Rancho Seco

Final Status Survey Summary Report

February 7, 2008

Room 113 Make Up Tank Room

Survey Unit F8131011

Prepared By: _____ Date: 3.14.2008

FSS Engineer

Reviewed By: _____ Date: 3/18/08

Lead FSS Engineer

Approved By: _____ Date: 3-18-08

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8131011, Room 113

Survey Unit Description:

Operating History: The 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. One report documented contamination of the auxiliary building roof. The roof was later replaced.

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 cm². Direct measurements on the –29' elevation showed a mean gross activity level of 544,756 dpm/100 cm² and a maximum value of 11,370,000 dpm/100 cm². Direct measurements on the –20' elevation showed a mean gross activity level of 247,831 dpm/100 cm² and a maximum value of 10,080,000 dpm/100 cm². Direct measurements on the grade elevation showed a mean gross activity level of 373,758 dpm/100 cm² and a maximum value of 5,800,000 dpm/100 cm². Direct measurements on the +20' elevation showed a mean gross activity level of 85,408 dpm/100 cm² and a maximum value of 1,900,000 dpm/100 cm². Direct measurements on the +40' elevation showed a mean gross activity level of 3,288 dpm/100 cm² and a maximum value of 24,781 dpm/100 cm². Direct measurements on the building exterior, including the mezzanine roof, showed a mean gross activity level of 1,897 dpm/100 cm² and a maximum value of 2,990 dpm/100 cm². (The roof had been replaced prior to the classification survey.) Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the interior of the auxiliary building was determined to be a Class 1, 2 area and the exterior was a Class 2,3.

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 60 m² were scanned for approximately 39% 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	Room 113
Survey Unit:	1011	Structure Surface
Class:	2	LTP Table 5-4
SU Area (m^2)**:**	155	
Evaluator:	Gary Frank	
DCGL (dpm/100 cm^2)**:**	43000	Gross Activity DCGL
Area Factor:	N/A	Class 2
Design DCGLemc (dpm/100 cm^2)**:**	N/A	Class 2
LBGR (dpm/100 cm^2)**:**	21500	Default = 50% DCGL
Design Sigma (dpm/100 cm^2)**:**	6935	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m^2)**:**	11	Class 2
Scan Area (m^2)**:**	60	
Scan Coverage (%):	39%	Class 2
$Z_{1-\alpha}$ **:**	1.645	
$Z_{1-\beta}$ **:**	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	3.1	
Relative Shift Used:	3	Uses 3.0 if Relative Shift is >3
N-Value:	11	
Design N-Value + 20%:	14	NUREG-1575 Table 5-5
Design Min Samples N:	14	Class 2
Grid Spacing L:	3.3	Class 2

Survey Results:

A total of 22 direct measurements were made in F8131011. The results including mean, median, standard deviation and range are shown in Table 2. All direct measurements were less than the DCGL. None of the scan measurements indicated areas of elevated activity. Scan activity ranged from 4284 to 14576 dpm/100 cm², based on a surveyor efficiency of 0.5 and no background subtracted. InSpector scan activity for penetrations P0064 through P0068 ranged from 734 to 2760 dpm/100cm^2 for Cs-137, with all scans MDA for Co-60 with a range of 812 to 2630 dpm/100cm^2. 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)
F8131011-C0001BD	1592
F8131011-C0002BD	1577
F8131011-C0003BD	1587
F8131011-C0004BD	1535
F8131011-C0005BD	1468
F8131011-C0006BD	1603
F8131011-C0007BD	1660
F8131011-C0008BD	1587
F8131011-C0009BD	1598
F8131011-C0010BD	1712
F8131011-C0011BD	1795
F8131011-C0012BD	1613
F8131011-C0013BD	1847
F8131011-C0014BD	1774
F8131011-C0015BD	1764
F8131011-C0016BD	1670
F8131011-C0017BD	1883
F8131011-C0018BD	2578
F8131011-C0019BD	2085
F8131011-C0020BD	2158
F8131011-C0021BD	1873
F8131011-C0022BD	1904
Mean:	1766
Median:	1691
Standard Deviation:	253
Range:	1468 - 2578

