

Rancho Seco

Final Status Survey Summary Report

October 24, 2007

Aux. Bldg (-) 20' El., Rm 48, Crud Tank Room

Survey Unit F8130661

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FSS Engineer

Reviewed By: *[Signature]* Date: 10/24/07

Lead FSS Engineer

Approved By: *[Signature]* Date: 11-14-07

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8130661, Aux. Bldg (-) 20' El., Rm 48, Crud Tank Room

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 60 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	Aux. Bldg (-) 20' El, Rm 48, Crud Tank Room
Survey Unit:	0661	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m ²):	60	
Evaluator:	D. Anderson	
DCGL (dpm/100 cm ²):	43,000	Gross Activity DCGL
Area Factor:	4.5	Class 1
Design DCGL _{mc} (dpm/100 cm ²):	193,500	Class 1
LBGR (dpm/100 cm ²):	40,666	Adjusted
Design Sigma (dpm/100 cm ²):	778	Based on post-remediation data.
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	Used Co-60 area factor as conservative measure
Sample Area (m ²):	4.2	Class 1
Scan Area (m ²):	60	
Scan Coverage (%):	100%	Class 1
Z _{1-α} :	1.645	
Z _{1-β} :	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	3	
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 1
Grid Spacing L:	2.04	Class 1

Survey Results:

A total of 14 direct measurements were made in F8130661. 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 2,071 dpm/100 cm² to 34,779 dpm/100 cm² for floor, wall, ceiling, and juncture surfaces, based on a surveyor efficiency of 0.5 with 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)
F8130661-C0001BD	1,883
F8130661-C0002BD	1,650
F8130661-C0003BD	1,525
F8130661-C0004BD	1,567
F8130661-C0005BD	1,447
F8130661-C0006BD	1,369
F8130661-C0007BD	1,504
F8130661-C0008BD	1,323
F8130661-C0009BD	1,733
F8130661-C0010BD	1,266
F8130661-C0011BD	1,240
F8130661-C0012BD	1,312
F8130661-M0013BD	824
F8130661-M0014BD	1,347
Mean:	1,428
Median:	1,408
Standard Deviation:	255
Range:	824 – 1,883

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm²)
F8130661C0001SM	2.29
F8130661C0002SM	6.14
F8130661C0003SM	8.7
F8130661C0004SM	6.14
F8130661C0005SM	7.42
F8130661C0006SM	4.86
F8130661C0007SM	12.55
F8130661C0008SM	6.14
F8130661C0009SM	4.86
F8130661C0010SM	3.58
F8130661C0011SM	3.58
F8130661C0012SM	3.58
F8130661M0013SM	-0.27
F8130661M0014SM	26.65
Mean:	6.87
Median:	5.5
Standard Deviation:	6.45
Range:	-0.27 to 26.65

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 cm ²):	N/A	Average Ambient BKG = 0	
Ambient Background Used (dpm/100 cm ²):	N/A		
Actual Direct Measurements (N):	14		
Median (dpm/100 cm ²):	1,408		
Mean (dpm/100 cm ²):	1,428		
Direct Measurement Standard Deviation (dpm/100 cm ²):	255		
Total Standard Deviation (dpm/100 cm ²):	255		Based on samples and backgrounds.
Maximum (dpm/100 cm ²):	1,883		Background Subtract Not Applied
Material Type:	N/A		
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 < DCGL_{mc}:	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. Therefore the EMC criterion was met.

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 43,000 dpm/100 cm² 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.

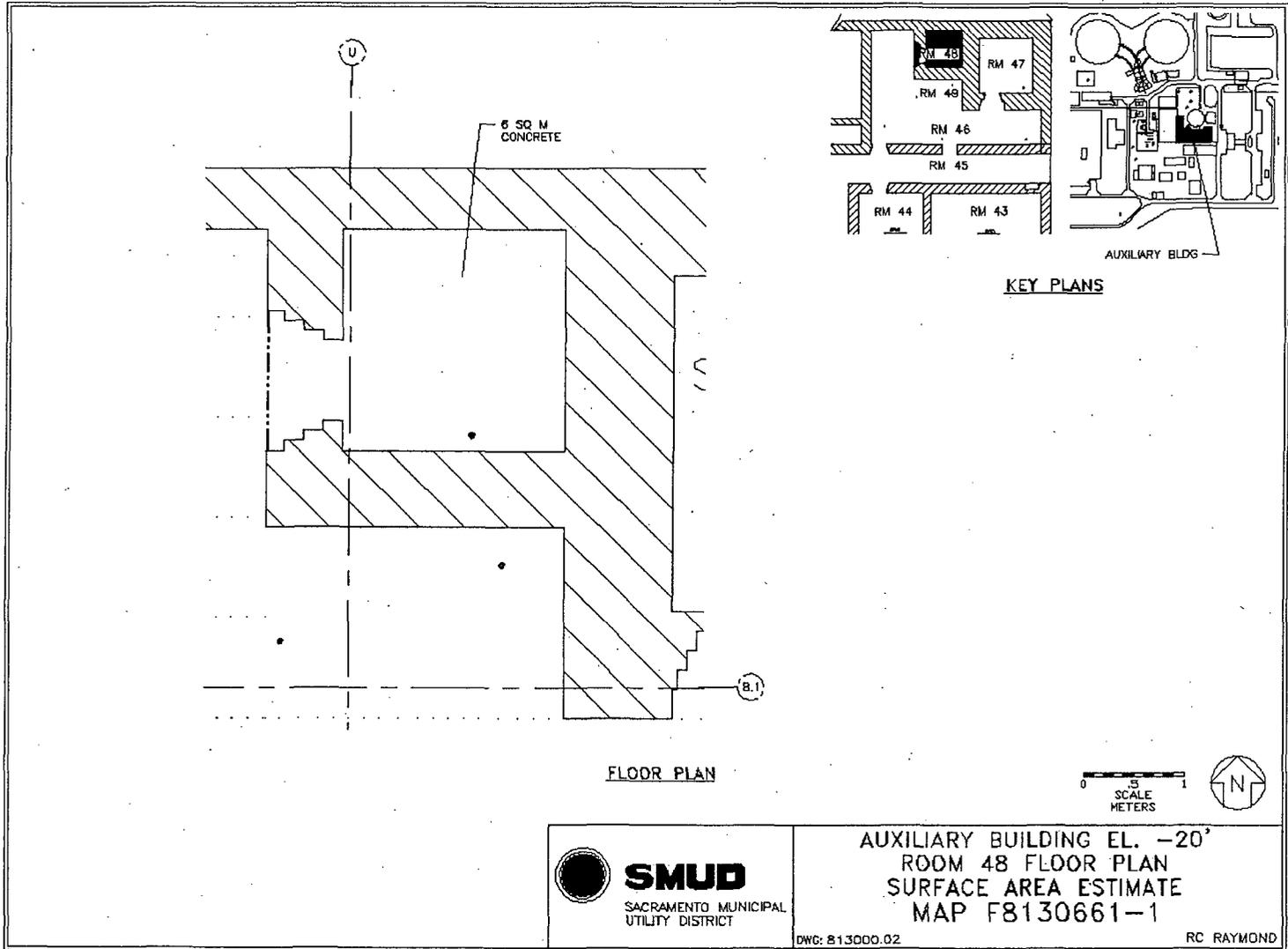
It is concluded that survey unit F8130661 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

