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Radiological Decommissioning of 12501 Washington Avenue, Rockville, MD

By

Clym Environmental, LLC.

The National Institutes of Health (NIH) implemented the Multi-Agency Radiation Site Survey Investigation Manual (MARSSIM) as the guidance document for decommissioning the facility located at 12501 Washington Avenue, Rockville, MD (known as the Flow Building or Danac 4). The MARSSIM framework is used to determine if the mean of collected survey data meets Derived Concentration Guideline Levels (DCGLs) and, therefore, is focused on the Final Status Survey (FSS).

The guidance provided in the MARSSIM on the Historical Site Assessment (HSA), the scoping surveys, the characterization surveys, and the remedial action support surveys is intended to address the need for appropriate data in designing the Final Status Survey. Upon direction of the Division of Radiation Safety, Office of Research Services, NIH, Clym Environmental Services, LLC (Clym) was instructed to assist with decommissioning activities in September of 2008.

Clym developed a Historical Site Assessment and submitted that document in October, 2008. Based on the HSA, the nuclides identified for potential residual contamination on building surfaces were Hydrogen-3, Carbon-14, Chlorine-36 and Uranium-238.

A sampling plan is intended to define the scope of facility surveys that will further qualify individual areas for final status. Surveys in this process are focused on surface contaminants and are comprised of two data collection mechanisms: scanning (e.g. direct measurement) and samples (e.g. wipes or *in situ* measurements). Scoping surveys and characterization surveys are used to support area classifications, to document areas of contamination and to qualify the radionuclides present at the site. Scoping surveys typically consist of limited surface activity measurements and sample collection. The intent of scoping surveys is to better define areas within a facility that are potentially contaminated, and therefore to support an initial classification of each area where contamination has not been previously defined. The results of these surveys aid in determining the area characterization surveys that follow. Characterization surveys, on the other hand, consist of thorough surface scans and systematic sampling of all potentially contaminated areas. If the historical assessment or scoping survey defines areas as contaminated or potentially contaminated, the characterization survey would serve to qualify and quantify those contaminants. Based on the history of radioactive material use at Danac 4 and the historical survey data that was available, scoping and characterization surveys could be performed concurrently. This design allowed for the efficient collection of data and efficient use of outsourced labor.

In November, 2008 Clym submitted an Initial Sampling Plan for Scoping Surveys based on the HSA, which is based on the MARSSIM process. This sampling plan was submitted by the NIH

Division of Radiation Safety (DRS) to NRC Region I via facsimile on November 18, 2008. There was no comment from the NRC regarding errors, omissions or inadequacy of the sampling plan. DRS approved the sampling plan and directed Clym to proceed to perform the characterization and final status surveys as soon as possible.

Upon receiving permission from the lessor, JBG, to access the facility for the surveys, Clym commenced the surveys in December of 2008.

Inputs into the final status survey design are from two sources: pre-release surveys and dose modeling. The pre-release surveys, including the historical site assessment, scoping survey, the characterization survey and the remedial action support survey, provide information into planning the FSS. Dose modeling provides DCGLs for both the statistical tests used in qualifying the uniformly distributed residual radioactivity and for the elevated measurement comparison of localized residual radioactivity.

MARSSIM provides a standardized statistical approach to sampling and describes the statistical tools, tests and assumptions needed. The intent of the statistical approach is to develop a representation of the distribution of residual radioactivity in the survey unit utilizing the least number of samples. Non-parametric statistical tests are used by MARSSIM to minimize the dependence on normality since many of these sampling distributions can be skewed by small areas of localized radioactivity that can result from remediation activities. Given the critical importance of sufficient data, scoping surveys met the following key objectives: 1) conservative classification, 2) thorough consideration of all surfaces and 3) design to meet Final Status Survey requirements based on initial classification.

A scoping survey was performed to substantiate and better define potential radioactive contaminants including the general extent of any residual activity. This survey consisted of surface scans and direct radiation level measurements at representative points. Samples of residues from surfaces, cracks, pipes, ducts and other areas of potential contamination were analyzed to determine radionuclide specific activity. If residual activity was detected, Clym proposed to proceed directly with characterization surveys to expedite the transition to final status. With this approach, the end of this phase of operations resulted in the designation of areas requiring remedial efforts.

Within any survey design, the units to be surveyed must be defined by type and risk level.

Clym identified two subgroups of these units: building structures and building systems. Building structures consist of ceilings, upper walls, shelves, lower walls, casework and sinks, and floors. Building systems consist of sink traps and drain lines, and chemical fume hoods, ducting and exhaust blower motors, filters and fans. All building systems and shelves, lower walls, casework

and sinks and floors are considered "high risk" units. All scans and sample collection activities were conducted in accordance with industry standard procedures and good work practices.

