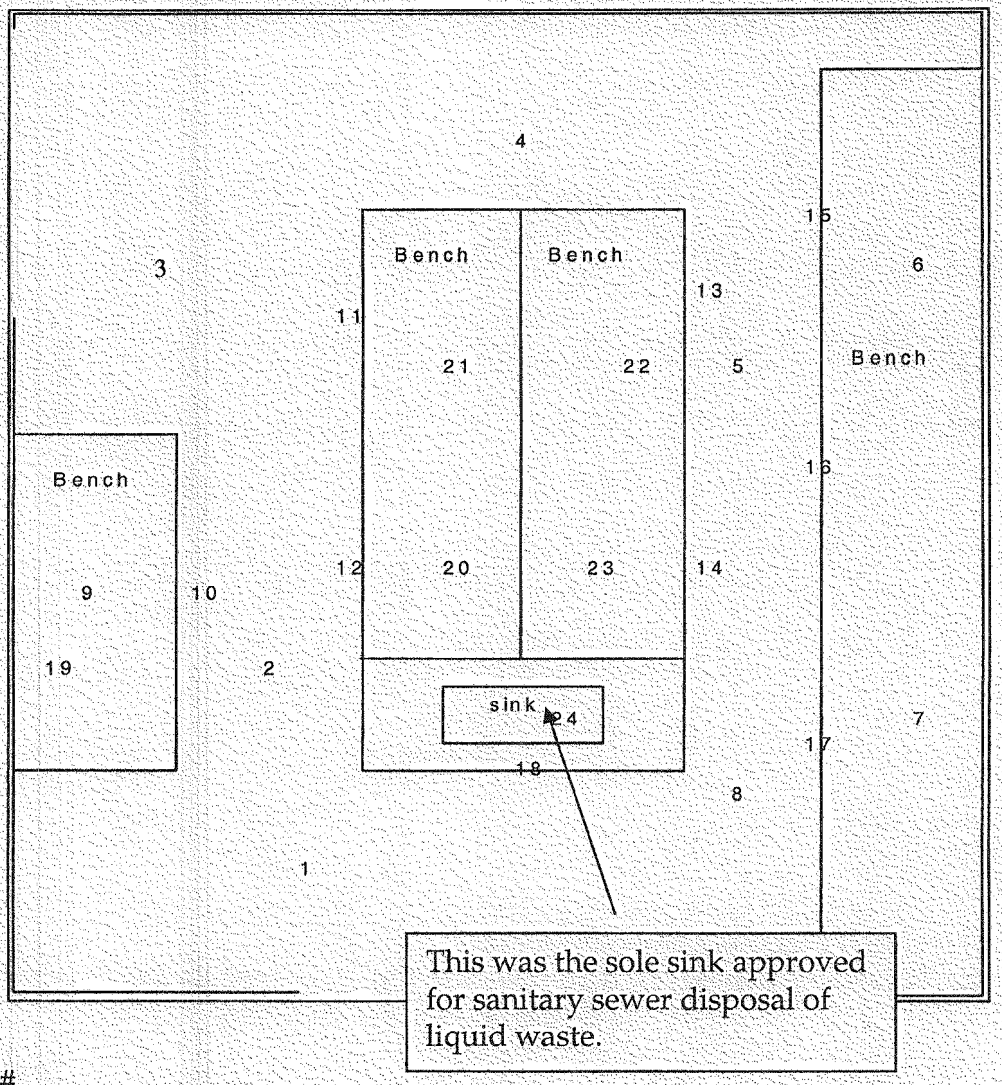
Sign Test of Lab 140 gamma survey measurements

Location	Gross cpm	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	327	-16	-143	4857	1
2	333	-10	-89	4911	1
3	330	-13	-116	4884	1
4	332	-11	-98	4902	1
5	342	-1	-9	4991	1
6	340	-3	-27	4973	1
7	347	4	36	4964	1
8	332	-11	-98	4902	1
9	354	11	98	4902	1
10	338	-5	-45	4955	1
11	330	-13	-116	4884	1
12	338	-5	-45	4955	1
13	332	-11	-98	4902	1
14	342	-1	-9	4991	1
15	350	7	63	4938	1
16	347	4	36	4964	1
17	330	-13	-116	4884	1
18	332	-11	-98	4902	1
19	340	-3	-27	4973	1
20	325	-18	-161	4839	1
21	354	11	98	4902	1
22	349	6	54	4946	1
23	341	-2	-18	4982	1
24	353	10	89	4911	1
Number of Positive Differences					24

Background (cpm)	343
Efficency	0.08
Probe Area/100 cm2	1.4
Count time	1

Sign Test of Lab 140 beta survey measurements

Lab 150



Wipe #	
19	wall cabinet
10 - 17	base cabinet
24	sink*

All other wipe samples are on the floor or bench top.
All cabinet wipe samples included the outside, handles, and interior surfaces.

*This data (fixed and removable) is from the bottom of the sink. A swab inside the trap was obtained and the results reported in Appendix D.

Location	Gross Counts	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	338	2	250	4750	1
2	325	-5	-563	4438	1
3	346	6	750	4250	1
4	325	-5	-563	4438	1
5	347	7	813	4188	1
6	338	2	250	4750	1
7	328	-3	-375	4625	1
8	343	5	563	4438	1
9	330	-2	-250	4750	1
10	337	2	188	4813	1
11	333	-1	-63	4938	1
12	336	1	125	4875	1
13	332	-1	-125	4875	1
14	331	-2	-188	4813	1
15	339	3	313	4688	1
16	334	0	0	5000	1
17	329	-3	-313	4688	1
18	339	3	313	4688	1
19	337	2	188	4813	1
20	338	2	250	4750	1
21	326	-4	-500	4500	1
22	337	2	188	4813	1
23	331	-2	-188	4813	1
24	334	0	0	5000	1
Number of Positive Differences					24

Background (cpm)	167
Efficency	0.16
Probe Area/100 cm2	0.05
Count time	2

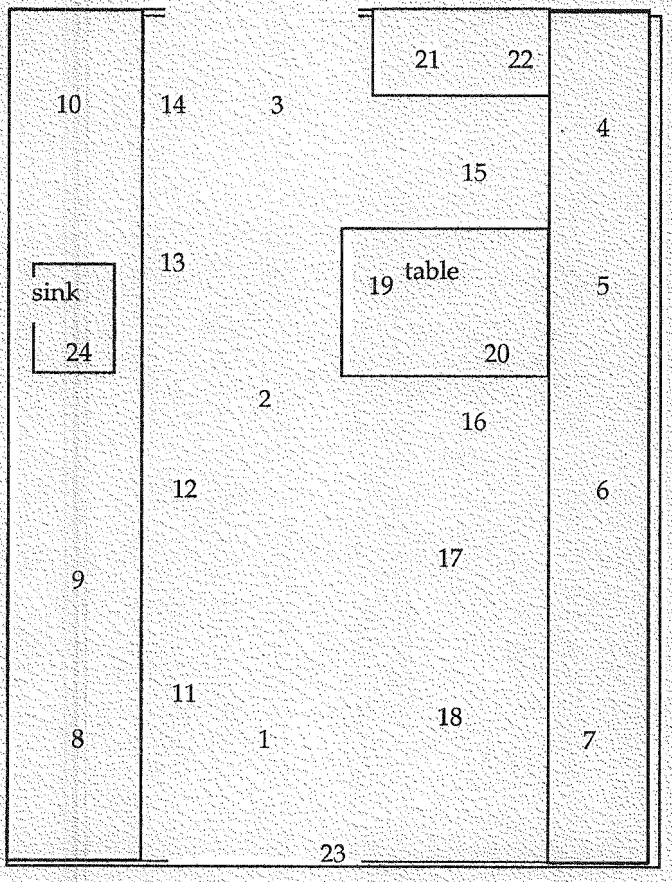
Sign Test of Lab 150 gamma survey measurements

Location	Gross cpm	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	332	-11	-98	4902	1
2	330	-13	-116	4884	1
3	323	-20	-179	4821	1
4	331	-12	-107	4893	1
5	330	-13	-116	4884	1
6	333	-10	-89	4911	1
7	337	-6	-54	4946	1
8	346	3	27	4973	1
9	320	-23	-205	4795	1
10	332	-11	-98	4902	1
11	323	-20	-179	4821	1
12	318	-25	-223	4777	1
13	328	-15	-134	4866	1
14	323	-20	-179	4821	1
15	345	2	18	4982	1
16	328	-15	-134	4866	1
17	321	-22	-196	4804	1
18	332	-11	-98	4902	1
19	323	-20	-179	4821	1
20	329	-14	-125	4875	1
21	331	-12	-107	4893	1
22	321	-22	-196	4804	1
23	344	1	9	4991	1
24	343	0	0	5000	1
Number of Positive Differences					24

Background (cpm)	343
Efficency	0.08
Probe Area/100 cm2	1.4
Count time	1

Sign Test of Lab 150 beta survey measurements

Lab 175



Wipe #	
11 - 14	base cabinet
24	sink*

All other wipe samples are on the floor or bench top.
All cabinet wipe samples included the outside, handles, and interior surfaces.

