Rancho Seco

Final Status Survey Summary Report

February 6, 2008

Rooms 115/203/315 Elevator Shaft

Survey Unit F8131031

Prepared By: _____ **Date:** 2-6-2008

FSS Engineer

Reviewed By: _____ **Date:** 2/14/08

Lead FSS Engineer

Approved By: _____ **Date:** 4-21-08

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8131031, Rooms 115/203/315 Elevator Shaft

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 cm^2 and a maximum value of 5,720,000 dpm/100 cm^2. Direct measurements on the –29' elevation showed a mean gross activity level of 544,756 dpm/100 cm^2 and a maximum value of 11,370,000 dpm/100 cm^2. Direct measurements on the –20' elevation showed a mean gross activity level of 247,831 dpm/100 cm^2 and a maximum value of 10,080,000 dpm/100 cm^2. Direct measurements on the grade elevation showed a mean gross activity level of 373,758 dpm/100 cm^2 and a maximum value of 5,800,000 dpm/100 cm^2. Direct measurements on the +20' elevation showed a mean gross activity level of 85,408 dpm/100 cm^2 and a maximum value of 1,900,000 dpm/100 cm^2. Direct measurements on the +40' elevation showed a mean gross activity level of 3,288 dpm/100 cm^2 and a maximum value of 24,781 dpm/100 cm^2. Direct measurements on the building exterior, including the mezzanine roof, showed a mean gross activity level of 1,897 dpm/100 cm^2 and a maximum value of 2,990 dpm/100 cm^2. (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 160 m^2 were scanned for approximately 80% 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	Rooms 115/203/315 Elevator Shaft
Survey Unit:	1031	Structure Surface
Class:	2	LTP Table 5-4
SU Area (m^2)**:**	199	
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)**:**	enter value	Class 2
Scan Area (m^2)**:**	160	
Scan Coverage (%):	80%	Class 2
$Z_{1-\alpha}$ **:**	1.645	
$Z_{1-\beta}$ **:**	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	3.6	
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:	3.7	Class 2

Survey Results:

A total of 15 direct measurements were made in F8131031. 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 1810 to 5759 dpm/100 cm^2, based on a surveyor efficiency of 0.5 and no background subtracted. ISOCS scan activity on walls and ceiling ranged from 81.6 to 688 dpm/100cm^2 for Cs-137, with all scans MDA for Co-60 with a range from 71.6 to 505 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)
F8131031-C0001BD	1089
F8131031-C0002BD	1250
F8131031-C0003BD	1198
F8131031-C0004BD	1344
F8131031-C0005BD	1504
F8131031-C0006BD	1380
F8131031-C0007BD	1276
F8131031-C0008BD	1380
F8131031-C0009BD	1333
F8131031-C0010BD	1255
F8131031-C0011BD	1069
F8131031-C0012BD	1312
F8131031-C0013BD	1146
F8131031-C0014BD	1203
F8131031-C0015BD	1271
Mean:	1267
Median:	1271
Standard Deviation:	116
Range:	1069 - 1504

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm^2)
F8131031C0001SM	0.34
F8131031C0002SM	-4.82
F8131031C0003SM	2.93
F8131031C0004SM	4.22
F8131031C0005SM	6.8
F8131031C0006SM	6.8
F8131031C0007SM	-2.24
F8131031C0007SM	-0.95
F8131031C0008SM	-2.24
F8131031C0009SM	-2.24
F8131031C0010SM	15.84
F8131031C0011SM	-3.53
F8131031C0012SM	0.34
F8131031C0013SM	-0.95
F8131031C0014SM	-3.53
F8131031C0015SM	5.51
Mean:	1.39
Median:	-0.3
Standard Deviation:	5.38
Range:	-4.82 to 15.84

Survey Unit Data Assessment:

The survey design required 15 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):	15	
Median (dpm/100 cm²):	1271	
Mean (dpm/100 cm²):	1267	
Direct Measurement Standard Deviation (dpm/100 cm²):	116	
Total Standard Deviation (dpm/100 cm²):	116	Based on samples and backgrounds.
Maximum (dpm/100 cm²):	1504	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	15	
S+ Value:	15	
Critical Value:	11	
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 (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 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.