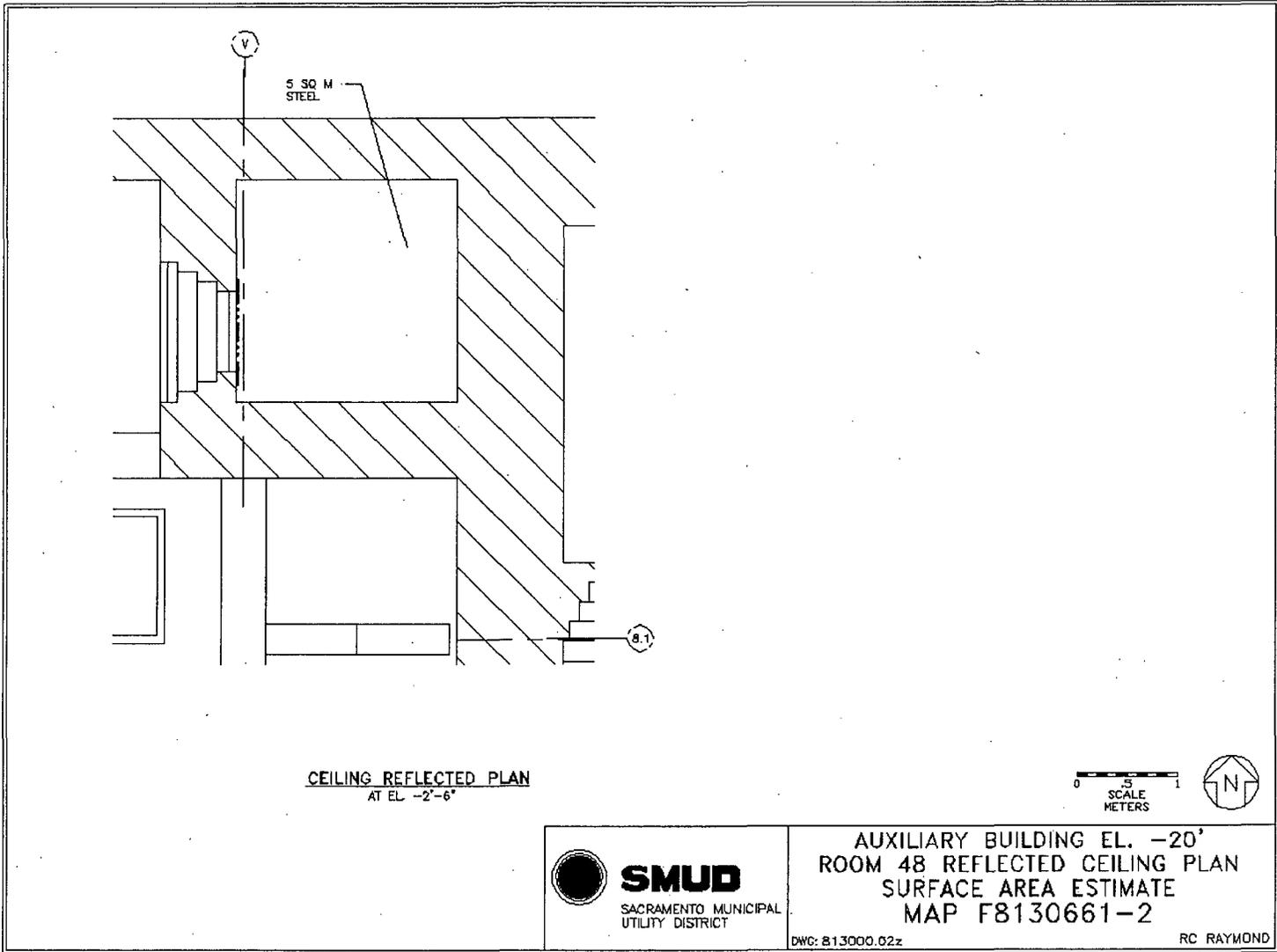
October 24, 2007

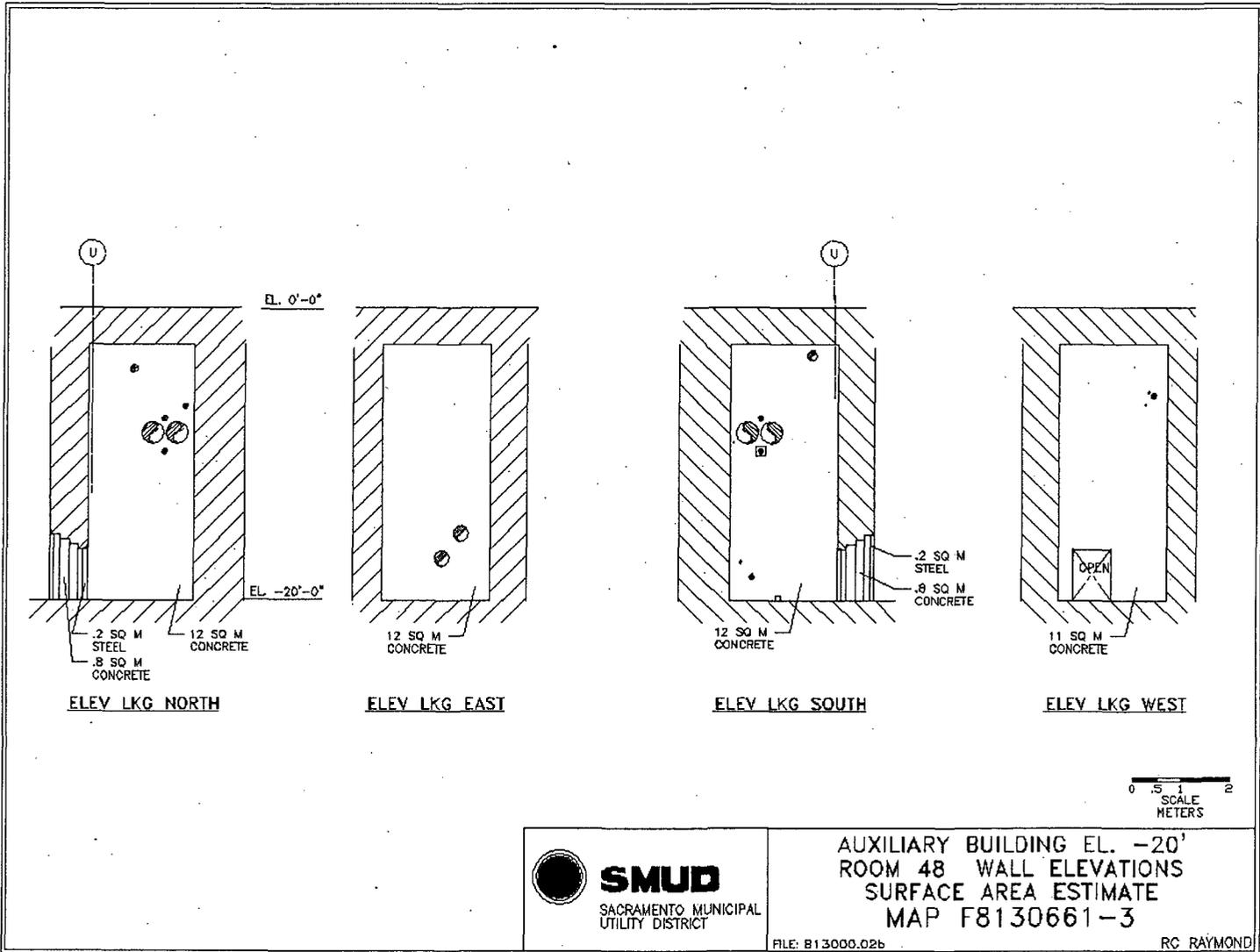
Survey Unit F8130661

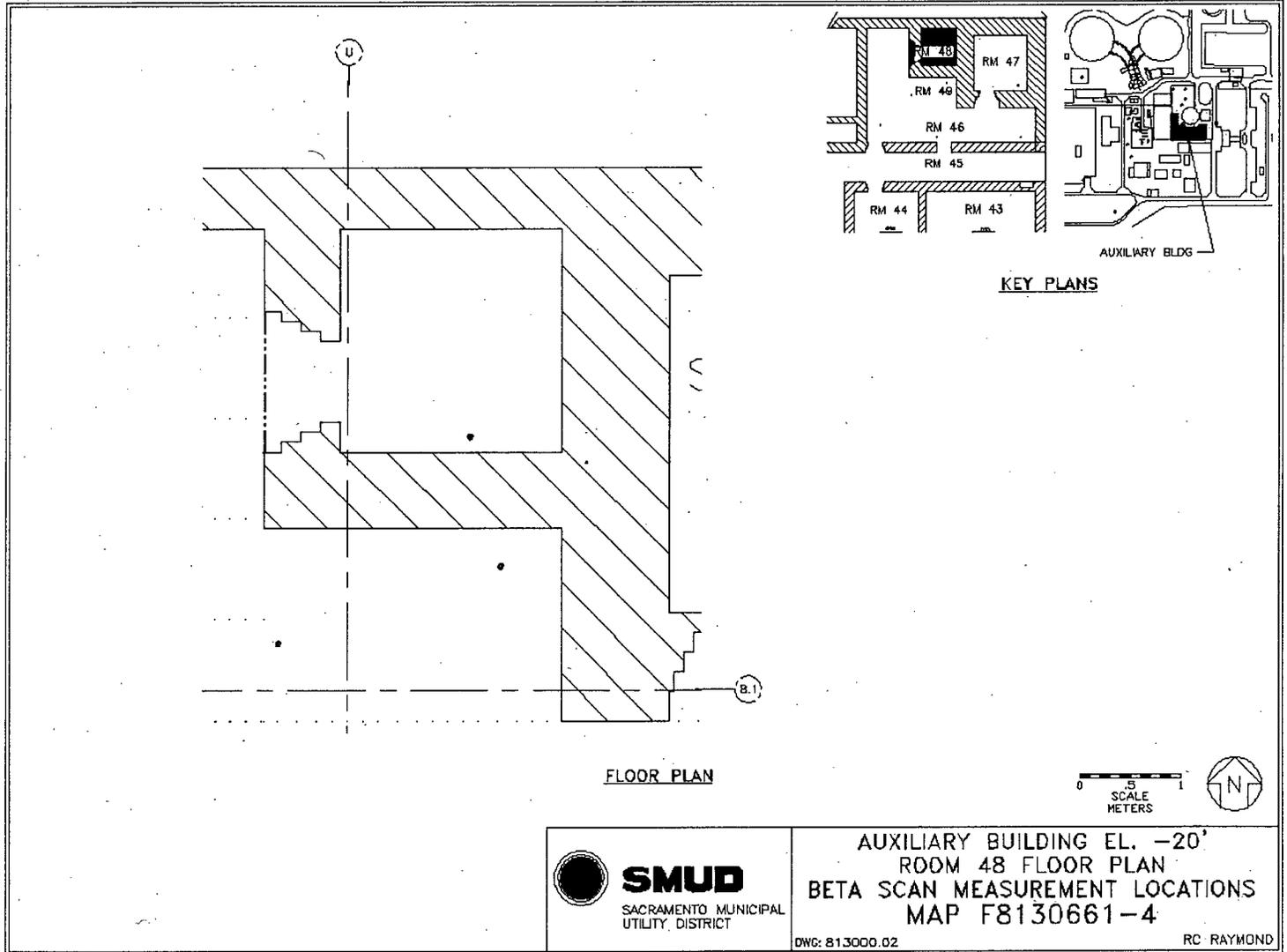


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AUXILIARY BUILDING EL. -20'
ROOM 48 FLOOR PLAN
SURFACE AREA ESTIMATE
MAP F8130661-1
DWG: 813000.02 RC RAYMOND