*This data (fixed and removable) is from the bottom of the sink. A swab inside the trap was obtained and the results reported in Appendix D.

Location	Gross Counts	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	331	-2	-188	4813	1
2	327	-4	-438	4563	1
3	338	2	250	4750	1
4	345	6	688	4313	1
5	335	1	63	4938	1
6	335	1	63	4938	1
7	331	-2	-188	4813	1
8	340	3	375	4625	1
9	335	1	63	4938	1
10	333	-1	-63	4938	1
11	335	1	63	4938	1
12	338	2	250	4750	1
13	332	-1	-125	4875	1
14	344	5	625	4375	1
15	337	2	188	4813	1
16	332	-1	-125	4875	1
17	331	-2	-188	4813	1
18	335	1	63	4938	1
19	342	4	500	4500	1
20	332	-1	-125	4875	1
21	340	3	375	4625	1
22	332	-1	-125	4875	1
23	327	-4	-438	4563	1
24	325	-5	-281	4719	1
Number of Positive Differences					24

Background (cpm)	167
Efficency	0.16
Probe Area/100 cm2	0.05
Count time	2

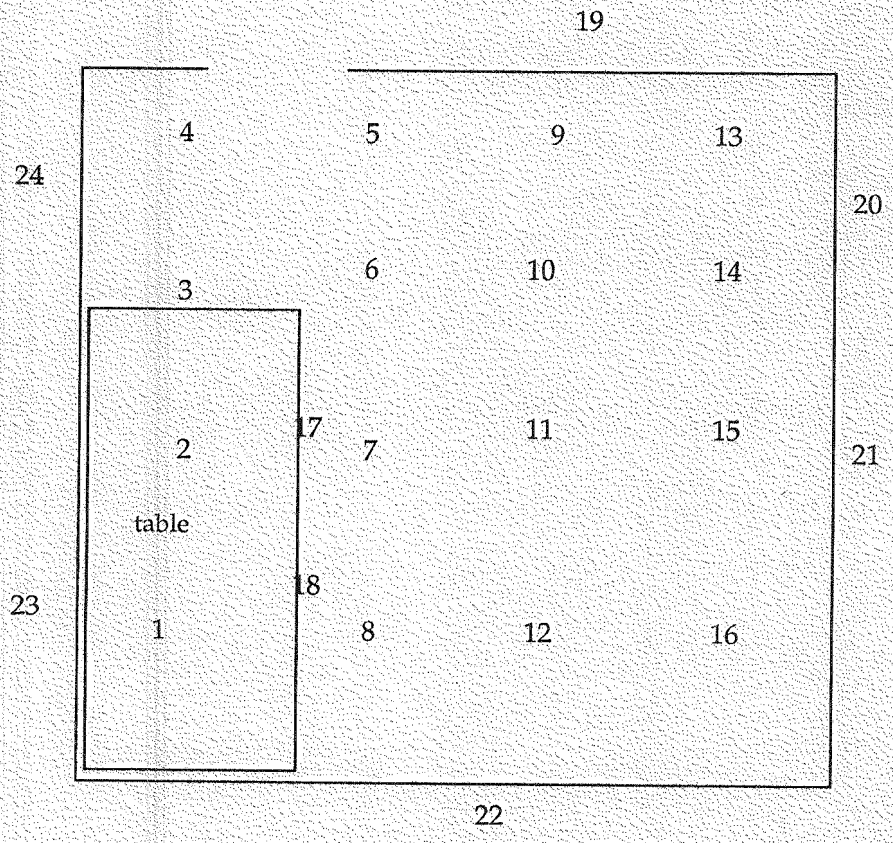
Sign Test of Lab 175 gamma survey measurements

Location	Gross cpm	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	337	-6	-54	4946	1
2	341	-2	-18	4982	1
3	340	-3	-27	4973	1
4	332	-11	-98	4902	1
5	327	-16	-143	4857	1
6	333	-10	-89	4911	1
7	343	0	0	5000	1
8	330	-13	-116	4884	1
9	341	-2	-18	4982	1
10	338	-5	-45	4955	1
11	333	-10	-89	4911	1
12	341	-2	-18	4982	1
13	334	-9	-80	4920	1
14	339	-4	-36	4964	1
15	350	7	63	4938	1
16	342	-1	-9	4991	1
17	336	-7	-63	4938	1
18	336	-7	-63	4938	1
19	345	2	18	4982	1
20	323	-20	-179	4821	1
21	326	-17	-152	4848	1
22	345	2	18	4982	1
23	328	-15	-134	4866	1
24	330	-13	-116	4884	1
Number of Positive Differences					24

Background (cpm)	343
Efficency	0.08
Probe Area/100 cm2	1.4
Count time	1

Sign Test of Lab 175 beta survey measurements

Lab 177



Wipe #	
1-16	floor
17 - 18	table top
19 - 24	walls

Location	Gross Counts	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	336	1	125	4875	1
2	337	2	188	4813	1
3	351	9	1063	3938	1
4	342	4	500	4500	1
5	337	2	188	4813	1
6	346	6	750	4250	1
7	324	-5	-625	4375	1
8	335	1	63	4938	1
9	328	-3	-375	4625	1
10	327	-4	-438	4563	1
11	331	-2	-188	4813	1
12	331	-2	-188	4813	1
13	332	-1	-125	4875	1
14	331	-2	-188	4813	1
15	330	-2	-250	4750	1
16	342	4	500	4500	1
17	325	-5	-563	4438	1
18	336	1	125	4875	1
19	337	2	188	4813	1
20	330	-2	-250	4750	1
21	341	4	438	4563	1
22	321	-7	-813	4188	1
23	334	0	0	5000	1
24	343	5	281	4719	1
Number of Positive Differences					24

Background (cpm)	167
Efficency	0.16
Probe Area/100 cm2	0.05
Count time	2

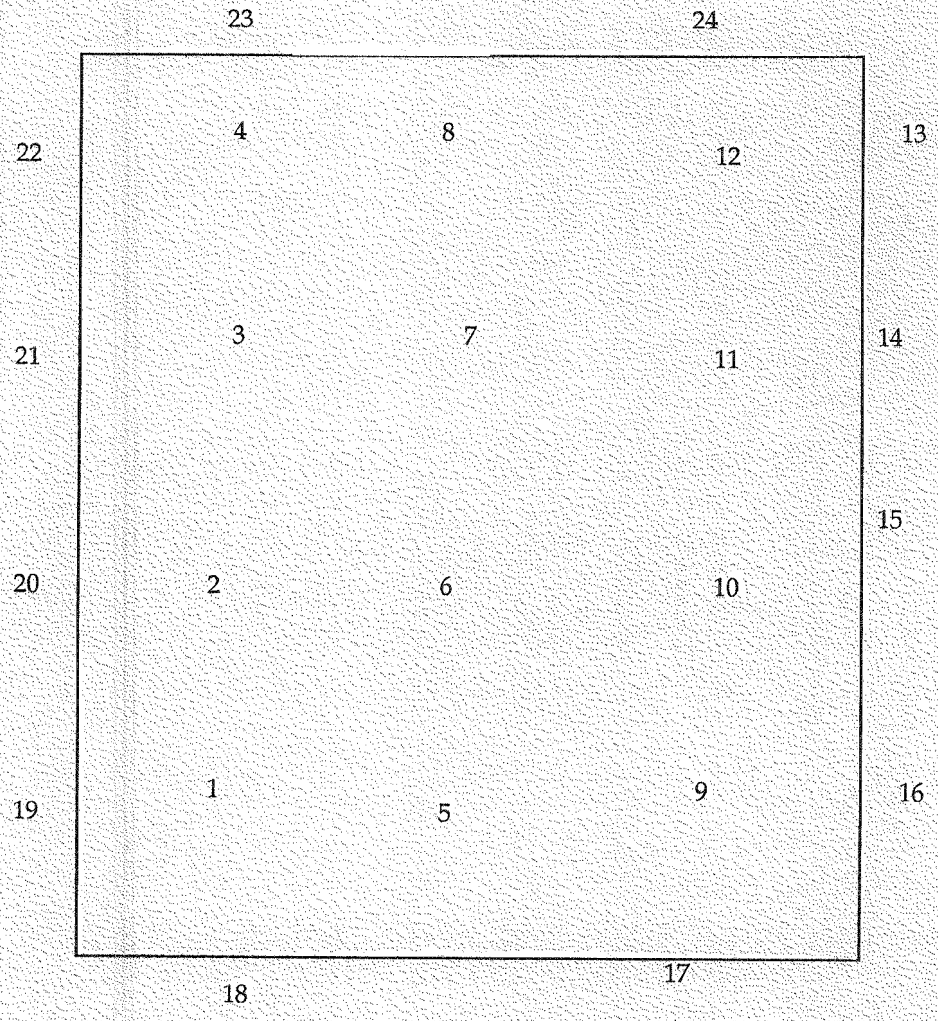
Sign Test of Lab 177 gamma survey measurements