Surface scans were conducted with special attention afforded to cracks, joints and other areas where contamination may have accumulated. Wipe samples were used to evaluate the presence of removable surface contamination. Wipe samples were collected and analyzed by Clym in accordance with their radioactive materials license (MD-21-035-01, expiring 11/30/2012). Samples were tracked from collection to receipt for analyses at Clym's analytical laboratory using a Chain of Custody process and documented on a Chain of Custody record.

Surveys in all areas focused on "high risk" surfaces. Survey units were divided into square meter grids for sampling. Radiation detection instrumentation was selected based on the radionuclides identified in the HSA and to afford the most efficient and thorough data collection by the survey team. Portable instruments included portable scaler/rate meters equipped with large area gas proportional detectors.

The tables in Attachments 7 and 8 of the Final Status Survey document each individual measurement by survey unit. The measured activity presented in Attachments 7 and 8 demonstrates the statistical tests selected, Sign and WRS, need not be conducted as each survey unit met the release criterion. In fact no residual radioactive contamination was found for any nuclide that approached the respective action level. Therefore, the Final Status Survey Report constitutes the "documentation and reporting system that produce a complete and unambiguous record of the radiological status of the survey areas relative to the established decision levels."

Note: A typographical error was noted in Attachment 7. The numerical value for the ^{14}C DCGL when converted from DPM/100 cm² to CPM/100cm² was originally entered as 1.3 E+06 rather than the correct value of 8.1 E+05. A revised Attachment 7 has been provided with this submission.

ATTACHMENT 7

Final Status Survey Results for
Unit - DN4

Sample Point	Bkg (counts)	Gross (counts)	Count time (in min)	Total Surface Activity ¹ in DPM/100cm ²		
				Gross Beta	Uncertainty ²	MDA
55 - B7	1238	1105	1	-185	132	230
39 - B44	886	894	1	11	115	195
39 - D20	886	688	1	-275	108	195
35 - A18	863	789	1	-103	111	193
35 - F3	1119	1179	1	83	131	219
31 - C7	863	865	1	3	113	193
East Animal Facility Hallway C - F2	1010	1026	1	22	123	208
78A - F5	1010	971	1	-54	121	208
74H - F18	1010	920	1	-125	120	208
74F - D14	863	740	1	-171	109	193
20 - D6	863	832	1	-43	112	193
5 - F114	1010	999	1	-15	122	208
81 - F144	1010	941	1	-96	120	208
North Hallway East - F40	1010	916	1	-131	120	208
North Hallway West - F27	1010	957	1	-74	121	208
3 - A1	863	869	1	8	113	193
5 - F96	1238	1315	1	107	138	230
5 - F253	1010	1022	1	17	123	208
61 - B40	1019	1202	1	255	129	209
68A - C13	863	724	1	-193	109	193
74H-2-B4	863	758	1	-146	110	193
74F - C2	863	802	1	-85	111	193
74F - C3	863	870	1	10	114	193
74F - F10	1010	967	1	-60	121	208
78 - A26	863	856	1	-10	113	193
81 - C24	863	732	1	-182	109	193
81 - F22	1010	996	1	-19	122	208
84 - C7	863	753	1	-153	110	193
84 - C12	863	783	1	-111	111	193
North Hallway West - C5	863	864	1	1	113	193
North Hallway West - F45	1010	970	1	-56	121	208
North Hallway West - F76	1010	1049	1	54	124	208
South Hallway - F2	1010	976	1	-47	122	208
South Hallway - F3	1010	979	1	-43	122	208

¹ - E 0.1235 , probe active area 582cm²

² - at the 95% confidence level

CPM/100cm²

-6.6 Average of the measurements
359,385 36Cl DCGL

Final Status Survey Results for
Unit - DN4

Sample Point	Bkg (counts)	Gross (counts)	Count time (in min)	Total Surface Activity ¹ in DPM/100cm ²		
				Gross Beta	Uncertainty ²	MDA
55 - B7	1238	1105	1	-609	435	752
39 - B44	886	894	1	37	379	637
39 - D20	886	688	1	-907	356	637
35 - A18	863	789	1	-339	365	629
35 - F3	1119	1179	1	275	431	715
31 - C7	863	865	1	9	373	629
East Animal Facility Hallway						
C - F2	1010	1026	1	73	405	680
78A - F5	1010	971	1	-179	400	680
74H - F18	1010	920	1	-412	395	680
74F - D14	863	740	1	-564	360	629
20 - D6	863	832	1	-142	370	629
5 - F114	1010	999	1	-50	403	680
81 - F144	1010	941	1	-316	397	680
North Hallway East - F40	1010	916	1	-431	394	680
North Hallway West - F27	1010	957	1	-243	398	680
3 - A1	863	869	1	27	374	629
5 - F96	1238	1315	1	353	454	752
5 - F253	1010	1022	1	55	405	680
61 - B40	1019	1202	1	838	423	683
68A - C13	863	724	1	-637	358	629
74H-2-B4	863	758	1	-481	362	629
74F - C2	863	802	1	-279	366	629
74F - C3	863	870	1	32	374	629
74F - F10	1010	967	1	-197	399	680
78 - A26	863	856	1	-32	372	629
81 - C24	863	732	1	-600	359	629
81 - F22	1010	996	1	-64	402	680
84 - C7	863	753	1	-504	361	629
84 - C12	863	783	1	-367	364	629
North Hallway West - C5	863	864	1	5	373	629
North Hallway West - F45	1010	970	1	-183	400	680
North Hallway West - F76	1010	1049	1	179	408	680
South Hallway - F2	1010	976	1	-156	400	680
South Hallway - F3	1010	979	1	-142	401	680

