Rancho Seco

Final Status Survey Summary Report

May 30, 2008

AB +40' Radiochemistry Lab (room 320 – lower)

Survey Unit F8131791

Prepared By: Dan A. Tallman **Date: May 30, 2008**

FSS Engineer

Reviewed By: _____ **Date:** 5/30/08

Lead FSS Engineer

Approved By: _____ **Date:** 7-29-08

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8131791, AB +40' Radiochemistry Lab (room 320) lower

Survey Unit Description:

Operating History: The Auxiliary Building is a reinforced concrete structure that 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 +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. Based on the classification procedure (DSIP-0020) and levels of gross activity reported, Survey Unit 8131791 (Room 320's lower walls and floor) within the interior of the auxiliary building was determined to be a Class 2 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 determined using a random-start, fixed grid pattern and 15 m^2 were scanned for approximately 25% 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	AB +40' Radiochemistry Lab (room 320) lower
Survey Unit:	1791	Structure Surface
Class:	2	LTP Table 5-4
SU Area (m^2)**:**	59	
Evaluator:	D.A.Tallman	
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)**:**	3627	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m^2)**:**	4.2	Class 2
Scan Area (m^2)**:**	15	
Scan Coverage (%):	25%	Class 2
$Z_{1-\alpha}$ **:**	1.645	
$Z_{1-\beta}$ **:**	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	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:	2.0	Class 2

Survey Results:

A total of 15 direct measurements were made in F8131791. 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 2010 to 2956 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 cm²)
F8131791-C0001BD	1349
F8131791-C0002BD	1618
F8131791-C0003BD	1437
F8131791-C0004BD	1577
F8131791-C0005BD	1333
F8131791-C0006BD	1587
F8131791-C0007BD	1380
F8131791-C0008BD	1203
F8131791-C0009BD	1043
F8131791-C0010BD	1136
F8131791-C0011BD	975
F8131791-C0012BD	1089
F8131791-C0013BD	1271
F8131791-C0014BD	1157
F8131791-C0015BD	1089
Mean:	1283
Median:	1271
Standard Deviation:	208
Range:	975 - 1618

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm^2)
F8131791C0008SM	-3.53
F8131791C0001SM	-3.53
F8131791C0002SM	-2.24
F8131791C0003SM	-3.53
F8131791C0004SM	-0.95
F8131791C0005SM	-4.82
F8131791C0006SM	-2.24
F8131791C0007SM	2.93
F8131791C0008SM	-4.82
F8131791C0009SM	0.34
F8131791C0010SM	-4.82
F8131791C0011SM	-2.24
F8131791C0012SM	-4.82
F8131791C0013SM	-2.24
F8131791C0014SM	-0.95
F8131791C0015SM	6.8
Mean:	-1.92
Median:	-2.24
Standard Deviation:	3.15
Range:	-4.82 to 6.8

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):	1283	
Direct Measurement Standard Deviation (dpm/100 cm²):	208	
Total Standard Deviation (dpm/100 cm²):	208	Based on samples and backgrounds.
Maximum (dpm/100 cm²):	1618	
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), 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.

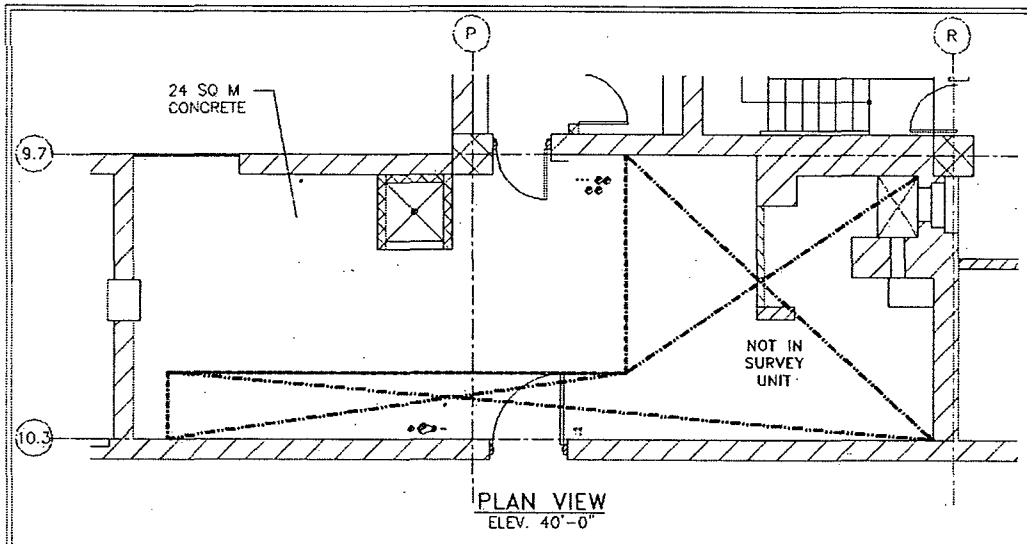
It is concluded that survey unit F8131791 meets the release criteria of 10CFR20.1402.