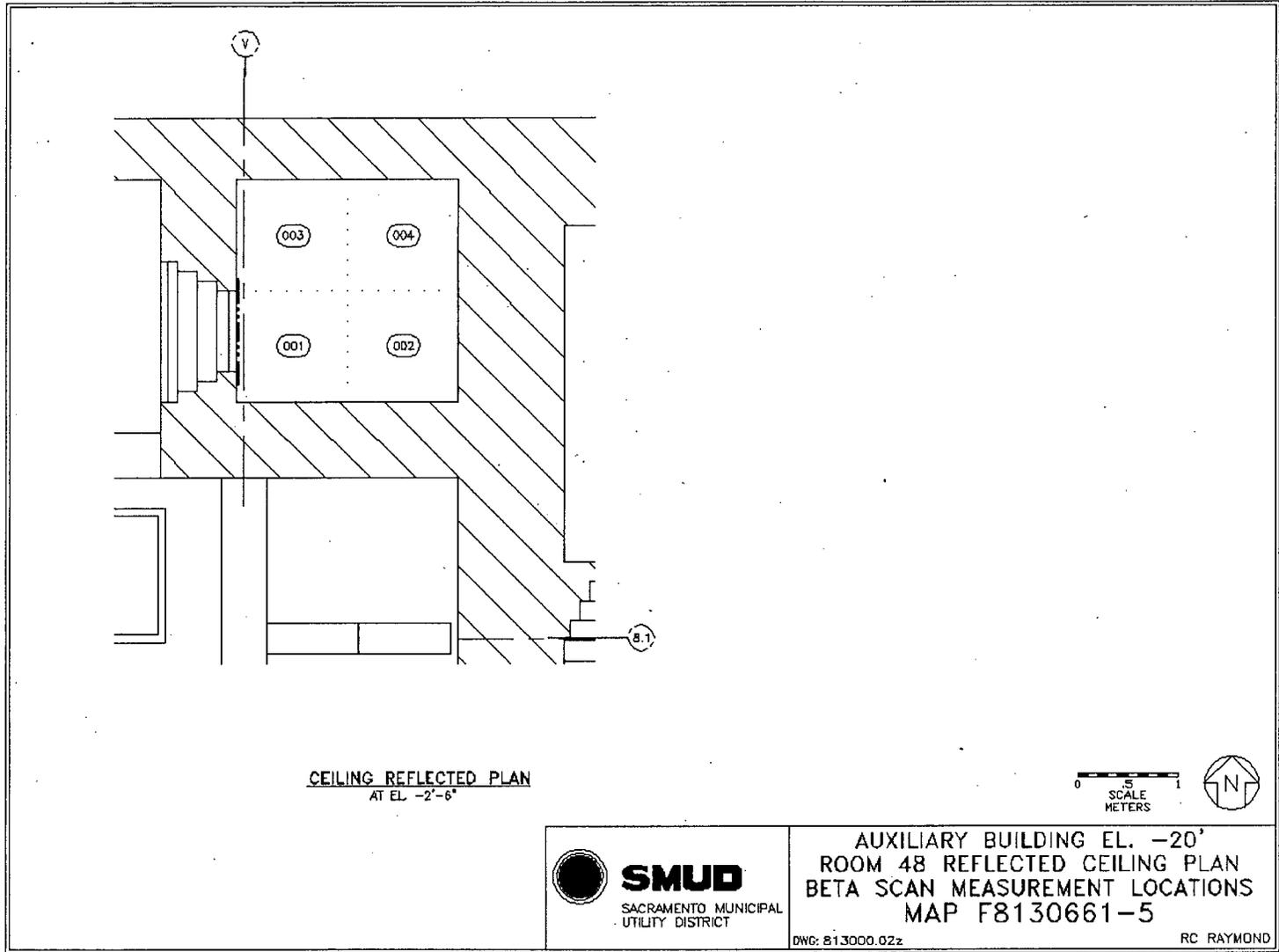


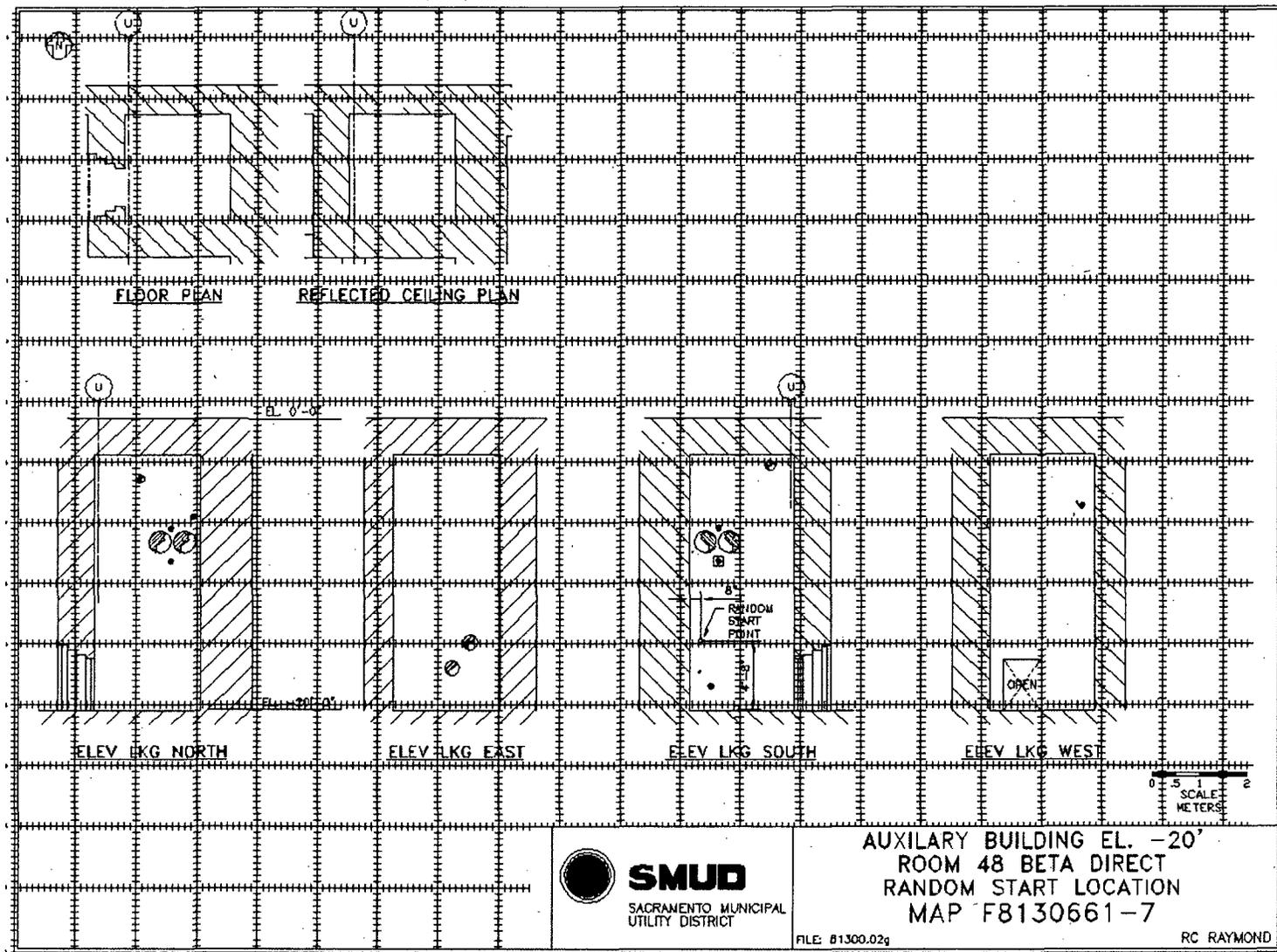


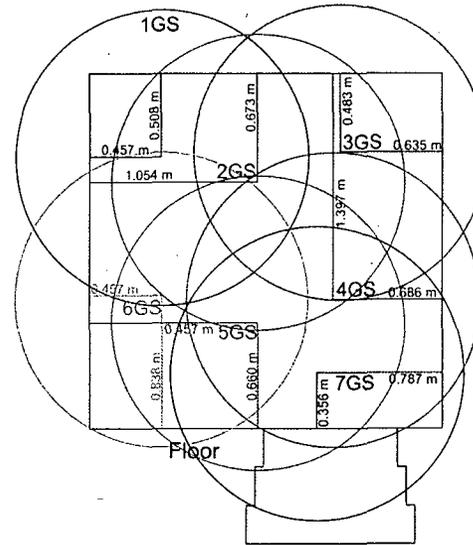
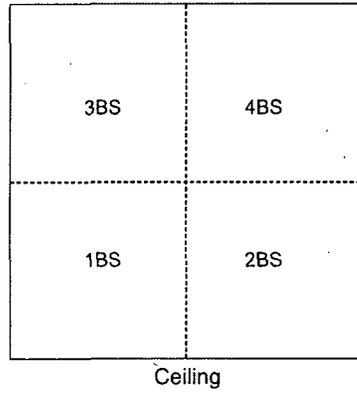


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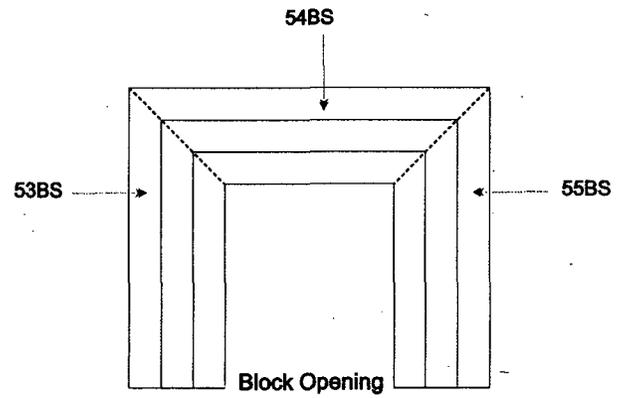
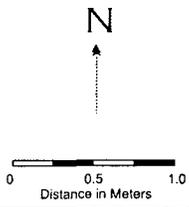
AUXILIARY BUILDING EL. -20'
ROOM 48 FLOOR PLAN
BETA SCAN MEASUREMENT LOCATIONS
MAP F8130661-4
DWG: 813000.02 RC RAYMOND