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm^2)
F8131011C0001SM	2.93
F8131011C0002SM	-4.82
F8131011C0003SM	-2.24
F8131011C0004SM	2.93
F8131011C0005SM	1.64
F8131011C0006SM	-0.95
F8131011C0007SM	-3.53
F8131011C0008SM	-4.82
F8131011C0009SM	-2.24
F8131011C0010SM	-2.24
F8131011C0011SM	-0.95
F8131011C0012SM	13.26
F8131011C0013SM	-3.53
F8131011C0014SM	4.22
F8131011C0015SM	0.34
F8131011C0016SM	4.22
F8131011C0017SM	19.72
F8131011C0018SM	39.09
F8131011C0019SM	22.3
F8131011C0020SM	32.63
F8131011C0021SM	6.8
F8131011C0022SM	6.8
Mean:	5.98
Median:	2.28
Standard Deviation:	12.16
Range:	-4.82 to 39.09

Survey Unit Data Assessment:

The survey design required 22 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 cm²):	N/A	
Ambient Background Used (dpm/100 cm²):	N/A	Average Ambient BKG = 0
Actual Direct Measurements (N):	22	
Median (dpm/100 cm²):	1691	
Mean (dpm/100 cm²):	1766	
Direct Measurement Standard Deviation (dpm/100 cm²):	253	
Total Standard Deviation (dpm/100 cm²):	253	Based on samples and backgrounds.
Maximum (dpm/100 cm²):	2578	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	22	
S+ Value:	22	
Critical Value:	15	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGLemc:	N/A	Class 2
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:

No investigations were required for either direct or scan measurements and no investigation results are reported.

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, the ALARA criterion has been met.

Changes in Initial Survey Unit Assumptions:

The survey unit was designed as a Class 2 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. No potential areas of elevated activity were detected.

Conclusion:

The FSS of this survey unit was properly designed as a Class 2 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 cm^2 and none of the removable surface activity measurements exceeded 10% of the DCGL. No investigations were required.

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.

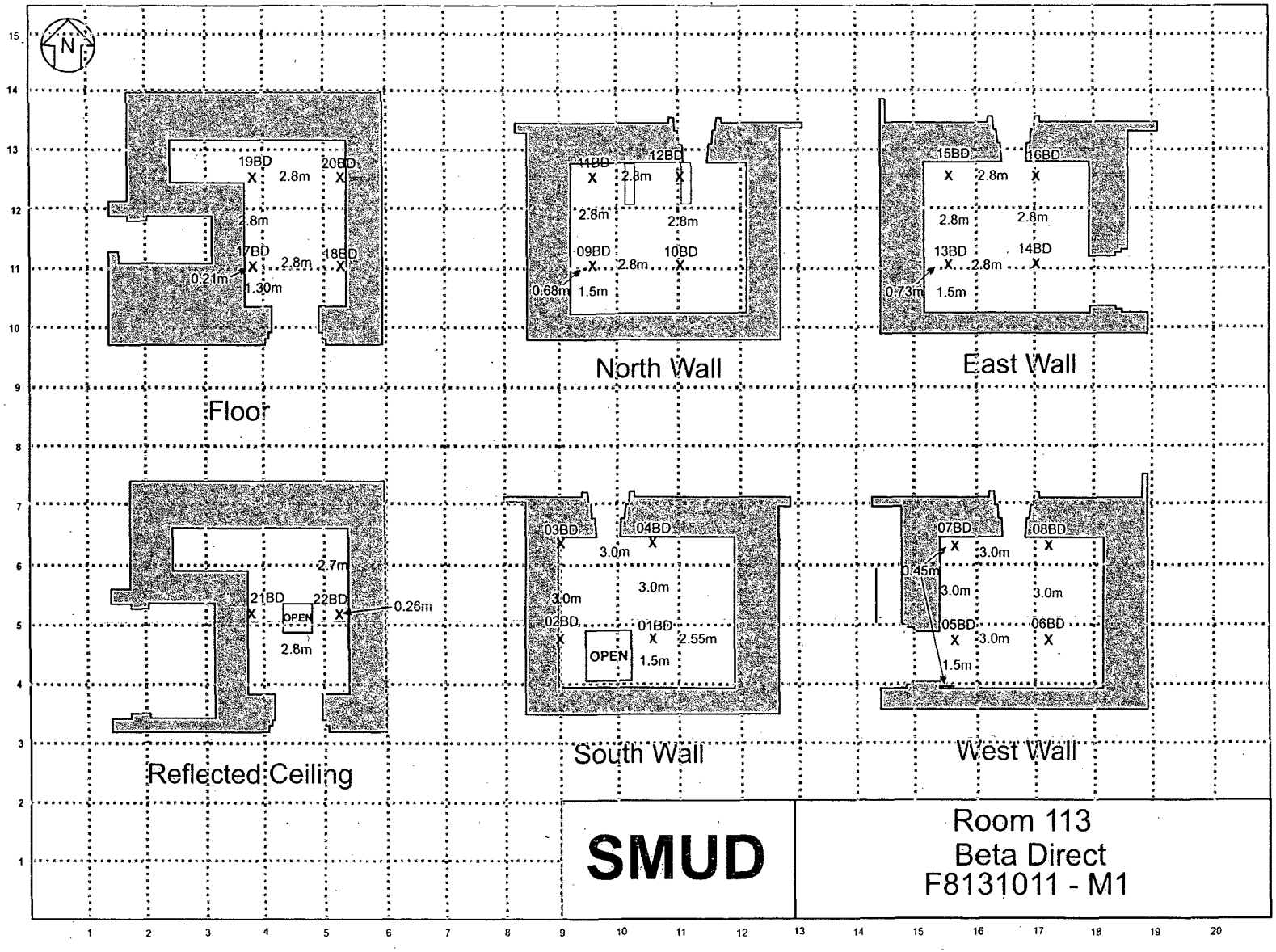
It is concluded that survey unit F8131011 meets the release criteria of 10CFR20.1402.

