Rancho Seco

Final Status Survey Summary Report

March 25, 2008

Mezzanine Roof, Auxiliary Building, Elevation 20'

Survey Unit F8131311

Prepared By: Michael Stein **Date:** 3/25/2008

FSS Engineer

Reviewed By: [signature] **Date:** 3/26/08

Lead FSS Engineer

Approved By: [signature] **Date:** 4-28-08

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8131311, Mezzanine Roof, Auxiliary Building, Elevation 20'

Survey Unit Description:

Operating History: The Mezzanine Roof is located on the 20' elevation of the Auxiliary Building. This roof covers a small section on the east end of the Auxiliary Building at grade level. The Auxiliary Building is a reinforced concrete structure that, during power operations, contained the Radwaste processing and supporting systems. The building has six main elevations. Residual levels of surface radioactivity were detected on all interior elevations 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 main auxiliary building roof, elevation ~ 60'. The roof was later replaced.

Site Characterization: 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 Mezzanine Roof was determined to be a Class 3 area.

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 randomly determined and 49 m^2 were scanned for beta radiation which represents approximately 10% area coverage. Samples of removable contamination were collected at each direct beta measurement location.

The Mezzanine Roof was covered with a new rubber membrane approximately nine years ago. In order to detect any residual radioactivity under the membrane, gamma scan measurements were also performed, with the membrane in place, on 226 m^2 which represents approximately 47% coverage. 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	Mezzanine Roof, Auxiliary Building, Elevation 20'
Survey Unit:	1311	Structure Surface
Class:	3	LTP Table 5-4
SU Area (m^2)**:**	482	
Evaluator:	Michael Stein	
DCGL (dpm/100 cm^2)**:**	43000	Gross Activity DCGL
Area Factor:	N/A	Class 3
Design DCGLemc (dpm/100 cm^2)**:**	N/A	Class 3
LBGR (dpm/100 cm^2)**:**	21500	Default = 50% DCGL
Design Sigma (dpm/100 cm^2)**:**	5461	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m^2)**:**	N/A	Class 3
Scan Area (m^2)**:**	49 m^2 beta, 226 m^2 gamma	
Scan Coverage (%):	10% beta, 47% gamma	Class 3
$Z_{1-\alpha}$ **:**	1.645	
$Z_{1-\beta}$ **:**	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	3.9	
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 3
Grid Spacing L:	N/A	Class 3

Survey Results:

A total of 14 direct measurements were made in F8131311. 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. Beta scan activity ranged from 3595 to 5583 dpm/100 cm², based on a surveyor efficiency of 0.5 and no background subtracted. There were no plant derived radionuclides detected when the gamma scan surveys were performed. 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)
F8131311-C0001BD	1779
F8131311-C0002BD	1364
F8131311-C0003BD	1494
F8131311-C0004BD	1411
F8131311-C0005BD	1805
F8131311-C0006BD	1613
F8131311-C0007BD	1681
F8131311-C0008BD	1509
F8131311-C0009BD	1484
F8131311-C0010BD	1432
F8131311-C0011BD	1758
F8131311-C0012BD	1530
F8131311-C0013BD	1541
F8131311-C0014BD	1380
Mean:	1556
Median:	1520
Standard Deviation:	149
Range:	1364 - 1805

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm^2)
F8131311C0001SM	2.93
F8131311C0002SM	9.38
F8131311C0003SM	2.93
F8131311C0004SM	6.8
F8131311C0005SM	5.51
F8131311C0006SM	5.51
F8131311C0007SM	13.26
F8131311C0008SM	-0.95
F8131311C0009SM	21.01
F8131311C0010SM	1.64
F8131311C0011SM	2.93
F8131311C0012SM	4.22
F8131311C0013SM	0.34
F8131311C0014SM	6.8
Mean:	5.88
Median:	4.86
Standard Deviation:	5.7
Range:	-0.95 to 21.01

Survey Unit Data Assessment:

The survey design required 14 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):	14	
Median (dpm/100 cm²):	1520	
Mean (dpm/100 cm²):	1556	
Direct Measurement Standard Deviation (dpm/100 cm²):	149	
Total Standard Deviation (dpm/100 cm²):	149	Based on samples and backgrounds.
Maximum (dpm/100 cm²):	1805	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	14	
S+ Value:	14	
Critical Value:	10	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGLemc:	N/A	Class 3
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), the ALARA criterion has been met.

