The College Of
WILLIAM & MARY

DL-123097_04

Department of Chemistry

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December 30, 1997

Mr. Bryan A. Parker, Radiation Specialist
Materials Licensing/Inspection Branch 1
Division of Nuclear Materials Safety
U.S. Nuclear Regulatory Commission, Region II
Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta GA 30303-3415

Dear Mr. Parker:

This letter is in reference to Control Number 257470 and your letter of November 7. I am responding to your four specific points concerning our radiation surveys.

A. I did not do any gamma radiation surveys because the ^{75}Se gamma emitter, which has a half life of 120 days, was purchased September 28, 1982 and thus had completely decayed.

B. I have attached the list of smear sample counting results in units of disintegrations per minute. In the columns labeled "Corr", the raw data has the blank subtracted. I have used the blank as the background instead of the actual instrument background because of the effect on the counting of the presence of a filter paper disk in the liquid scintillation vial. The columns labeled "s" contain the standard deviation calculated according to equation 8-9 in NUREG 5849. The smears were done as surveys to see if there was any residual radioactive material present in all places where such material was used. As such, the area of most smears was between 1000 cm^2 and 1 m^2. Smears for Room 217, were for smaller areas since some radiochemistry was done in that room until 1985. No other smears were taken since all counts hovered on either side of the value of the blank.

C. An attached sheet from a recent preventive maintenance shows the counter efficiencies to be 60% for ^3H and 96% for ^{14}C. I have observed from many LSC counts with smear samples that counts for the blank can be somewhat variable, probably due to the position of the disk relative to the detectors, etc. On this basis, I would estimate that the minimum detectable activity is 15 dpm after background subtraction.

D. The instrument used for the survey is a Beckman Instruments LS-5000 CE liquid scintillation counter. A copy of its recent calibration is attached.

I am very interested in terminating NRC License No. 45-03499-09. I you have any further questions, I can be reached by telephone at (757) 221-2553, or by e-mail at rlkief@chem1.chem.wm.edu .

Sincerely,

Richard L. Kiefer
Professor of Chemistry

Enclosures:
1) Survey data
2) Liquid scintillation counter information

Survey Results for NRC License # 45-03499-09
Department of Chemi[illegible]ge of William & Mary
"Corr" is raw data min[illegible]43)
"s" is the standard devi[illegible] Eq. 8-9 of NUREG 5849

Number	Sample Desc[illegible]ption	Corr 3H dpm	s 3H dpm	Corr 14C dpm	s 14C dpm	Raw 3H dpm	Raw 14C dpm
1	Large lead box	0.5	3.0	0.0	1.8	26.5	14.9
2	Top of bench 1 in [illegible]7	2.7	3.0	0.5	1.8	28.7	15.4
3	Underneath bench 2 in R-217	1.7	3.0	0.1	1.8	27.7	15.0
4	Top of bench 2 in R-217	-3.7	2.8	-1.2	1.7	22.3	13.8
5	Top of bench 3 in R-217	-0.8	2.9	-0.1	1.8	25.2	14.8
6	Floor area 5 in R-217	1.3	3.0	0.4	1.8	27.3	15.3
7	Inside the refrigerator in R-217	3.0	3.0	1.1	1.8	29.0	16.0
8	Floor area 6 in R-217	-4.2	2.8	0.5	1.8	21.8	15.4
9	Top of bench 4 in R-217	-5.0	2.8	0.3	1.8	21.0	15.2
10	Underneath bench 4 in R-217	-1.7	2.9	0.8	1.8	24.3	15.7
11	Hood in R-217	-1.3	2.9	1.6	1.8	24.7	16.5
12	Radioactive waste can in R-217	1.3	3.0	-2.0	1.7	27.3	12.9
13	Floor area 7 in R-217	0.3	3.0	-1.3	1.7	26.3	13.6
14	Bench in R-203	-2.2	2.9	1.6	1.8	23.8	16.5
15	Floor in R-203	2.3	3.0	-2.3	1.7	28.3	12.6
16	Wooden sample holder in R-203	-4.3	2.8	-2.6	1.7	21.7	12.3
17	Hood 1 in R-110	-1.8	2.9	-1.0	1.7	24.2	13.9
18	Hood 2 in R-110	-5.2	2.8	0.3	1.8	20.8	15.2
19	Hood 3 in R-110	-2.7	2.9	0.9	1.8	23.3	15.8
20	Hood 4 in R-110	-4.2	2.8	3.6	1.9	21.8	18.5
21	Underneath hoods in R-110	-2.7	2.9	1.0	1.8	23.3	15.9
22	Benches in R-110	3.8	3.1	3.3	1.9	29.8	18.2
23	Floor in R-110	4.8	3.1	-0.3	1.8	30.8	14.6
24	Hood 1 in R-111	0.0	2.9	2.6	1.8	26.0	17.5
25	Hood 2 in R-111	-6.2	2.8	2.3	1.8	19.8	17.2
26	Hood 3 in R-111	1.3	3.0	-0.8	1.7	27.3	14.1
27	Hood 4 in R-111	-6.5	2.8	0.3	1.8	19.5	15.2
28	Benches in R-111	1.3	3.0	0.7	1.8	27.3	15.6
29	Floor in R-111	-3.2	2.9	0.4	1.8	22.8	15.3
30	Underneath hoods in R-111	-2.8	2.9	-0.8	1.7	23.2	14.1
31	Benches in R-106K	-3.5	2.8	-1.5	1.7	22.5	13.4
32	Floor in R-106K	3.0	3.0	-2.3	1.7	29.0	12.6
33	Hood 1 in R-108	2.8	3.0	0.6	1.8	28.8	15.5
34	Hood 2 in R-108	-3.2	2.9	-0.6	1.7	22.8	14.3
35	Hood 3 in R-108	-1.5	2.9	-1.8	1.7	24.5	13.1
36	Hood 4 in R-108	-1.8	2.9	2.9	1.8	24.2	17.8
37	Underneath hoods in R-108	-3.8	2.8	3.5	1.9	22.2	18.4
38	Benches in R-108	-0.3	2.9	1.7	1.8	25.7	16.6
39	Floor in R-108	-1.0	2.9	1.2	1.8	25.0	16.1
40	Hood in storerm betwn 108 &110	-2.2	2.9	4.4	1.9	23.8	19.3
41	Underneath hood in R-217	3.5	3.0	1.2	1.8	29.5	16.1
42	Underneath sink in R-217	10.2	3.2	3.4	1.9	36.2	18.3
43	Blank	0.0	2.9	-0.0	1.8	26.0	14.9
44	Sink in R-217	8.8	3.2	3.5	1.9	34.8	18.4
45	Hood in R-106K	7.8	3.2	1.2	1.8	33.8	16.1
46	Sink in R-106K	0.5	3.3	1.1	1.8	26.5	16.0
	Background					46.7	41.7

PERFORMANCE SPECIFICATIONS CHECK LIST
FOR
THE LS-5000 CE
LIQUID SCINTILLATION COUNTER

	SPEC.	ACTUAL
1. EFFICIENCY		
3H	>58%	60%
14C	>95%	96%
14C Above 3H	>70%	79%
2. E^2/B BASED ON 1% SPILL WINDOW		
3H	>120	128
14C	>200	230
14C Above 3H	>320	1040
3. BACKGROUND		
3H	<28 CPM	28 CPM
14C	<45 CPM	40 CPM
14C Above 3H	<15 CPM	6 CPM
4. ENDPOINTS		
3H	400	404
14C	670	670

MODEL NO. LS5000CE DATE. 11-18-97

SERIAL NO. 7032737 ENGINEER. Bo Jacob