

Rancho Seco

Final Status Survey Summary Report

June 20, 2008

Chemical Storage Room, Room #106, 0' AB

Survey Unit F8130862

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FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8130862, Chemical Storage Room, Room #106, 0' AB

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 296.5 m² 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	Chemical Storage Room, Room #106, 0' AB
Survey Unit:	0862	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m²):	296.5	
Evaluator:	Erin L. Brown	
DCGL (dpm/100 cm²):	43000	Gross Activity DCGL
Area Factor:	3.5	Class 1
Design DCGL_{emc} (dpm/100 cm²):	150500	Class 1
LBGR (dpm/100 cm²):	21500	Default = 50% DCGL
Design Sigma (dpm/100 cm²):	6935	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m²):	7.1	Class 1
Scan Area (m²):	296.5	
Scan Coverage (%):	100%	Class 1
Z_{1-α}:	1.645	
Z_{1-β}:	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:	43	Class 1
Grid Spacing L:	2.6	Class 1

Survey Results:

A total of 43 direct measurements were made in F8130862. The results including mean, median, standard deviation and range are shown in Table 2. All direct measurements were less than the DCGL. One of the scan measurements indicated elevated activity and required investigation as noted in Attachment 3. Scan activity ranged from 1834 to 487881 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 cm ²)
F8130862-C0001BD	1333
F8130862-C0002BD	1525
F8130862-C0003BD	1463
F8130862-C0004BD	1484
F8130862-C0005BD	1816
F8130862-C0006BD	4440
F8130862-C0007BD	2697
F8130862-C0008BD	1613
F8130862-C0009BD	1509
F8130862-C0010BD	1551
F8130862-C0011BD	1821
F8130862-C0012BD	1276
F8130862-C0013BD	1152
F8130862-C0014BD	1037
F8130862-C0015BD	1063
F8130862-C0016BD	1209
F8130862-C0017BD	1167
F8130862-C0018BD	1152
F8130862-C0019BD	1240
F8130862-C0020BD	1069
F8130862-C0021BD	1312
F8130862-C0022BD	1069
F8130862-C0023BD	1032
F8130862-C0024BD	1126
F8130862-C0025BD	1048
F8130862-C0026BD	1261
F8130862-C0027BD	1183
F8130862-C0028BD	1525
F8130862-C0029BD	1271
F8130862-C0030BD	1333
F8130862-C0031BD	1520
F8130862-C0032BD	1375
F8130862-C0033BD	1520
F8130862-C0034BD	1395
F8130862-C0035BD	1380
F8130862-C0036BD	1525

F8130862-C0037BD	1375
F8130862-C0038BD	1541
F8130862-C0039BD	1307
F8130862-C0040BD	1535
F8130862-C0041BD	1162
F8130862-C0042BD	1219
F8130862-C0043BD	674
Mean:	1426
Median:	1333
Standard Deviation:	561
Range:	674 - 4440

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm²)
F8130862C0001SM	4.22
F8130862C0002SM	-2.24
F8130862C0003SM	-2.24
F8130862C0004SM	0.34
F8130862C0005SM	-2.24
F8130862C0006SM	-0.95
F8130862C0007SM	-3.53
F8130862C0008SM	0.34
F8130862C0009SM	-3.53
F8130862C0010SM	-2.24
F8130862C0011SM	-0.95
F8130862C0012SM	-0.95
F8130862C0013SM	-2.24
F8130862C0014SM	-4.82
F8130862C0015SM	-2.24
F8130862C0016SM	-4.82
F8130862C0017SM	-2.24
F8130862C0018SM	-4.82
F8130862C0019SM	2.93
F8130862C0020SM	-4.82
F8130862C0021SM	-3.53
F8130862C0022SM	-3.53
F8130862C0023SM	-3.53
F8130862C0024SM	-0.95
F8130862C0025SM	-0.95
F8130862C0026SM	-4.82
F8130862C0027SM	-4.82
F8130862C0028SM	-2.24
F8130862C0029SM	-3.53
F8130862C0030SM	-2.24
F8130862C0031SM	-4.82
F8130862C0032SM	-3.53
F8130862C0033SM	-2.24
F8130862C0034SM	-2.24
F8130862C0035SM	-3.53
F8130862C0036SM	-4.82
F8130862C0037SM	-0.95
F8130862C0038SM	-2.24
F8130862C0039SM	-3.53
F8130862C0040SM	1.64
F8130862C0041SM	-2.24
F8130862C0042SM	6.8
F8130862C0043SM	-0.95
Mean:	-2.12
Median:	-2.24
Standard Deviation:	2.5
Range:	-4.82 to 6.8

Survey Unit Data Assessment:

The survey design required 43 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 cm ²):	N/A	Average Ambient BKG = 0
Ambient Background Used (dpm/100 cm ²):	N/A	
Actual Direct Measurements (N):	43	
Median (dpm/100 cm ²):	1333	
Mean (dpm/100 cm ²):	1426	
Direct Measurement Standard Deviation (dpm/100 cm ²):	561	Based on samples and backgrounds.
Total Standard Deviation (dpm/100 cm ²):	561	
Maximum (dpm/100 cm ²):	4440	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	43	
S+ Value:	43	
Critical Value:	27	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	Class 1
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGL_{mc}:	Yes	
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:

An investigation was required for one scan measurement as indicated in Attachment 3. Investigation of the area resulted in the decision to perform additional remediation. The investigation result in attachment 3 represent the residual radioactivity levels achieved after additional remediation.

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. One potential area of elevated activity was detected as indicated in Attachment 3.

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 cm² and none of the removable surface activity measurements exceeded 10% of the DCGL. An investigation was required for one scan measurement as indicated in Attachment 3.

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.

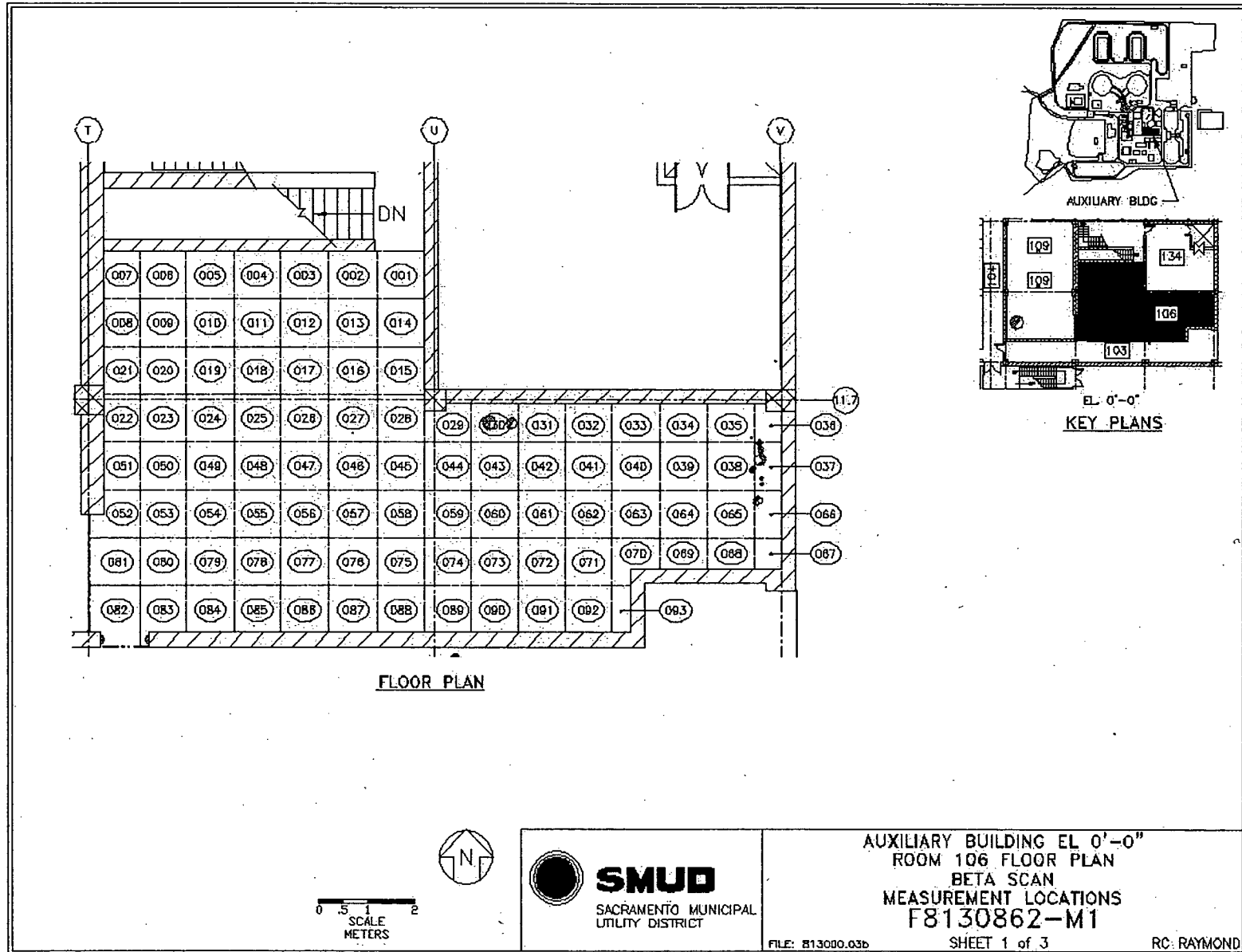
It is concluded that survey unit F8130862 meets the release criteria of 10CFR20.1402.