¹ - E 0.0375, probe active area 582cm²

² - at the 95% confidence level

CPM/100cm²

-6.6 Average of the measurements
807,525 14C DCGL

Final Status Survey Results for
Unit - DN4

Sample Point	Bkg (counts)	Gross (counts)	Count time (in min)	Total Surface Activity ¹ in DPM/100cm ²		
				Gross Alpha	Uncertainty ²	MDA
61 - A10	14	19	1	20	46	73
61 - B47	14	19	1	20	46	73
55 - B4	14	17	1	12	44	73
55 - F13	12	12	1	0	39	68
55 - F54	12	11	1	-4	38	68
64 - A3	9	7	1	-8	32	59
5 - D27	9	10	1	4	35	59
5 - F187	12	13	1	4	40	68
84 - B15	9	6	1	-12	31	59
84 - D20	8	8	1	0	32	56

¹ - E 0.0425, probe active area 582cm²

² - at the 95% confidence level

CPM/100cm²

0.2 Average of the Survey Unit measurements

-0.3 Average of the Reference Area measurements

0.4 Difference

62 DCGL for 238U

5 Largest of Survey Unit measurements

-5 Smallest of the Reference Area measurements

10 Difference

62 DCGL for 238U

Final Status Survey Results for
Unit - 47 Adj. Hallway

Sample Point	Bkg (counts)	Gross (counts)	Count time (in min)	Total Surface Activity ¹ in DPM/100cm ²		
				Gross Beta	Uncertainty ²	MDA
47 Adj. Hallway - B3	1113	1052	1	-85	127	219
47 Adj. Hallway - B8	1113	1050	1	-88	127	219
47 Adj. Hallway - B9	863	823	1	-56	112	193
47 Adj. Hallway - B17	863	835	1	-39	112	193
47 Adj. Hallway - B19	1113	1078	1	-49	128	219
47 Adj. Hallway - B20	1113	1056	1	-79	127	219
47 Adj. Hallway - B21	1113	1077	1	-50	128	219
47 Adj. Hallway - B23	1113	1073	1	-56	127	219
47 Adj. Hallway - D1	863	896	1	46	114	193
47 Adj. Hallway - D4	863	867	1	6	113	193
47 Adj. Hallway - D6	863	816	1	-65	112	193
47 Adj. Hallway - D12	886	823	1	-88	113	195
47 Adj. Hallway - D13	863	875	1	17	114	193
47 Adj. Hallway - D18	863	810	1	-74	112	193
47 Adj. Hallway - F2	1010	994	1	-22	122	208

¹ - E 0.06175, probe active area 582cm²

² - at the 95% confidence level

CPM/100cm²

-5.6 Average of the measurements
359,385 36CI DCGL

Final Status Survey Results for
Unit - 47 Adj Hallway

Sample Point	Bkg (counts)	Gross (counts)	Count time (in min)	Total Surface Activity ¹ in DPM/100cm ²		
				Gross Alpha	Uncertainty ²	MDA
47 Adjacent Hallway - B5	9	10	1	4	35	59
47 Adjacent Hallway - B8	9	8	1	-4	33	59
47 Adjacent Hallway - B11	9	9	1	0	34	59
47 Adjacent Hallway - B12	9	7	1	-8	32	59
47 Adjacent Hallway - B13	9	7	1	-8	32	59
47 Adjacent Hallway - B14	9	7	1	-8	32	59
47 Adjacent Hallway - B16	8	6	1	-8	30	56
47 Adjacent Hallway - B17	9	10	1	4	35	59
47 Adjacent Hallway - B19	9	8	1	-4	33	59
47 Adjacent Hallway - D8	9	10	1	4	35	59