Attachment 1

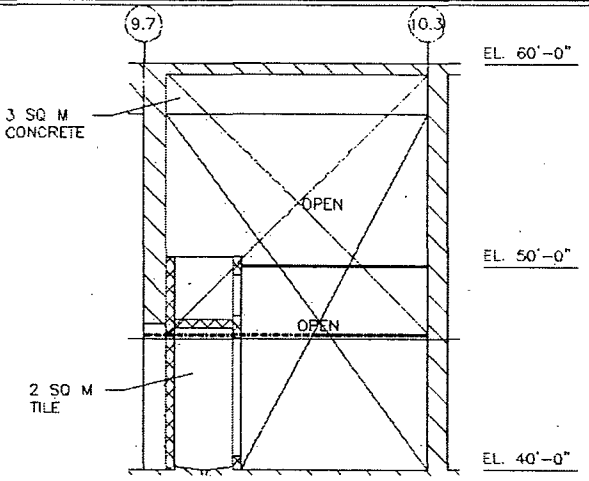
Maps

May 30, 2008

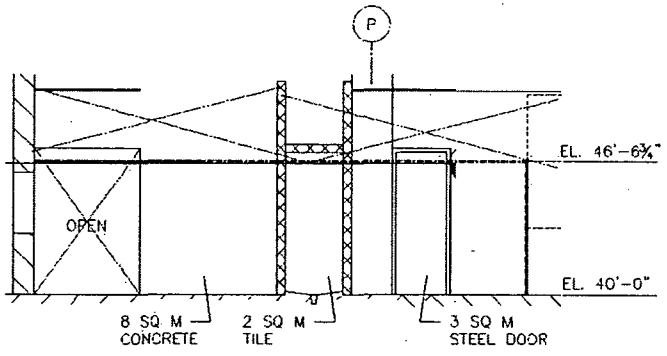
Survey Unit F8131791



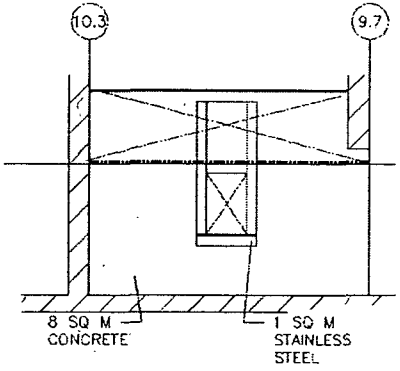
PLAN VIEW
ELEV. 40'-0"



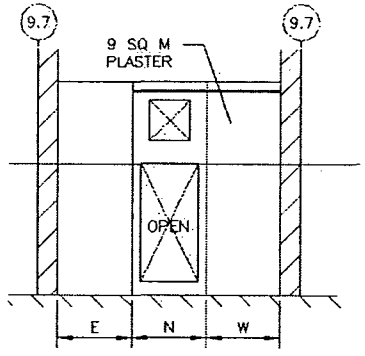
ELEVATION LOOKING EAST
AT COL. P



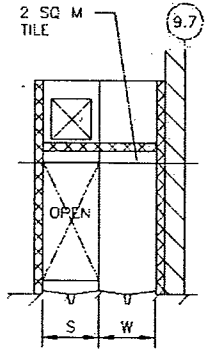
ELEVATION LOOKING NORTH
AT COL. LINE 9.7



ELEVATION LOOKING WEST
EAST OF COL. LINE N



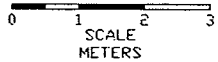
DEVELOPED VIEW
SHOWER EXTERIOR



DEVELOPED VIEW
SHOWER INTERIOR

General Surface Area Estimates

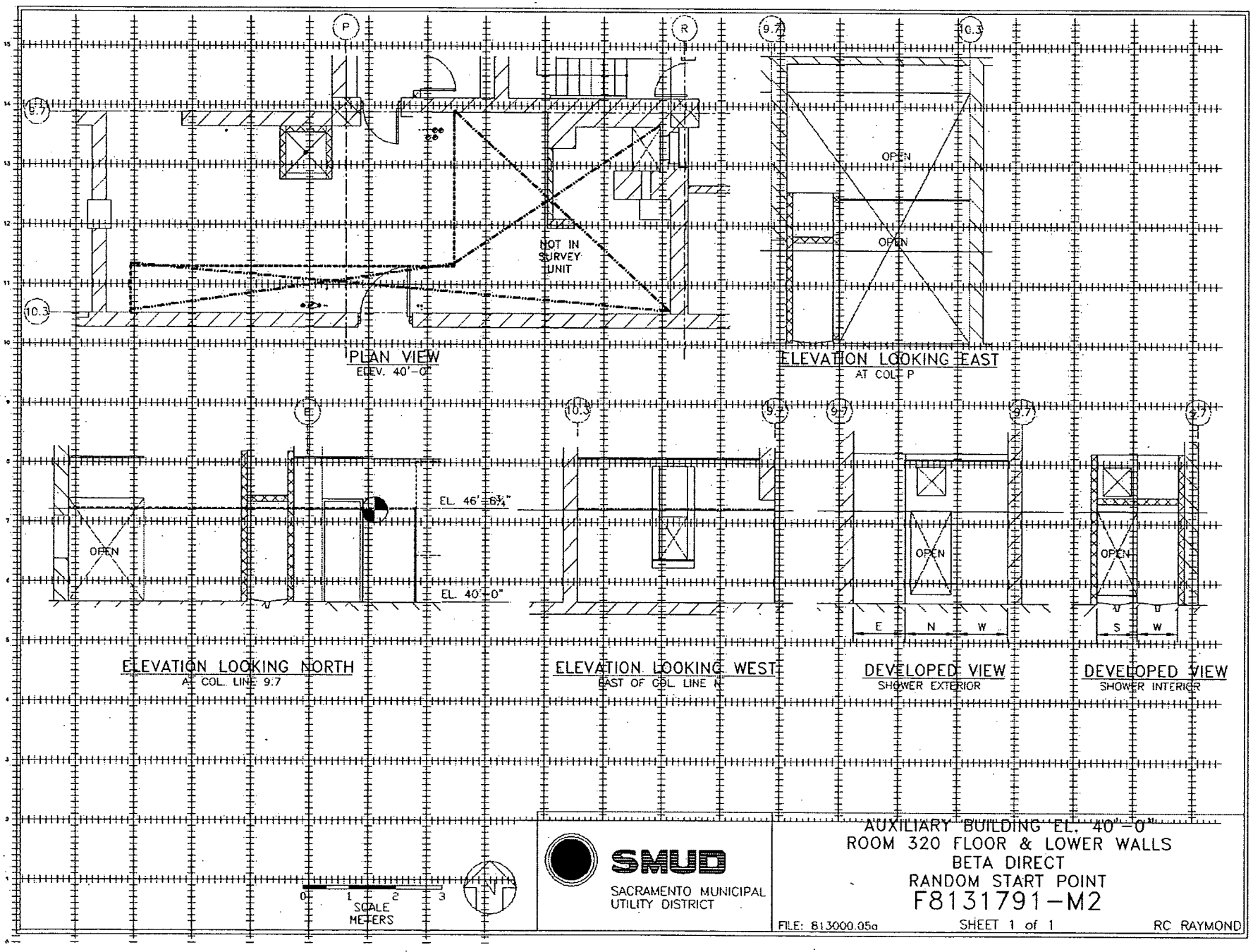
Walls –	35.0	m²
Floor –	24.0	m²
Total –	59.0	m²