Location	Gross cpm	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	332	-11	-98	4902	1
2	323	-20	-179	4821	1
3	327	-16	-143	4857	1
4	326	-17	-152	4848	1
5	319	-24	-214	4786	1
6	332	-11	-98	4902	1
7	349	6	54	4946	1
8	322	-21	-188	4813	1
9	345	2	18	4982	1
10	332	-11	-98	4902	1
11	324	-19	-170	4830	1
12	333	-10	-89	4911	1
13	357	14	125	4875	1
14	332	-11	-98	4902	1
15	330	-13	-116	4884	1
16	348	5	45	4955	1
17	329	-14	-125	4875	1
18	328	-15	-134	4866	1
19	324	-19	-170	4830	1
20	326	-17	-152	4848	1
21	325	-18	-161	4839	1
22	333	-10	-89	4911	1
23	333	-10	-89	4911	1
24	345	2	18	4982	1
Number of Positive Differences					24

Background (cpm)	343
Efficency	0.08
Probe Area/100 cm2	1.4
Count time	1

Sign Test of Lab 177 beta survey measurements

Lab 185 - Equipment Room



Wipe #	
1-12	floor
13 - 24	walls

This area contained refrigerators and centrifuges formerly utilized for radioactive material work. They were moved to other controlled areas in the building. This room also served as a corridor from the back hallway (radioactive material laboratories) to the front hallway (waste room).

Location	Gross Counts	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	333	-1	-63	4938	1
2	339	3	313	4688	1
3	327	-4	-438	4563	1
4	335	1	63	4938	1
5	324	-5	-625	4375	1
6	331	-2	-188	4813	1
7	348	7	875	4125	1
8	334	0	0	5000	1
9	339	3	313	4688	1
10	337	2	188	4813	1
11	333	-1	-63	4938	1
12	332	-1	-125	4875	1
13	344	5	625	4375	1
14	340	3	375	4625	1
15	332	-1	-125	4875	1
16	339	3	313	4688	1
17	336	1	125	4875	1
18	330	-2	-250	4750	1
19	332	-1	-125	4875	1
20	334	0	0	5000	1
21	338	2	250	4750	1
22	339	3	313	4688	1
23	325	-5	-563	4438	1
24	337	2	94	4906	1
Number of Positive Differences					24

Background (cpm)	167
Efficency	0.16
Probe Area/100 cm2	0.05
Count time	2

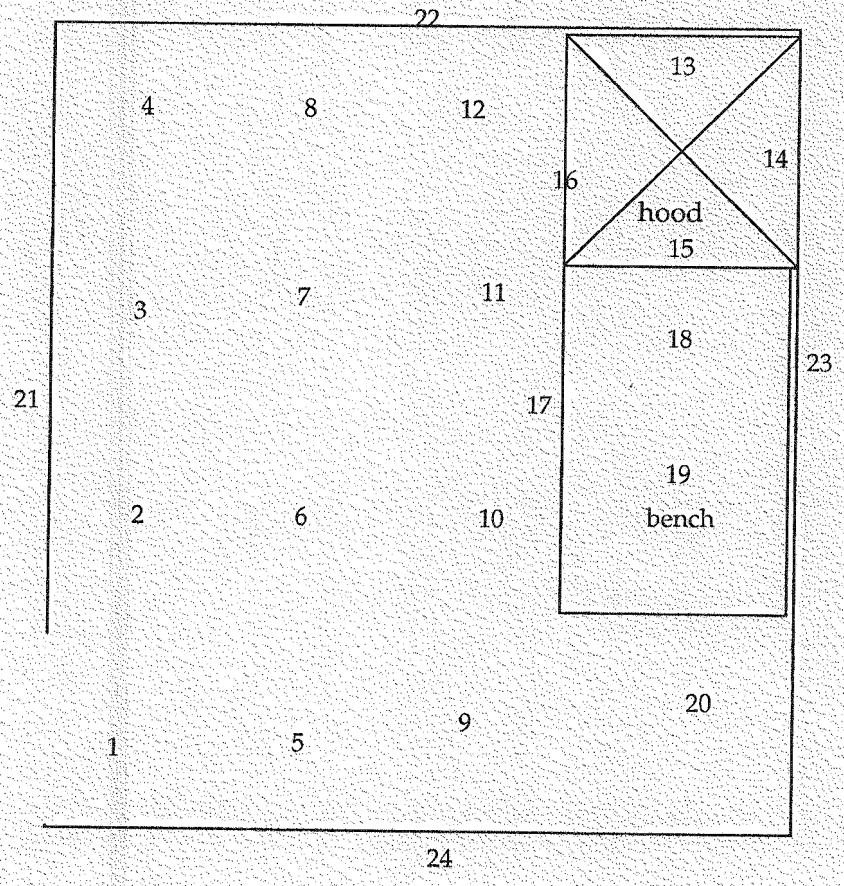
Sign Test of Lab 185 gamma survey measurements

Location	Gross cpm	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	329	-14	-125	4875	1
2	329	-14	-125	4875	1
3	336	-7	-63	4938	1
4	344	1	9	4991	1
5	333	-10	-89	4911	1
6	344	1	9	4991	1
7	339	-4	-36	4964	1
8	342	-1	-9	4991	1
9	349	6	54	4946	1
10	347	4	36	4964	1
11	327	-16	-143	4857	1
12	350	7	63	4938	1
13	332	-11	-98	4902	1
14	343	0	0	5000	1
15	347	4	36	4964	1
16	334	-9	-80	4920	1
17	342	-1	-9	4991	1
18	328	-15	-134	4866	1
19	319	-24	-214	4786	1
20	336	-7	-63	4938	1
21	328	-15	-134	4866	1
22	324	-19	-170	4830	1
23	328	-15	-134	4866	1
24	326	-17	-152	4848	1
Number of Positive Differences					24

Background (cpm)	343
Efficency	0.08
Probe Area/100 cm2	1.4
Count time	1

Sign Test of Lab 185 beta survey measurements

Lab 187



Wipe #	
21-24	wall
16 - 17	base cabinets

This laboratory contained the freezer and refrigerator used to store the majority of radioactive material stock vials. They were both moved to the new radioactive waste storage room in the North wing of the building.

Rear hood wall sample includes the front and back of the baffle.

Location	Gross Counts	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	334	0	0	5000	1
2	339	3	313	4688	1
3	327	-4	-438	4563	1
4	328	-3	-375	4625	1
5	330	-2	-250	4750	1
6	332	-1	-125	4875	1
7	325	-5	-563	4438	1
8	321	-7	-813	4188	1
9	320	-7	-875	4125	1
10	327	-4	-438	4563	1
11	326	-4	-500	4500	1
12	325	-5	-563	4438	1
13	334	0	0	5000	1
14	336	1	125	4875	1
15	324	-5	-625	4375	1
16	338	2	250	4750	1
17	335	1	63	4938	1
18	334	0	0	5000	1
19	335	1	63	4938	1
20	330	-2	-250	4750	1
21	325	-5	-563	4438	1
22	324	-5	-625	4375	1
23	322	-6	-750	4250	1
24	326	-4	-250	4750	1
Number of Positive Differences					24