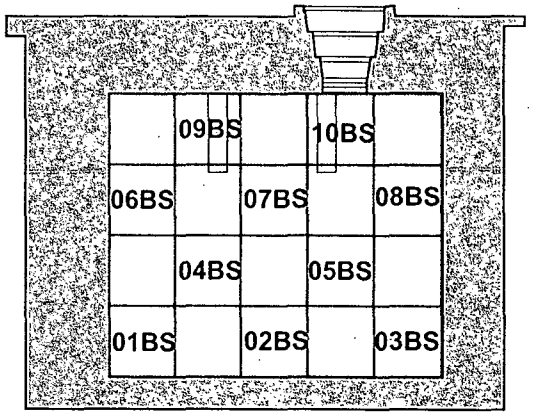
Attachment 1

Maps

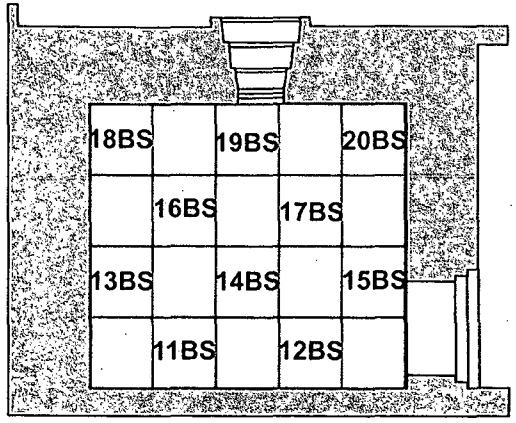
February 7, 2008

Survey Unit F8131011

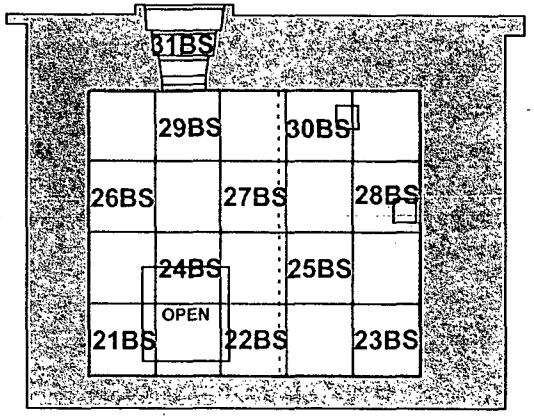

Floor
19BD
20BD
2.8m
17BD
18BD
0.21m
1.30m
North Wall
14BD
12BD
09BD
10BD
0.68m
1.5m
East Wall
15BD
16BD
13BD
14BD
0.73m
1.5m
Reflected Ceiling
2.7m
21BD
22BD
OPEN
0.26m
South Wall
03BD
04BD
3.0m
02BD
01BD
2.55m
West Wall
07BD
08BD
0.45m
05BD
06BD
SMUD
Room 113
Beta Direct
F8131011 - M1