SMUD
SACRAMENTO MUNICIPAL
UTILITY DISTRICT

AUXILIARY BUILDING EL. 40'-0"
ROOM 320 FLOOR & LOWER WALLS
GENERAL ARRANGEMENT
SURFACE AREA ESTIMATE
F8131791-M1

FILE: 813000.05a SHEET 1 of 1 RC RAYMOND


P
R
9.7
G.3
10.3
NOT IN SURVEY UNIT
OPEN
OPEN
PLAN VIEW
ELEV. 40'-0"
ELEVATION LOOKING EAST
AT COL. P
E
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9.7
9.7
9.7
EL. 46'-6¾"
EL. 40'-0"
OPEN
OPEN
OPEN
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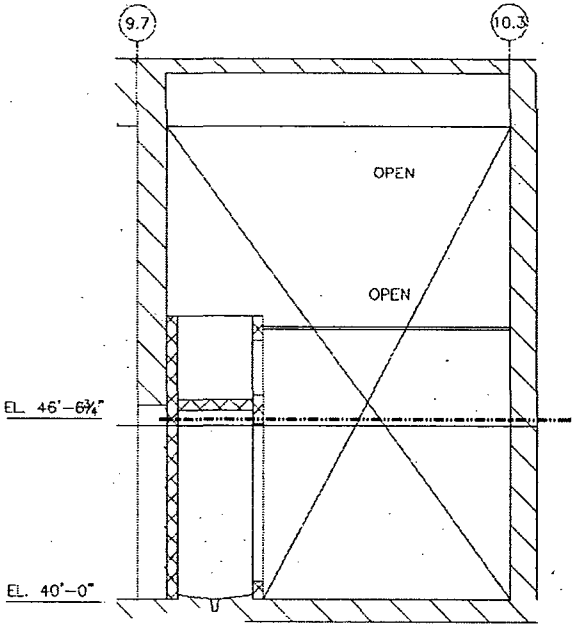
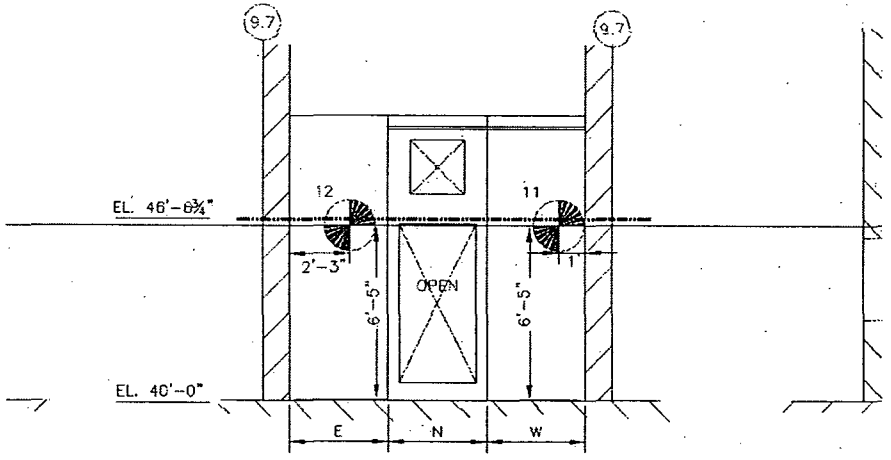
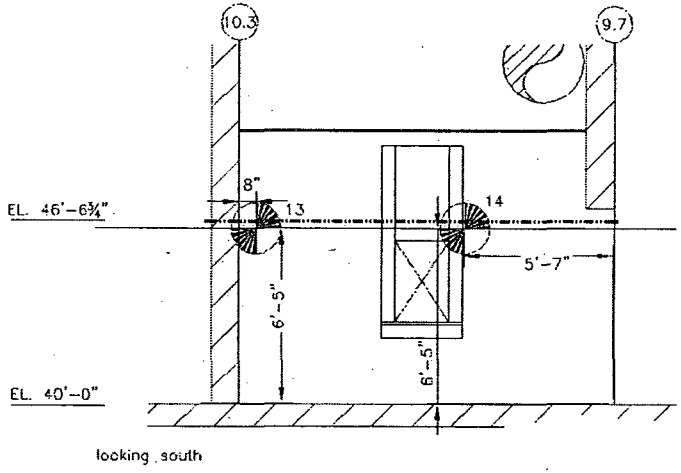
W
ELEVATION LOOKING NORTH
AT COL. LINE 9.7
ELEVATION LOOKING WEST
EAST OF COL. LINE N
DEVELOPED VIEW
SHOWER EXTERIOR
DEVELOPED VIEW
SHOWER INTERIOR
0
1
2
3
SCALE
METERS
SMUD
SACRAMENTO MUNICIPAL
UTILITY DISTRICT
AUXILIARY BUILDING EL. 40'-0"
ROOM 320 FLOOR & LOWER WALLS
BETA DIRECT
RANDOM START POINT
F8131791-M2
FILE: 813000.05a
SHEET 1 of 1
RC RAYMOND



