Rancho Seco

Final Status Survey Summary Report

June 24, 2008

Decon Room +0' AB Room 134

Survey Unit F8131231

Prepared By: Erin L. Brown **Date:** 6/24/2008

FSS Engineer

Reviewed By: Robert F Dexter **Date:** 7/3/08

Lead FSS Engineer

Approved By: E. T. [illegible] **Date:** 7-28-08

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8131231, Decon Room +0' AB Room 134

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 260 m^2 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	Decon Room +0' AB Room 134
Survey Unit:	1231	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m^2)**:**	260	
Evaluator:	Erin L. Brown	
DCGL (dpm/100 cm^2)**:**	43000	Gross Activity DCGL
Area Factor:	3.6	Class 1
Design DCGLemc (dpm/100 cm^2)**:**	155071	Class 1
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)**:**	6.8	Class 1
Scan Area (m^2)**:**	260	
Scan Coverage (%):	100%	Class 1
$Z_{1-\alpha}$ **:**	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:	38	Class 1
Grid Spacing L:	2.6	Class 1

Survey Results:

A total of 38 direct measurements were made in F8131231. 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 1727 to 13001 dpm/100 cm^2, 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)
F8131231-C0001BD	2403
F8131231-C0002BD	2513
F8131231-C0003BD	2392
F8131231-C0004BD	2668
F8131231-C0005BD	2337
F8131231-C0006BD	2612
F8131231-C0007BD	3020
F8131231-C0008BD	2315
F8131231-C0009BD	2172
F8131231-C0010BD	3252
F8131231-C0011BD	3042
F8131231-C0012BD	3296
F8131231-C0013BD	2304
F8131231-C0014BD	2756
F8131231-C0015BD	2767
F8131231-C0016BD	3252
F8131231-C0017BD	2712
F8131231-C0018BD	2910
F8131231-C0019BD	3042
F8131231-C0020BD	2116
F8131231-C0021BD	2568
F8131231-C0022BD	2910
F8131231-C0023BD	3131
F8131231-C0024BD	2811
F8131231-C0025BD	3031
F8131231-C0026BD	2756
F8131231-C0027BD	1885
F8131231-C0028BD	5556
F8131231-C0029BD	2767
F8131231-C0030BD	2381
F8131231-C0031BD	2943
F8131231-C0032BD	2778
F8131231-C0033BD	2712
F8131231-C0034BD	2976
F8131231-C0035BD	3053
F8131231-C0036BD	2910

F8131231-C0037BD	2855
F8131231-C0038BD	2877
Mean:	2810
Median:	2772
Standard Deviation:	566
Range:	1885 - 5556

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm^2)
F8131231C0001SM	-0.95
F8131231C0002SM	-3.53
F8131231C0003SM	-4.82
F8131231C0004SM	1.64
F8131231C0005SM	-2.24
F8131231C0006SM	-3.53
F8131231C0007SM	-3.53
F8131231C0008SM	-3.53
F8131231C0009SM	-3.53
F8131231C0010SM	-0.95
F8131231C0011SM	-0.95
F8131231C0012SM	-3.53
F8131231C0013SM	-0.95
F8131231C0014SM	-3.53
F8131231C0015SM	-3.53
F8131231C0016SM	-4.82
F8131231C0017SM	-3.53
F8131231C0018SM	-2.24
F8131231C0019SM	-2.24
F8131231C0020SM	-3.53
F8131231C0021SM	0.34
F8131231C0022SM	-3.53
F8131231C0023SM	-3.53
F8131231C0024SM	-0.95
F8131231C0025SM	-2.24
F8131231C0026SM	-4.82
F8131231C0027SM	-3.53
F8131231C0028SM	-3.53
F8131231C0029SM	0.34
F8131231C0030SM	-3.53
F8131231C0031SM	-2.24
F8131231C0032SM	-4.82
F8131231C0033SM	-6.11
F8131231C0034SM	-3.53
F8131231C0035SM	-4.82
F8131231C0036SM	-0.95
Mean:	-2.81
Median:	-3.53
Standard Deviation:	1.7
Range:	-6.11 to 1.64

Survey Unit Data Assessment:

The survey design required 38 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):	38	
Median (dpm/100 cm²):	2772	
Mean (dpm/100 cm²):	2810	
Direct Measurement Standard Deviation (dpm/100 cm²):	566	
Total Standard Deviation (dpm/100 cm²):	566	Based on samples and backgrounds.
Maximum (dpm/100 cm²):	5556	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	38	
S+ Value:	38	
Critical Value:	24	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGLemc:	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:

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 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. No potential areas of elevated activity were detected.

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 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.

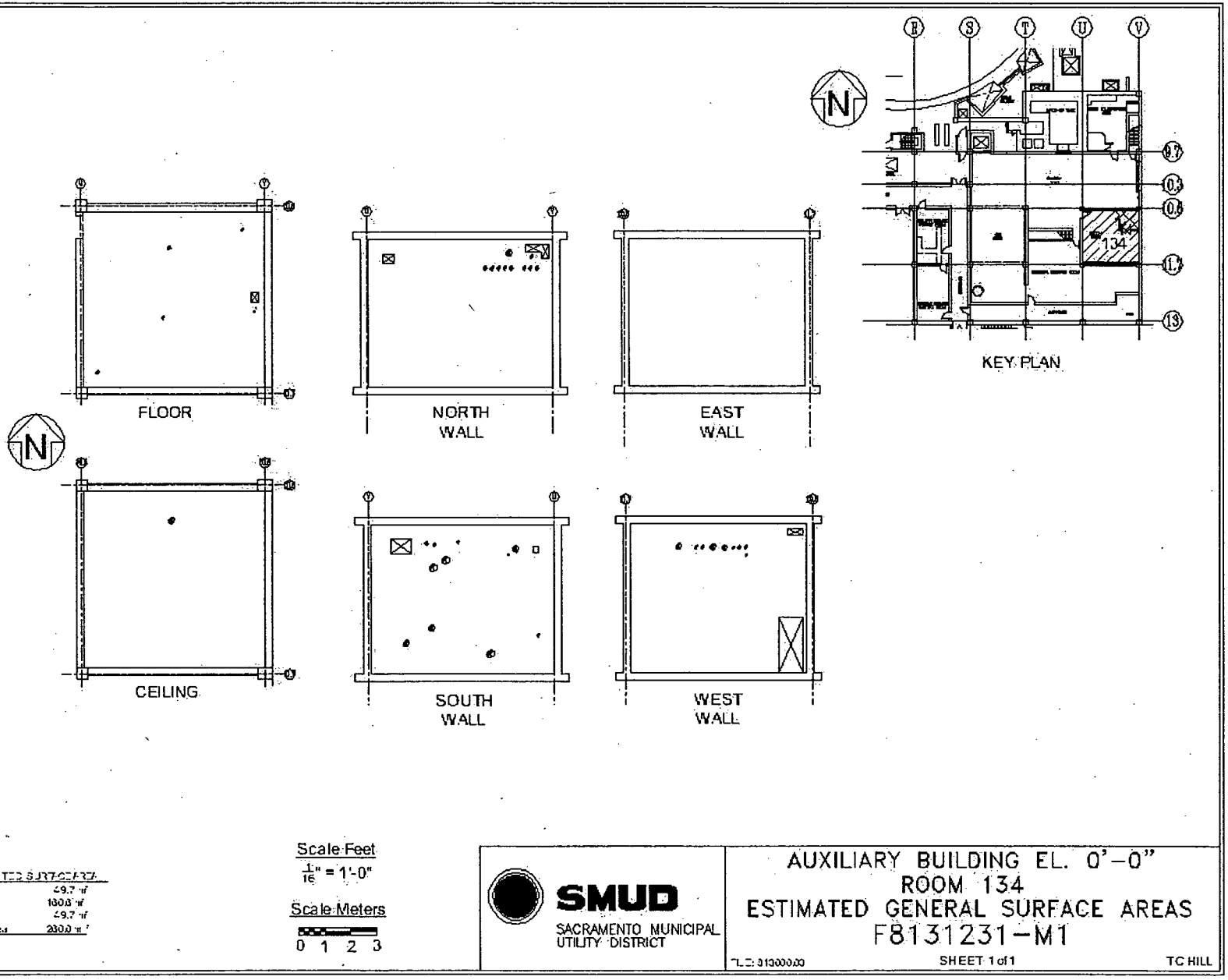
It is concluded that survey unit F8131231 meets the release criteria of 10CFR20.1402.