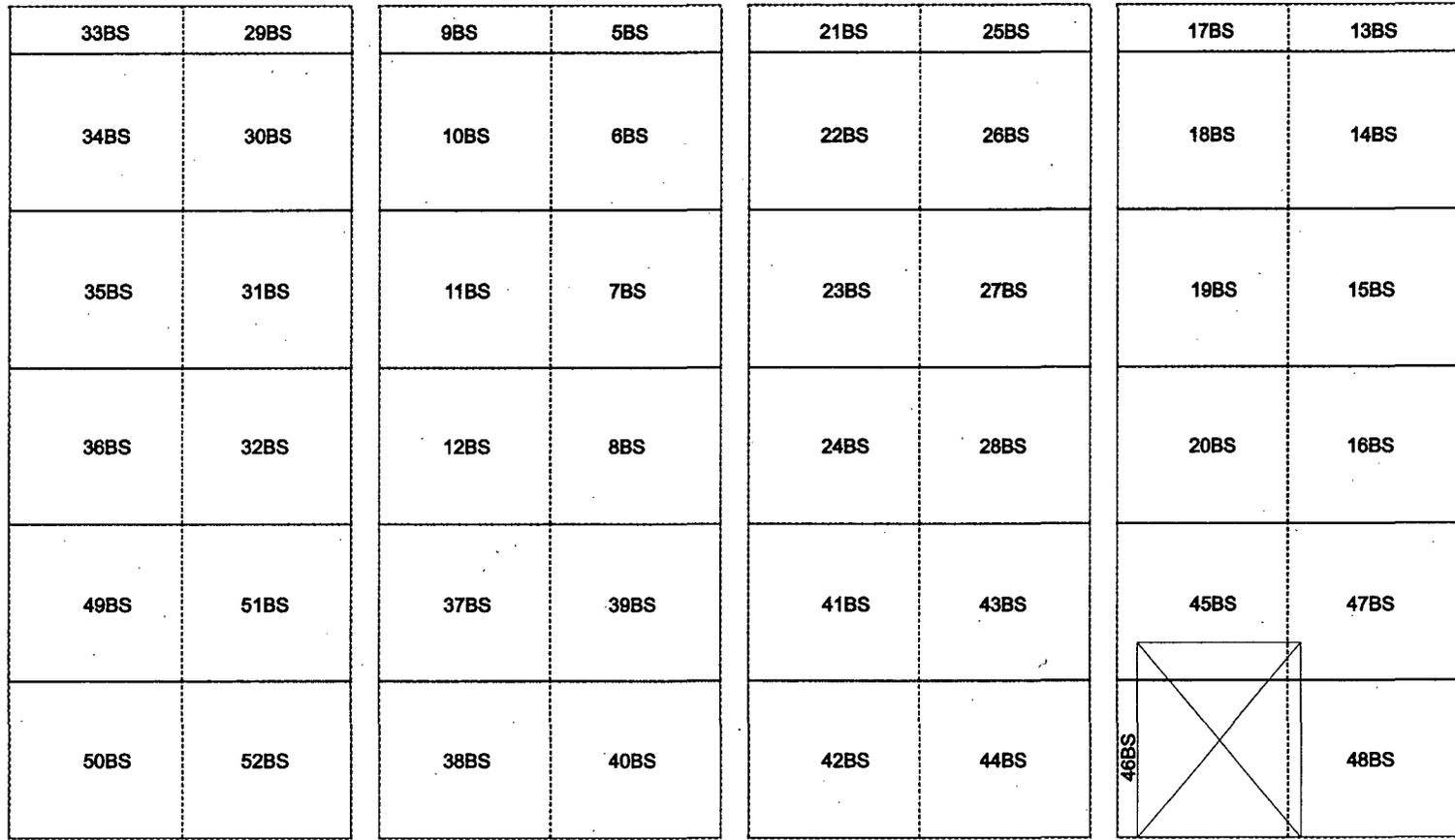






Map F8130661-8, Auxiliary Building -20' El.
Rm 48, Crud Tank Room Ceiling Beta Scan Measurements
F8130661M0001BS to F8130661M0004BS,
F8130661C0053BS to F8130661C0055BS
Floor Gamma Scan Measurements
F8130661C0001GS to F8130661C0007GS



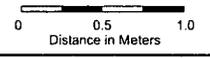


North Wall

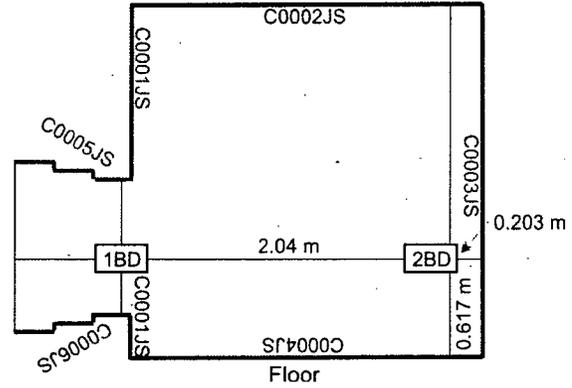
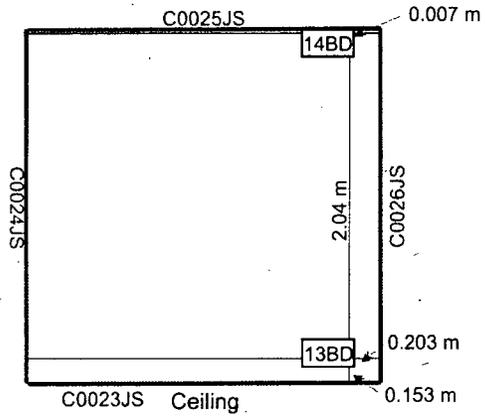
East Wall

South Wall

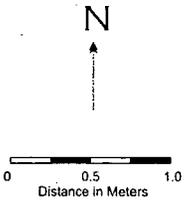
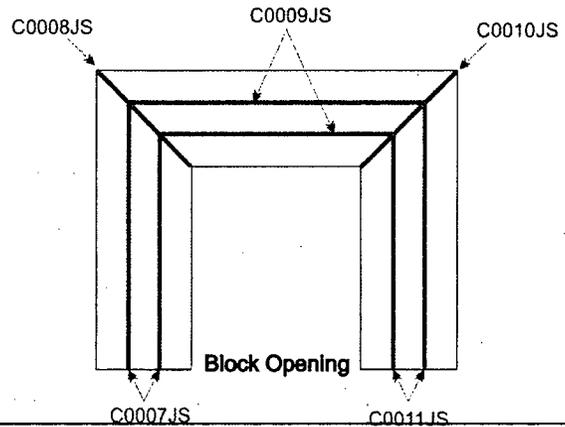
West Wall