Changes in Initial Survey Unit Assumptions:

The survey unit was designed as a Class 3 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 3 survey based on Table 5-4 of the LTP. The required number of direct measurements was made and the scan coverage met or exceeded 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 F8131311 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

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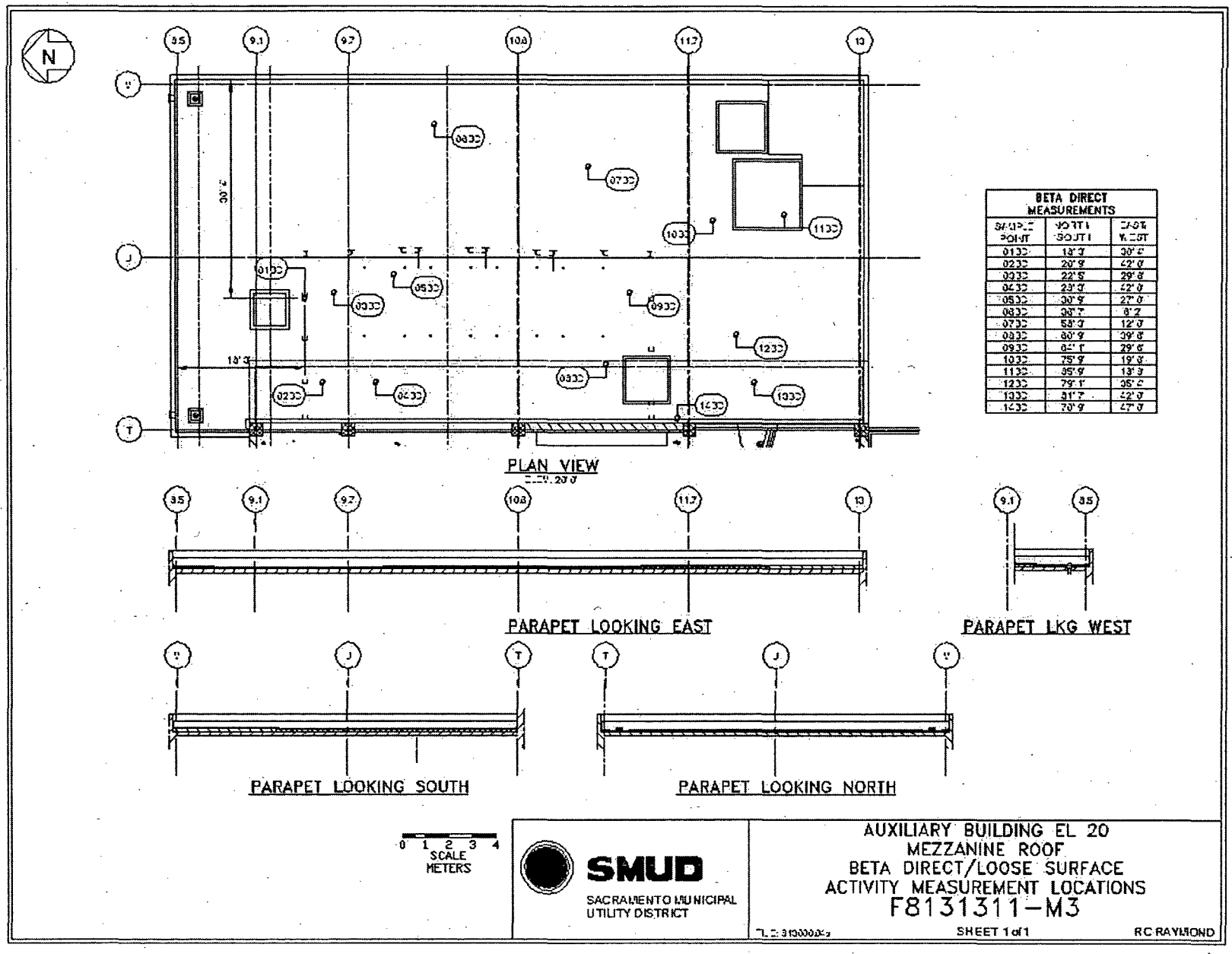
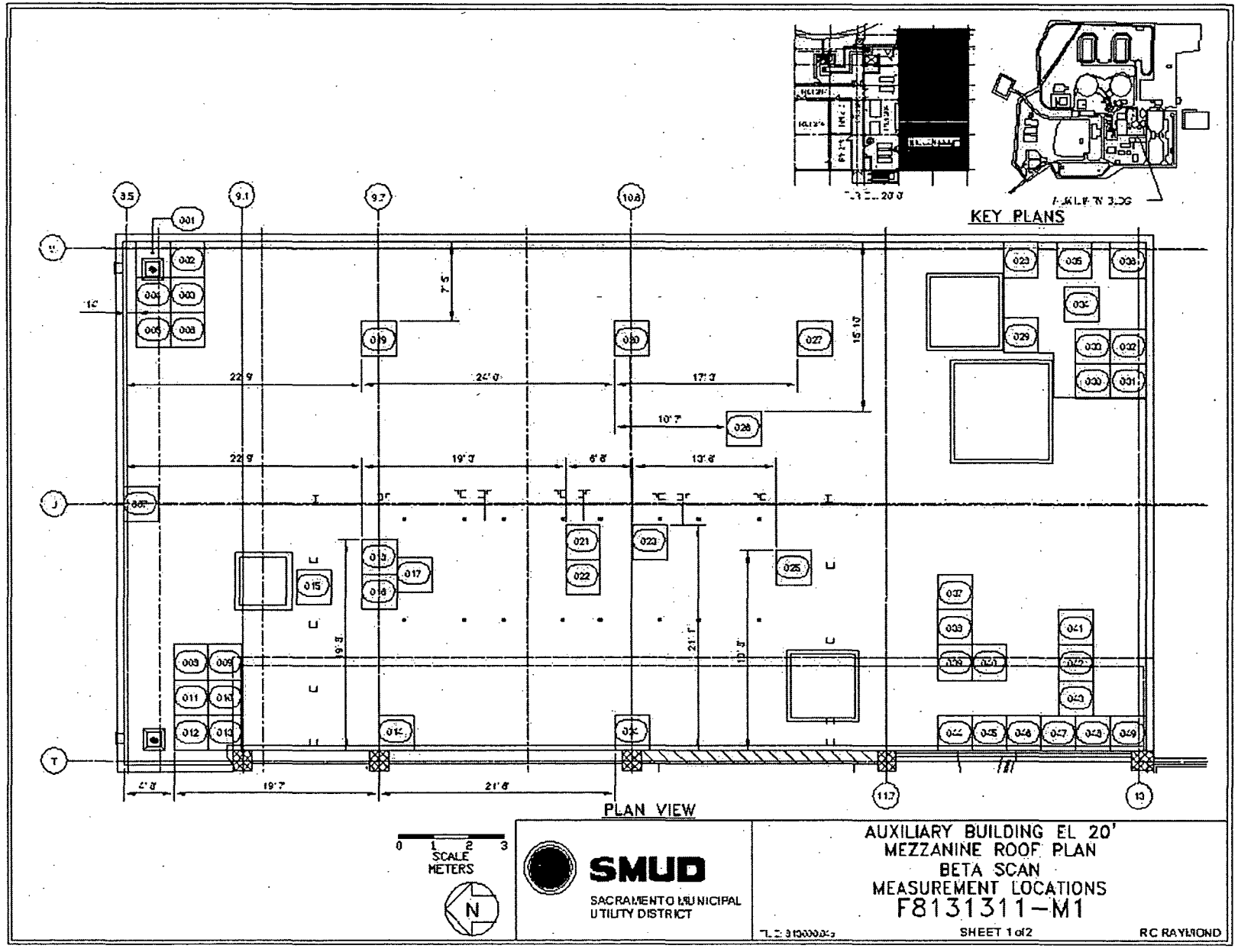
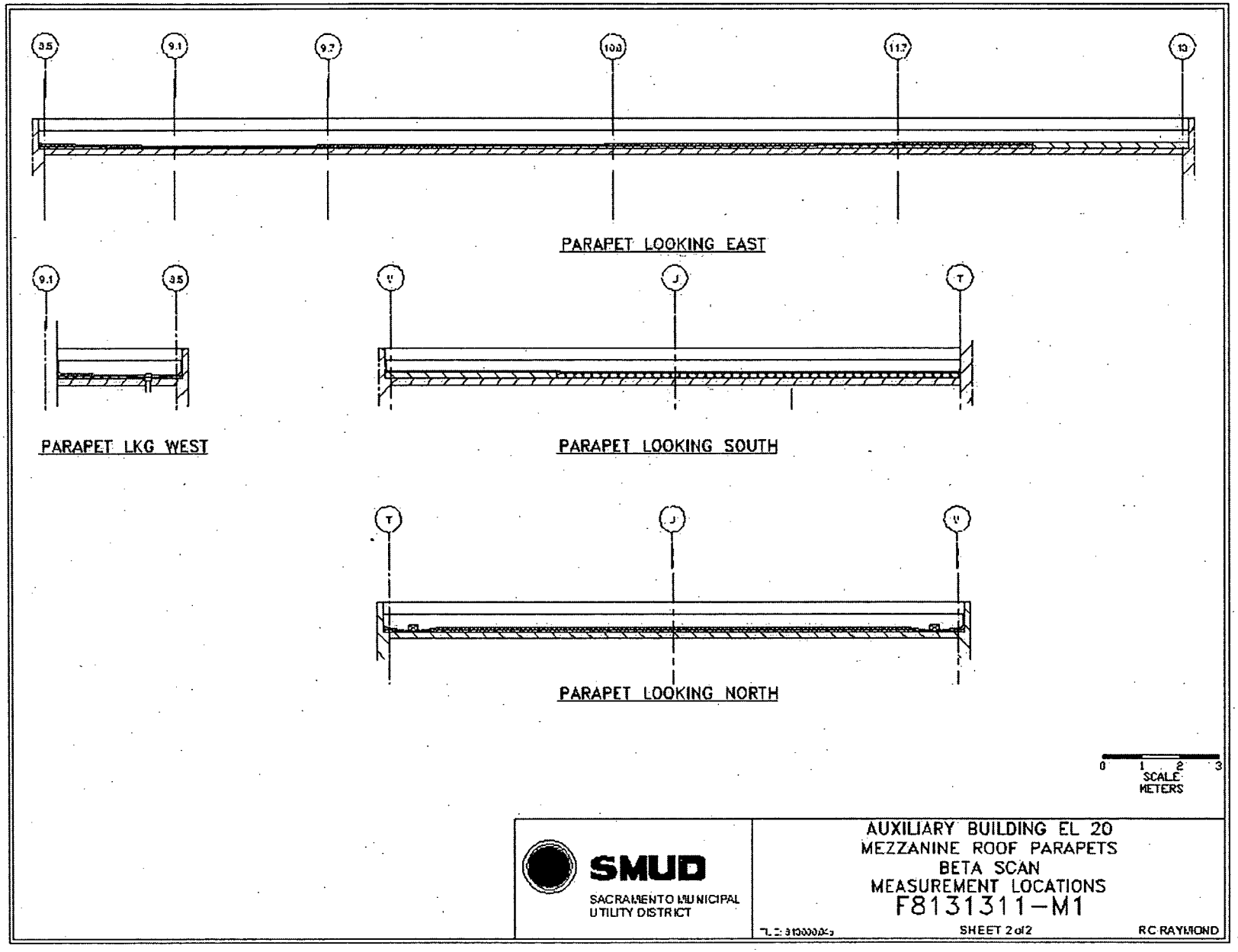
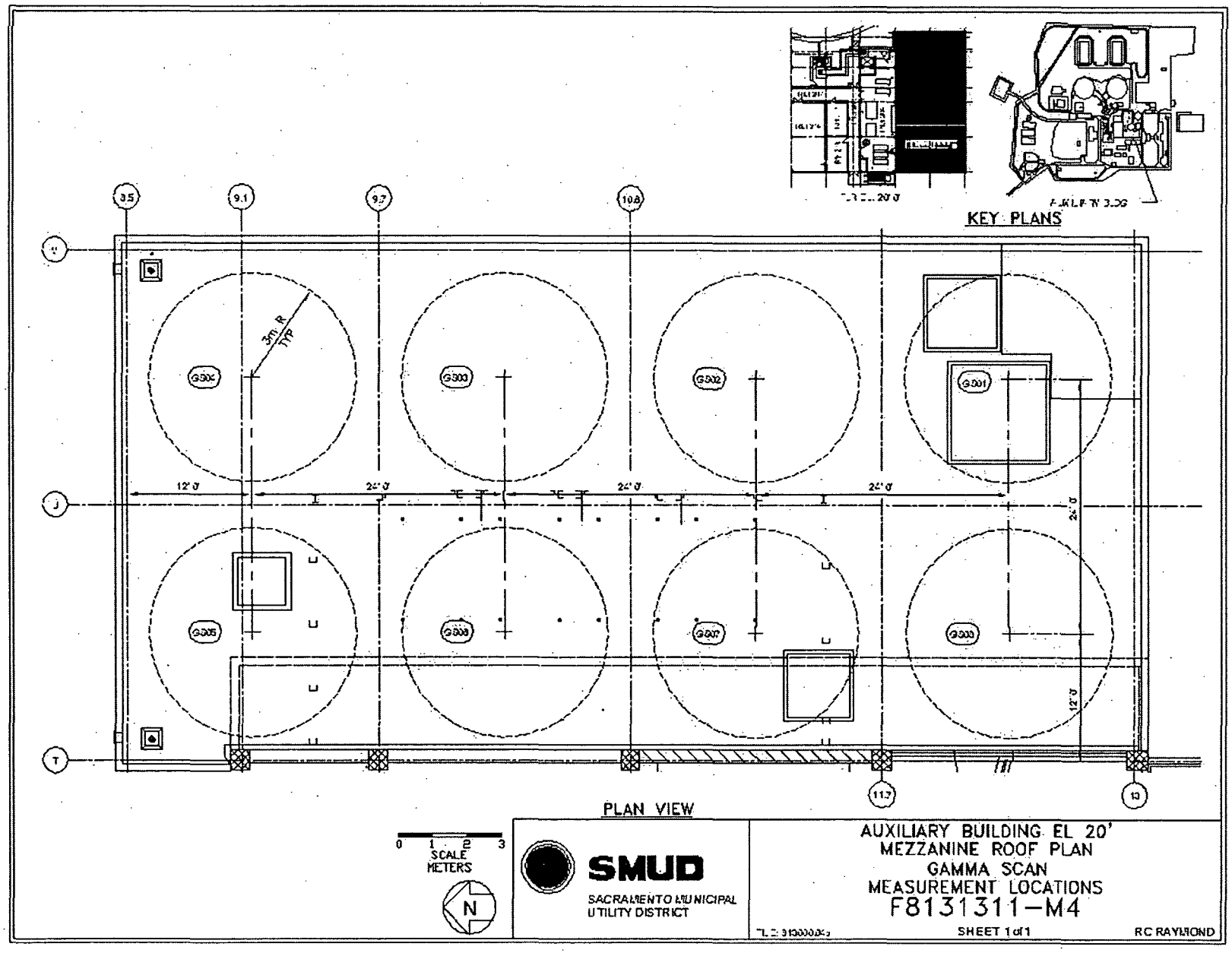
Survey Unit F8131311