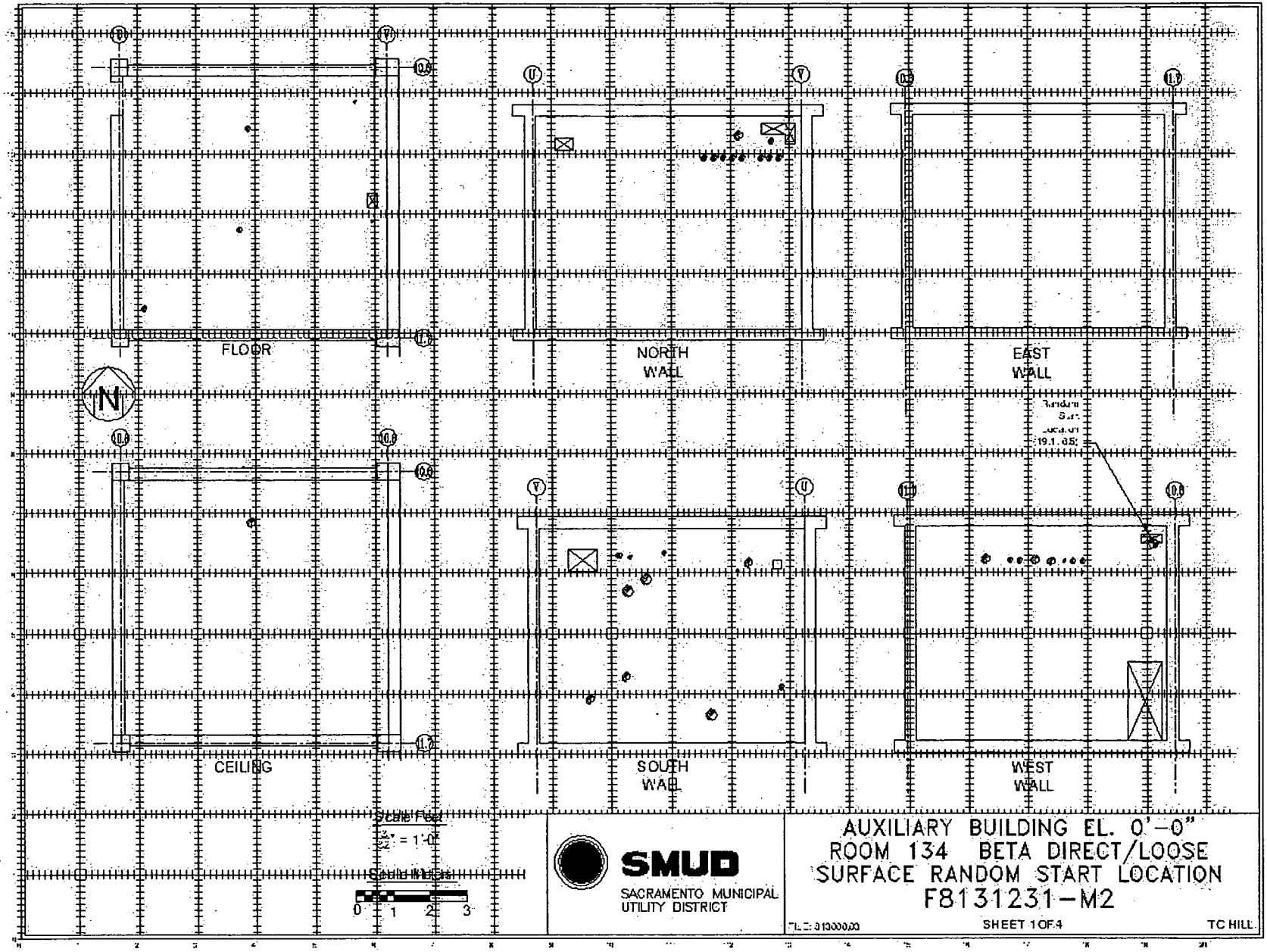
Attachment 1

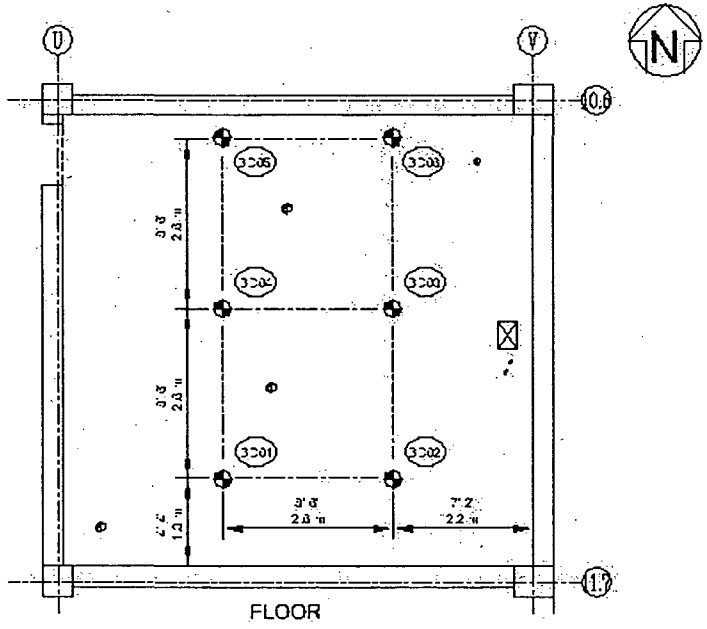
Maps

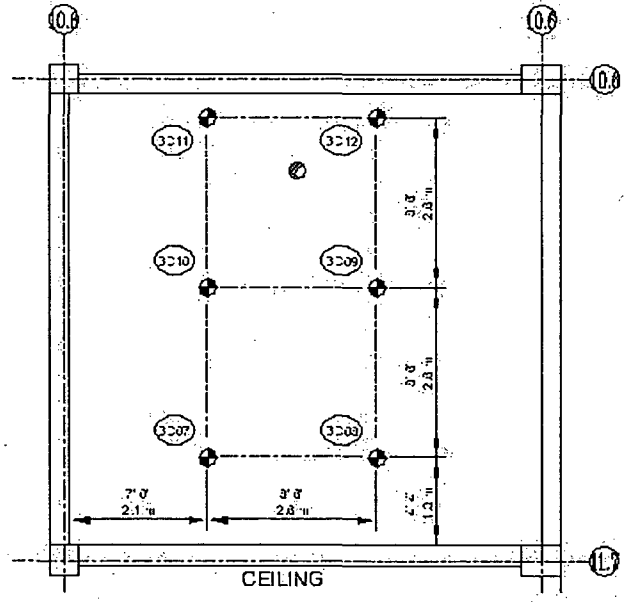
June 24, 2008

Survey Unit F8131231


R
S
T
U
V
N
0.7
0.3
0.6
134
1.7
13
KEY PLAN
FLOOR
NORTH WALL
EAST WALL
N
CEILING
SOUTH WALL
WEST WALL
ESTIMATED SURFACE AREA
Ceiling 29.7 m²
Walls 180.8 m²
Floor 29.7 m²
Total Areas 280.0 m²
Scale Feet
1/16" = 1'-0"
Scale Meters
0 1 2 3
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
AUXILIARY BUILDING EL. 0'-0"
ROOM 134
ESTIMATED GENERAL SURFACE AREAS
F8131231-M1
TLC: 313000.00
SHEET 1 of 1
TC HILL


FLOOR
NORTH WALL
EAST WALL
CEILING