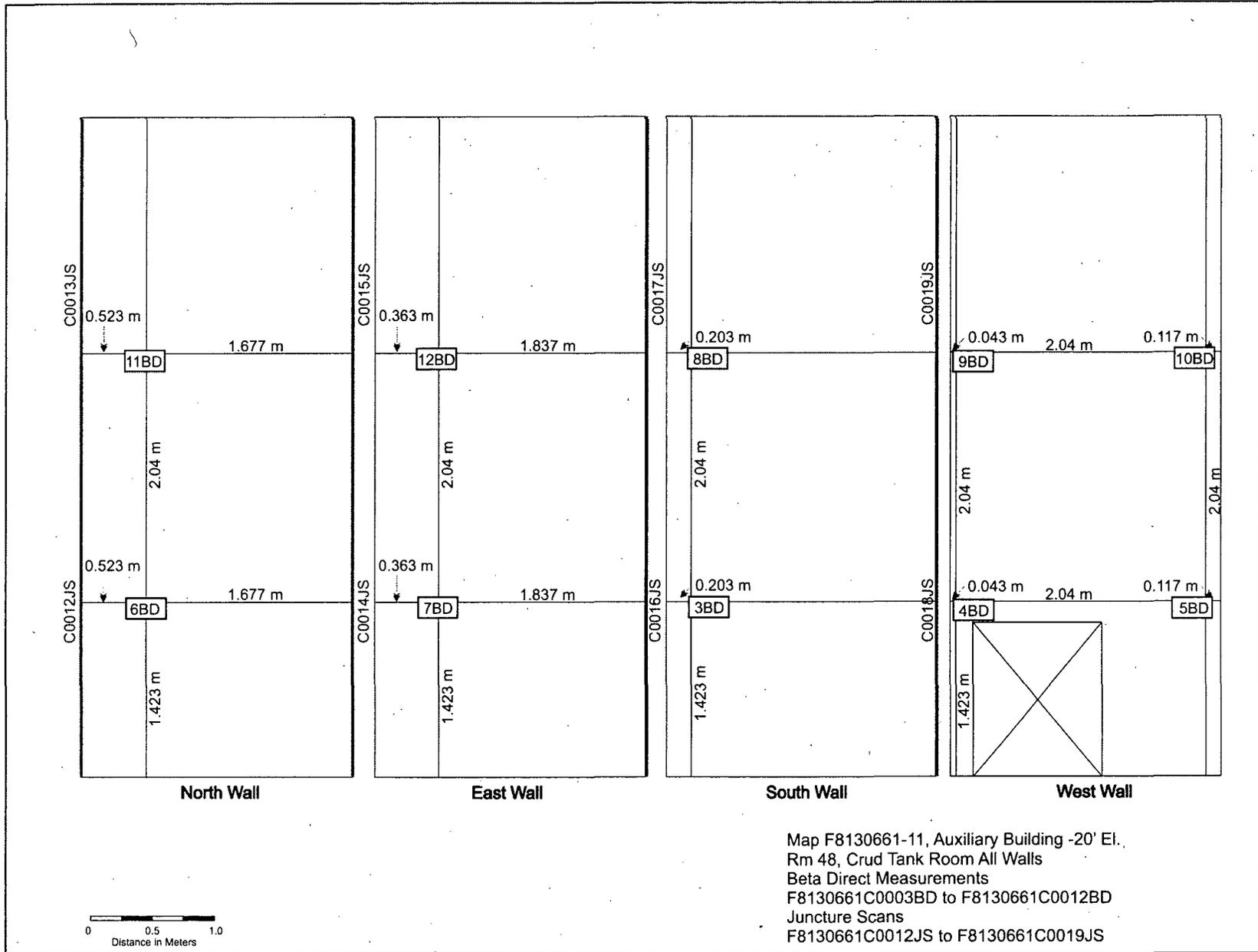


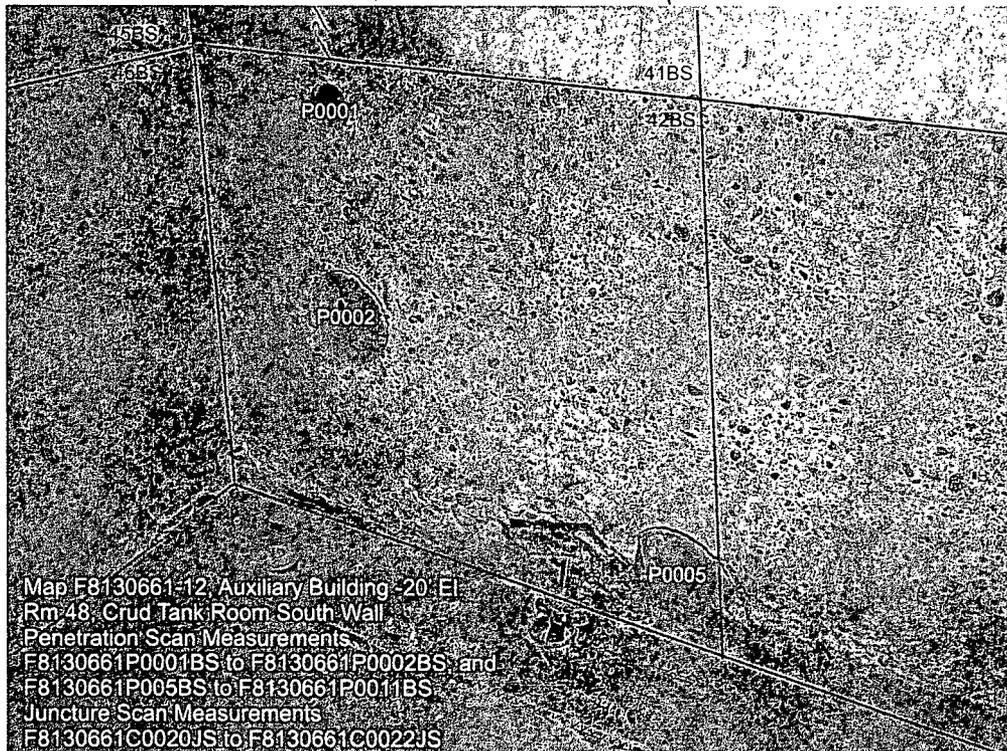
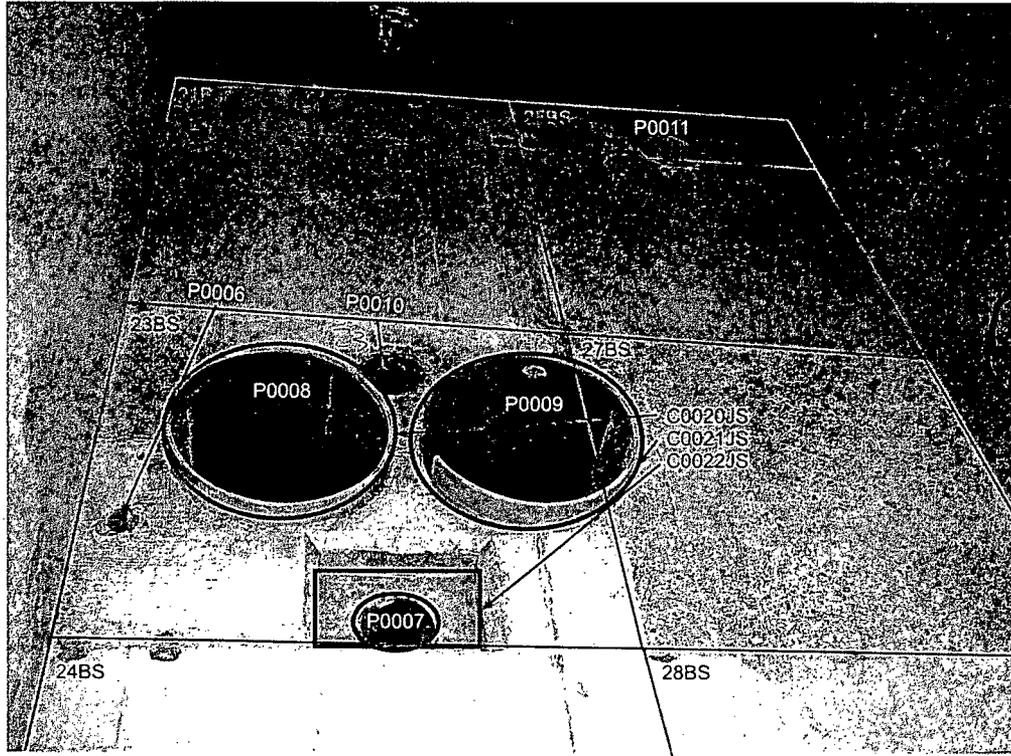
Map F8130661-9, Auxiliary Building -20' El.
Rm 48, Crud Tank Room All Walls
Beta Scan Measurements
F8130661C0005BS to F8130661C0052BS