Background (cpm)	167
Efficency	0.16
Probe Area/100 cm2	0.05
Count time	2

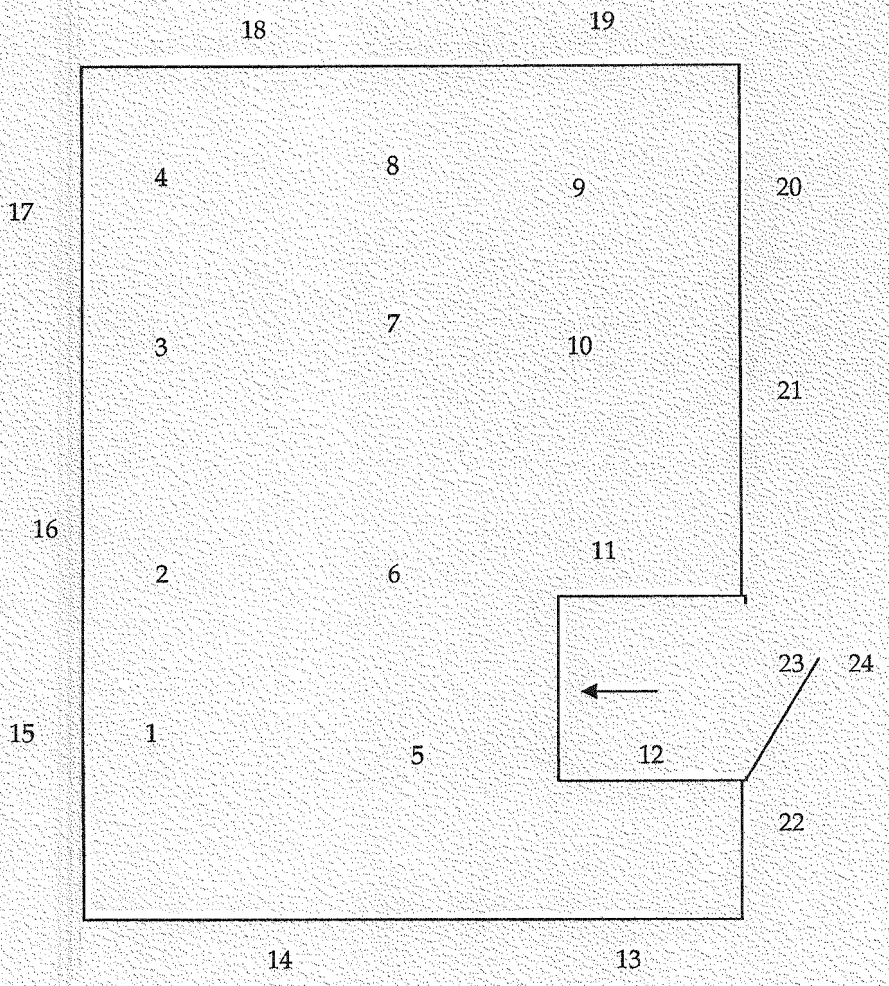
Sign Test of Lab 187 gamma survey measurements

Location	Gross cpm	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	336	-7	-63	4938	1
2	337	-6	-54	4946	1
3	335	-8	-71	4929	1
4	355	12	107	4893	1
5	334	-9	-80	4920	1
6	346	3	27	4973	1
7	324	-19	-170	4830	1
8	338	-5	-45	4955	1
9	326	-17	-152	4848	1
10	324	-19	-170	4830	1
11	337	-6	-54	4946	1
12	330	-13	-116	4884	1
13	345	2	18	4982	1
14	328	-15	-134	4866	1
15	321	-22	-196	4804	1
16	324	-19	-170	4830	1
17	325	-18	-161	4839	1
18	351	8	71	4929	1
19	329	-14	-125	4875	1
20	354	11	98	4902	1
21	332	-11	-98	4902	1
22	334	-9	-80	4920	1
23	332	-11	-98	4902	1
24	331	-12	-107	4893	1
Number of Positive Differences					24

Background (cpm)	343
Efficency	0.08
Probe Area/100 cm2	1.4
Count time	1

Sign Test of Lab 187 beta survey measurements

Lab 188



Wipe #	
1-12	floor
13 - 22	walls
23 - 24	Door

This area was the former radioactive waste storage room. The floor is solid epoxy over concrete.

Location	Gross Counts	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	343	5	563	4438	1
2	329	-3	-313	4688	1
3	324	-5	-625	4375	1
4	321	-7	-813	4188	1
5	330	-2	-250	4750	1
6	337	2	188	4813	1
7	329	-3	-313	4688	1
8	335	1	63	4938	1
9	336	1	125	4875	1
10	349	8	938	4063	1
11	346	6	750	4250	1
12	338	2	250	4750	1
13	331	-2	-188	4813	1
14	338	2	250	4750	1
15	338	2	250	4750	1
16	340	3	375	4625	1
17	334	0	0	5000	1
18	328	-3	-375	4625	1
19	332	-1	-125	4875	1
20	331	-2	-188	4813	1
21	326	-4	-500	4500	1
22	341	4	438	4563	1
23	333	-1	-63	4938	1
24	326	-4	-250	4750	1
Number of Positive Differences					24

Background (cpm)	167
Efficency	0.16
Probe Area/100 cm2	0.05
Count time	2

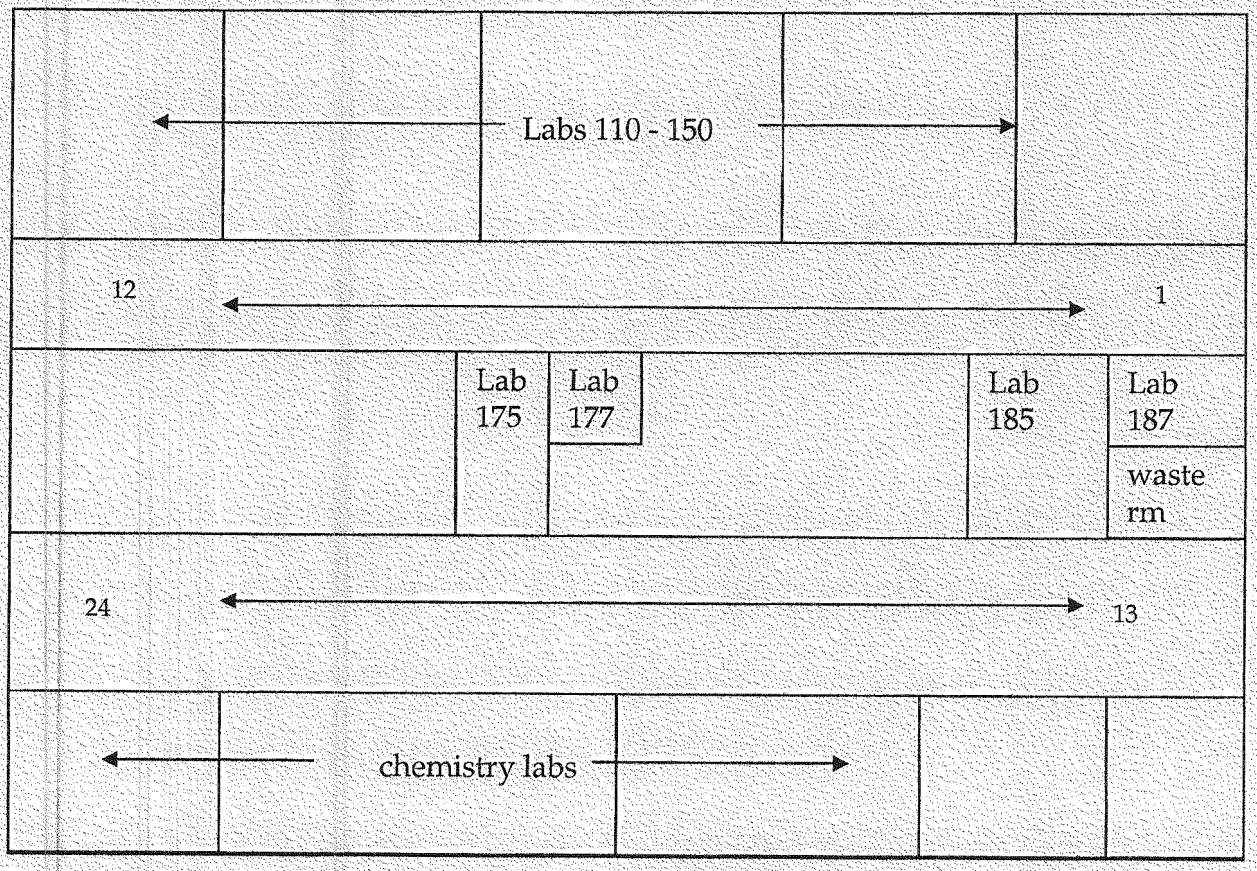
Sign Test of Lab 188 gamma survey measurements

Location	Gross cpm	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	337	-6	-54	4946	1
2	334	-9	-80	4920	1
3	337	-6	-54	4946	1
4	335	-8	-71	4929	1
5	324	-19	-170	4830	1
6	338	-5	-45	4955	1
7	339	-4	-36	4964	1
8	341	-2	-18	4982	1
9	331	-12	-107	4893	1
10	342	-1	-9	4991	1
11	338	-5	-45	4955	1
12	342	-1	-9	4991	1
13	338	-5	-45	4955	1
14	344	1	9	4991	1
15	328	-15	-134	4866	1
16	347	4	36	4964	1
17	337	-6	-54	4946	1
18	332	-11	-98	4902	1
19	348	5	45	4955	1
20	352	9	80	4920	1
21	348	5	45	4955	1
22	332	-11	-98	4902	1
23	331	-12	-107	4893	1
24	318	-25	-223	4777	1
Number of Positive Differences					24

Background (cpm)	343
Efficency	0.08
Probe Area/100 cm2	1.4
Count time	1

Sign Test of Lab 188 beta survey measurements

East Wing hallways



All measurement locations were on the floor.

There was no use or storage of radioactive material in the hallways; they were solely used for transporting material between laboratories.

