

Rancho Seco

Final Status Survey Summary Report

(Rev. 1)

June 16, 2008

West Decay Heat Removal Pump Room (lowers)

Survey Unit F8130011

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FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8130011, West Decay Heat Removal Pump Room (lowers)

Survey Unit Description:

Operating History: The Auxiliary Building, a reinforced concrete structure contained the RadWaste processing and supporting systems. The building contained six main elevations. Residual radioactive material was known to be present on all levels of the interior of the building. Operating records and the HSA document several events with the potential for a release of radioactivity inside this structure.

Site Characterization: Direct measurements were made of each of the interior elevation surfaces as well as the exterior surfaces of the structure. These measurements confirmed the presence of plant-derived radionuclides. Direct measurements on the -47' elevation showed a mean gross activity level of 320,071 dpm/100 cm² and a maximum value of 5,720,000 dpm/100 cm. Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the West Decay Heat Removal Pump Room of the auxiliary building was determined to be a Class 1 survey unit.

HSA Events: HSA Report pg. 63.

Survey Unit Design Information:

The Survey Unit Design Parameters are presented in Table 1 below. The survey unit and measurement locations are depicted on the maps in Attachment 1. Direct measurement locations were determined using a random-start, fixed grid pattern and 189 m² were scanned for 100% coverage. Samples of removable contamination were collected at each direct measurement location. The instrumentation used for the survey along with the MDC values are listed in Tables 2-1 and 2-2 in Attachment 2.

Table 1. Survey Unit Design Parameters

Survey Design Parameter	Value	Comment
Survey Area:	F813	West Decay Heat Removal Pump Room (lowers) Structure Surface LTP Table 5-4
Survey Unit:	0011	
Class:	1	
SU Area (m ²):	189	Gross Activity DCGL Class 1
Evaluator:	D.A.Tallman	
DCGL (dpm/100 cm ²):	43000	
Area Factor:	3.54	Class 1
Design DCGL _{emc} (dpm/100 cm ²):	152220	
LBGR (dpm/100 cm ²):	21500	Default = 50% DCGL
Design Sigma (dpm/100 cm ²):	9976	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m ²):	7	Class 1
Scan Area (m ²):	189	
Scan Coverage (%):	100%	Class 1
Z _{1-α} :	1.645	
Z _{1-β} :	1.645	
Sign P:	0.97725	
Calculated Relative Shift:	2.1	
Relative Shift Used:	2.1	Uses 3.0 if Relative Shift is >3
N-Value:	12	
Design N-Value + 20%:	15	NUREG-1575 Table 5-5
Design Min Samples N:	27	Class 1
Grid Spacing L:	2.6	Class 1

Survey Results:

A total of 30 direct measurements were made in F8130011. The results including mean, median, standard deviation and range are shown in Table 2. All direct measurements were less than the DCGL. Two of the scan measurements indicated areas of elevated activity. Scan activity ranged from 1300 to 62318 dpm/100 cm², based on a surveyor efficiency of 0.5 and no background subtracted. Samples for removable surface activity were all less than 10% of the DCGL as shown in Table 3. Removable surface activity samples were counted for alpha activity and none was detected at the MDC shown in Table 2-1 of Attachment 2.

Table 2. Direct Measurement Results

Measurement ID	Gross Activity (dpm/100 cm ²)
F8130011-C0001BD	1758
F8130011-C0002BD	7018
F8130011-C0003BD	2007
F8130011-C0004BD	5841
F8130011-C0005BD	1950
F8130011-C0006BD	1852
F8130011-C0007BD	3081
F8130011-C0008BD	1665
F8130011-C0009BD	1935
F8130011-C0010BD	1369
F8130011-C0011BD	1509
F8130011-C0012BD	1437
F8130011-C0013BD	2236
F8130011-C0014BD	1629
F8130011-C0015BD	1707
F8130011-C0016BD	2723
F8130011-C0017BD	6951
F8130011-C0018BD	2111
F8130011-C0019BD	1504
F8130011-C0020BD	1546
F8130011-C0021BD	1878
F8130011-C0022BD	1930
F8130011-C0023BD	1660
F8130011-C0024BD	1421
F8130011-C0025BD	1484
F8130011-C0026BD	1359
F8130011-C0027BD	1229
F8130011-C0028BD	1375
F8130011-C0029BD	9187
F8130011-C0030BD	2931
Mean:	2543
Median:	1805
Standard Deviation:	1981
Range:	1229 - 9187

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm ²)
F8130011C0001SM	4.86
F8130011C0002SM	3.58
F8130011C0003SM	6.14
F8130011C0004SM	4.86
F8130011C0005SM	6.14
F8130011C0006SM	8.7
F8130011C0007SM	38.19
F8130011C0008SM	9.98
F8130011C0009SM	11.27
F8130011C0010SM	8.7
F8130011C0011SM	25.37
F8130011C0012SM	17.68
F8130011C0013SM	16.39
F8130011C0014SM	15.11
F8130011C0015SM	20.24
F8130011C0016SM	18.96
F8130011C0017SM	97.15
F8130011C0018SM	9.98
F8130011C0019SM	7.42
F8130011C0020SM	7.42
F8130011C0021SM	12.55
F8130011C0022SM	6.14
F8130011C0023SM	3.58
F8130011C0024SM	3.58
F8130011C0025SM	7.42
F8130011C0026SM	13.83
F8130011C0027SM	6.14
F8130011C0028SM	6.14
F8130011C0029SM	66.39
F8130011C0030SM	44.6
Mean:	16.95
Median:	9.34
Standard Deviation:	20.48
Range:	3.58 to 97.15

Survey Unit Data Assessment:

The survey design required 30 direct measurements for the Sign Test. The critical value and the results of the Sign Test are presented in Table 4. The sample mean and median values were less than the DCGL. The sample standard deviation was less than the design standard deviation so no additional samples were required.