SOUTH WALL
WEST WALL
N
Scale Feet
1/2" = 1'-0"
Scale Meters
0 1 2 3
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
AUXILIARY BUILDING EL. 0'-0"
ROOM 134 BETA DIRECT/LOOSE
SURFACE RANDOM START LOCATION
F8131231-M2
SHEET 1 OF 4
TC HILL





Scale Feet

1/2" = 1'-0"

Scale Meters

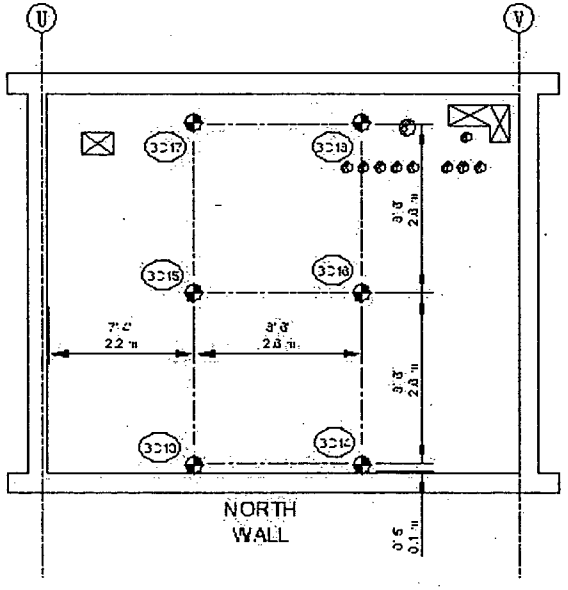
0 1 2 3

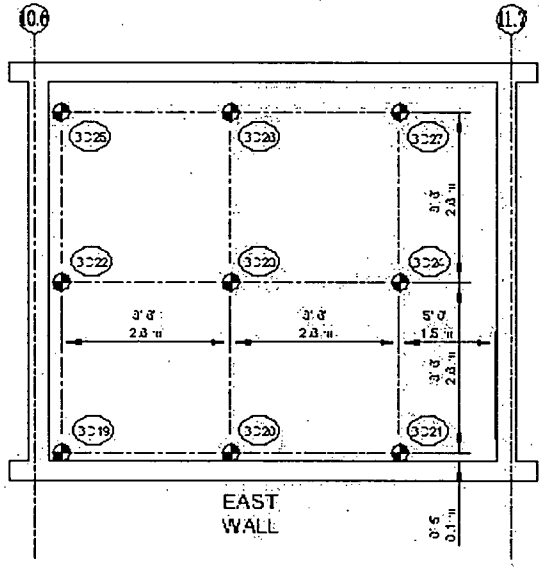
SMUD

SACRAMENTO MUNICIPAL UTILITY DISTRICT

AUXILIARY BUILDING EL. 0'-0"
ROOM 134 BETA DIRECT/LOOSE
SURFACE MEASUREMENT LOCATIONS
F8131231-M2

TLD: 81000.00 SHEET 2 OF 4 TC HILL





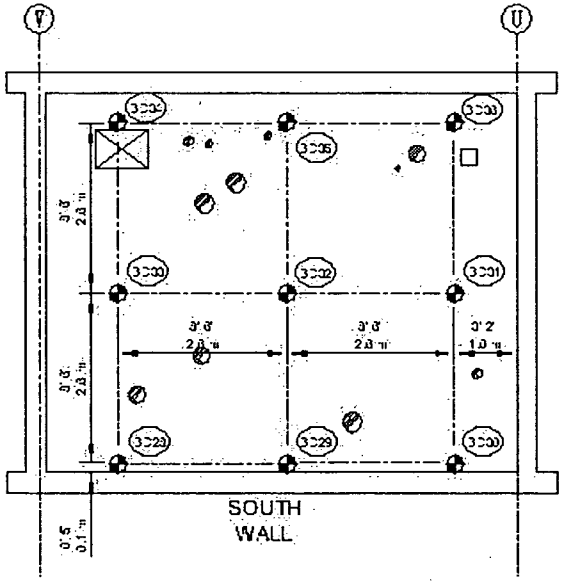
Scale Feet
1/2" = 1'-0"