Location	Gross Counts	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	332	-1	-125	4875	1
2	329	-3	-313	4688	1
3	333	-1	-63	4938	1
4	325	-5	-563	4438	1
5	329	-3	-313	4688	1
6	333	-1	-63	4938	1
7	323	-6	-688	4313	1
8	342	4	500	4500	1
9	337	2	188	4813	1
10	349	8	938	4063	1
11	337	2	188	4813	1
12	338	2	250	4750	1
13	318	-8	-1000	4000	1
14	322	-6	-750	4250	1
15	327	-4	-438	4563	1
16	324	-5	-625	4375	1
17	329	-3	-313	4688	1
18	332	-1	-125	4875	1
19	328	-3	-375	4625	1
20	338	2	250	4750	1
21	337	2	188	4813	1
22	334	0	0	5000	1
23	323	-6	-688	4313	1
24	334	0	0	5000	1
Number of Positive Differences					24

Background (cpm)	167
Efficency	0.16
Probe Area/100 cm2	0.05
Count time	2

Sign Test of hallways gamma survey measurements

Location	Gross cpm	Net cpm	dpm/ 100 cm2	DCGL-data	Sign
1	325	-18	-161	4839	1
2	323	-20	-179	4821	1
3	332	-11	-98	4902	1
4	347	4	36	4964	1
5	326	-17	-152	4848	1
6	346	3	27	4973	1
7	333	-10	-89	4911	1
8	327	-16	-143	4857	1
9	329	-14	-125	4875	1
10	324	-19	-170	4830	1
11	347	4	36	4964	1
12	322	-21	-188	4813	1
13	337	-6	-54	4946	1
14	348	5	45	4955	1
15	328	-15	-134	4866	1
16	332	-11	-98	4902	1
17	329	-14	-125	4875	1
18	333	-10	-89	4911	1
19	350	7	63	4938	1
20	354	11	98	4902	1
21	348	5	45	4955	1
22	328	-15	-134	4866	1
23	334	-9	-80	4920	1
24	329	-14	-125	4875	1
Number of Positive Differences					24

Background (cpm)	343
Efficency	0.08
Probe Area/100 cm2	1.4
Count time	1

Sign Test of hallways beta survey measurements

References

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

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

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

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

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

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

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

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

Appendix A

Facility Floor Plan

Page Withheld – Contains Security Related Material

Appendix B

Radioactive Material License

NRC FORM 374

U.S. NUCLEAR REGULATORY COMMISSION

Amendment No. 15

MATERIALS LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

Licensee	In accordance with the letter dated March 11, 2009,
1. Ligand Pharmaceuticals Incorporated (Ligand)	3. License number 29-30152-01 is amended in its entirety to read as follows:
2. 3000 Eastpark Boulevard Cranbury, New Jersey 08512	4. Expiration date December 31, 2014
	5. Docket No. 03033542 Reference No.

6. Byproduct, source, and/or special nuclear material	7. Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
A. Hydrogen 3	A. Any	A. 150 millicuries
B. Carbon 14	B. Any	B. 50 millicuries
C. Phosphorus 32	C. Any	C. 50 millicuries
D. Phosphorus 33	D. Any	D. 150 millicuries
E. Sulfur 35	E. Any	E. 50 millicuries
F. Calcium 45	F. Any	F. 1 millicuries
G. Iodine 125 agents	G. Non volatile agents	G. 50 millicuries

9. Authorized use:

A. through G. Research and development as defined in 10 CFR 30.4.

CONDITIONS

10. Licensed material may be used or stored only at the licensee's facilities located at 3000 Eastpark Boulevard, Cranbury, New Jersey.

MATERIALS LICENSE SUPPLEMENTARY SHEET

License Number
29-30152-01

Docket or Reference Number
03033542

Amendment No. 15

11. A. Licensed material shall be used by, or under the supervision of, James R.Beasley, Tsung Lin, Jinqi Liu, Ilana Stroke, Robert N.Swanson, Jiuqiao Zhao or Lorraine I. McKay.

B. Licensed material in items 6.A., 6.B. and 6.E. through 6.G., may also be used by or under the supervision of Elizabeth Quadros.

12. The Radiation Safety Officer for this license is Robert N. Swanson, Ph.D.

13. The licensee shall not use licensed material in or on human beings.

14. The licensee shall not use licensed material in field applications where it is released except as provided otherwise by specific condition of this license.

15. The licensee is authorized to hold byproduct material with a physical half-life of less than or equal to 120 days for decay-in-storage before disposal without regard to its radioactivity if the licensee:

A. Monitors byproduct material at the surface before disposal and determines that its radioactivity cannot be distinguished from the background radiation level with an appropriate radiation detection survey meter set on its most sensitive scale and with no interposed shielding; and

B. Removes or obliterates all radiation labels, except for radiation labels on materials that are within containers and that will be managed as biomedical waste after they have been released from the licensee; and

C. Maintains records of the disposal of licensed materials for 3 years. The record must include the date of disposal, the survey instrument used, the background radiation level, the radiation level measured at the surface of each waste container, and the name of the individual who performed the disposal.

16. The licensee is authorized to transport licensed material in accordance with the provisions of 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."

17. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The U.S. Nuclear Regulatory Commission's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.

A. Letter dated April 28, 2004 (ML041330096)
B. Application dated June 29, 2004 (ML042020232)
C. Letter dated September 14, 2004 (ML042720160)
D. Letter dated November 22, 2004 (ML043420238)
E. Letter dated September 12, 2007 (ML072640629
F. Letter dated March 11, 2009 with enclosures (ML090770827)

MATERIALS LICENSE SUPPLEMENTARY SHEET

License Number
29-30152-01

Docket or Reference Number
03033542

Amendment No. 15

For the U.S. Nuclear Regulatory Commission

Date May 15, 2009

By Thomas K. Thompson

Thomas K. Thompson
Commercial and R&D Branch
Division of Nuclear Materials Safety
Region I
King of Prussia, Pennsylvania 19406

Friday, May 15, 2009 10:44:08

Appendix C

Decommissioning Waste Manifest

FORM 540 — Duratek, Inc. - Commercial Processing

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST
SHIPPING PAPER

1. EMERGENCY TELEPHONE NUMBER (Include Area Code): 1-877-818-0087

ORGANIZATION: Veolia ES

2. IS THIS AN "EXCLUSIVE USE" SHIPMENT? ☐ YES ☑ NO

3. TOTAL NUMBER OF PACKAGES IDENTIFIED ON THIS MANIFEST: 12

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

EPA MANIFEST NUMBER

5. SHIPPER – NAME AND FACILITY
Pharmacopeia, Inc. / Licand Pharmaceuticals
3000 Eastpark Blvd @ 8A
C/O Veolia ES
Cranbury, NJ 08512

SHIPPER I.D. NUMBER: NJR000018389
☐ COLLECTOR ☐ PROCESSOR ☑ GENERATOR TYPE (Specify:)

USER PERMIT NUMBER: T-NJ011-G09
SHIPMENT NUMBER: VES-09-06
CONTACT: John Trogdon
TELEPHONE NUMBER (Include Area Code): (609) 452-3790

6. CARRIER – Name and Address

Transporter #1	Transporter #2	EPA ID Number
Veolia ES Technical Solutions, L.L.C.	S-J Transportation Company	#1 NJD030631369 #2 NJD071629976
1 Eden Lane	US Route 40	Ship Date:
Flanders, NJ 07836	Woodstown, NJ 08098	Telephone
Contact: Dispatch	Contact: Dispatch	#1: 973-347-7111 #2: 856-769-2741

SIGNATURE – Authorized carrier acknowledging waste receipt
#1 Date: 5/18/09 — #2 Date: 5-19-09

7. FORM 540 AND 540A — PAGE 1 OF 2 PAGE(S)
FORM 541 AND 541A — 2 PAGE(S)
FORM 542 AND 542A — None PAGE(S)
ADDITIONAL INFORMATION — None PAGE(S)

8. MANIFEST NUMBER (Use this number on all continuation pages): ZZ00135869

9. CONSIGNEE - Name and Facility
DURATEK, INC.
1560 BEAR CREEK ROAD
OAK RIDGE, TN 37830

CONTACT: TIM STOUT
TELEPHONE (Include Area Code): (865) 481-0222

SIGNATURE – Authorized consignee acknowledging waste receipt: Danielle Anderson
DATE: 5/21/09
3104 / 709335D