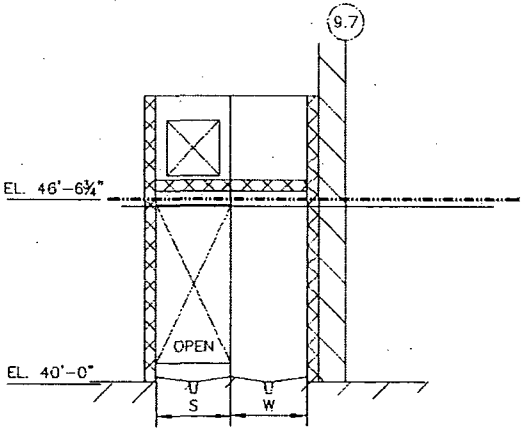
ELEVATION LOOKING EAST
AT COL. P



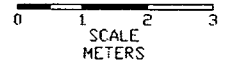
DEVELOPED VIEW
SHOWER EXTERIOR



ELEVATION LOOKING WEST
EAST OF COL. LINE N



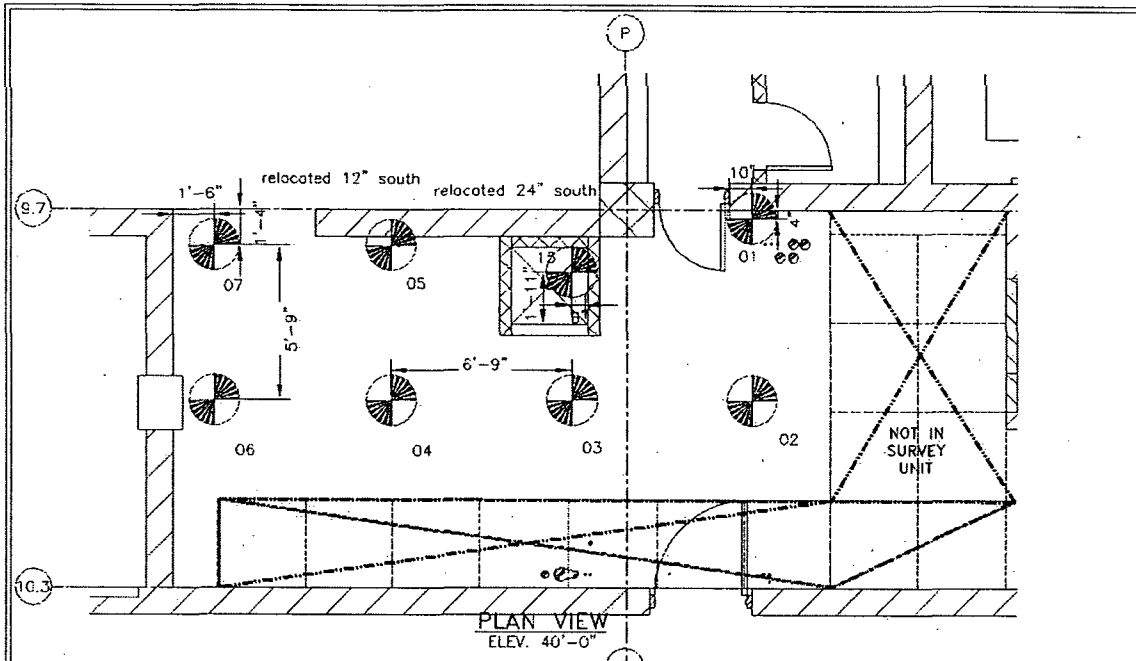
DEVELOPED VIEW
SHOWER INTERIOR



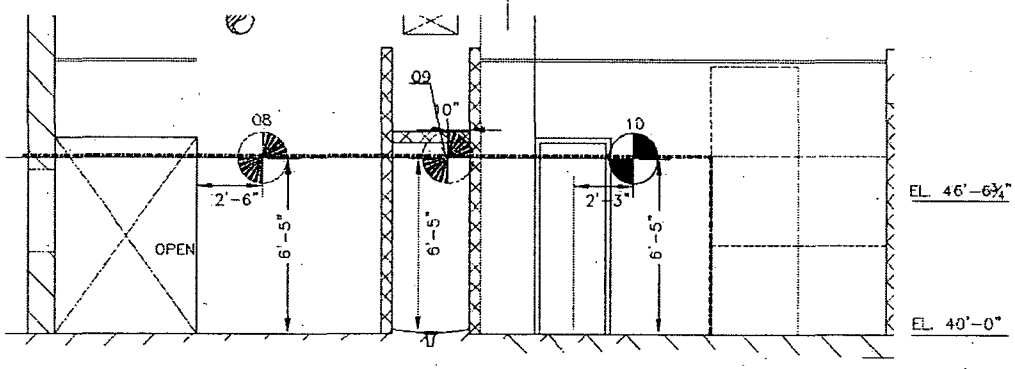
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT