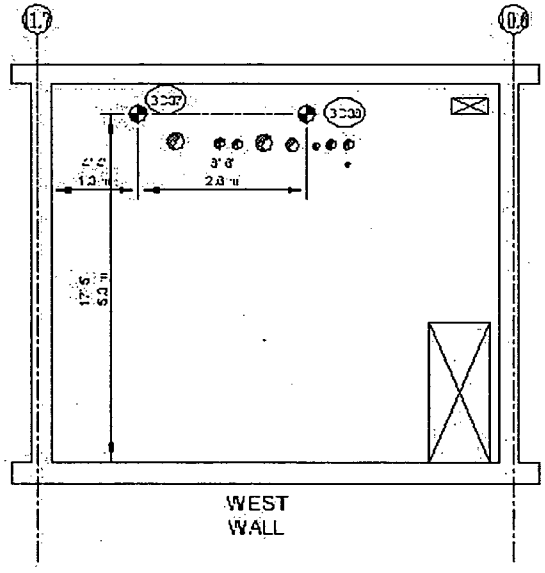
Scale Meters
0 1 2 3

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT

AUXILIARY BUILDING EL. 0'-0"
ROOM 134 BETA DIRECT/LOOSE
SURFACE MEASUREMENT LOCATIONS
F8131231-M2

TLD: 810000.00 SHEET 3 OF 4 TC HILL





Scale Feet
$\frac{1}{2}$" = 1'-0"

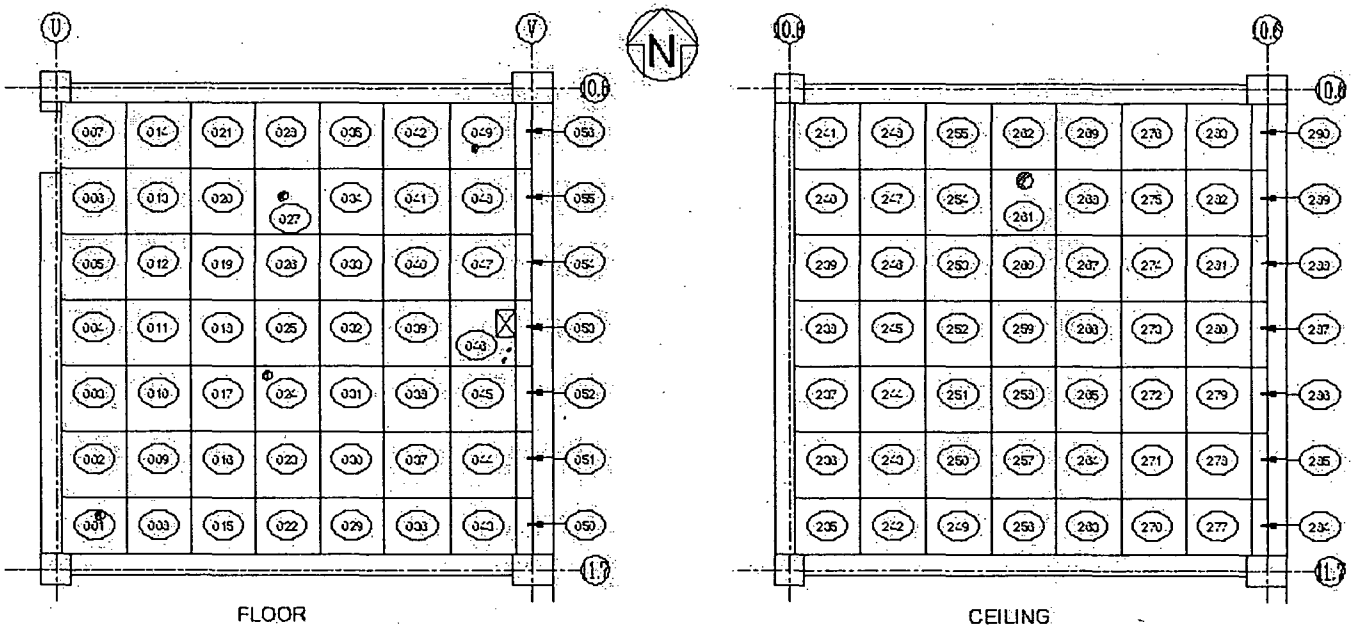
Scale Meters

0 1 2 3

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT

AUXILIARY BUILDING EL. 0'-0"
ROOM 134 BETA DIRECT/LOOSE
SURFACE MEASUREMENT LOCATIONS
F8131231-M2

FILE: 313000.00 SHEET 4 OF 4 TC HILL



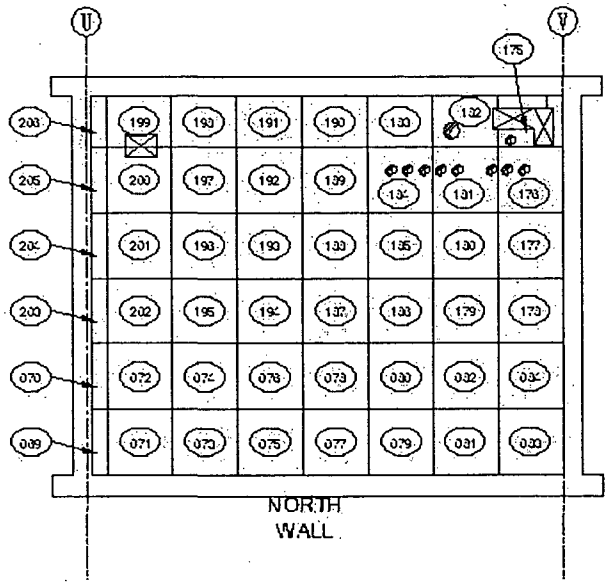
Scale Feet
1/2" = 1'-0"