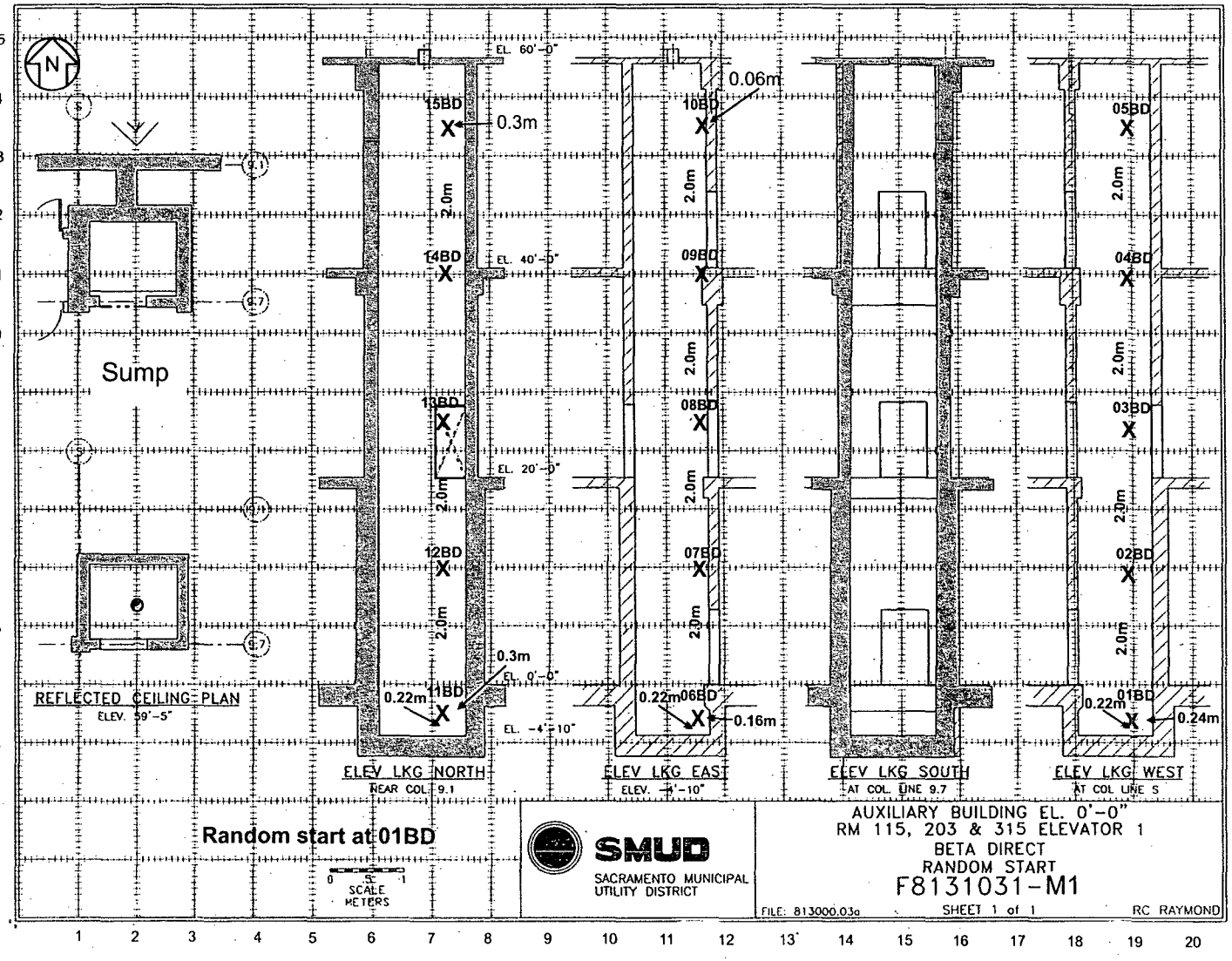
It is concluded that survey unit F8131031 meets the release criteria of 10CFR20.1402.