AUXILIARY BUILDING EL. 40'-0"
ROOM 320 FLOOR & LOWER WALLS
BETA DIRECT/REMOVABLE ACTIVITY
MEASUREMENT LOCATIONS
F8131791-M2

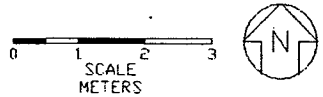
FILE: 813000.05a SHEET 2 of 3 RC RAYMOND



PLAN VIEW
ELEV. 40'-0"



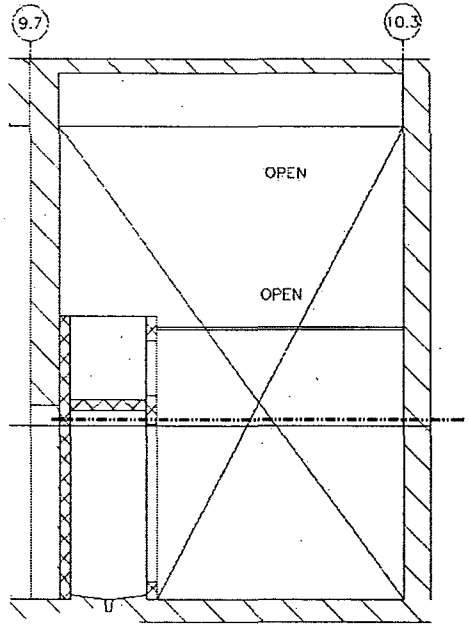
ELEVATION LOOKING NORTH
AT COL. LINE 9.7



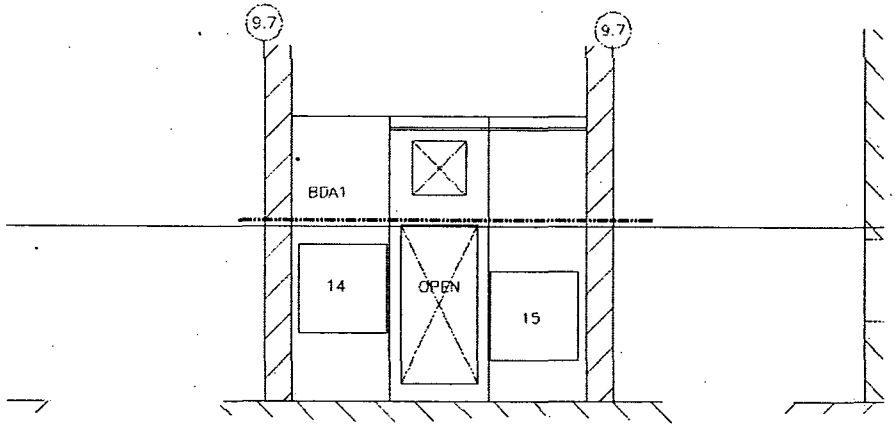
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT

AUXILIARY BUILDING EL. 40'-0"
ROOM 320 FLOOR & LOWER WALLS
BETA DIRECT/REMOVABLE ACTIVITY
MEASUREMENT LOCATIONS
F8131791-M2

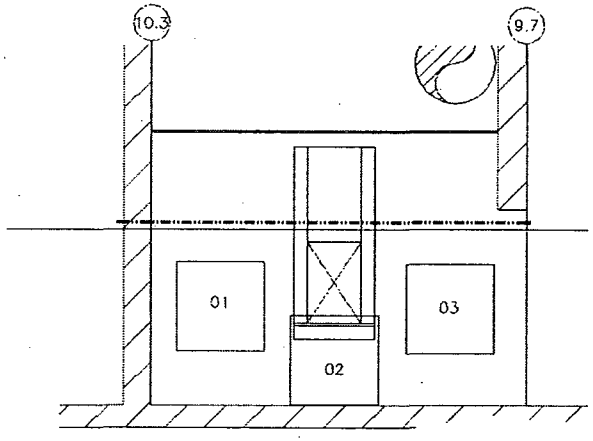
FILE: 813000.05a SHEET 3 of 3 RC RAYMOND