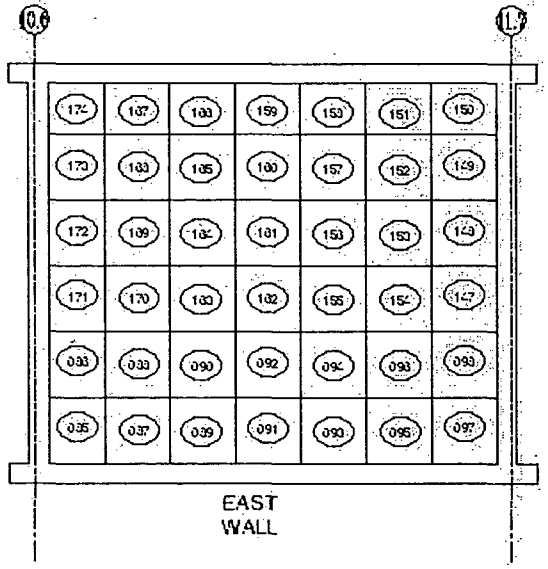
Scale Meters
0 1 2 3

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT

AUXILIARY BUILDING EL. 0'-0"
ROOM 134 BETA SCAN
MEASUREMENT LOCATIONS
F8131231-M3

FILE: 813000.00 SHEET 1 OF 3 TC HILL





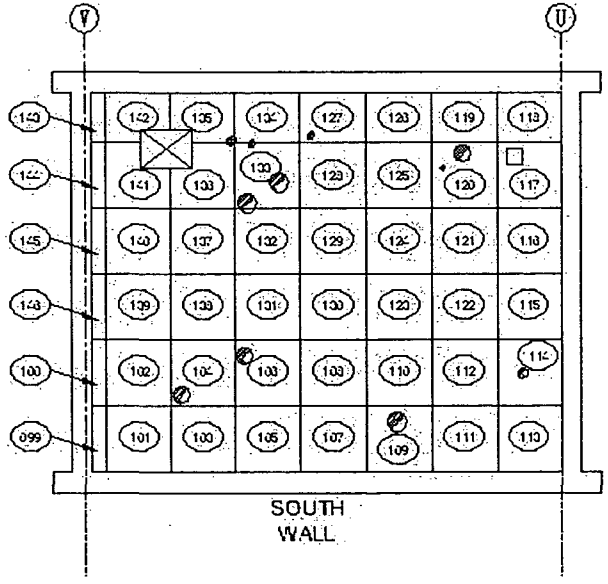
Scale Feet
$\frac{1}{2}$" = 1'-0"

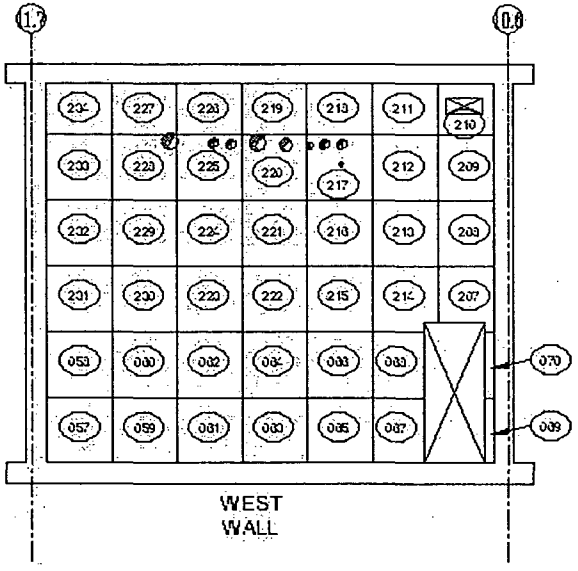
Scale Meters
0 1 2 3

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT

AUXILIARY BUILDING EL. 0'-0"
ROOM 134 BETA SCAN
MEASUREMENT LOCATIONS
F8131231-M3

TLD: 31000.00 SHEET 2 OF 3 TC HILL





Scale Feet
$\frac{1}{2}$" = 1'-0"