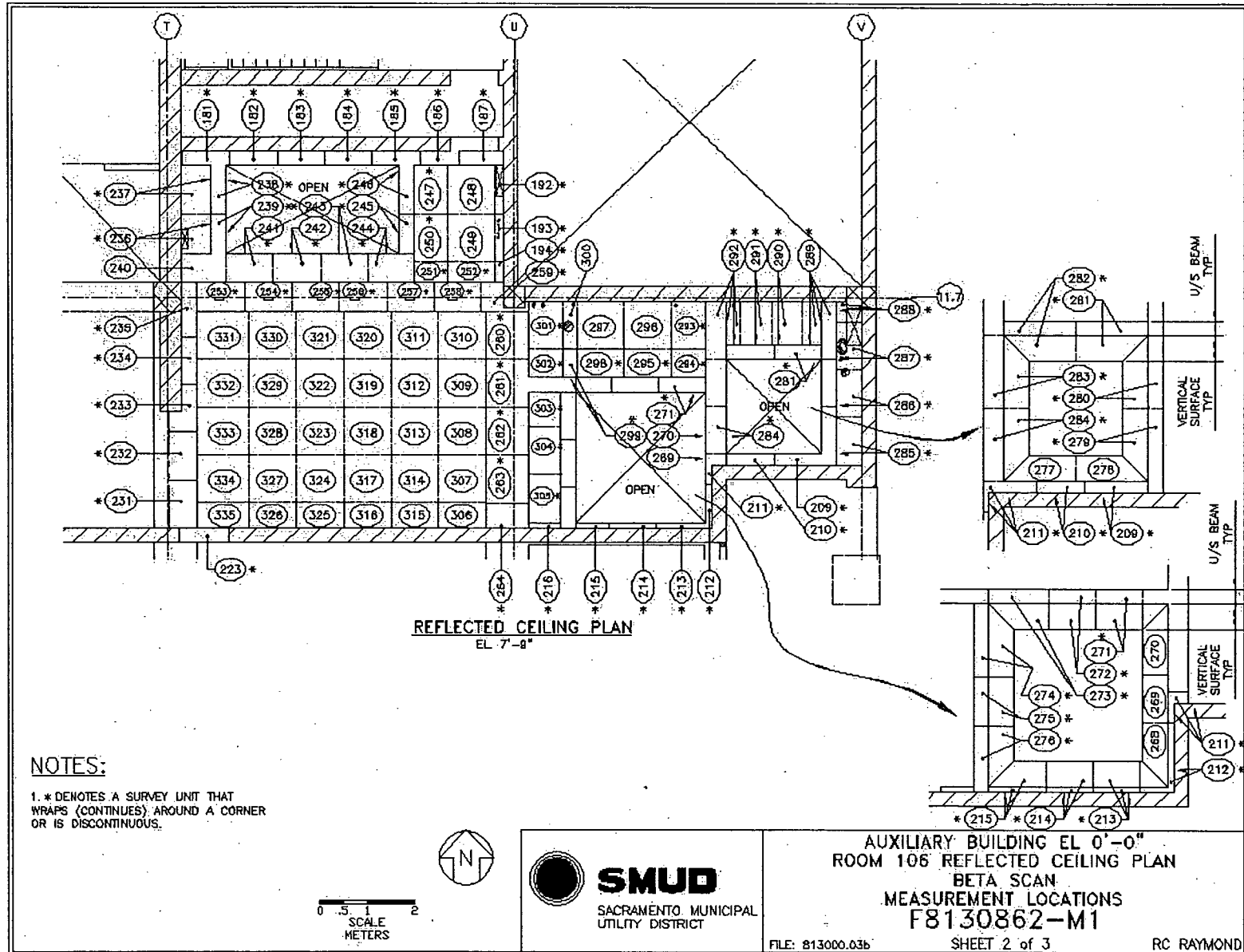
Attachment 1

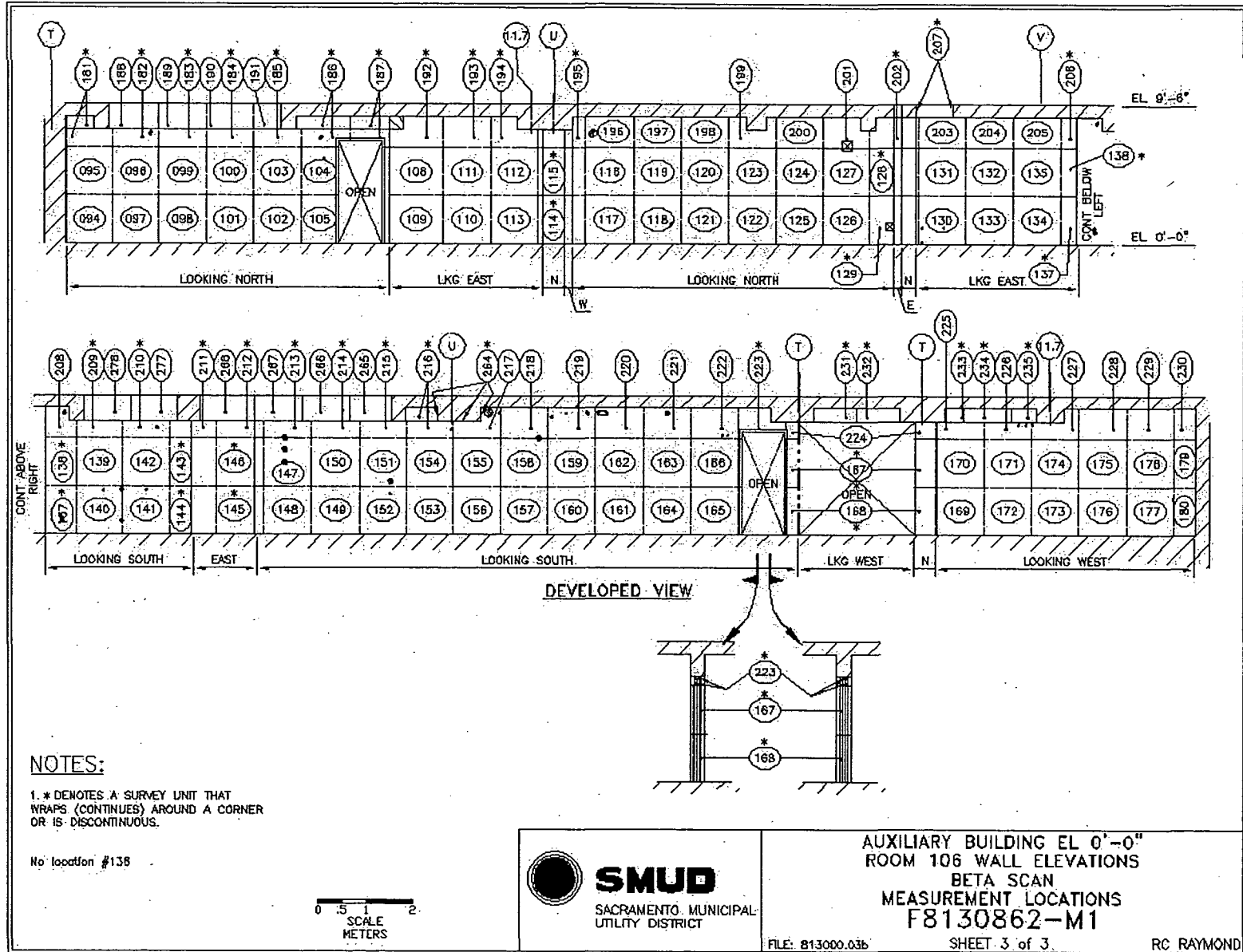
Maps

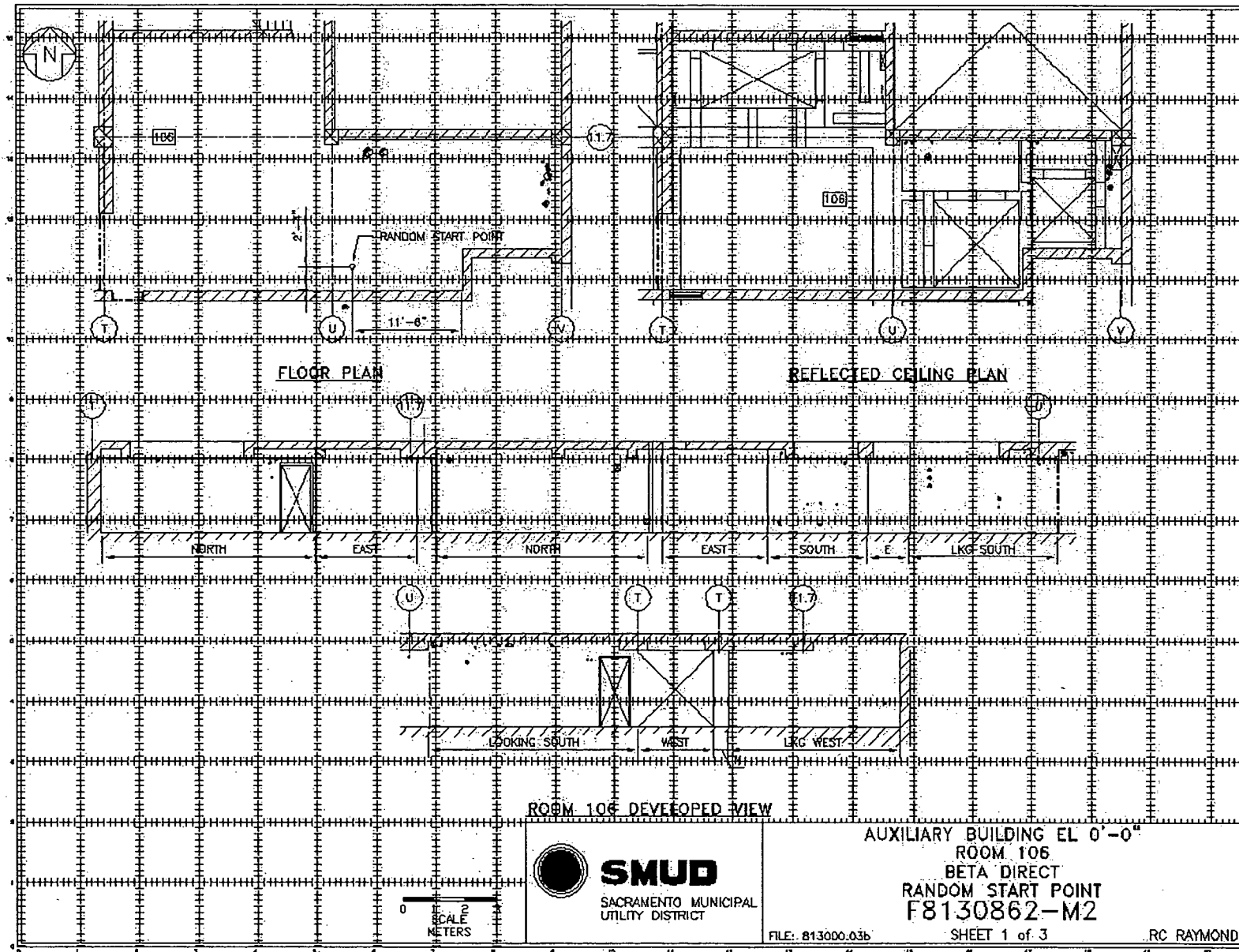