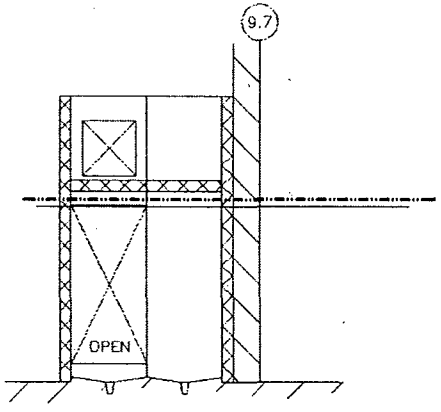
ELEVATION LOOKING EAST
AT COL. P



DEVELOPED VIEW
SHOWER EXTERIOR



ELEVATION LOOKING WEST
EAST OF COL. LINE N



DEVELOPED VIEW
SHOWER INTERIOR

0 1 2 3
SCALE
METERS

N

SMUD
SACRAMENTO MUNICIPAL
UTILITY DISTRICT

AUXILIARY BUILDING EL. 40'-0"
ROOM 320 FLOOR & LOWER WALLS
BETA SCAN
MEASUREMENT LOCATIONS
F8131791-M3

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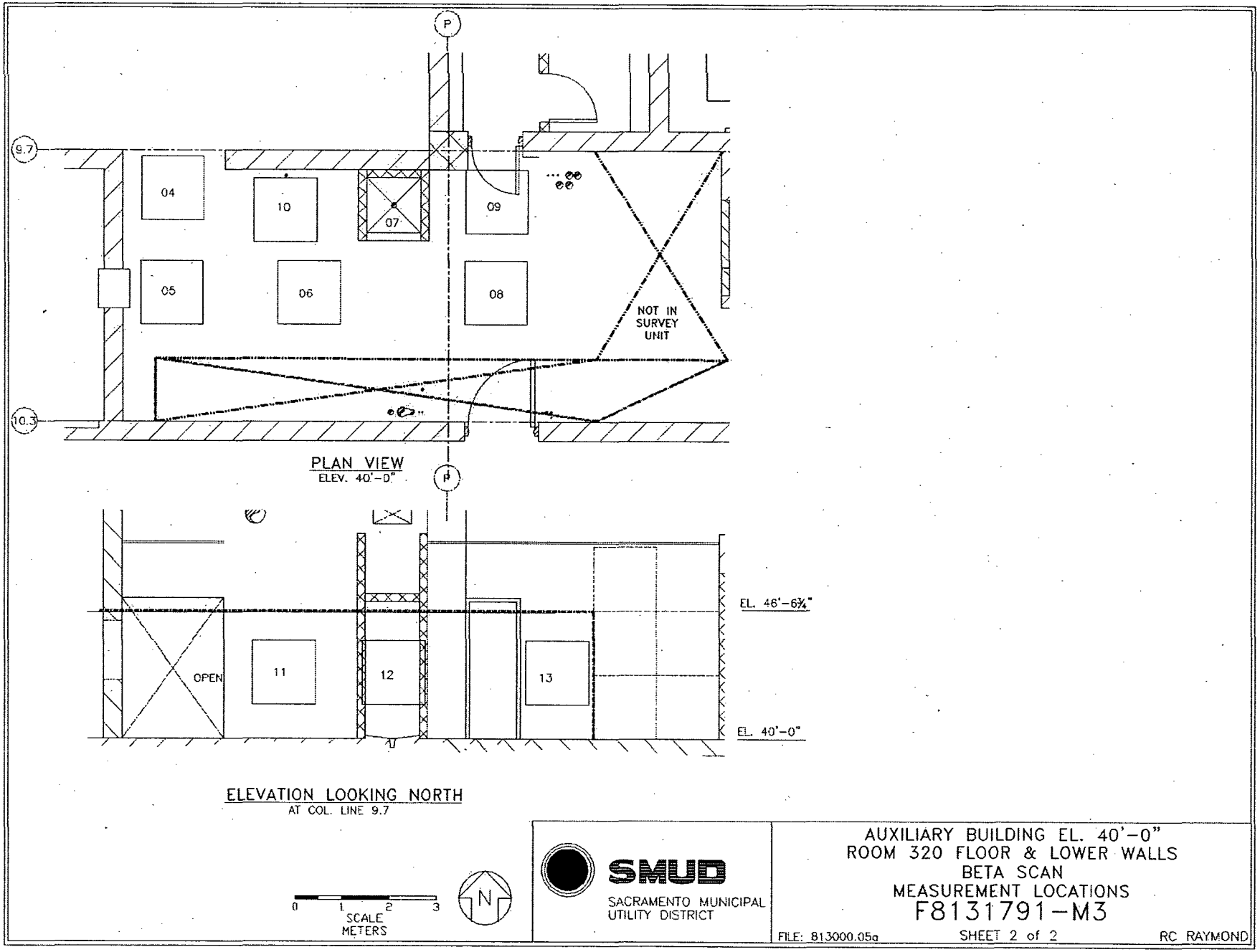
P
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08
NOT IN SURVEY UNIT
PLAN VIEW
ELEV. 40'-0"
OPEN
11
12
13
EL. 46'-6¾"
EL. 40'-0"
ELEVATION LOOKING NORTH
AT COL. LINE 9.7
0 1 2 3
SCALE METERS
N
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
AUXILIARY BUILDING EL. 40'-0"
ROOM 320 FLOOR & LOWER WALLS
BETA SCAN
MEASUREMENT LOCATIONS
F8131791-M3
FILE: 813000.05a
SHEET 2 of 2
RC RAYMOND

Attachment 2

Instrumentation

May 30, 2008

Survey Unit F8131791

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; 190476	433	1033
Tennelec; 0401171	N/A	6 dpm α, 12 dpm β	N/A