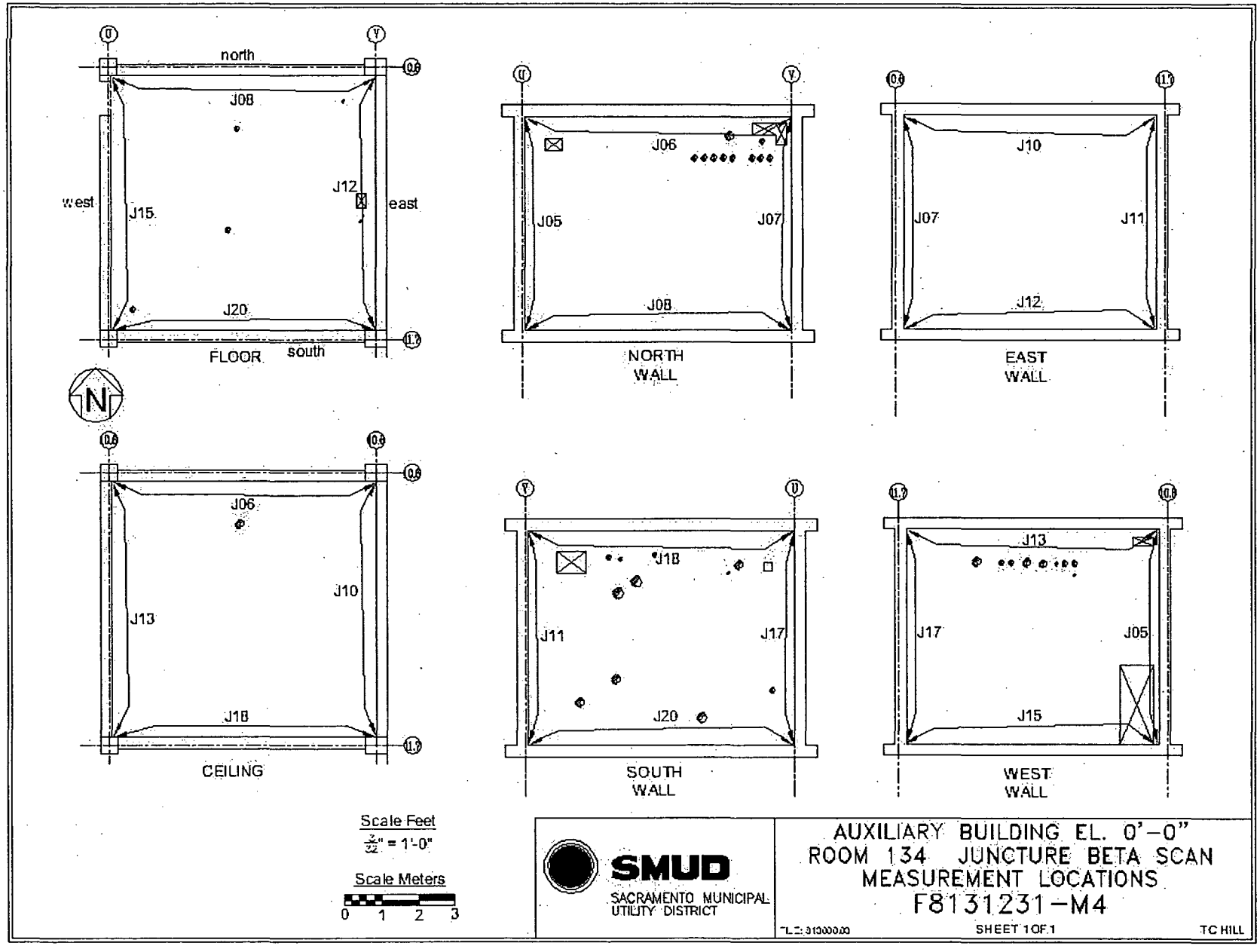
Scale Meters

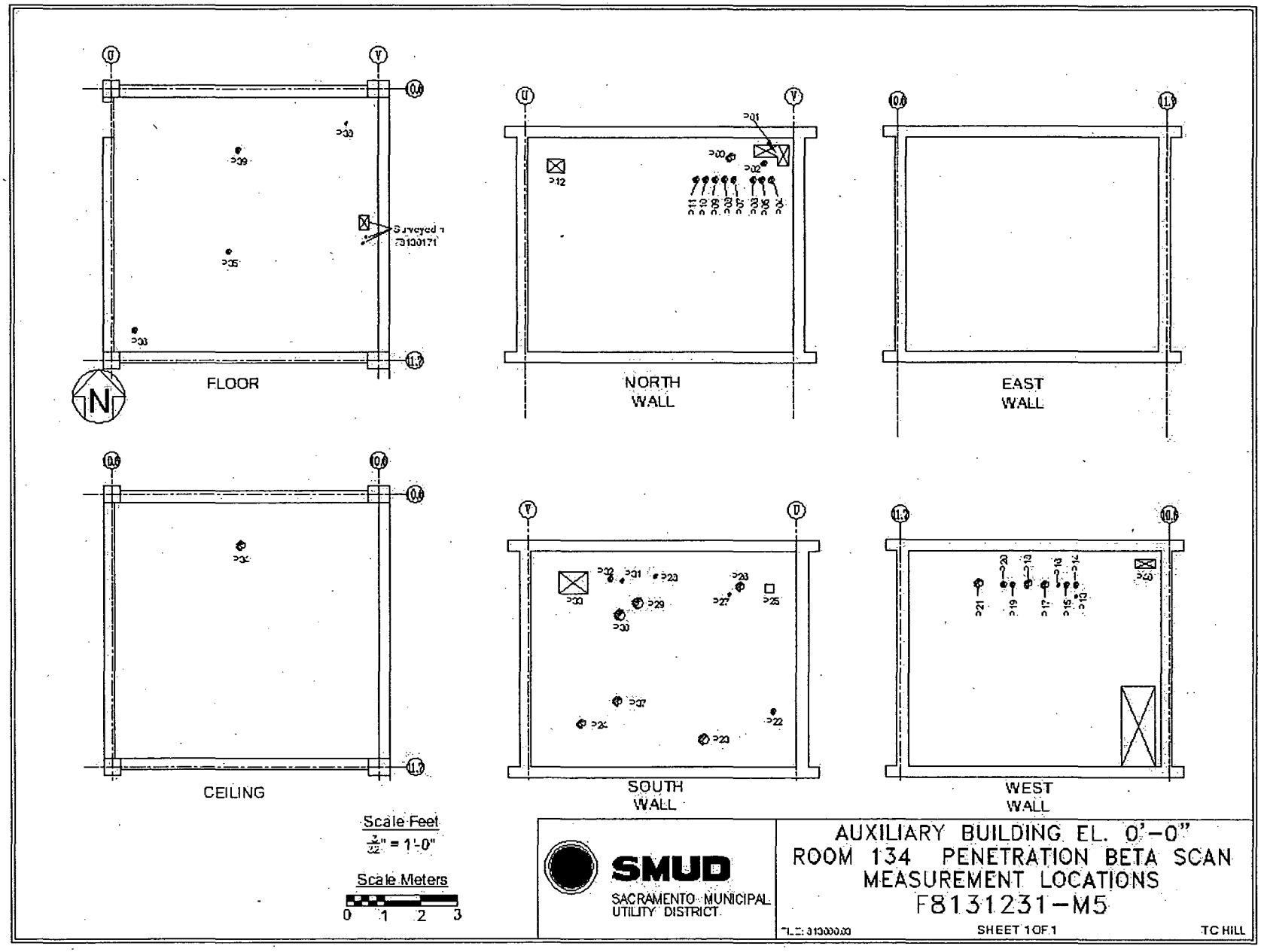
0 1 2 3

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT

AUXILIARY BUILDING EL. 0'-0"
ROOM 134 BETA SCAN
MEASUREMENT LOCATIONS
F8131231-M3

TLC: 31000.00 SHEET 3 OF 3 TC HILL


north
J08
west
J15
J12
east
J20
FLOOR
south
N
J06
J05
J07
J08
NORTH WALL
J10
J07
J11
J12
EAST WALL
J06
J10
J13
J18
CEILING
J18
J11
J17
J20
SOUTH WALL
J13
J17
J05
J15
WEST WALL
Scale Feet
3/32" = 1'-0"
Scale Meters
0 1 2 3
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
AUXILIARY BUILDING EL. 0'-0"
ROOM 134 JUNCTURE BETA SCAN
MEASUREMENT LOCATIONS
F8131231-M4
SHEET 1 OF 1
TC HILL


FLOOR
NORTH WALL
EAST WALL
CEILING
SOUTH WALL
WEST WALL
N
Scale Feet
3/32" = 1'-0"
Scale Meters
0 1 2 3
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
AUXILIARY BUILDING EL. 0'-0"
ROOM 134 PENETRATION BETA SCAN
MEASUREMENT LOCATIONS
F8131231-M5
SHEET 1 OF 1
TC HILL

Attachment 2

Instrumentation

June 24, 2008

Survey Unit F8131231

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; 180733	43-98B; 148638	N/A	2520
M2350; 180733	43-94B; 148620	N/A	2800
M2350; 203486	43-68B; 190476	912	2176
M2350; 189089	43-68B; 161406	912	2176
M2350; 203486	43-68B; 161400	912	217+
M2350; 175834	43-116-1B; 190642	N/A	6854
M2350; 203486	43-116-1B; 190173	N/A	6854
Tennelec; 0401171	N/A	5.9 dpm α, 11.7 dpm β	N/A

The MDC noted for the detector model 43-98B is for the 4" diameter piping and for the detector model 43-94B is for the 2" diameter piping which are the most conservative.