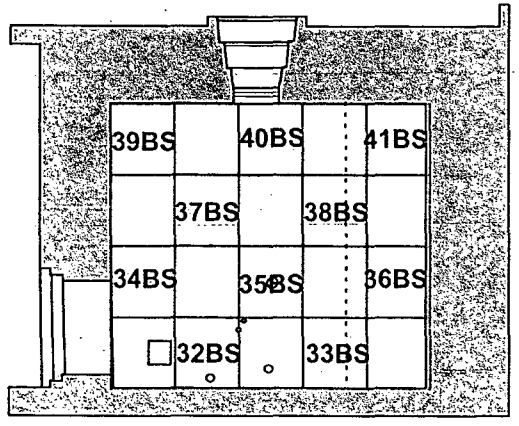
North Wall



East Wall



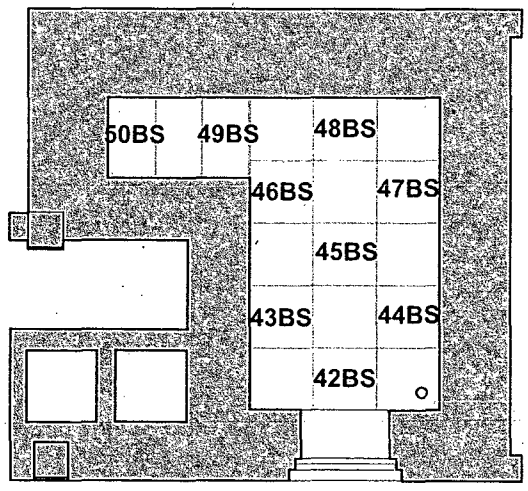
South Wall



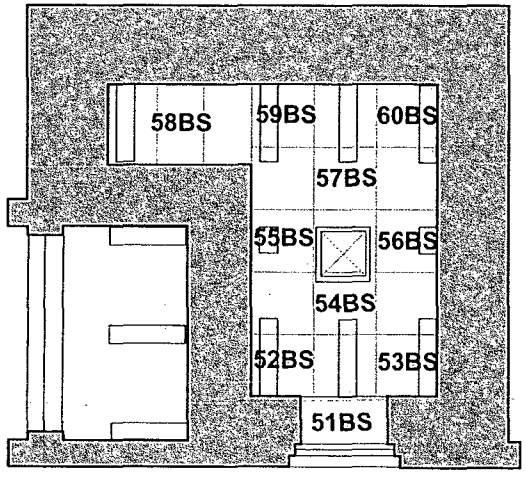
West Wall

SMUD

Room 113
Wall Beta Scans
F8131011 - M2

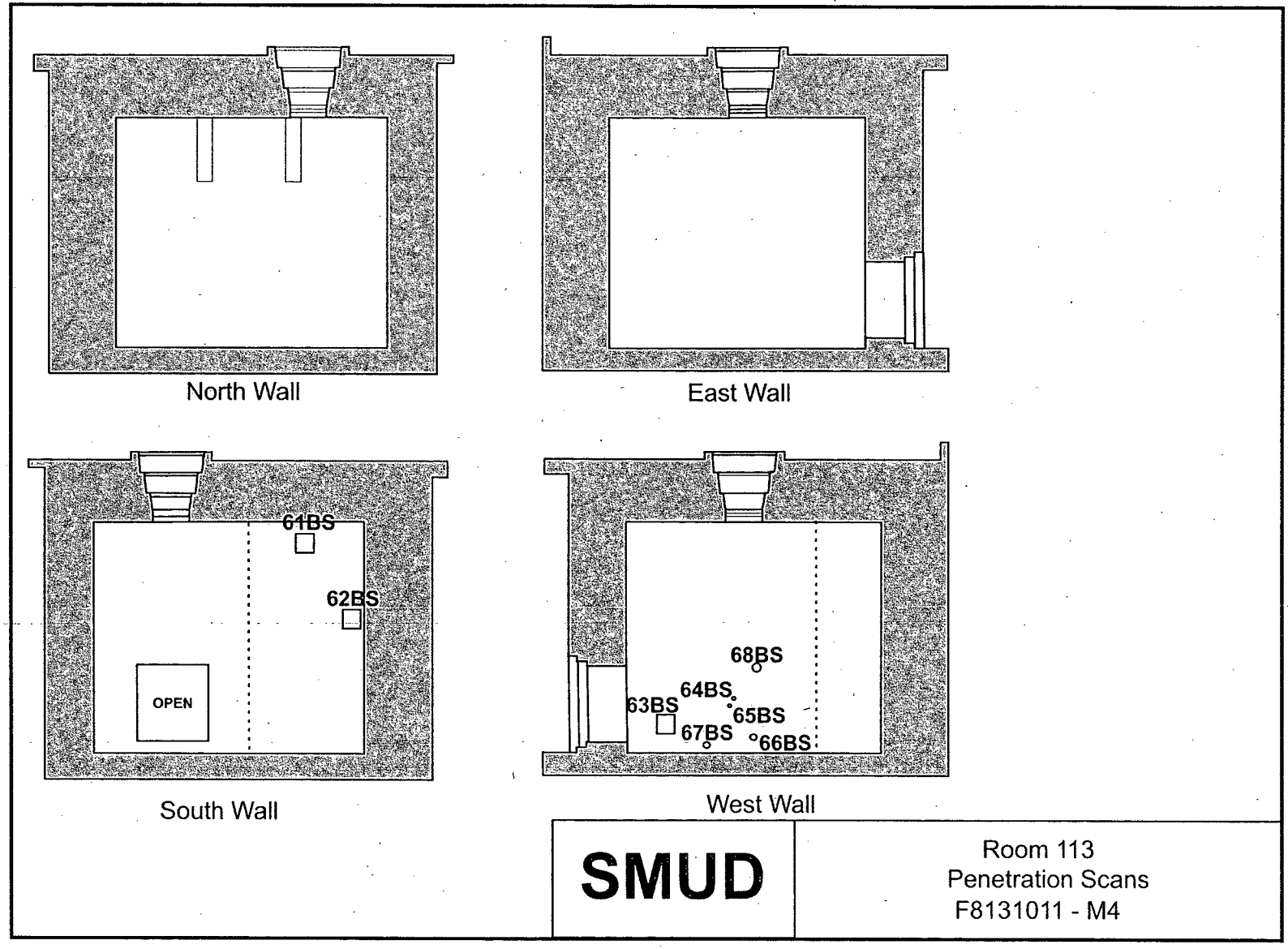


Floor



Reflected Ceiling

SMUD	ROOM 113 FLOOR & REFLECTED CEILING BETA SCAN MEASUREMENTS F8131011 - M3


North Wall
East Wall
61BS
62BS
OPEN
South Wall
68BS
64BS
63BS
65BS
67BS
66BS
West Wall
SMUD
Room 113
Penetration Scans
F8131011 - M4

Attachment 2

Instrumentation

February 7, 2008

Survey Unit F8131011

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; 203486	43-68B; 161400	433	1033
Tennelec; 0401171	N/A	5 dpm α, 11 dpm β	N/A

Table 2.1, Survey Unit Instrumentation

Instrument	Detector Serial No.	MDC (dpm/100cm^2)
InSpector	08051294	734 Cs-137 812 C0-60

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm^2)
Investigation Criteria - Direct	43000
Investigation Criteria – Scan	43000
$DCGL_W$	43000
$DCGL_{EMC}$	N/A