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

May 30, 2008

Survey Unit F8131791

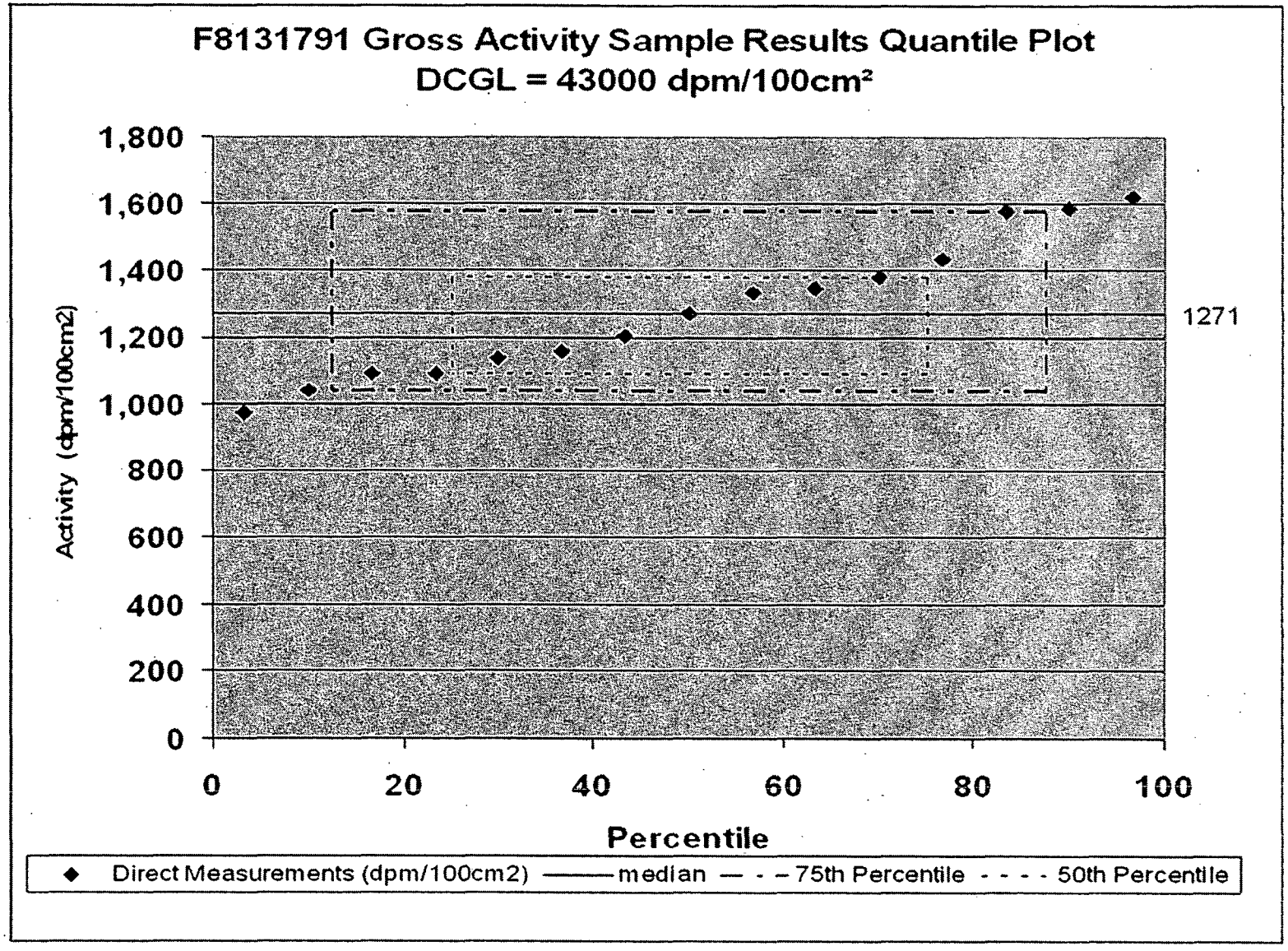
(none required)