BETA DIRECT MEASUREMENTS		
SAMPLE POINT	NORTH (SOUTH)	EAST (WEST)
0133	18' 3"	30' 6"
0233	20' 9"	42' 0"
0333	22' 5"	29' 6"
0433	23' 0"	42' 0"
0533	30' 9"	27' 0"
0633	38' 7"	8' 2"
0733	58' 3"	12' 0"
0833	60' 9"	39' 6"
0933	62' 1"	29' 6"
1033	75' 9"	19' 3"
1133	95' 9"	13' 9"
1233	79' 1"	36' 6"
1333	91' 7"	42' 0"
1433	70' 9"	47' 0"


KEY PLANS
PLAN VIEW
SCALE METERS
0 1 2 3
N
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
AUXILIARY BUILDING EL 20'
MEZZANINE ROOF PLAN
BETA SCAN
MEASUREMENT LOCATIONS
F8131311-M1
SHEET 1 of 2
RC RAYMOND


PARAPET LOOKING EAST
PARAPET LKG WEST
PARAPET LOOKING SOUTH
PARAPET LOOKING NORTH
0 1 2 3
SCALE
METERS
SMUD
SACRAMENTO MUNICIPAL
UTILITY DISTRICT
AUXILIARY BUILDING EL 20
MEZZANINE ROOF PARAPETS
BETA SCAN
MEASUREMENT LOCATIONS
F8131311-M1
SHEET 2 of 2
RC RAYMOND


KEY PLANS
PLAN VIEW
3m R TYP
12'-0"
24'-0"
24'-0"
24'-0"
24'-0"
12'-0"
G001
G002
G003
G004
G005
G006
G007
G008
9.5
9.1
9.7
10.8
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0 1 2 3
SCALE METERS
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SACRAMENTO MUNICIPAL UTILITY DISTRICT
AUXILIARY BUILDING EL 20'
MEZZANINE ROOF PLAN
GAMMA SCAN
MEASUREMENT LOCATIONS
F8131311-M4
SHEET 1 of 1
RC RAYMOND