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	154800
Investigation Criteria – Scan	154800
$DCGL_W$	43000
$DCGL_{EMC}$	154800

Attachment 3

Investigation

June 24, 2008

Survey Unit F8131231

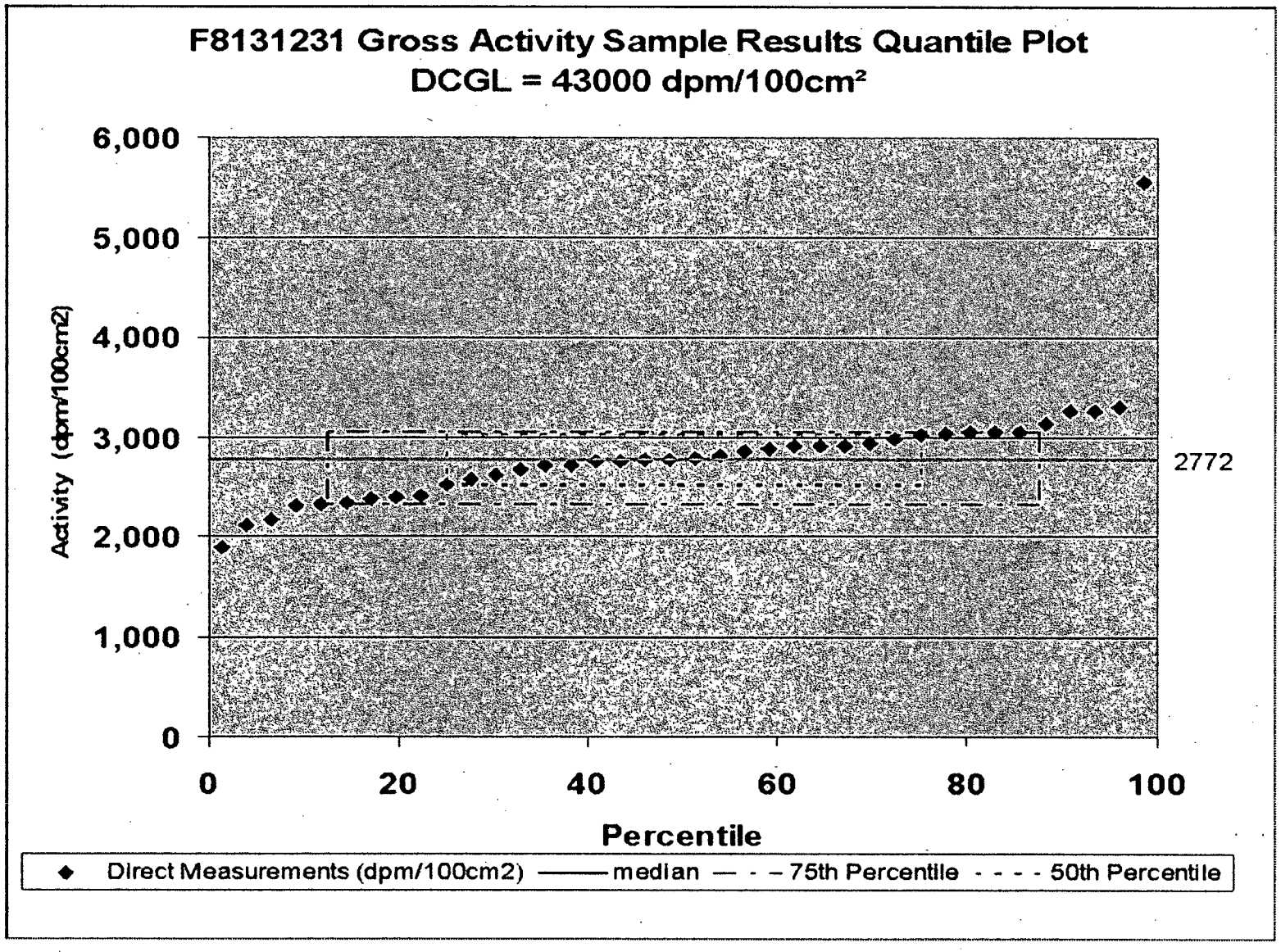
(none required)