June 20, 2008

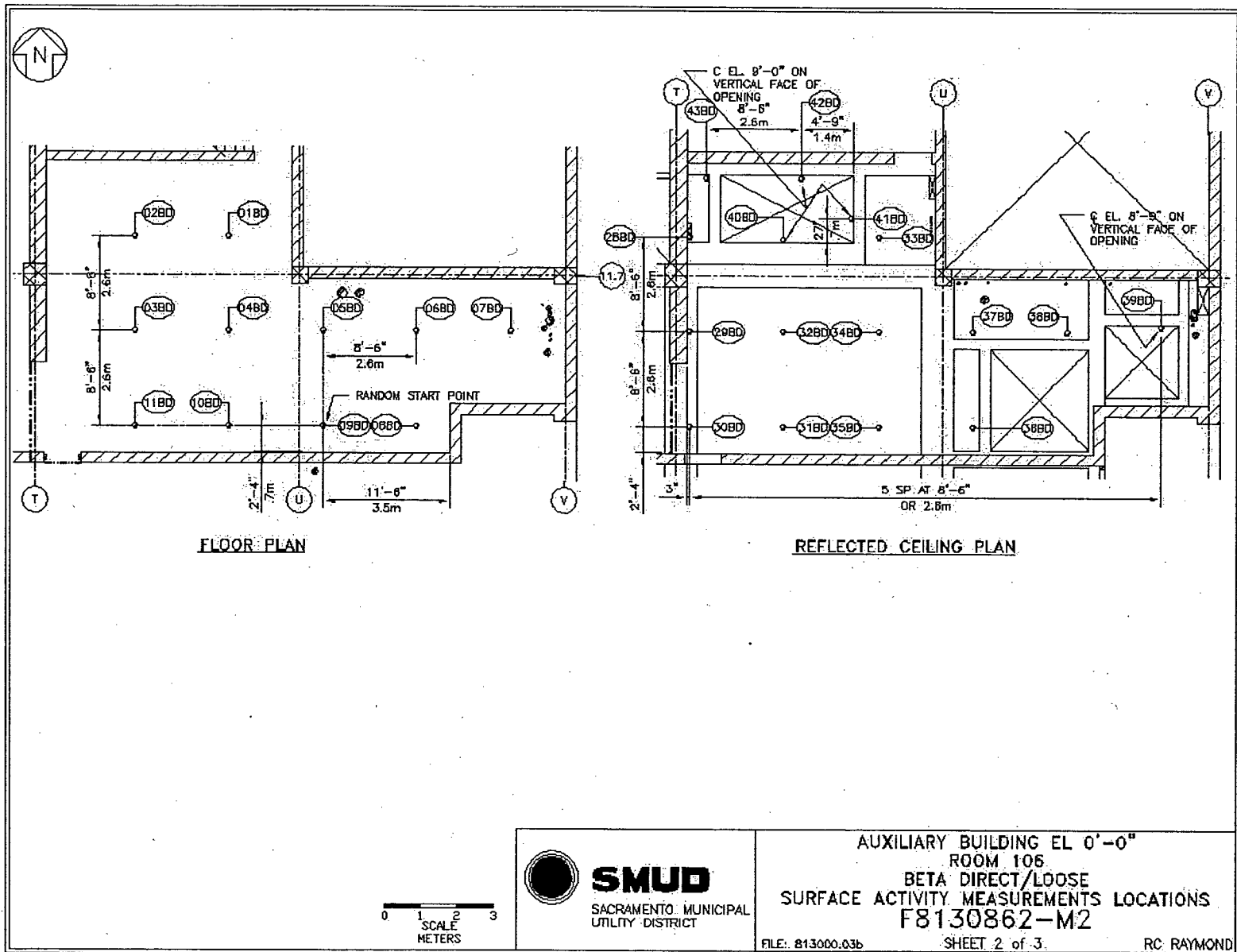
Survey Unit F8130862

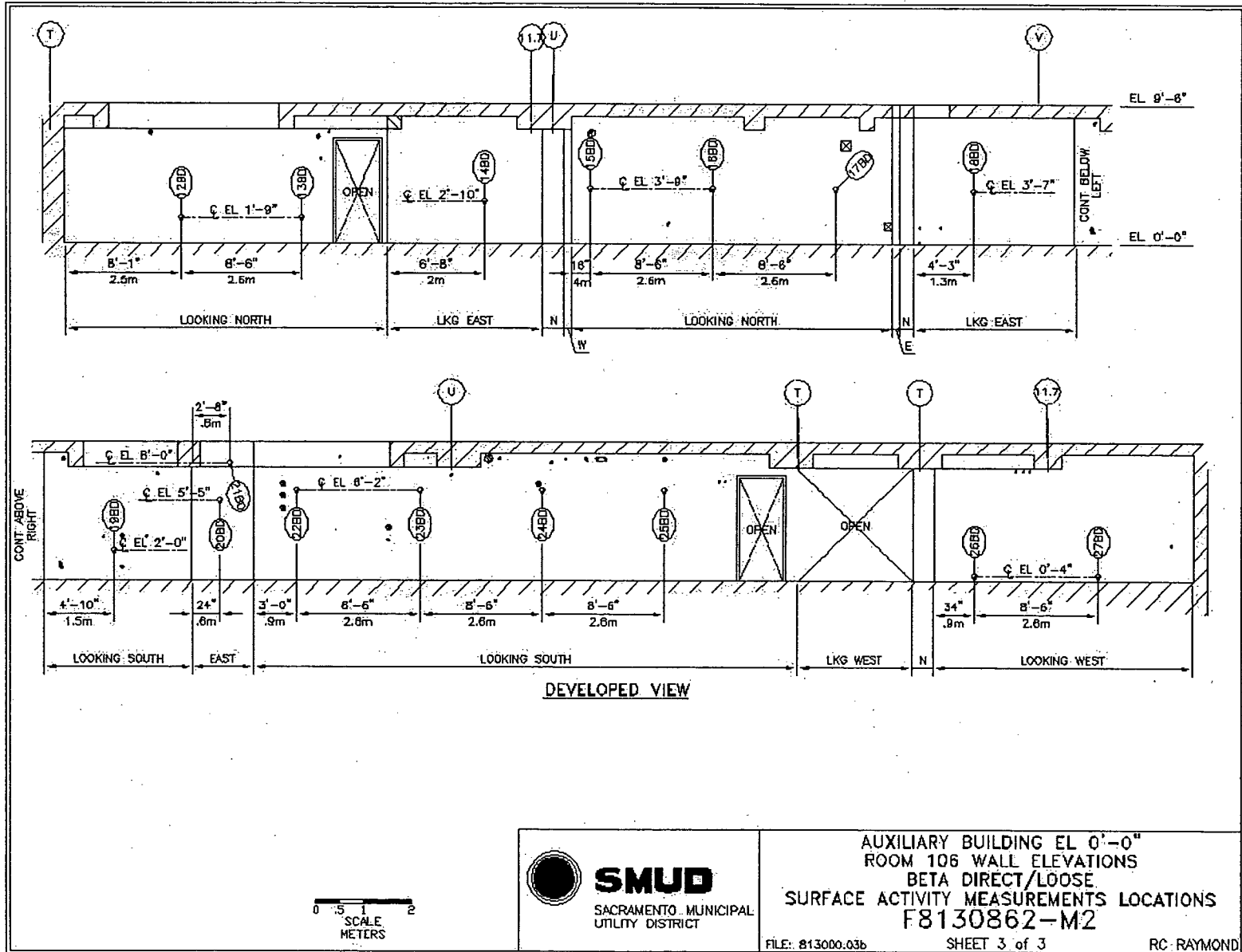