Attachment 2

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; 203481	43-68B; 148629	433	1033
Tennelec; 0401171	N/A	5.9 dpm α, 11.7 dpm β	N/A
ISOCS	2983947	N/A	1170 Cs-137 792 Co-60

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	21500
Investigation Criteria – Scan	43000
$DCGL_W$	43000
$DCGL_{EMC}$	N/A

Attachment 3

Investigation

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(none required)

Attachment 4

Data Assessment

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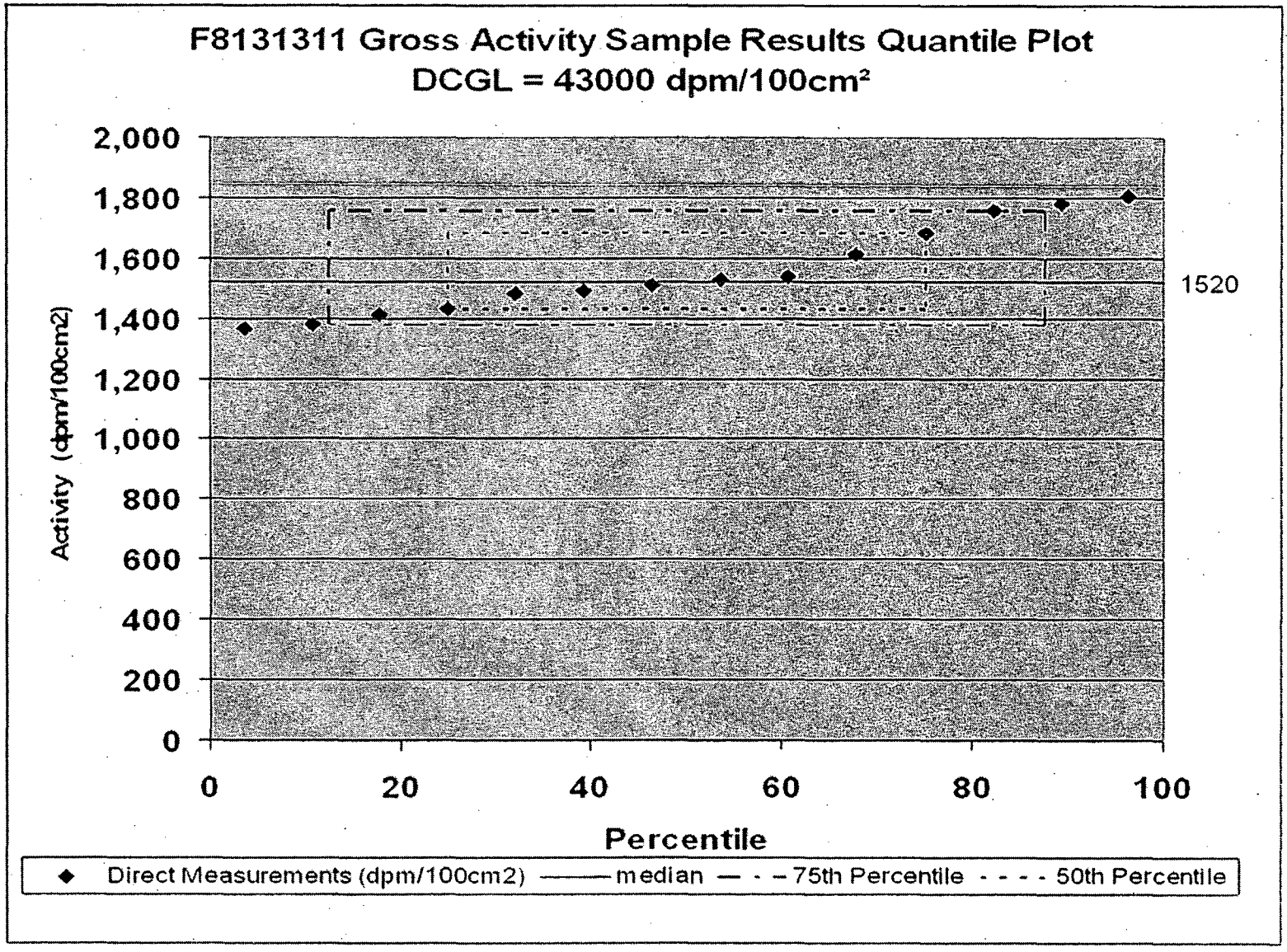
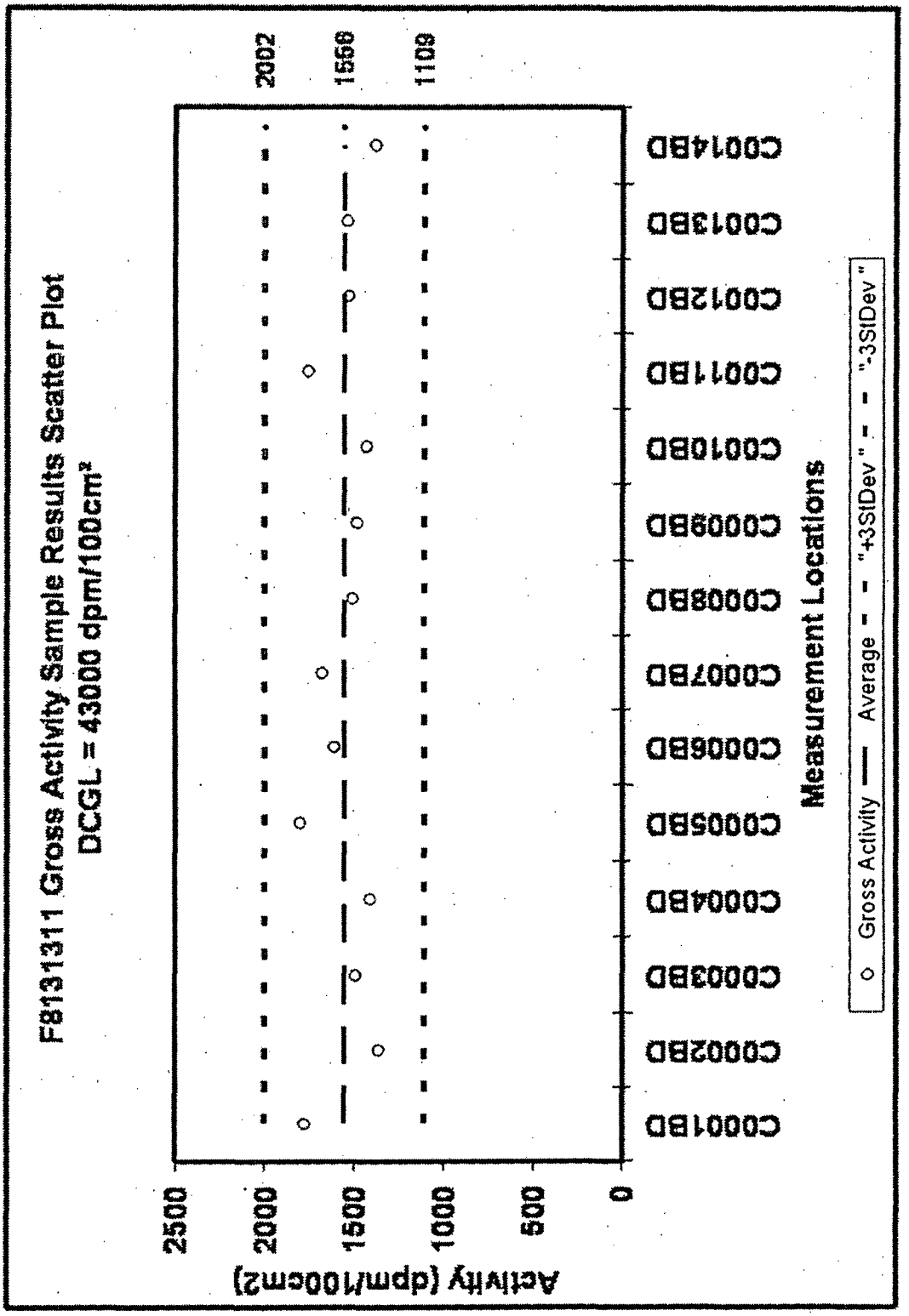
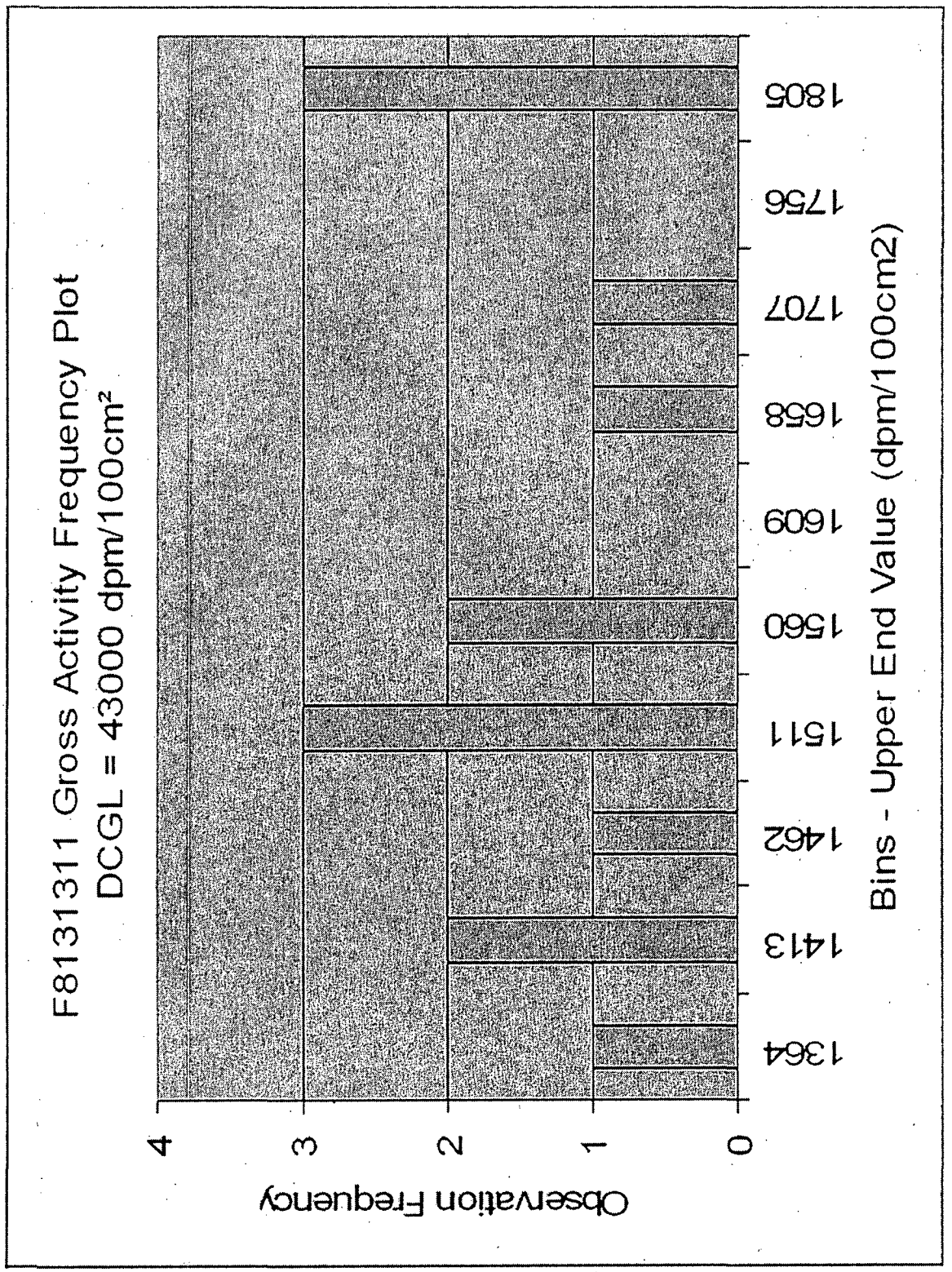
Survey Unit F8131311


F8131311 Gross Activity Sample Results Quantile Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
1520
0
20
40
60
80
100
Percentile
Direct Measurements (dpm/100cm2)
median
75th Percentile
50th Percentile


F8131311 Gross Activity Sample Results Scatter Plot
DCGL = 43000 dpm/100cm²
2002
1556
1109
2500
2000
1500
1000
500
0
Activity (dpm/100cm2)
C00014BD
C00013BD
C00012BD
C00011BD
C00010BD
C00009BD
C00008BD
C00007BD
C00006BD
C00005BD
C00004BD
C00003BD
C00002BD
C00001BD
Measurement Locations
Gross Activity
Average
"+3StDev"
"-3StDev"


F8131311 Gross Activity Frequency Plot
DCGL = 43000 dpm/100cm²
Observation Frequency
0
1
2
3
4
Bins - Upper End Value (dpm/100cm2)
1364
1413
1462
1511
1560
1609
1658
1707
1756
1805