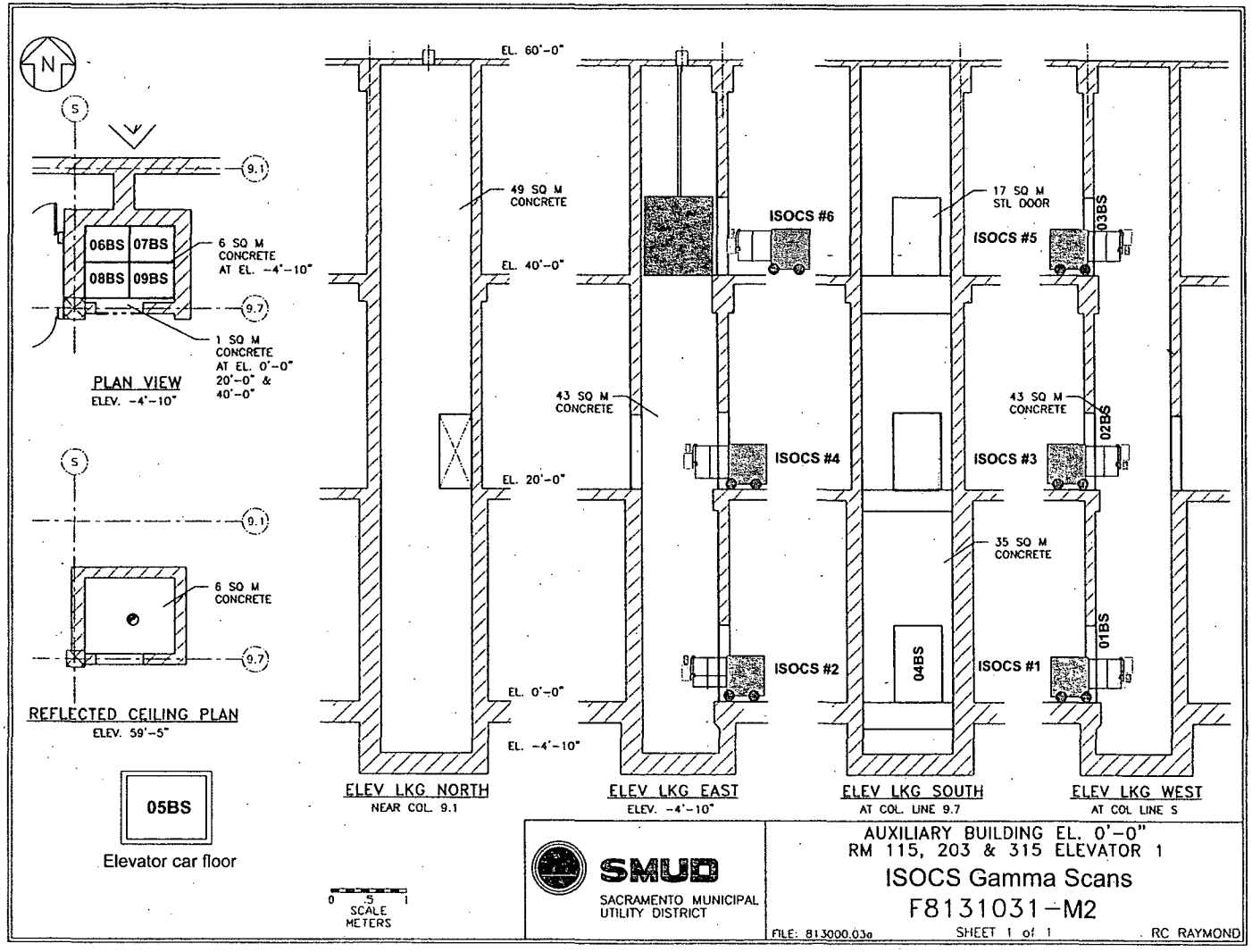
Attachment 1

Maps

February 6, 2008

Survey Unit F8131031


N
Sump
REFLECTED CEILING PLAN
ELEV. 59'-5"
EL. 60'-0"
EL. 40'-0"
EL. 20'-0"
EL. 0'-0"
EL. -4'-10"
15BD
14BD
13BD
12BD
11BD
10BD
09BD
08BD
07BD
06BD
05BD
04BD
03BD
02BD
01BD
0.3m
0.06m
0.22m
0.16m
0.24m
2.0m
ELEV LKG NORTH
NEAR COL. 9.1
ELEV LKG EAST
ELEV. -4'-10"
ELEV LKG SOUTH
AT COL. LINE 9.7
ELEV LKG WEST
AT COL LINE S
Random start at 01BD
SCALE METERS
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
AUXILIARY BUILDING EL. 0'-0"
RM 115, 203 & 315 ELEVATOR 1
BETA DIRECT
RANDOM START
F8131031-M1
FILE: 813000.03a
SHEET 1 of 1
RC RAYMOND


N
S
9.1
9.7
06BS
07BS
08BS
09BS
6 SQ M CONCRETE AT EL. -4'-10"
1 SQ M CONCRETE AT EL. 0'-0" 20'-0" & 40'-0"
PLAN VIEW
ELEV. -4'-10"
6 SQ M CONCRETE
REFLECTED CEILING PLAN
ELEV. 59'-5"
05BS
Elevator car floor
EL. 60'-0"
EL. 40'-0"
EL. 20'-0"
EL. 0'-0"
EL. -4'-10"