Table 4. Data Assessment Results

Survey Results Parameter	Value	Comment
Material Background Used (dpm/100 cm ²):	N/A	
Ambient Background Used (dpm/100 cm ²):	N/A	Average Ambient BKG = 0
Actual Direct Measurements (N):	30	
Median (dpm/100 cm ²):	1805	
Mean (dpm/100 cm ²):	2543	
Direct Measurement Standard Deviation (dpm/100 cm ²):	1981	
Total Standard Deviation (dpm/100 cm ²):	1981	Based on samples and backgrounds.
Maximum (dpm/100 cm ²):	9187	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	30	
S+ Value:	30	
Critical Value:	20	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGL_{emc}:	Yes	Class 1
Total Standard Deviation <= Sigma:	Yes	
Pass the Sign Test?	Yes	
Reject the Null Hypothesis?	Yes	
Does the Survey Unit Pass All Criteria?	Yes	

Survey Unit Investigations and Results:

Two (2) investigations (Beta Scan Grid 18 and 105) were required for the scan measurements based on the investigation level, as detailed in attachment 2 table 2.2 and the results are reported in Attachment 3. The EMC unity rule was not exceeded as shown in Table 3-1.

During routine surveillance surveys utilizing the 44-10 NaI detector, discovery was made in grids 06, 12, and 30. The results of this discovery are detailed in Revision 1 to Attachment 3. The EMC unity rule was not exceeded as shown in Revision 1 to Table 3-1.

ALARA Statement:

As stated in Chapter 4 of the LTP, as long as the residual activity within the survey unit is less than the DCGL (i.e. the survey unit average activity is less than the DCGL and the EMC criterion has been met), the ALARA criterion has been met.

Changes in Initial Survey Unit Assumptions:

The survey unit was designed as a Class 1 structure survey and the sample results are consistent with that classification. The variability of the survey results was less than the characterization data used for survey design. Two potential area of elevated activity were detected and evaluated as shown in Attachment 3. Therefore the EMC criterion was met.

Conclusion:

The FSS of this survey unit was properly designed as a Class 1 survey based on Table 5-4 of the LTP. The required number of direct measurements was made and the scan coverage met the requirement of Table 5-6 of the LTP. No direct measurements exceeded the DCGL of 43000 dpm/100 cm² and none of the removable surface activity measurements exceeded 10% of the DCGL. The required investigations were performed and the results documented demonstrating compliance with the acceptance criteria.

The direct measurement data support rejection of the null hypothesis, providing high confidence that the survey unit satisfied the release criteria and that the data quality objectives were met.

It is concluded that survey unit F8130011 meets the release criteria of 10CFR20.1402.

Attachment 2 (Rev. 1)

Instrumentation

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Table 2-1. Survey Unit Instrumentation

Instrument Model; Serial No.	Detector Model; Serial No.	MDC Static (dpm/100 cm²)	MDC Scan (dpm/100 cm²)
M2350; 193700	43-68B; 190294	433	1033
M2350; 149789	43-68B; 161397	433	1033
M2350; 203481	43-68B; 148629	433	1033
M2350; 142515	43-68B; 148453	433	1033
M2350; 149794	43-68/5B; 149103	433	1033
M2350; 142515	43-116-1B; 256007 ¹	491	739
M2350; 149794	43-116-1B; 256005 ¹	491	739
M2350; 149794	43-116-1B; 256005	796	3258
M2350; 203482	44-10; 211672	NA	18720
M2350; 203486	44-10; 171995	NA	18720
Tennelec; 0401171	N/A	5.15 dpm α , 8.12 dpm β	N/A

¹Juncture

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	152220
Investigation Criteria – Scan	43000 ^{1,2}
DCGL _w	43000
DCGL _{EMC}	152220

¹ Scan Investigation Level set at DCGL_w

² Scan Investigation Level for routine 44-10 surveillance scan set at 20,000 cpm.

Attachment 3 (Rev. 1)

Investigation

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Table 3-1 Survey Unit Investigation

<i>Grid</i>	<i>Investigation Level (cpm)</i>	<i>Initial Value (cpm)</i>	<i>Investigation Result (cpm)</i>	<i>Elevated Area (m²)</i>	<i>Area Factor</i>	<i>DCGL_{emc}</i>	<i>Investigation Result (dpm/100cm²)</i>	<i>DCGL_{emc} Unity Fraction</i>
C0018	5840	8495	1461	N/A	N/A	N/A	<DCGL _w	0.0
C0105	5840	5921	5678	N/A	N/A	N/A	<DCGL _w	0.0
06GS	20000	48000	48000	0.01	1294.1	55,646,300	1,863,063	0.033
12GS	20000	36000	36000	0.005	2333.3	100,331,900	1,397,297	0.014
30GS	20000	35000	35000	0.01	1294.1	55,646,300	1,358,483	0.024
Comments: During routine surveillance surveys using the 44-10 (NaI), discovery was made within grids 06, 12, & 30.								
Survey Unit Remainder						DCGL = 43,000	SU Mean = 6194	0.144
EMC Unity Sum								0.217