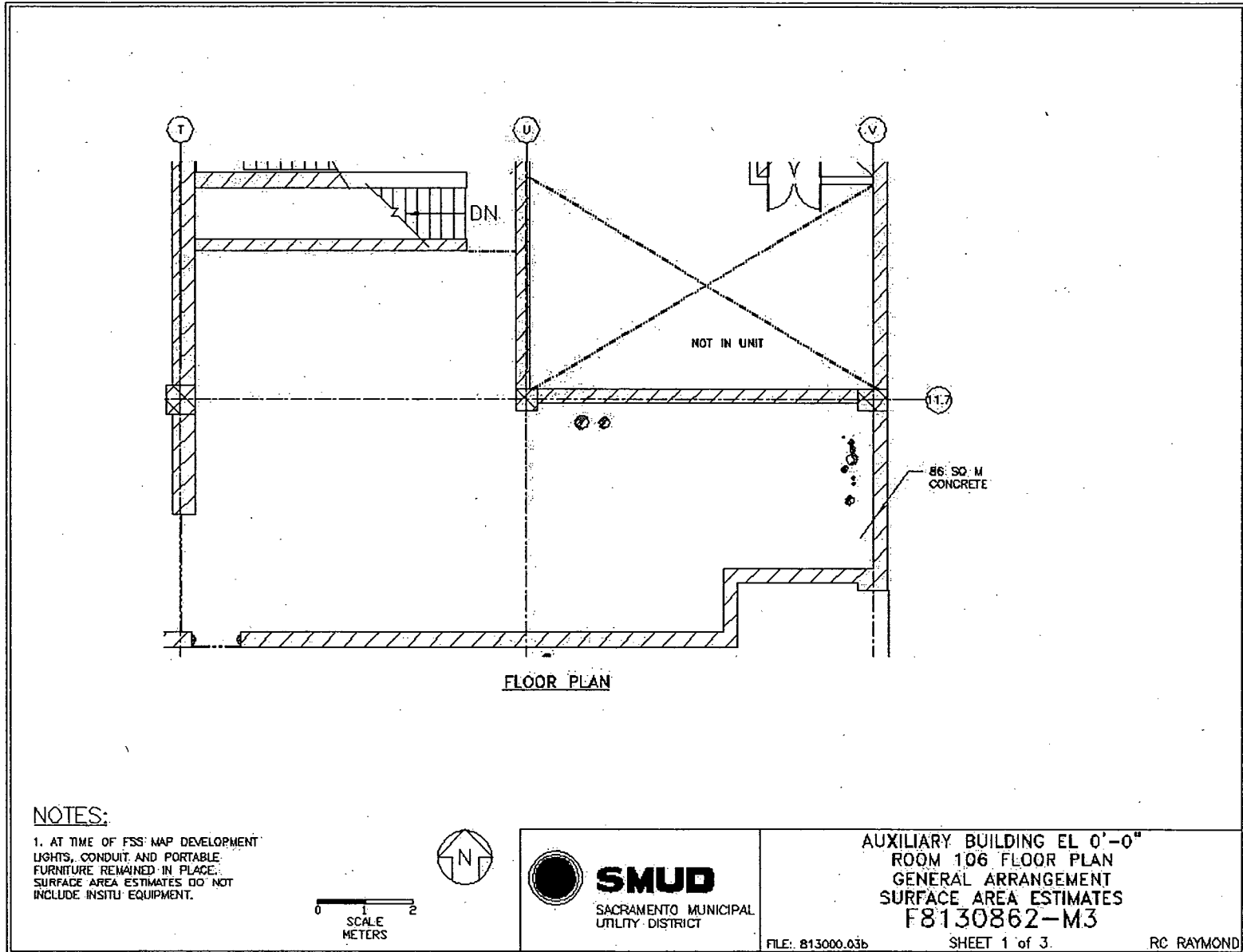


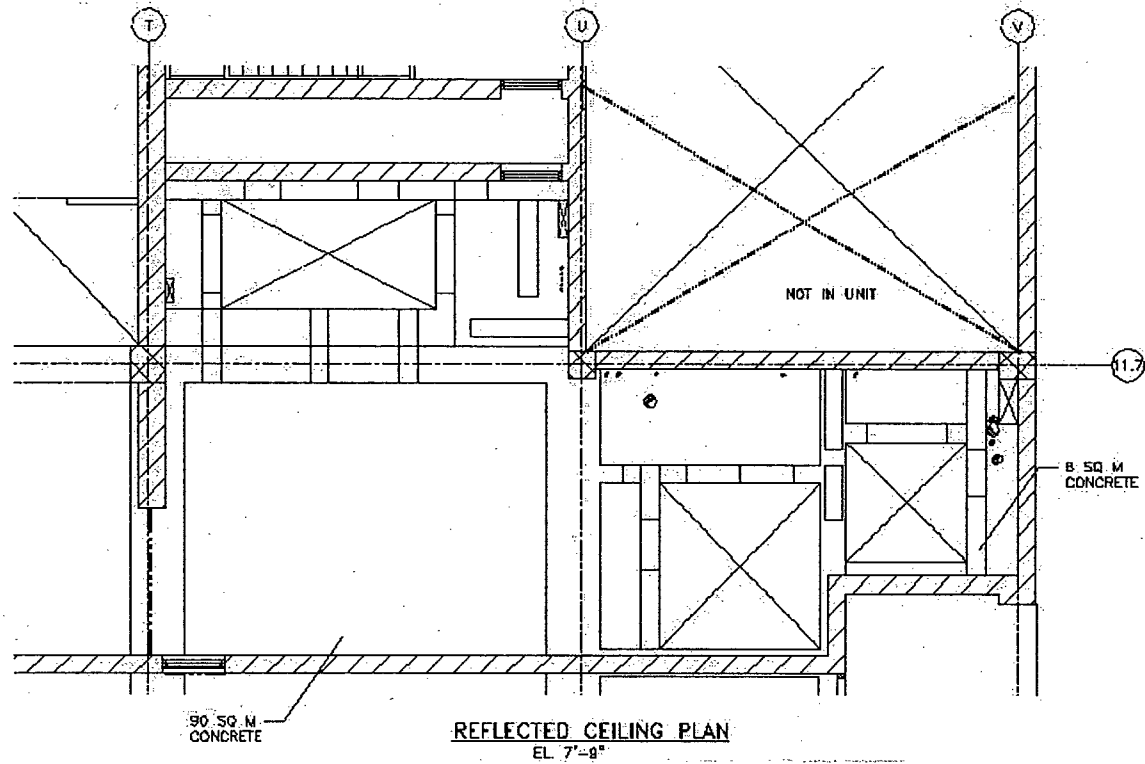












NOTES:

1. AT TIME OF FSS MAP DEVELOPMENT
LIGHTS, CONDUIT AND PORTABLE
FURNITURE REMAINED IN PLACE.
SURFACE AREA ESTIMATES DO NOT
INCLUDE INSITU EQUIPMENT.