49 SQ M CONCRETE
43 SQ M CONCRETE
ISOCS #6
ISOCS #4
ISOCS #2
ELEV LKG NORTH
NEAR COL. 9.1
ELEV LKG EAST
ELEV. -4'-10"
17 SQ M STL DOOR
ISOCS #5
ISOCS #3
ISOCS #1
03BS
02BS
01BS
04BS
35 SQ M CONCRETE
ELEV LKG SOUTH
AT COL. LINE 9.7
ELEV LKG WEST
AT COL LINE S
0 .5 1
SCALE METERS
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
AUXILIARY BUILDING EL. 0'-0"
RM 115, 203 & 315 ELEVATOR 1
ISOCS Gamma Scans
F8131031-M2
FILE: 813000.03a
SHEET 1 of 1
RC RAYMOND

Attachment 2

Instrumentation

February 6, 2008

Survey Unit F8131031

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; 142509	43-68B; 160699	433	1033
Tennelec; 0401171	N/A	5.9 dpm α, 11.7 dpm β	N/A

Table 2.1, Survey Unit Instrumentation

Instrument	Detector Serial No.	MDC (dpm/100cm²)
ISOCS	1983920	163 Cs-137 153 Co-60

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	43000
Investigation Criteria – Scan	43000
$DCGL_W$	43000
$DCGL_{EMC}$	N/A