¹ - E 0.0425, probe active area 582cm²

² - at the 95% confidence level

CPM/100cm²

-0.1 Average of the Survey Unit measurements

-0.2 Average of the Reference Area measurements

0.0 Difference

62 DCGL for 238U

1 Largest of Survey Unit measurements

-3 Smallest of the Reference Area measurements

4 Difference

62 DCGL for 238U

Final Status Survey Results for
Unit - 47 Adj. Hallway

Sample Point	Bkg (counts)	Gross (counts)	Count time (in min)	Total Surface Activity ¹ in DPM/100cm ²		
				Gross Beta	Uncertainty ²	MDA
47 Adj. Hallway - B3	1113	1052	1	-279	418	714
47 Adj. Hallway - B8	1113	1050	1	-289	418	714
47 Adj. Hallway - B9	863	823	1	-183	369	629
47 Adj. Hallway - B17	863	835	1	-128	370	629
47 Adj. Hallway - B19	1113	1078	1	-160	420	714
47 Adj. Hallway - B20	1113	1056	1	-261	418	714
47 Adj. Hallway - B21	1113	1077	1	-165	420	714
47 Adj. Hallway - B23	1113	1073	1	-183	420	714
47 Adj. Hallway - D1	863	896	1	151	377	629
47 Adj. Hallway - D4	863	867	1	18	374	629
47 Adj. Hallway - D6	863	816	1	-215	368	629
47 Adj. Hallway - D12	886	823	1	-289	371	637
47 Adj. Hallway - D13	863	875	1	55	374	629
47 Adj. Hallway - D18	863	810	1	-243	367	629
47 Adj. Hallway - F2	1010	994	1	-73	402	680

¹ - E 0.0375, probe active area 582cm²

² - at the 95% confidence level

CPM/100cm²

-5.6 Average of the measurements
807,525 14C DCGL

Final Status Survey Results for
Unit - 47

Sample Point	Bkg (counts)	Gross (counts)	Count time (in min)	Total Surface Activity ¹ in DPM/100cm ²		
				Gross Alpha	Uncertainty ²	MDA
47 - A5	9	8	1	-4	33	59
47 - A11	9	8	1	-4	33	59
47 - B10	9	9	1	0	34	59
47 - B14	9	9	1	0	34	59
47 - B15	9	9	1	0	34	59
47 - C11	9	11	1	8	35	59
47 - D15	9	7	1	-8	32	59
47 - F24	12	10	1	-8	37	68
47 - F25	12	12	1	0	39	68
47 - F28	12	9	1	-12	36	68

¹ - E 0.0425, probe active area 582cm²

² - at the 95% confidence level

CPM/100cm²

-0.1 Average of the Survey Unit measurements

-0.5 Average of the Reference Area measurements

0.4 Difference

62 DCGL for 238U

2 Largest of Survey Unit measurements

-5 Smallest of the Reference Area measurements

7 Difference

62 DCGL for 238U

Final Status Survey Results for
Unit - 47

Sample Point	Bkg (counts)	Gross (counts)	Count time (in min)	Total Surface Activity ¹ in DPM/100cm ²		
				Gross Beta	Uncertainty ²	MDA
47 - A1	863	886	1	32	114	193
47 - A2	863	886	1	32	114	193
47 - A5	863	862	1	-1	113	193
47 - A7	863	827	1	-50	112	193
47 - A8	863	851	1	-17	113	193
47 - A9	863	865	1	3	113	193
47 - A13	863	811	1	-72	112	193
47 - A16	863	825	1	-53	112	193
47 - B9	863	849	1	-19	113	193
47 - B12	863	802	1	-85	111	193
47 - B14	863	819	1	-61	112	193
47 - C1	863	886	1	32	114	193
47 - C10	863	833	1	-42	112	193
47 - D13	886	859	1	-38	114	195
47 - F23	1010	979	1	-43	122	208

¹ - E 0.06175, probe active area 582cm²

² - at the 95% confidence level

CPM/100cm²

-3.2 Average of the measurements
359,385 36CI DCGL

Final Status Survey Results for
Unit - 47

Sample Point	Bkg (counts)	Gross (counts)	Count time (in min)	Total Surface Activity ¹ in DPM/100cm ²		
				Gross Beta	Uncertainty ²	MDA
47 - A1	863	886	1	105	376	629
47 - A2	863	886	1	105	376	629
47 - A5	863	862	1	-5	373	629
47 - A7	863	827	1	-165	369	629
47 - A8	863	851	1	-55	372	629
47 - A9	863	865	1	9	373	629
47 - A13	863	811	1	-238	367	629
47 - A16	863	825	1	-174	369	629
47 - B9	863	849	1	-64	372	629
47 - B12	863	802	1	-279	366	629
47 - B14	863	819	1	-202	368	629
47 - C1	863	886	1	105	376	629
47 - C10	863	833	1	-137	370	629
47 - D13	886	859	1	-124	375	637
47 - F23	1010	979	1	-142	401	680

¹ - E 0.0375, probe active area 582cm²

² - at the 95% confidence level

CPM/100cm²

-3.2 Average of the measurements
807525 14C DCGL