BIOLOGY GREENHOUSE

(SURVEY UNITS 107 AND 108)

The floors within the Biology Greenhouse were classified as a MARSSIM Class 2 area, while the walls were classified as a MARSSIM Class 3 area. Figures (including sample locations) are included in Attachment A-11-1. Radiologically impacted areas were divided into SUs based on MARSSIM-recommended size constraints, resulting in a total of two SUs (SU-107 and SU-108) in the Biology Greenhouse. Survey data from the floors and walls are located in Tables A11.1 and A11.2.

Overview of Surveys Performed. Ludlum Model 43-89 dual phosphor ZnS detectors coupled with Ludlum Model 2360 scalers were used for the collection of quantitative alpha/beta scan surveys and fixed-point (i.e., static) measurements. The alpha/beta static measurements were performed at systematic locations for MARSSIM Class 2 areas and at randomly generated locations for Class 3 areas. Given that scan surveys did not detect the presence of activity that was elevated with respect to the investigation level, biased fixed-point measurements were not necessary. Removable contamination measurements (i.e., swipes) were also collected at each static location to quantify residual removable activity. The swipes were counted using a Ludlum Model 43-10-1 alpha/beta sample counter. QA/QC information relative to the instruments used is contained in Section 5.0 of the main text and in Appendix C.

Fixed-Point Measurements. Fixed-point measurements were obtained from MARSSIM Class 2 (systematic - random start triangular grid) or MARSSIM Class 3 (random) locations. Class 3 fixed-point measurements were obtained from random locations, with emphasis on areas with a greater likelihood of residual activity. Results of the static measurement are listed in Tables A11.1 and A11.2, and locations are shown on Figures A11.1 and A11.2. All alpha results were below the site-specific alpha DCGL of 1,160 dpm/100 cm^2 for Am-241. Residual beta activity was compliant with both the Cs-137 surface contamination level of 5,000 dpm/100 cm^2 specified in AEC Regulatory Guide 1.86 (AEC 1974) and the NRC screening level DCGL of 28,000 dpm/100 cm^2 cited in Table 5.19 of NUREG-5512 (NRC 1999) for Cs-137 on structures.

The floor of the Biology Greenhouse was surveyed as one MARSSIM Class 2 SU. The area of this SU is 600 m^2.

Table A11.1. SU-107 Biology Greenhouse Class 2 Floor Measurement Results

Sample Number	Survey Surface	Total Alpha Activity (dpm/100 cm^2)	Total Beta Activity (dpm/100 cm^2)	Removable Alpha Activity (dpm/100 cm^2)	Removable Beta Activity (dpm/100 cm^2)
1	Concrete	46	2,226	-1	-26
2	Concrete	46	1,672	-1	-9
3	Concrete	91	1,672	3	18
4	Concrete	1	1,590	-1	-18
5	Concrete	31	1,723	-1	3
6	Concrete	61	1,374	-1	12
7	Concrete	46	1,415	3	0
8	Concrete	31	1,467	-1	15
9	Concrete	31	1,446	-1	6
10	Concrete	31	1,651	-1	-23
11	Concrete	31	1,364	-1	23
12	Concrete	31	1,374	-1	3

The MDC is the minimum detectable concentration on a surface, that an instrument is expected to detect with 95 percent confidence.

The instrument MDCs for fixed measurements 1-12 are 83.7 dpm/100 cm^2 (alpha) and 300.9 dpm/100 cm^2 (beta); and the MDCs for removable samples 1-10 are 15 dpm/100 cm^2 (alpha) and 75 dpm/100 cm^2 (beta).

Negative results indicate results that are below background for the respective building material.

The walls of the Biology Greenhouse were surveyed as one MARSSIM Class 3 SU. The area of this SU is 1,100 m^2.

Table A11.2. SU-108 Biology Greenhouse Class 3 Wall Measurement Results

Sample Number	Survey Surface	Total Alpha Activity (dpm/100 cm^2)	Total Beta Activity (dpm/100 cm^2)	Removable Alpha Activity (dpm/100 cm^2)	Removable Beta Activity (dpm/100 cm^2)
1	Concrete	1	769	3	-15
2	Concrete	1	1,118	-1	-12
3	Concrete	1	1,692	-1	0
4	Concrete	16	985	3	-6
5	Concrete	1	1,097	-1	-6
6	Concrete	46	1,303	3	-9
7	Concrete	16	1,456	3	-12
8	Concrete	16	1,538	-1	-15
9	Concrete	16	2,123	-1	-12
10	Concrete	1	1,056	-1	0

The MDC is the minimum detectable concentration on a surface, that an instrument is expected to detect with 95 percent confidence.

The instrument MDCs for fixed measurements 1-10 are 83.7 (alpha) and 300.9 dpm/100 cm^2 (beta); and the MDCs for removable samples 1-10 are 15 (alpha) and 75 dpm/100 cm^2 (beta).

Negative results indicate results that are below background for the respective building material.

Summary. Residual levels of radioactivity in the Biology Greenhouse clearly demonstrate that residual concentrations of radionuclide COPCs achieve the site-specific alpha DCGL of 1,160 dpm/100 cm^2. In addition, the actual percentage of removable activity was determined to be approximately 3 percent.

Given these results, it is clearly demonstrated that the null hypothesis (i.e., that the Biology Greenhouse exceeds DCGLs) is rejected. Review of survey data supports the conclusion that the Biology Greenhouse contains an adequate number of measurements/samples; a sufficient percentage has been scanned; and it has been appropriately classified consistent with MARSSIM requirements using the process noted in Section 4.0 of the main text of this document. All scan and fixed measurement results collected from the Biology Greenhouse at Southeast were below the $DCGL_W$. As such, formal assessment using the Sign Test is not required.

Conclusion. Levels of radioactivity in the Biology Greenhouse achieve criteria for unrestricted release consistent with the provisions of 10 *CFR* 20, Subpart E.

ATTACHMENT A-11-1

FIGURES

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