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

AUTHORIZED SIGNATURE: [signature] TITLE: RADIOACTIVE MGR DATE: 5/18/09

11. U.S. DEPARTMENT OF TRANSPORTATION DESCRIPTION (Including proper shipping name, hazard class, UN ID number, and any additional information)	12. DOT LABEL "RADIOACTIVE"	13. TRANSPORT INDEX	14. PHYSICAL AND CHEMICAL FORM	15. INDIVIDUAL RADIONUCLIDES		16. TOTAL PACKAGE ACTIVITY MBq	16. TOTAL PACKAGE ACTIVITY mCi	17. LSA/SCO CLASS	18. TOTAL WEIGHT OR VOLUME (Use appropriate units)	19. IDENTIFICATION NUMBER OF PACKAGE
UN2910, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE-LIMITED QUANTITY OF MATERIAL, 7	NA	NA	SOLID ORGANIC	H-3	I-125	7.4000E-02	2.0000E-03	NA	20 LBS; 4.09 FT3	NR-10233390 00-001-01
UN2910, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE-LIMITED QUANTITY OF MATERIAL, 7	NA	NA	SOLID ORGANIC	H-3	I-125	7.4000E-02	2.0000E-03	NA	28 LBS; 4.09 FT3	NR-10233390 00-001-02
UN2910, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE-LIMITED QUANTITY OF MATERIAL, 7	NA	NA	SOLID ORGANIC	H-3	I-125	7.4000E-02	2.0000E-03	NA	30 LBS; 4.09 FT3	NR-10233390 00-001-03
UN2910, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE-LIMITED QUANTITY OF MATERIAL, 7	NA	NA	SOLID ORGANIC	H-3	I-125	7.4000E-02	2.0000E-03	NA	33 LBS; 4.09 FT3	NR-10233390 00-001-04
UN2910, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE-LIMITED QUANTITY OF MATERIAL, 7	NA	NA	SOLID ORGANIC	H-3	I-125	7.4000E-02	2.0000E-03	NA	40 LBS; 4.09 FT3	NR-10233390 00-001-05
UN2910, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE-LIMITED QUANTITY OF MATERIAL, 7	NA	NA	SOLID ORGANIC	H-3	I-125	7.4000E-02	2.0000E-03	NA	50 LBS; 4.09 FT3	NR-10233390 00-001-06

FOR CONSIGNEE USE ONLY

TENNESSEE "LICENSE FOR DELIVERY" NO

SOUTH CAROLINA TRANSPORT PERMIT NO

US ECOLOGY GENERATOR NO

US ECOLOGY PERMIT NO

20. GENERATOR CERTIFICATION STATEMENT

A) Radioactive Materials. Certification is hereby made to Duratek, Inc. that this shipment of low-level radioactive material/waste has been prepared in accordance with radioactive waste management program which has been approved by the Nuclear Regulatory Commission or an Agreement State regulatory agency and with the current revision of the Duratek Material Acceptance Criteria.

B) Hazardous Materials. Generator hereby certifies that this material does not contain a hazardous waste as defined in 40 CFR 261.

C) Data. Generator hereby represents and warrants that all data set forth in this (UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST) are true and correct in all respects and in accordance with all applicable governmental laws, rules, regulations and Duratek, Inc. State of Tennessee Radioactive Material Licenses.

Print Name: Scott Demmerle — Signature: [signature] — Date: 5/18/09

FORM 540 (10-96)

FORM 540A

Duratek, Inc. - Commercial Processing

8. MANIFEST NUMBER (Use this number on all continuation pages)
ZZ00135869

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

SHIPPING PAPER (CONTINUATION)

11. U.S. DEPARTMENT OF TRANSPORTATION DESCRIPTION (Including proper shipping name, hazard class, UN ID number, and any additional information)	12. DOT LABEL "RADIOACTIVE"	13. TRANSPORT INDEX	14. PHYSICAL AND CHEMICAL FORM	15. INDIVIDUAL RADIONUCLIDES	16. TOTAL PACKAGE ACTIVITY MBq	mCi	17. LSA/SCO CLASS	18. TOTAL WEIGHT OR VOLUME (Use appropriate units)	19. IDENTIFICATION NUMBER OF PACKAGE
UN2910, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE-LIMITED QUANTITY OF MATERIAL, 7	NA	NA	SOLID ORGANIC	H-3 I-125	7.4000E-02	2.0000E-03	NA	36 LBS; 4.09 FT3	NR-10233390 00-001-07
UN2910, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE-LIMITED QUANTITY OF MATERIAL, 7	NA	NA	SOLID ORGANIC	H-3 I-125	7.4000E-02	2.0000E-03	NA	25 LBS; 4.09 FT3	NR-10233390 00-001-08
UN2910, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE-LIMITED QUANTITY OF MATERIAL, 7	NA	NA	SOLID ORGANIC	H-3 I-125	7.4000E-02	2.0000E-03	NA	31 LBS; 4.09 FT3	NR-10233390 00-001-09
UN2910, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE-LIMITED QUANTITY OF MATERIAL, 7	NA	NA	SOLID ORGANIC	H-3 I-125	7.4000E-02	2.0000E-03	NA	25 LBS; 4.09 FT3	NR-10233390 00-001-10
UN2910, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE-LIMITED QUANTITY OF MATERIAL, 7	NA	NA	SOLID ORGANIC	H-3 I-125	7.4000E-02	2.0000E-03	NA	25 LBS; 4.09 FT3	NR-10233390 00-001-11
UN2910, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE-LIMITED QUANTITY OF MATERIAL, 7	NA	NA	SOLID ORGANIC	S-35	9.2944E+01	2.5120E+00	NA	44 LBS; 4.09 FT3	NR-10233390 00-002-1

Appendix D

Wallac MicroBeta results

Liquid Scintillation Counter
Wipe Identification

Counter: Wallac microbeta Serial # 4500

Loaded By: S. Dennerlein Count Date 4/7/04

Sample Type: ~~Wipes~~ cotton swabs in sink traps, 4ml vials

Sample	Description
1	Sink Lab 110
2	Sink Lab 120
3	Sink Lab 130
4	Sink Lab 140
5	Sink Lab 150
6	Sink Lab 175

Comments: Decommissioning Survey

C:\MBW27\results\A15_282.txt

RUN INFORMATION:

Counting protocol no: 15 Tue 7-Apr-2009 10:02
Name: WIPE_TEST__EFFIC____47_3_
CPM normalization protocol no: 8

COLUMNS:

SAMPLE	POS	CCPM1	CCPM1%
Unk_1	A01	18	81.7
Unk_1	A03	21	75.6
Unk_1	A05	17	81.7
Unk_1	C01	21	75.6
Unk_1	C03	27	66.7
Unk_1	C05	12	100.0

Total count rate: 115.9 CCPM

Liquid Scintillation Counter
Wipe Identification

Counter: Wallac microbeta 1450 Serial # 4500

Loaded By: S. Dennerlein Count Date 4/13/09

Sample Type: (Wipes) filter paper

Sample	Description
1-24	Lab 110
25-48	Lab 120
49-72	Lab 130
73-96	Lab 140
97-119	Lab 150

Comments: Decommissioning Survey

A03_071.txt

RUN INFORMATION:

Counting protocol no: 3 Mon 13-Apr-2009 10:18
Name: LAB_SURVEYS
CPM normalization protocol no: 1

*** Cycle 2

COLUMNS:

SAMPLE	POS	CCPM1	CCPM1%
Unk_1	A01	32	35.4
Unk_1	A03	24	40.8
Unk_2	A05	28	38.5
Unk_3	A02	29	37.1
Unk_4	A04	24	40.8
Unk_5	A06	23	42.6
Unk_6	B01	31	35.9
Unk_7	B02	37	32.9
Unk_8	B03	35	34.3
Unk_9	B04	35	34.3
Unk_10	B05	21	44.7
Unk_11	B06	34	34.8
Unk_12	C01	30	38.5
Unk_13	C02	34	35.9
Unk_14	C03	28	38.5
Unk_15	C04	27	39.2
Unk_16	C05	46	30.5
Unk_17	C06	29	38.5
Unk_18	D01	38	34.3
Unk_19	D02	26	41.7
Unk_20	D03	27	39.2
Unk_21	D04	32	36.5
Unk_22	D05	36	34.8
Unk_23	D06	32	36.5
Unk_24	A01	21	43.7
Unk_25	A02	24	40.8
Unk_26	A03	28	37.8
Unk_27	A04	23	41.7
Unk_28	A05	34	34.8
Unk_29	A06	24	41.7
Unk_30	B01	36	33.3
Unk_31	B02	38	32.5
Unk_32	B03	31	35.9
Unk_33	B04	23	41.7
Unk_34	B05	30	37.1
Unk_35	B06	35	34.3
Unk_36	C01	31	37.8
Unk_37	C02	43	32.0
Unk_38	C03	33	35.9
Unk_39	C04	23	42.6
Unk_40	C05	26	40.8
Unk_41	C06	32	36.5
Unk_42	D01	52	29.2
Unk_43	D02	30	38.5
Unk_44	D03	39	32.9
Unk_45	D04	31	37.1
Unk_46	D05	31	37.1
Unk_47	D06	29	38.5
Unk_48	A01	32	35.4
Unk_49	A02	28	37.8
Unk_50	A03	42	31.2
Unk_51	A04	19	45.9
Unk_52	A05	32	35.9
Unk_53	A06	29	37.8
Unk_54	B01	38	32.5
Unk_55	B02	45	29.8
Unk_56	B03	32	35.4
Unk_57	B04	32	35.4
Unk_58	B05	20	45.9
Unk_59	B06	39	32.5
Unk_60	C01	34	35.9
Unk_61	C02	28	40.0
Unk_62	C03	37	33.8
Unk_63	C04	36	34.3
Unk_64	C05	30	37.8