Attachment 3

Investigation

February 6, 2008

Survey Unit F8131031

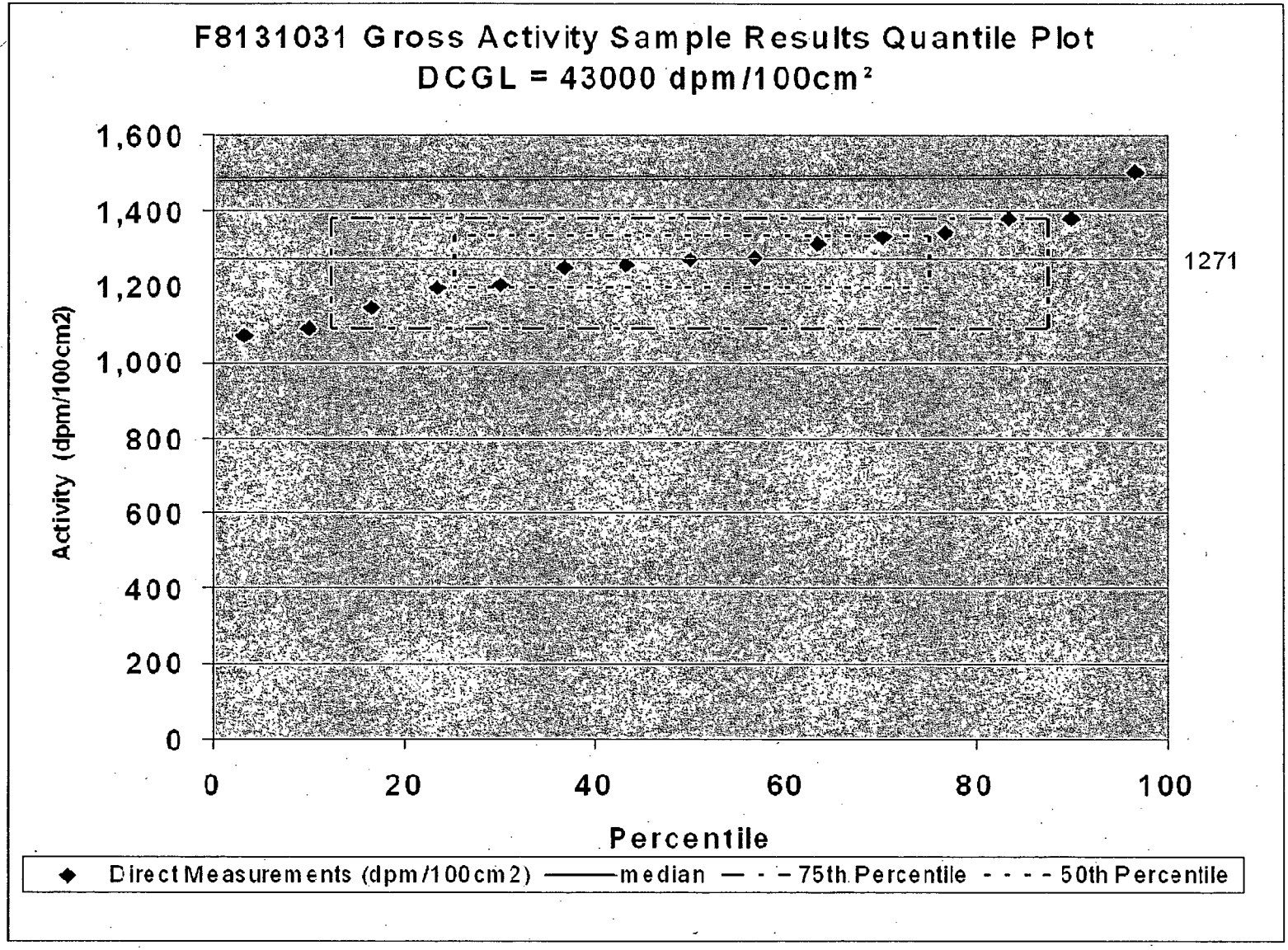
(none required)