0 1 2
SCALE
METERS



SMUD

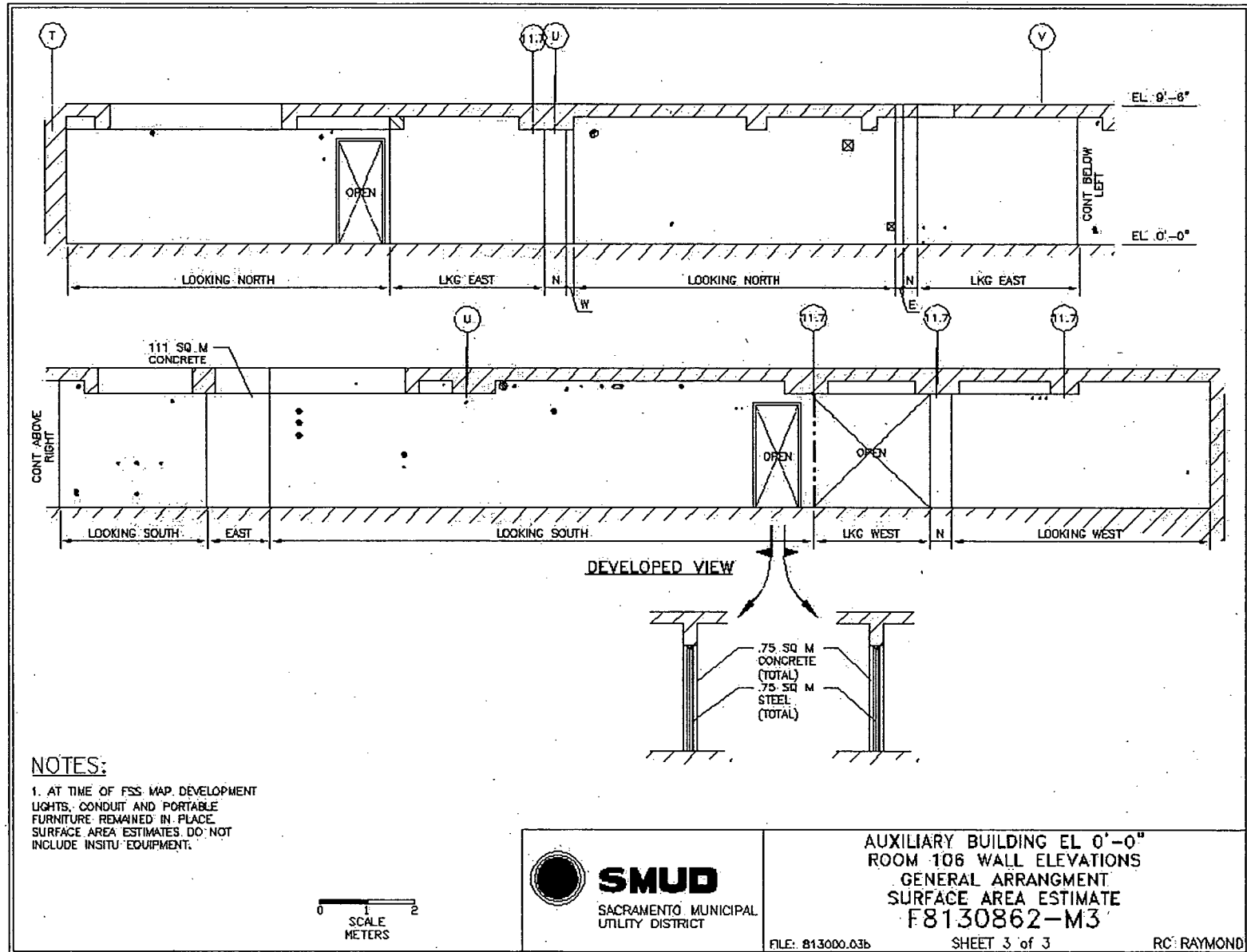
SACRAMENTO MUNICIPAL
UTILITY DISTRICT

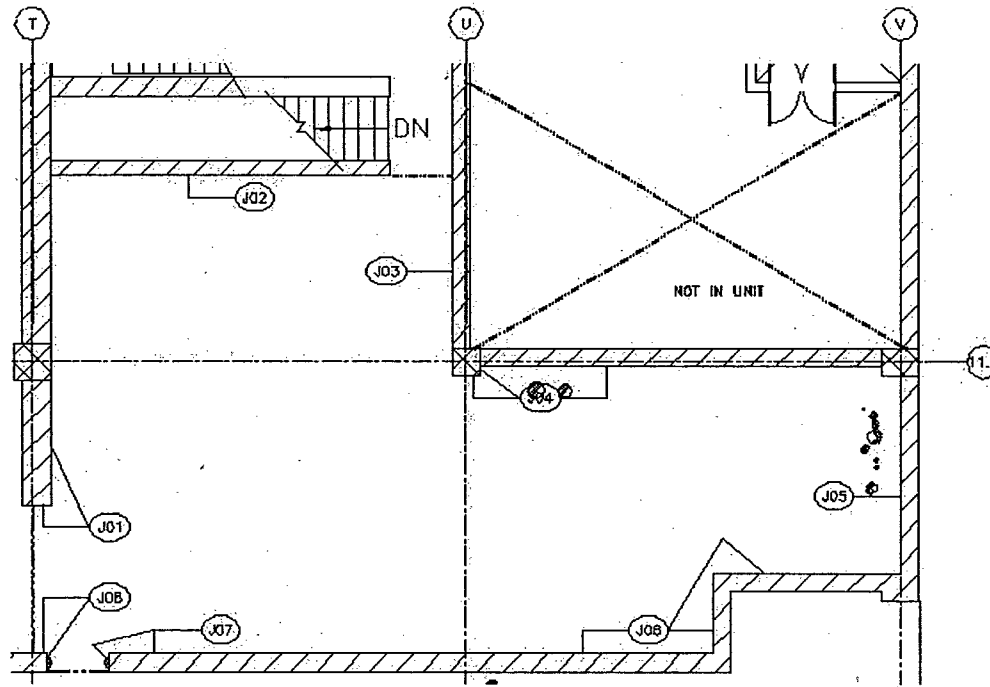
AUXILIARY BUILDING EL. 0'-0"
ROOM 106 REFLECTED CEILING PLAN
GENERAL ARRANGEMENT
SURFACE AREA ESTIMATES
F8130862-M3

FILE: 813000.03b

SHEET 2 of 3

RC RAYMOND





FLOOR PLAN

0 1 2
SCALE
METERS



SMUD

SACRAMENTO MUNICIPAL
UTILITY DISTRICT

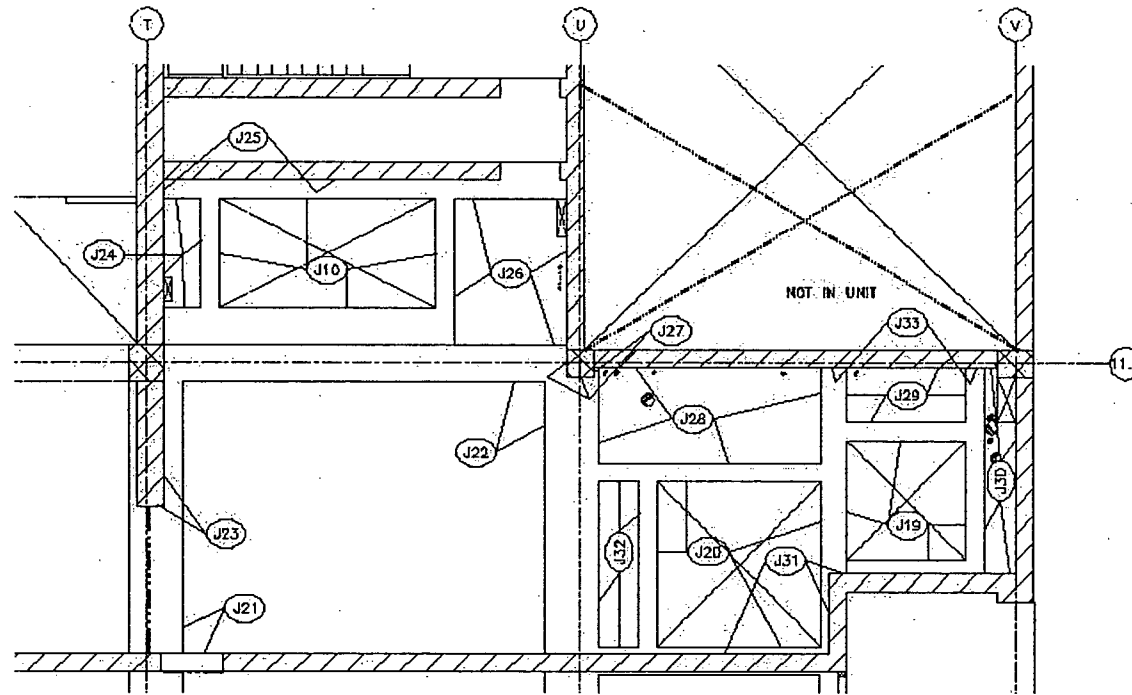
AUXILIARY BUILDING EL 0'-0"
ROOM 106 FLOOR PLAN
JUNCTURE SCANS

F8130862-M4

FILE: 813000.03b

SHEET 1 of 3

RC RAYMOND



REFLECTED CEILING PLAN
EL. 7'-8"