Unk_65	C06	33	35.9
Unk_66	D01	33	36.5
Unk_67	D02	30	38.5
Unk_68	D03	38	33.3
Unk_69	D04	33	35.9
Unk_70	D05	22	44.7
Unk_71	D06	30	37.8
Unk_72	A01	26	39.2
Unk_73	A02	37	32.9
Unk_74	A03	23	41.7
Unk_75	A04	38	32.9
Unk_76	A05	28	38.5
Unk_77	A06	39	32.5
Unk_78	B01	30	36.5
Unk_79	B02	39	32.0
Unk_80	B03	43	30.9
Unk_81	B04	35	34.3
Unk_82	B05	26	40.0
Unk_83	B06	26	40.0
Unk_84	C01	33	36.5
Unk_85	C02	42	32.5
Unk_86	C03	39	32.9
Unk_87	C04	34	35.4
Unk_88	C05	41	32.5
Unk_89	C06	30	37.8
Unk_90	D01	33	36.5
Unk_91	D02	29	39.2
Unk_92	D03	37	33.8
Unk_93	D04	34	35.4
Unk_94	D05	29	38.5
Unk_95	D06	32	36.5
Unk_96	A01	28	37.8
Unk_97	A02	35	33.8
Unk_98	A03	26	39.2
Unk_99	A04	25	40.0
Unk_100	A05	19	47.1
Unk_101	A06	25	40.8
Unk_102	B01	24	40.8
Unk_103	B02	43	30.5
Unk_104	B03	29	37.1
Unk_105	B04	44	30.5
Unk_106	B05	31	36.5
Unk_107	B06	32	35.9
Unk_108	C01	26	41.7
Unk_109	C02	40	33.3
Unk_110	C03	34	35.4
Unk_111	C04	30	37.8
Unk_112	C05	31	37.1
Unk_113	C06	36	34.8
Unk_114	D01	27	40.8
Unk_115	D02	31	37.8
Unk_116	D03	26	40.0
Unk_117	D04	32	36.5
Unk_118	D05	36	34.8
Unk_119	D06	40	32.9

Total count rate: 3807.8 CCPM

Liquid Scintillation Counter
Wipe Identification

Counter: Wallac microbeta Serial # 4500

Loaded By: S. Dennerlein Count Date 4/14/09

Sample Type: (Wipes)

Sample	Description
1-24	Lab 175
25-48	Lab 177
49-72	Lab 185
73-96	Lab 187
97-120	Lab 188
121-143	Hallways

Comments: Decommissioning Survey

A03_078.txt

RUN INFORMATION:

Counting protocol no: 3 Tue 14-Apr-2009 13:09
Name: LAB_SURVEYS
CPM normalization protocol no: 1

*** Cycle 1

COLUMNS:

SAMPLE	POS	CCPM1	CCPM1%
Unk_1	A01	45	29.8
Unk_1	A03	20	44.7
Unk_2	A05	27	39.2
Unk_3	A02	26	39.2
Unk_4	A04	25	40.0
Unk_5	A06	33	35.4
Unk_6	B01	26	39.2
Unk_7	B02	30	36.5
Unk_8	B03	42	31.2
Unk_9	B04	30	36.5
Unk_10	B05	31	36.5
Unk_11	B06	25	40.8
Unk_12	C01	27	40.8
Unk_13	C02	24	42.6
Unk_14	C03	30	37.8
Unk_15	C04	37	33.8
Unk_16	C05	29	38.5
Unk_17	C06	22	44.7
Unk_18	D01	19	48.5
Unk_19	D02	31	37.8
Unk_20	D03	24	41.7
Unk_21	D04	28	38.5
Unk_22	D05	27	40.0
Unk_23	D06	31	37.1
Unk_24	A01	30	36.5
Unk_25	A02	25	40.0
Unk_26	A03	34	34.8
Unk_27	A04	26	39.2
Unk_28	A05	33	35.4
Unk_29	A06	24	41.7
Unk_30	B01	26	39.2
Unk_31	B02	32	35.4
Unk_32	B03	32	35.4
Unk_33	B04	35	34.3
Unk_34	B05	40	32.0
Unk_35	B06	29	37.8
Unk_36	C01	32	37.1
Unk_37	C02	40	33.3
Unk_38	C03	44	30.9
Unk_39	C04	32	36.5
Unk_40	C05	26	40.8
Unk_41	C06	31	37.1
Unk_42	D01	29	39.2
Unk_43	D02	33	36.5
Unk_44	D03	25	40.8
Unk_45	D04	35	34.8
Unk_46	D05	33	35.9
Unk_47	D06	24	42.6
Unk_48	A01	37	32.9
Unk_49	A02	32	35.4
Unk_50	A03	27	38.5
Unk_51	A04	30	36.5
Unk_52	A05	30	37.1
Unk_53	A06	32	35.9
Unk_54	B01	27	38.5
Unk_55	B02	35	33.8
Unk_56	B03	23	41.7
Unk_57	B04	34	34.8
Unk_58	B05	30	37.1
Unk_59	B06	28	38.5
Unk_60	C01	41	32.9
Unk_61	C02	53	28.9
Unk_62	C03	37	33.8
Unk_63	C04	34	35.4
Unk_64	C05	37	34.3

A03_078.txt

RUN INFORMATION:

Counting protocol no: 3 Tue 14-Apr-2009 13:09
Name: LAB_SURVEYS
CPM normalization protocol no: 1

*** Cycle 1

COLUMNS:

SAMPLE	POS	CCPM1	CCPM1%
Unk_1	A01	45	29.8
Unk_1	A03	20	44.7
Unk_2	A05	27	39.2
Unk_3	A02	26	39.2
Unk_4	A04	25	40.0
Unk_5	A06	33	35.4
Unk_6	B01	26	39.2
Unk_7	B02	30	36.5
Unk_8	B03	42	31.2
Unk_9	B04	30	36.5
Unk_10	B05	31	36.5
Unk_11	B06	25	40.8
Unk_12	C01	27	40.8
Unk_13	C02	24	42.6
Unk_14	C03	30	37.8
Unk_15	C04	37	33.8
Unk_16	C05	29	38.5
Unk_17	C06	22	44.7
Unk_18	D01	19	48.5
Unk_19	D02	31	37.8
Unk_20	D03	24	41.7
Unk_21	D04	28	38.5
Unk_22	D05	27	40.0
Unk_23	D06	31	37.1
Unk_24	A01	30	36.5
Unk_25	A02	25	40.0
Unk_26	A03	34	34.8
Unk_27	A04	26	39.2
Unk_28	A05	33	35.4
Unk_29	A06	24	41.7
Unk_30	B01	26	39.2
Unk_31	B02	32	35.4
Unk_32	B03	32	35.4
Unk_33	B04	35	34.3
Unk_34	B05	40	32.0
Unk_35	B06	29	37.8
Unk_36	C01	32	37.1
Unk_37	C02	40	33.3
Unk_38	C03	44	30.9
Unk_39	C04	32	36.5
Unk_40	C05	26	40.8
Unk_41	C06	31	37.1
Unk_42	D01	29	39.2
Unk_43	D02	33	36.5
Unk_44	D03	25	40.8
Unk_45	D04	35	34.8
Unk_46	D05	33	35.9
Unk_47	D06	24	42.6
Unk_48	A01	37	32.9
Unk_49	A02	32	35.4
Unk_50	A03	27	38.5
Unk_51	A04	30	36.5
Unk_52	A05	30	37.1
Unk_53	A06	32	35.9
Unk_54	B01	27	38.5
Unk_55	B02	35	33.8
Unk_56	B03	23	41.7
Unk_57	B04	34	34.8
Unk_58	B05	30	37.1
Unk_59	B06	28	38.5
Unk_60	C01	41	32.9
Unk_61	C02	53	28.9
Unk_62	C03	37	33.8
Unk_63	C04	34	35.4
Unk_64	C05	37	34.3

A03_078.txt

RUN INFORMATION:

Counting protocol no: 3 Tue 14-Apr-2009 13:09
Name: LAB_SURVEYS
CPM normalization protocol no: 1

*** Cycle 1

COLUMNS:

SAMPLE	POS	CCPM1	CCPM1%
Unk_1	A01	45	29.8
Unk_1	A03	20	44.7
Unk_2	A05	27	39.2
Unk_3	A02	26	39.2
Unk_4	A04	25	40.0
Unk_5	A06	33	35.4
Unk_6	B01	26	39.2
Unk_7	B02	30	36.5
Unk_8	B03	42	31.2
Unk_9	B04	30	36.5
Unk_10	B05	31	36.5
Unk_11	B06	25	40.8
Unk_12	C01	27	40.8
Unk_13	C02	24	42.6
Unk_14	C03	30	37.8
Unk_15	C04	37	33.8
Unk_16	C05	29	38.5
Unk_17	C06	22	44.7
Unk_18	D01	19	48.5
Unk_19	D02	31	37.8
Unk_20	D03	24	41.7
Unk_21	D04	28	38.5
Unk_22	D05	27	40.0
Unk_23	D06	31	37.1
Unk_24	A01	30	36.5
Unk_25	A02	25	40.0
Unk_26	A03	34	34.8
Unk_27	A04	26	39.2
Unk_28	A05	33	35.4
Unk_29	A06	24	41.7
Unk_30	B01	26	39.2
Unk_31	B02	32	35.4
Unk_32	B03	32	35.4
Unk_33	B04	35	34.3
Unk_34	B05	40	32.0
Unk_35	B06	29	37.8
Unk_36	C01	32	37.1
Unk_37	C02	40	33.3
Unk_38	C03	44	30.9
Unk_39	C04	32	36.5
Unk_40	C05	26	40.8
Unk_41	C06	31	37.1
Unk_42	D01	29	39.2
Unk_43	D02	33	36.5
Unk_44	D03	25	40.8
Unk_45	D04	35	34.8
Unk_46	D05	33	35.9
Unk_47	D06	24	42.6
Unk_48	A01	37	32.9
Unk_49	A02	32	35.4
Unk_50	A03	27	38.5
Unk_51	A04	30	36.5
Unk_52	A05	30	37.1
Unk_53	A06	32	35.9
Unk_54	B01	27	38.5
Unk_55	B02	35	33.8
Unk_56	B03	23	41.7
Unk_57	B04	34	34.8
Unk_58	B05	30	37.1
Unk_59	B06	28	38.5
Unk_60	C01	41	32.9
Unk_61	C02	53	28.9
Unk_62	C03	37	33.8
Unk_63	C04	34	35.4
Unk_64	C05	37	34.3

Unk_65	C06	28	39.2
Unk_66	D01	33	36.5
Unk_67	D02	42	32.5
Unk_68	D03	25	40.8
Unk_69	D04	37	33.8
Unk_70	D05	31	37.1
Unk_71	D06	40	32.9
Unk_72	A01	33	34.8
Unk_73	A02	27	38.5
Unk_74	A03	31	35.9
Unk_75	A04	40	32.0
Unk_76	A05	19	47.1
Unk_77	A06	23	42.6
Unk_78	B01	24	40.8
Unk_79	B02	27	38.5
Unk_80	B03	24	40.8
Unk_81	B04	30	36.5
Unk_82	B05	28	38.5
Unk_83	B06	30	37.1
Unk_84	C01	49	30.2
Unk_85	C02	39	33.8
Unk_86	C03	35	34.8
Unk_87	C04	40	32.5
Unk_88	C05	34	35.4
Unk_89	C06	29	38.5
Unk_90	D01	34	35.9
Unk_91	D02	28	40.0
Unk_92	D03	27	39.2
Unk_93	D04	21	44.7
Unk_94	D05	33	35.9
Unk_95	D06	32	36.5
Unk_96	A01	35	33.8
Unk_97	A02	36	33.3
Unk_98	A03	26	39.2
Unk_99	A04	27	38.5
Unk_100	A05	27	39.2
Unk_101	A06	29	37.8
Unk_102	B01	47	29.2
Unk_103	B02	36	33.3
Unk_104	B03	28	37.8
Unk_105	B04	39	32.5
Unk_106	B05	34	34.8
Unk_107	B06	28	38.5
Unk_108	C01	31	37.8
Unk_109	C02	38	34.3
Unk_110	C03	33	35.9
Unk_111	C04	35	34.8
Unk_112	C05	38	33.8
Unk_113	C06	29	38.5
Unk_114	D01	23	43.7
Unk_115	D02	38	34.3
Unk_116	D03	30	37.8
Unk_117	D04	37	33.8
Unk_118	D05	32	36.5
Unk_119	D06	37	34.3
Unk_120	A01	31	35.9
Unk_121	A02	24	40.8
Unk_122	A03	39	32.5
Unk_123	A04	43	30.9
Unk_124	A05	40	32.0
Unk_125	A06	37	33.3
Unk_126	B01	26	39.2
Unk_127	B02	32	35.4
Unk_128	B03	42	31.2
Unk_129	B04	26	39.2
Unk_130	B05	33	35.4
Unk_131	B06	24	41.7
Unk_132	C01	32	37.1
Unk_133	C02	38	34.3
Unk_134	C03	49	29.5
Unk_135	C04	38	33.3
Unk_136	C05	31	37.1
Unk_137	C06	29	38.5
Unk_138	D01	31	37.8
Unk_139	D02	30	38.5
Unk_140	D03	40	32.5
Unk_141	D04	16	51.6
Unk_142	D05	32	36.5
Unk_143	D06	23	43.7

Appendix E

Calibration Certificates

Certificate of Calibration

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

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

Voltage Setting: 900v **Background: 167 cpm**

Linearity Test

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

Beta Efficiency Determination

Isotope / serial#	NIST Activity	Net Counts	cpm/dpm 4π
C-14 841-31-3	224,442	N/A	
Pm-147 841-36-2	21,674	N/A	
Tc-99 841-32-1	23,510	N/A	
Cl-36 841-33-2	22,289	N/A	
Sr/Y-90 841-35-2	22,711	N/A	
I-129 1270-102	59,300	9,500	0.16

Comments: _____

NRC Calibration License # 29-30366-01 Date: 2/24/2009

Certificate of Calibration

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

Meter: **Ludlum model 12 # 186772** Probe: **44-92 ##161430**

Voltage Setting: 1250v **Background: 343 cpm**

Linearity Test

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

Beta Efficiency Determination

Isotope / serial#	NIST Activity	Net Counts	cpm/dpm 4π
C-14 841-31-3	224,442	18,000	0.08
Pm-147 841-36-2	21,674	N/A	
Tc-99 841-32-1	23,510	N/A	
Cl-36 841-33-2	22,289	N/A	
Sr/Y-90 841-35-2	22,711	N/A	

Comments: _____

NRC Calibration License # 29-30366-01 **Date:** 2/24/2009

MicroBeta Calibration Data (Tritium)

N02.txt

RUN INFORMATION:

CPM normalization protocol no: 2 Thu 1-May-2008 15:10
Name: WIPE_TEST_STANDARIZATION

*** DETECTOR EFFICIENCY NORMALIZATION

COLUMNS:

	SAMPLE	POS	CCPM1	CCPM1%
	Normalization_1	D05	112566	0.6
	Normalization_1	D05	110791	0.6
	Normalization_1	D05	108684	0.6
	Normalization_1	D05	101162	0.7
	Normalization_1	D05	106423	0.6
	Normalization_1	D05	104649	0.6
DET	SQP(I)	BGND	EFF	
1	184.4	0.0	0.5140	
2	169.2	0.0	0.5059	
3	173.3	0.0	0.4963	
4	169.8	0.0	0.4619	
5	164.4	0.0	0.4860	
6	167.2	0.0	0.4778	

Total count rate: 112565.8 CCPM

Appendix F

Scott Dennerlein & Associates, LLC
Statement of Qualifications

Scott Dennerlein & Associates, LLC was incorporated in New Jersey in 2000. The principal, Scott Dennerlein, has twenty-five years experience in the field of radiation safety. He has worked at radium contaminated sites, nuclear power plants, a fusion reactor and in the New Jersey Radiation Protection Bureau. His hands-on experience includes handling 100s of curies of tritium in Alaskan oil fields, and job coverage of workers in radiation areas in excess of 10 R/hr. Mr. Dennerlein has a Masters degree in Radiation Science from Rutgers University, and attended the School of Public Health at Columbia University.

Additional support is provided by Joel Antkowiak and Bob Mahoney, each with more than twenty years experience in radiation protection practices.

The major service provided by SD&A, LLC is total management of Radiation Safety Programs for pharmaceutical and biotech research firms. Currently we provide personnel listed as the Radiation Safety Officer on radioactive material licenses for;

Bracco Research USA	Johnson & Johnson, CPC	
Signum Biosciences	Biotranex	Amicus Therapuetics
NJ Institute of Technology	Linde Gases	

In addition, Scott Dennerlein and Associates, LLC is licensed by the NRC (# 29-30660-01) to provide onsite instrument calibration and sealed source leak testing.

Scott Dennerlein & Associates, LLC maintains a $2,000,000 professional and pollution liability insurance policy.