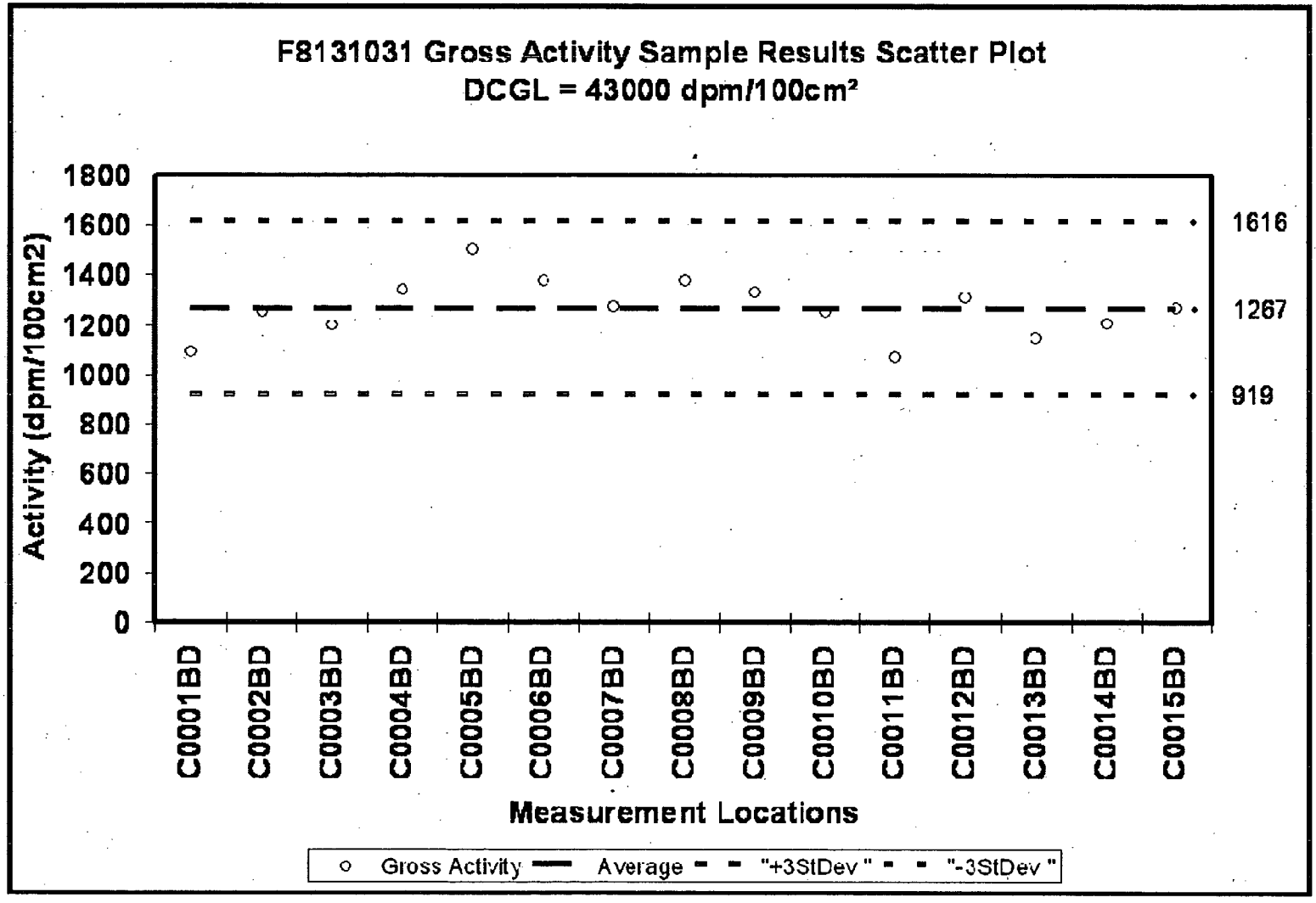
Attachment 4

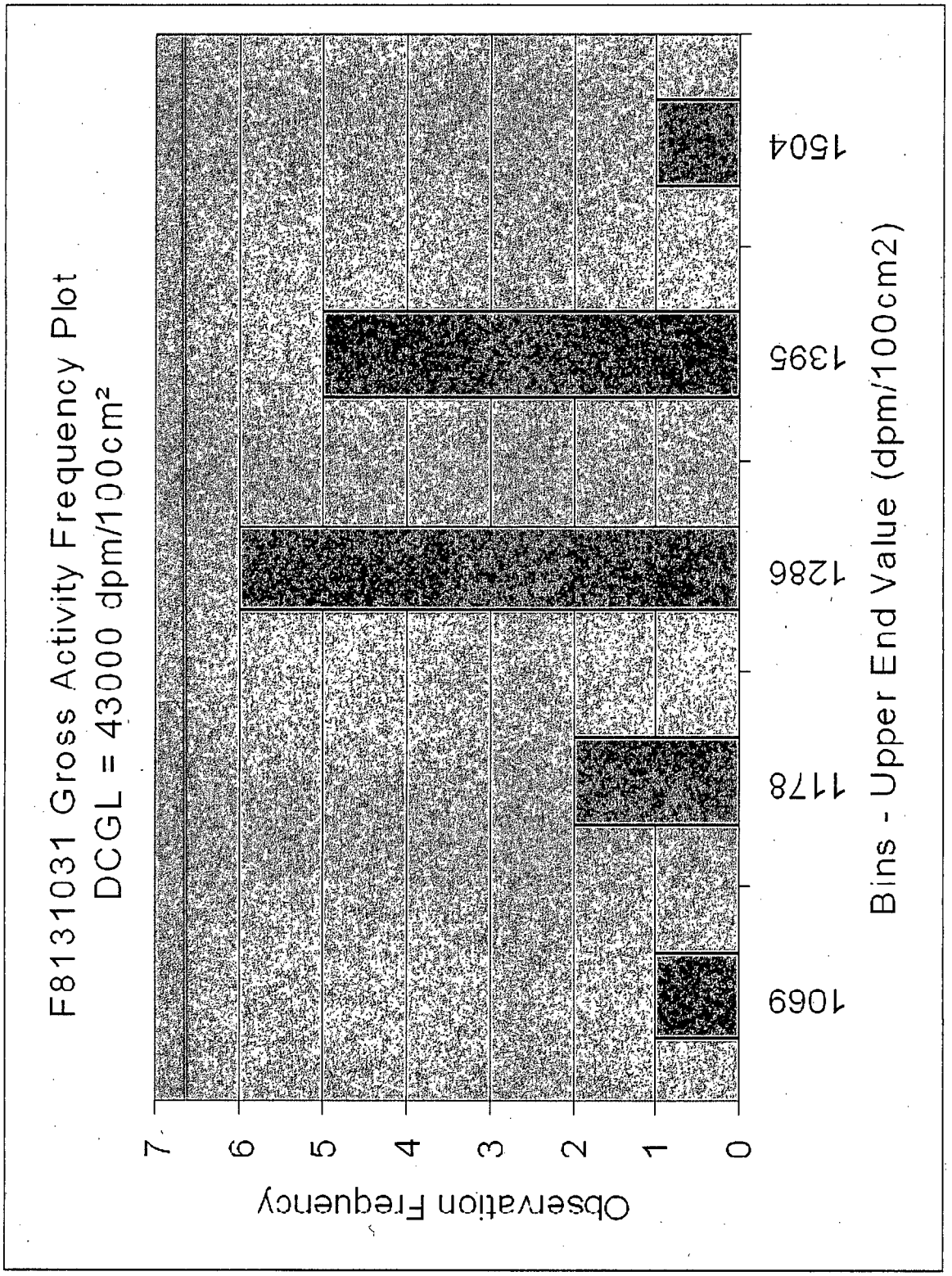
Data Assessment

February 6, 2008

Survey Unit F8131031


F8131031 Gross Activity Sample Results Quantile Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
1,600
1,400
1,200
1,000
800
600
400
200
0
1271
0
20
40
60
80
100
Percentile
Direct Measurements (dpm/100cm2)
median
75th Percentile
50th Percentile


F8131031 Gross Activity Sample Results Scatter Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
1800
1600
1400
1200
1000
800
600
400
200
0
1616
1267
919
C0001BD
C0002BD
C0003BD
C0004BD
C0005BD
C0006BD
C0007BD
C0008BD
C0009BD
C0010BD
C0011BD
C0012BD
C0013BD
C0014BD
C0015BD
Measurement Locations
Gross Activity
Average
"+3StDev"
"-3StDev"


F8131031 Gross Activity Frequency Plot
DCGL = 43000 dpm/100cm²
Observation Frequency
0
1
2
3
4
5
6
7
1069
1178
1286
1395
1504
Bins - Upper End Value (dpm/100cm2)