Attachment 3

Investigation

February 7, 2008

Survey Unit F8131011

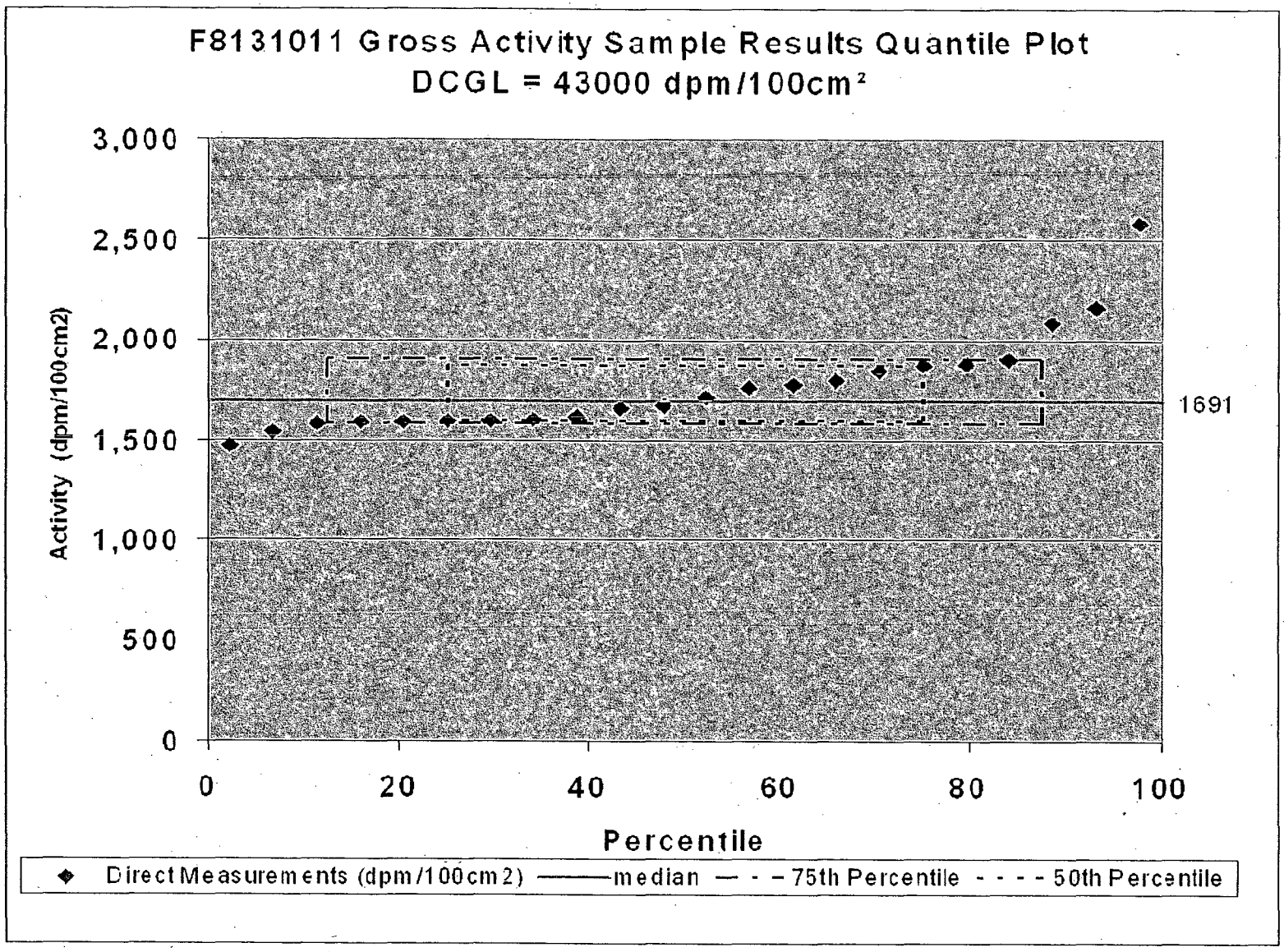
(none required)