0 1 2
SCALE
METERS



SMUD

SACRAMENTO MUNICIPAL
UTILITY DISTRICT

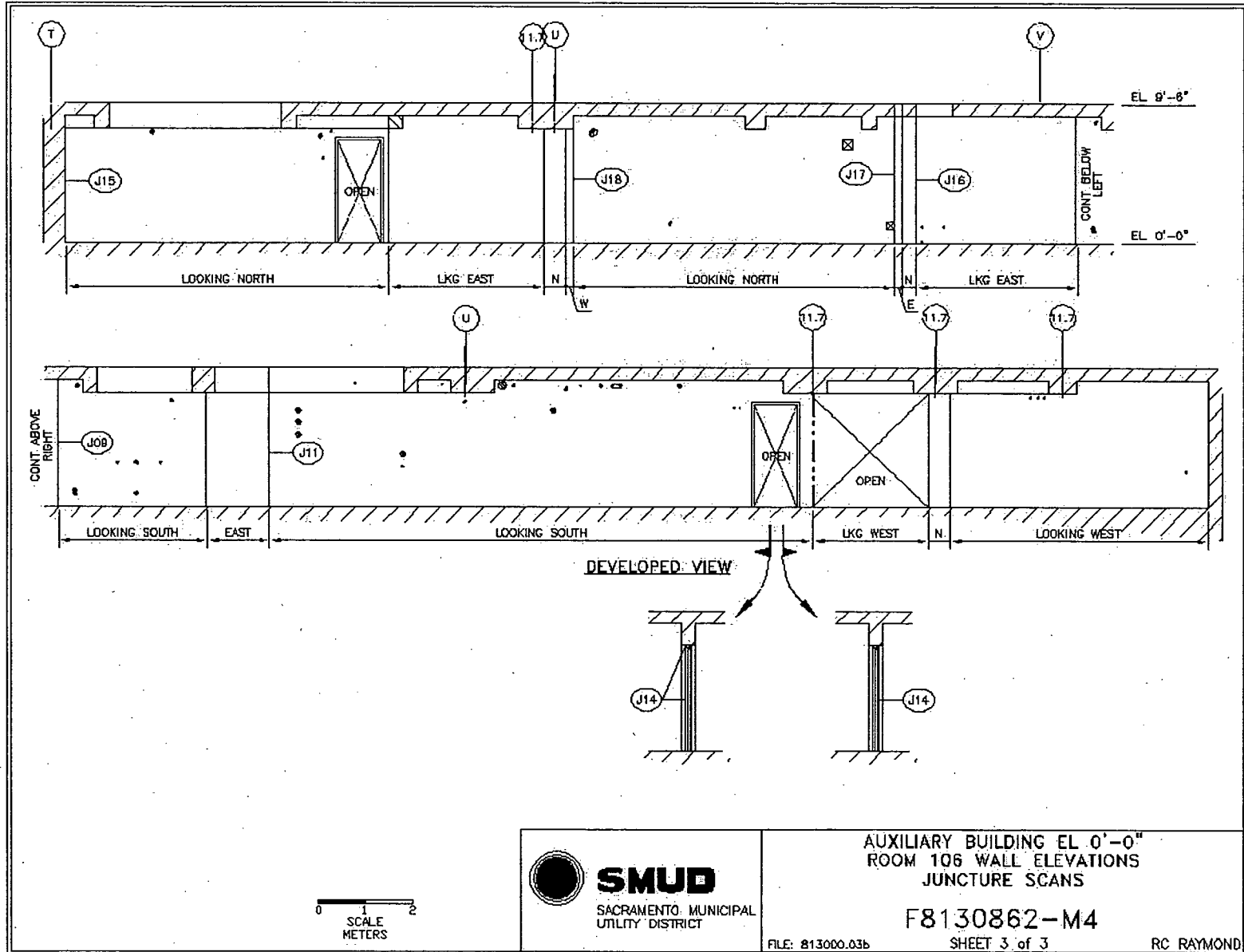
AUXILIARY BUILDING EL. 0'-0"
ROOM 106 REFLECTED CEILING PLAN
JUNCTURE SCANS

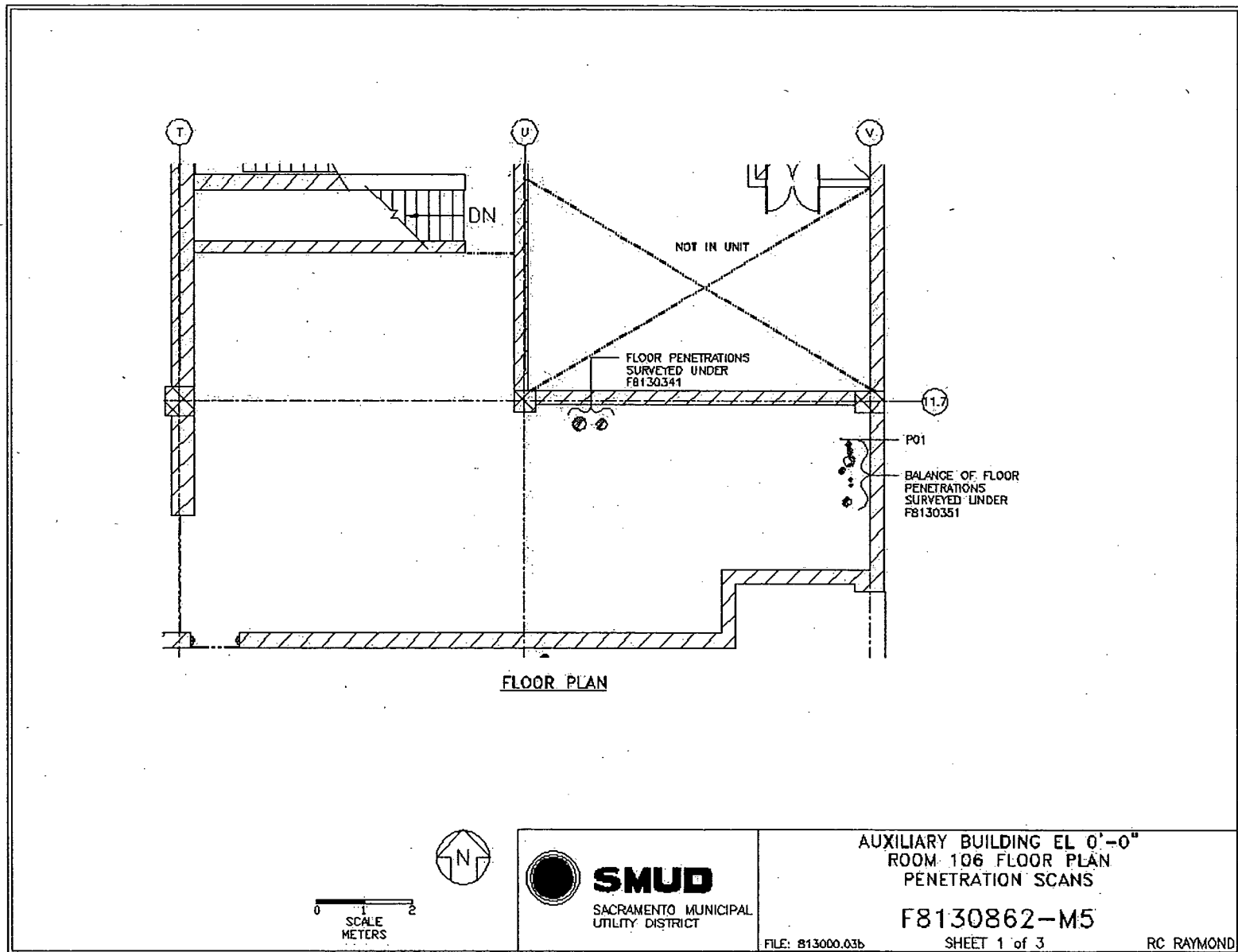
F8130862-M4

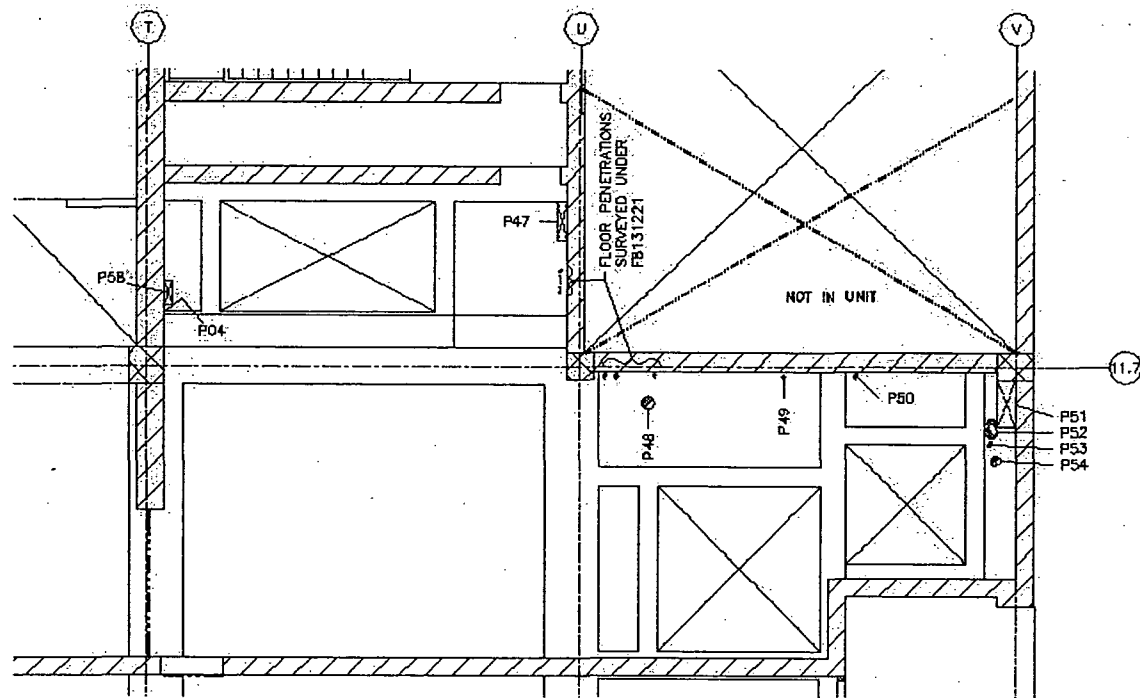
FILE: 813000.03b

SHEET 2 of 3

RC RAYMOND







REFLECTED CEILING PLAN
EL. 7'-9"

0 1 2
SCALE
METERS



SMUD

SACRAMENTO MUNICIPAL
UTILITY DISTRICT

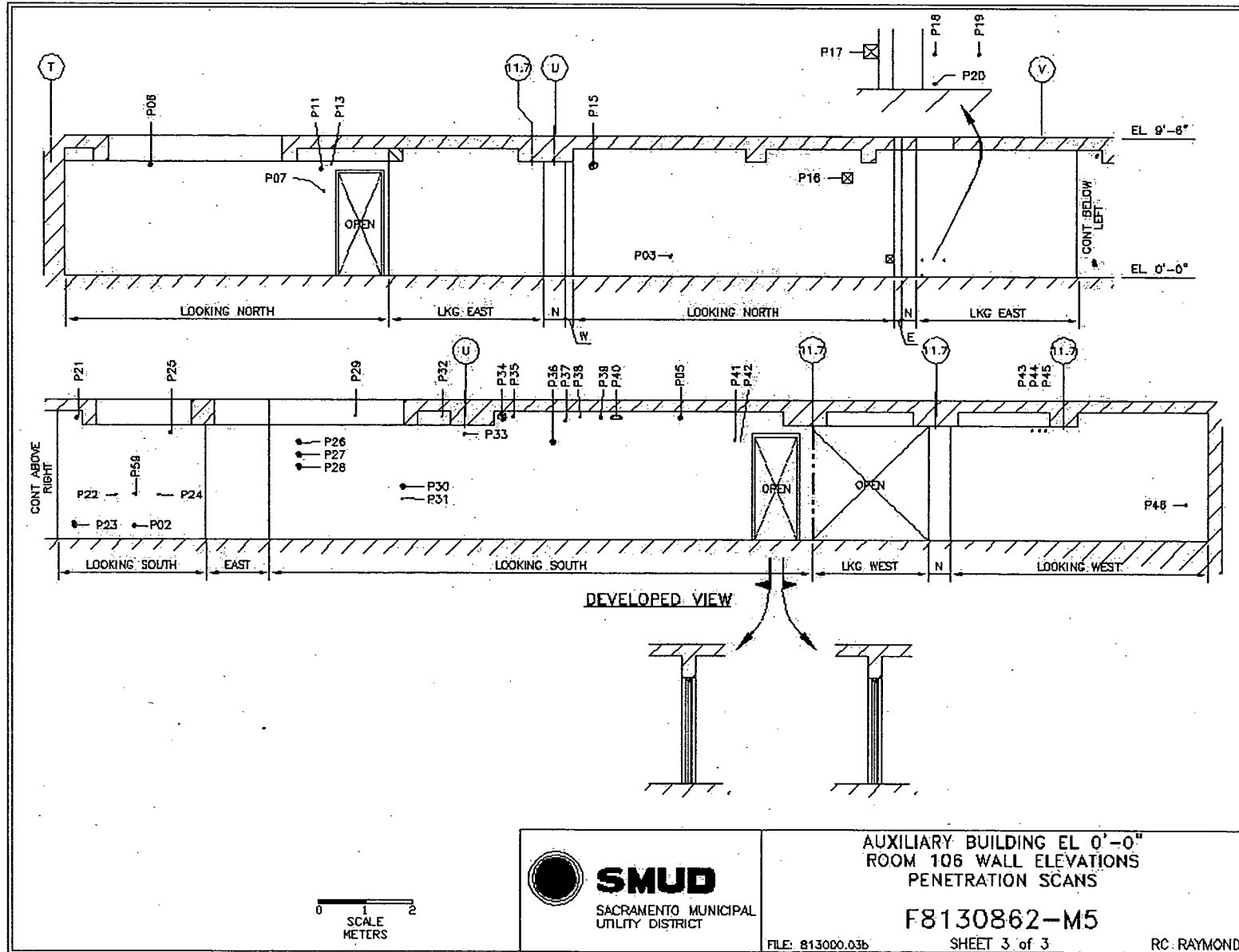
AUXILIARY BUILDING EL. 0'-0"
ROOM 106 REFLECTED CEILING PLAN
PENETRATION SCANS

F8130862-M5

FILE: 813000.03b

SHEET 2 of 3

RC RAYMOND



Attachment 2

Instrumentation

June 20, 2008

Survey Unit F8130862

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; 142514	43-98B; 148639	N/A	1680
M2350; 180733	43-94; 148620	N/A	1030
M2350; 203486	43-68B; 190476	433	1033
M2350; 193700	43-68B; 190294	433	1033
M2350; 149789	43-68B; 161397	433	1033
M2350; 203486	43-116-1B; 190173	N/A	3258
M2350; 142514	43-111B; 148642	N/A	7020
M2350; 180733	43-111B; 148641	N/A	1120
Tennelec; 0401171	N/A	5.9 dpm α , 11.7 dpm β	N/A

The MDC noted for the detector model 43-98B, serial # 148639 and detector model 43-111B, serial # 148642 is for the three inch diameter piping which is the most conservative.

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	150500
Investigation Criteria – Scan	150500
DCGL _W	43000
DCGL _{EMC}	150500

Attachment 3

Investigation

June 20, 2008

Survey Unit F8130862

Table 3-1 Survey Unit Investigation

<i>Grid</i>	<i>Investigation Level (cpm)</i>	<i>Initial Value (cpm)</i>	<i>Investigation Result (cpm)</i>	<i>Elevated Area (m²)</i>	<i>Area Factor</i>	<i>DCGL_{emc}</i>	<i>Investigation Result (dpm/100cm²)</i>	<i>DCGL_{emc} Unity Fraction</i>
C0040BS	20,440	66,506	2,108	N/A	N/A	150,500	15,464	0
Survey Unit Remainder						DCGL = 43,000	SU Mean = 1426	0.03
EMC Unity Sum								0.03

The grid above was initially greater than DCGL_{emc}. Investigation of the area resulted in the decision to perform additional remediation. The investigation result above represents the residual radioactivity level after additional remediation.

Attachment 4

Data Assessment

June 20, 2008

Survey Unit F8130862