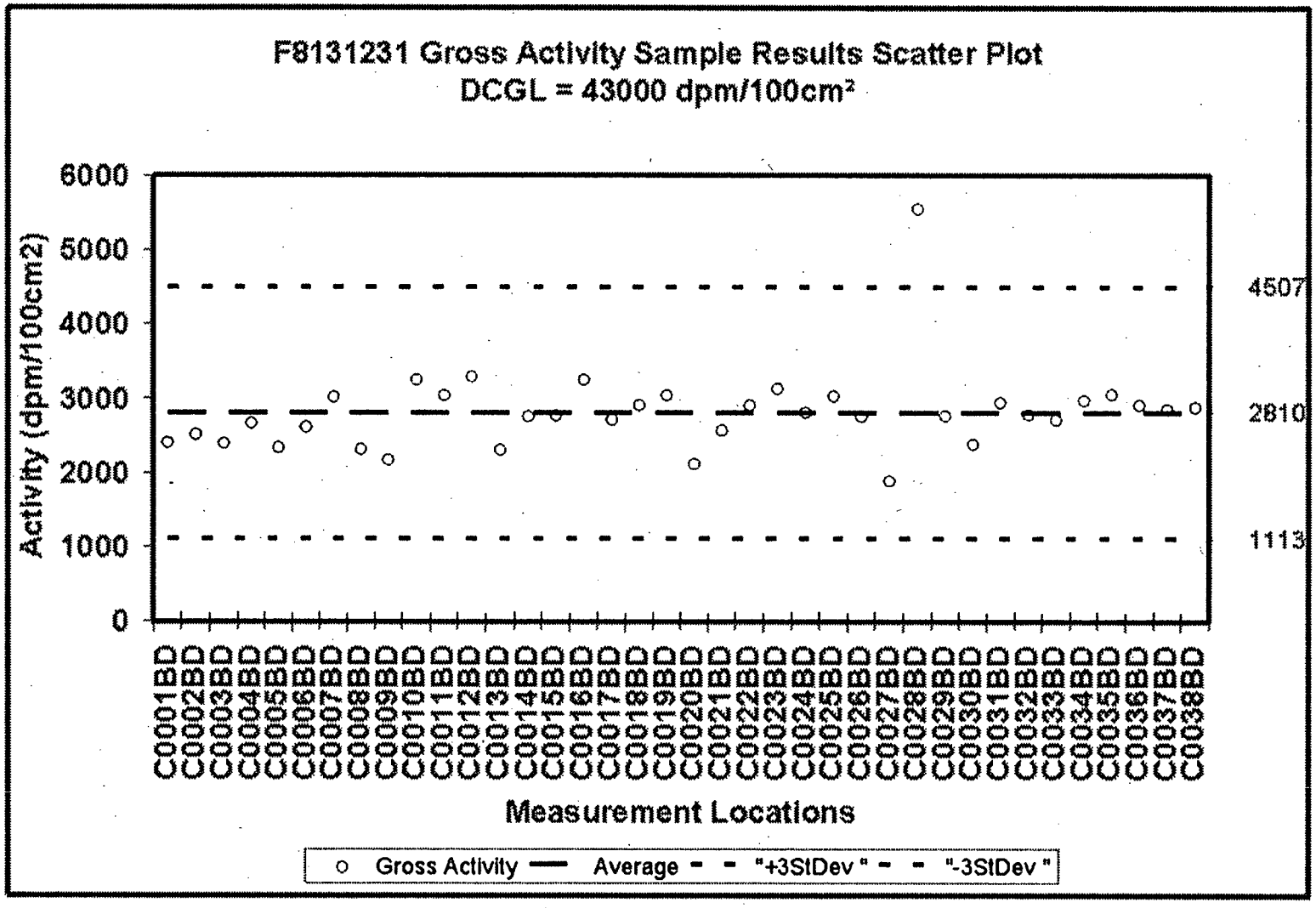
Attachment 4

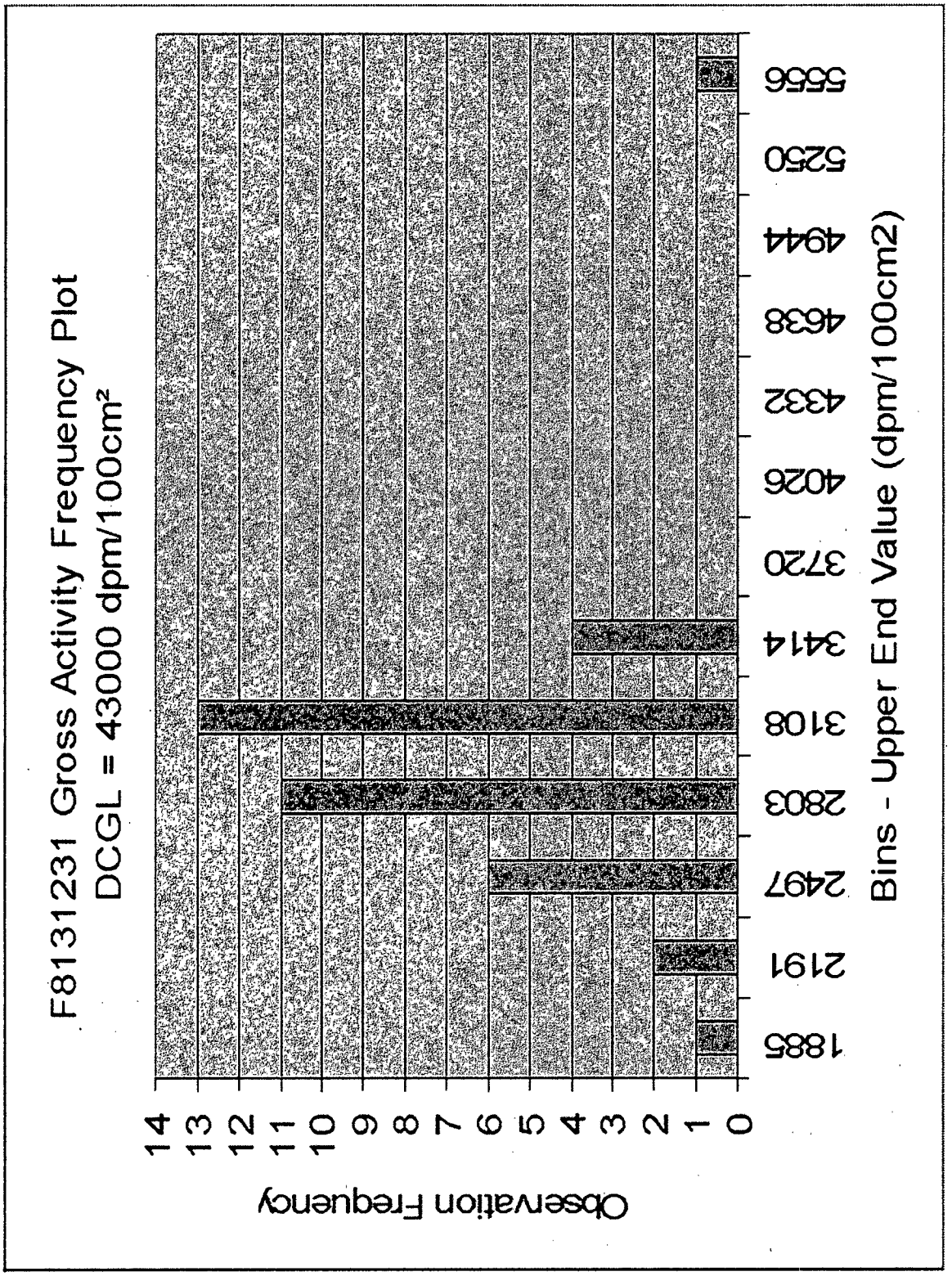
Data Assessment

June 24, 2008

Survey Unit F8131231


F8131231 Gross Activity Sample Results Quantile Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
6,000
5,000
4,000
3,000
2,000
1,000
0
0
20
40
60
80
100
Percentile
2772
Direct Measurements (dpm/100cm2)
median
75th Percentile
50th Percentile


F8131231 Gross Activity Sample Results Scatter Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
6000
5000
4000
3000
2000
1000
0
4507
2810
1113
C0001BD
C0002BD
C0003BD
C0004BD
C0005BD
C0006BD
C0007BD
C0008BD
C0009BD
C0010BD
C0011BD
C0012BD
C0013BD
C0014BD
C0015BD
C0016BD
C0017BD
C0018BD
C0019BD
C0020BD
C0021BD
C0022BD
C0023BD
C0024BD
C0025BD
C0026BD
C0027BD
C0028BD
C0029BD
C0030BD
C0031BD
C0032BD
C0033BD
C0034BD
C0035BD
C0036BD
C0037BD
C0038BD
Measurement Locations
Gross Activity
Average
"+3StDev"
"-3StDev"


F8131231 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
1885
2191
2497
2803
3108
3414
3720
4026
4332
4638
4944
5250
5556
Bins - Upper End Value (dpm/100cm2)