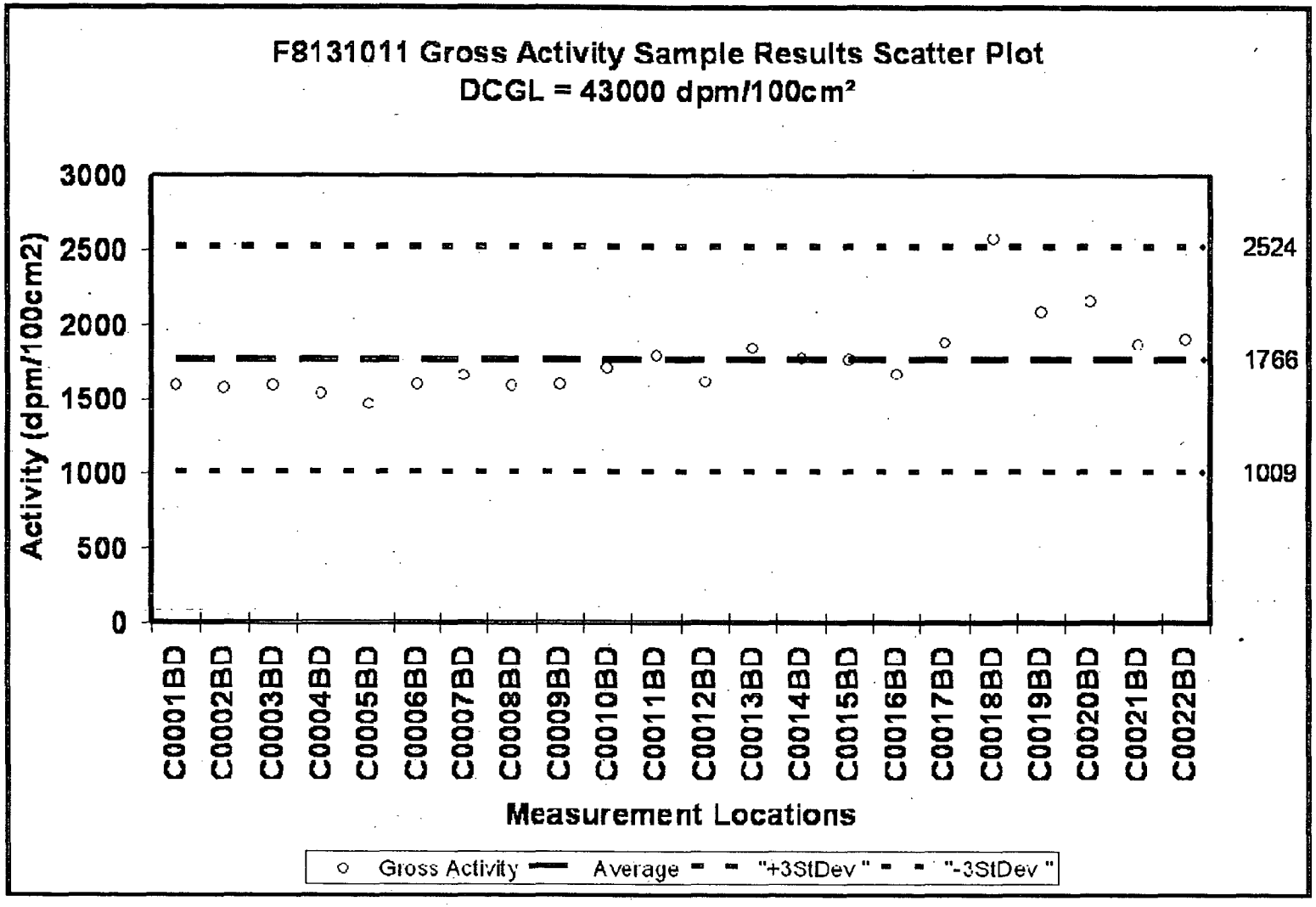
Attachment 4

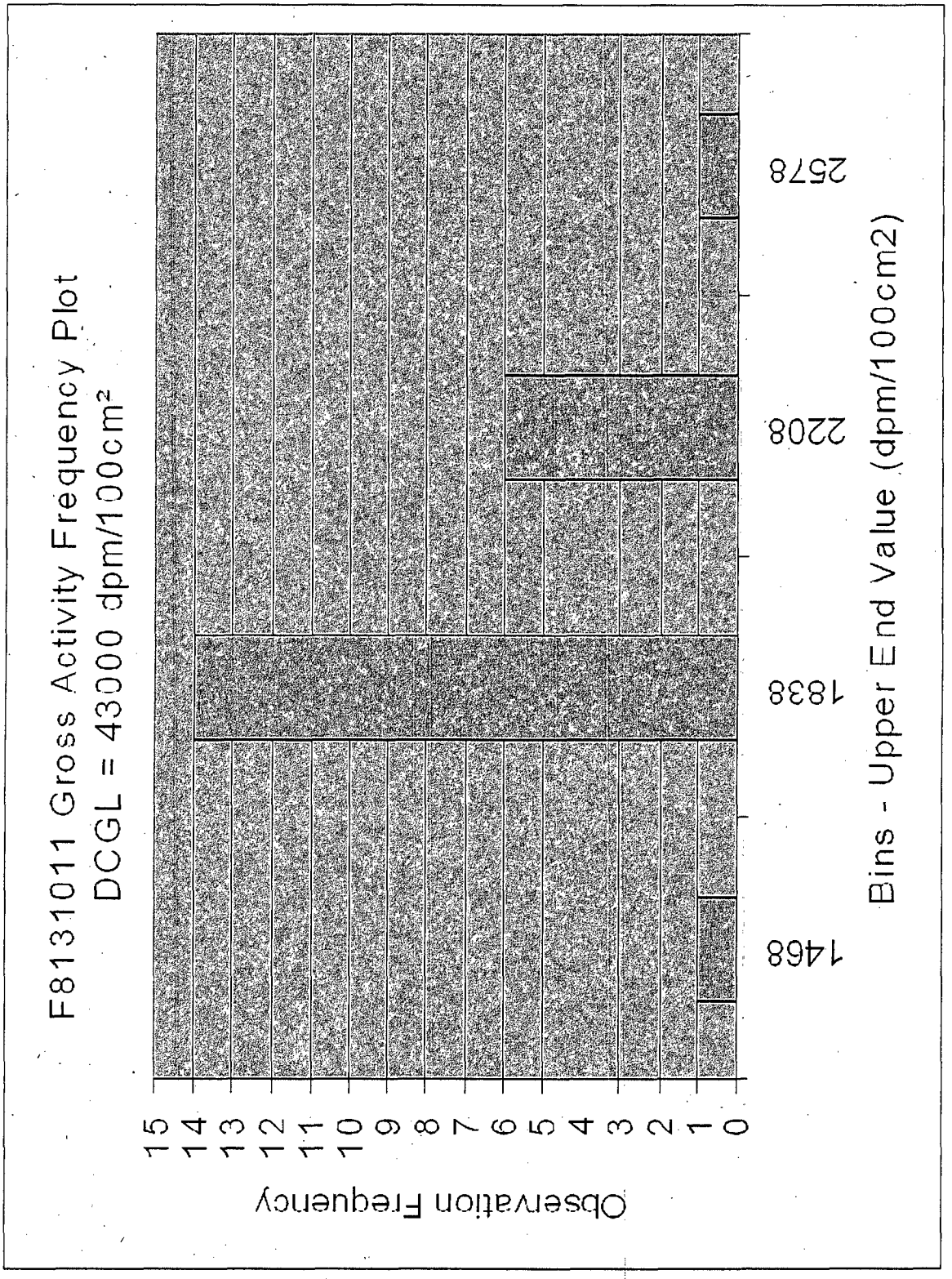
Data Assessment

February 7, 2008

Survey Unit F8131011


F8131011 Gross Activity Sample Results Quantile Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
3,000
2,500
2,000
1,500
1,000
500
0
1691
0
20
40
60
80
100
Percentile
Direct Measurements (dpm/100cm2)
median
75th Percentile
50th Percentile


F8131011 Gross Activity Sample Results Scatter Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
3000
2500
2000
1500
1000
500
0
2524
1766
1009
C0001BD
C0002BD
C0003BD
C0004BD
C0005BD
C0006BD
C0007BD
C0008BD
C0009BD
C0010BD
C0011BD
C0012BD
C0013BD
C0014BD
C0015BD
C0016BD
C0017BD
C0018BD
C0019BD
C0020BD
C0021BD
C0022BD
Measurement Locations
Gross Activity
Average
"+3StDev"
"-3StDev"


F8131011 Gross Activity Frequency Plot
DCGL = 43000 dpm/100cm²
Observation Frequency
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
1468
1838
2208
2578
Bins - Upper End Value (dpm/100cm2)