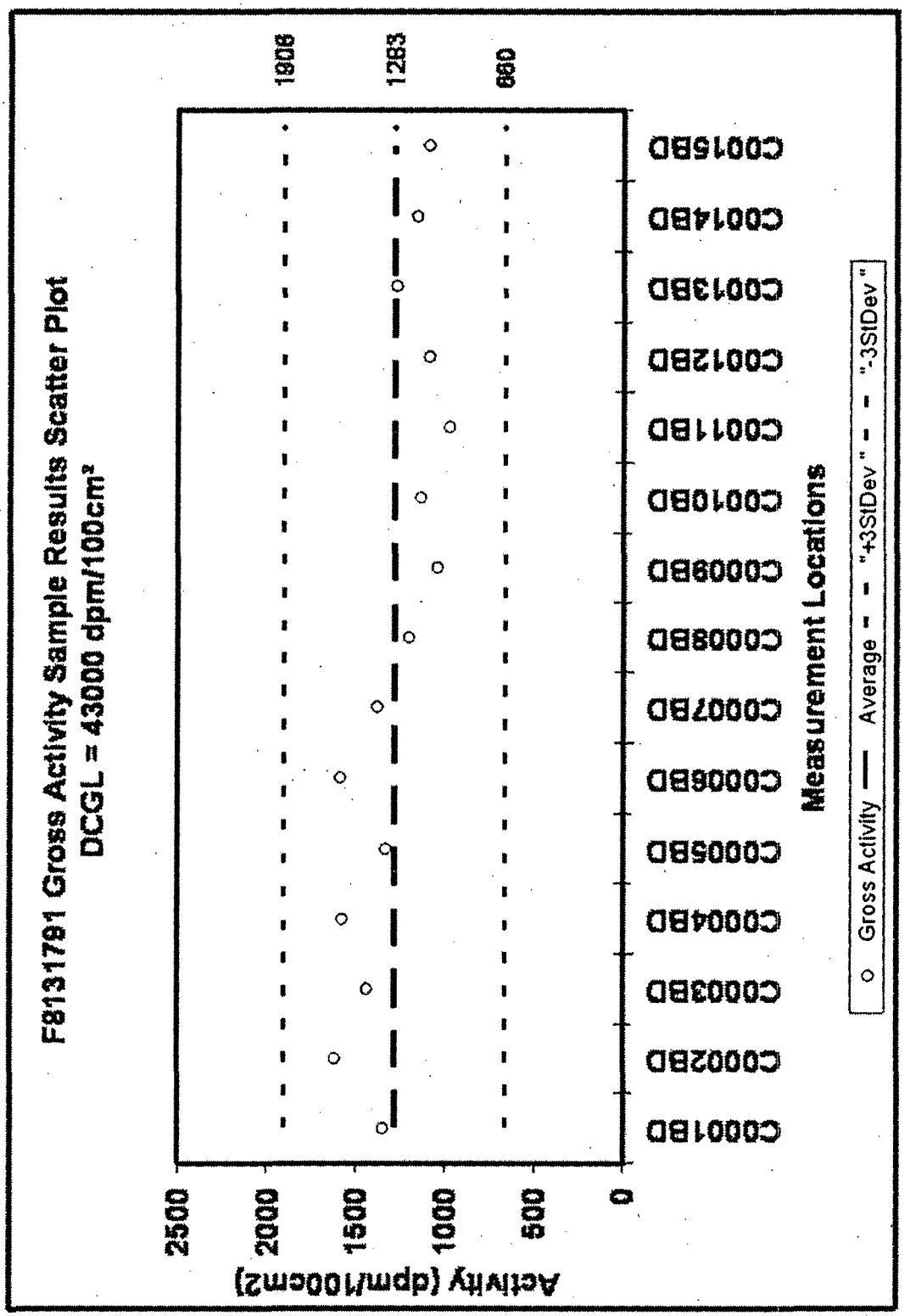
Attachment 4

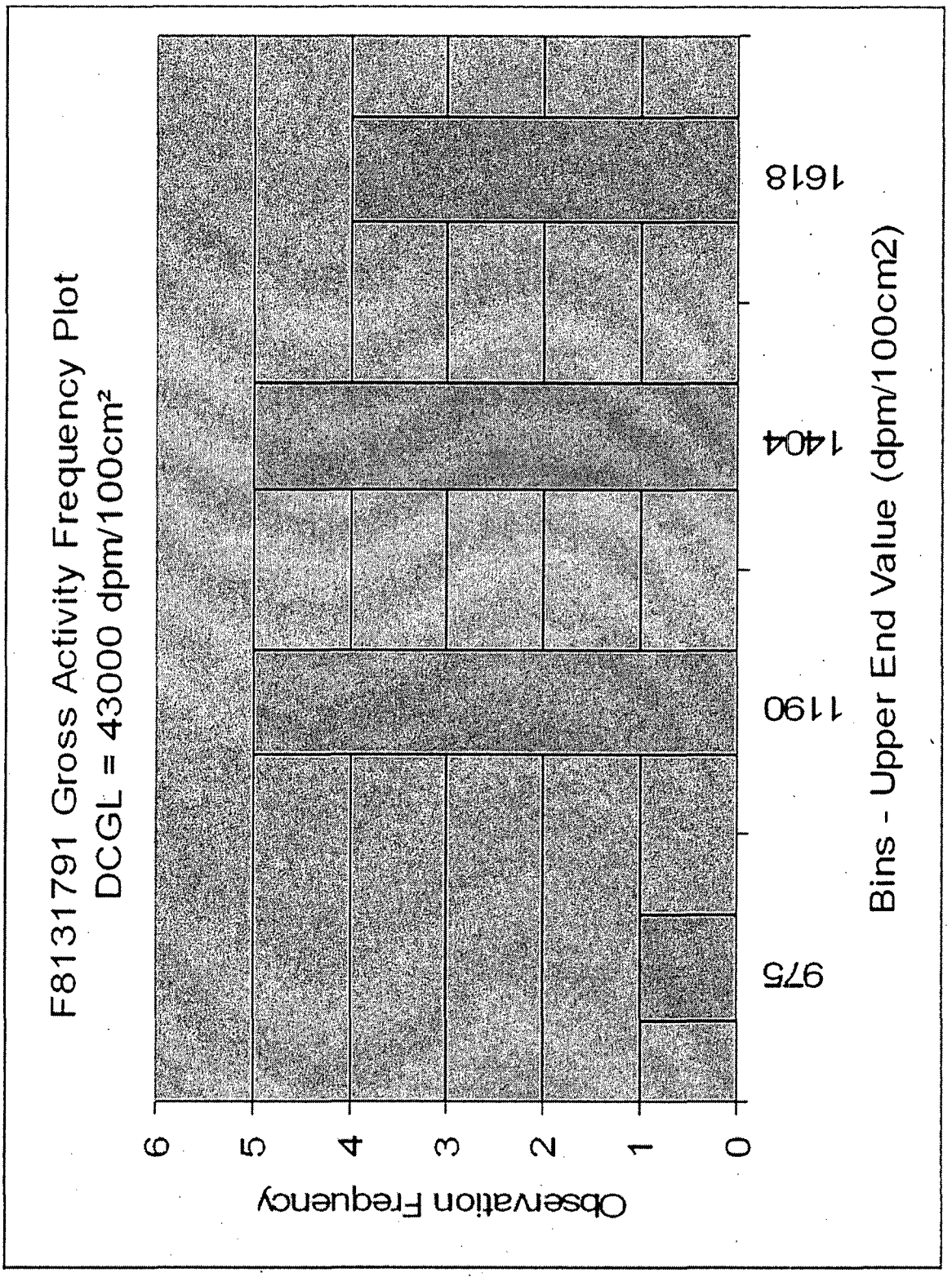
Data Assessment

May 30, 2008

Survey Unit F8131791


F8131791 Gross Activity Sample Results Quantile Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
1,800
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


F8131791 Gross Activity Sample Results Scatter Plot
DCGL = 43000 dpm/100cm²
1908
1283
658
2500
2000
1500
1000
500
0
Activity (dpm/100cm2)
C00015BD
C00014BD
C00013BD
C00012BD
C00011BD
C00010BD
C00009BD
C00008BD
C00007BD
C00006BD
C00005BD
C00004BD
C00003BD
C00002BD
C00001BD
Measurement Locations
Gross Activity
Average
"+3StDev"
"-3StDev"


F8131791 Gross Activity Frequency Plot
DCGL = 43000 dpm/100cm²
Observation Frequency
0
1
2
3
4
5
6
975
1190
1404
1618
Bins - Upper End Value (dpm/100cm2)