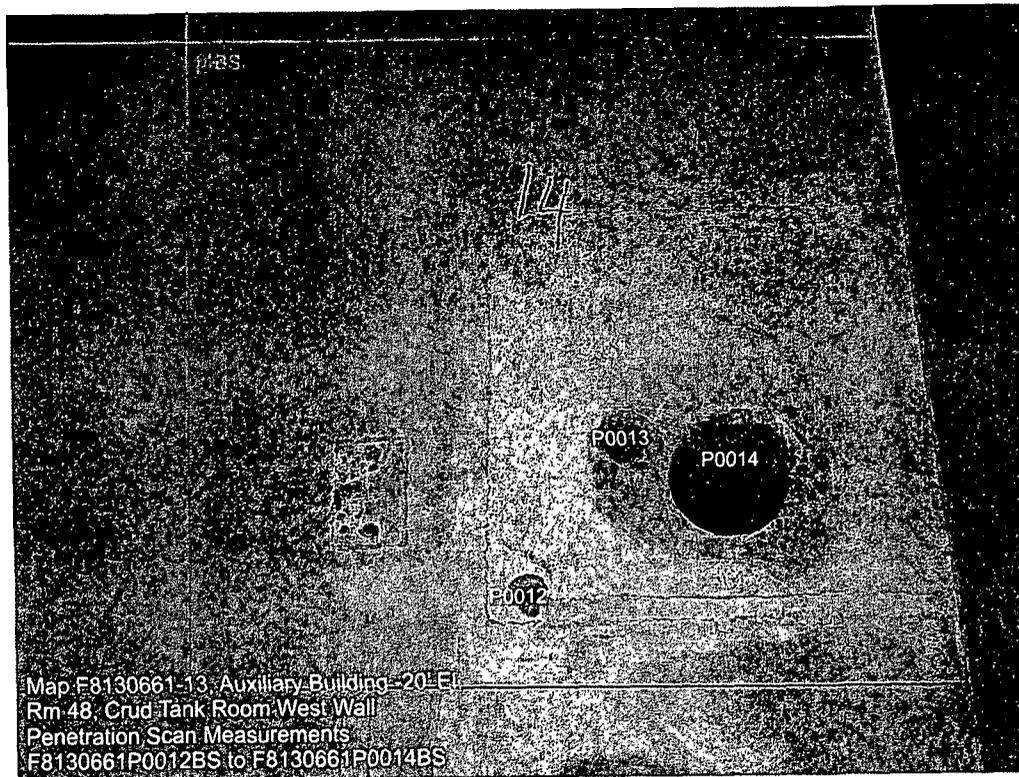
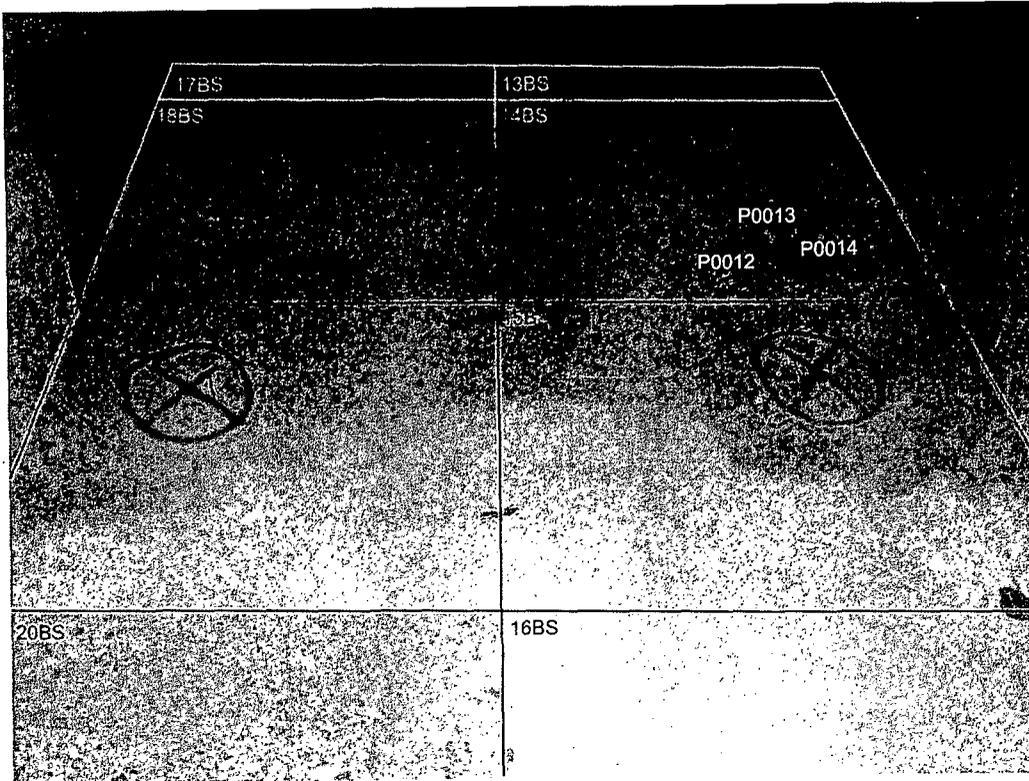
Map F8130651-10, Auxiliary Building -20' El.
Rm 48, Crud Tank Room Ceiling Beta Direct Measurements
F8130661C0001BD to F8130661C0002BD and
F8130661M0013BD to F8130661M0014BD
Juncture Scan Measurements
F8130661C0001JS to F8130661C0011JS and
F8130661C0023JS to F8130661C0026JS

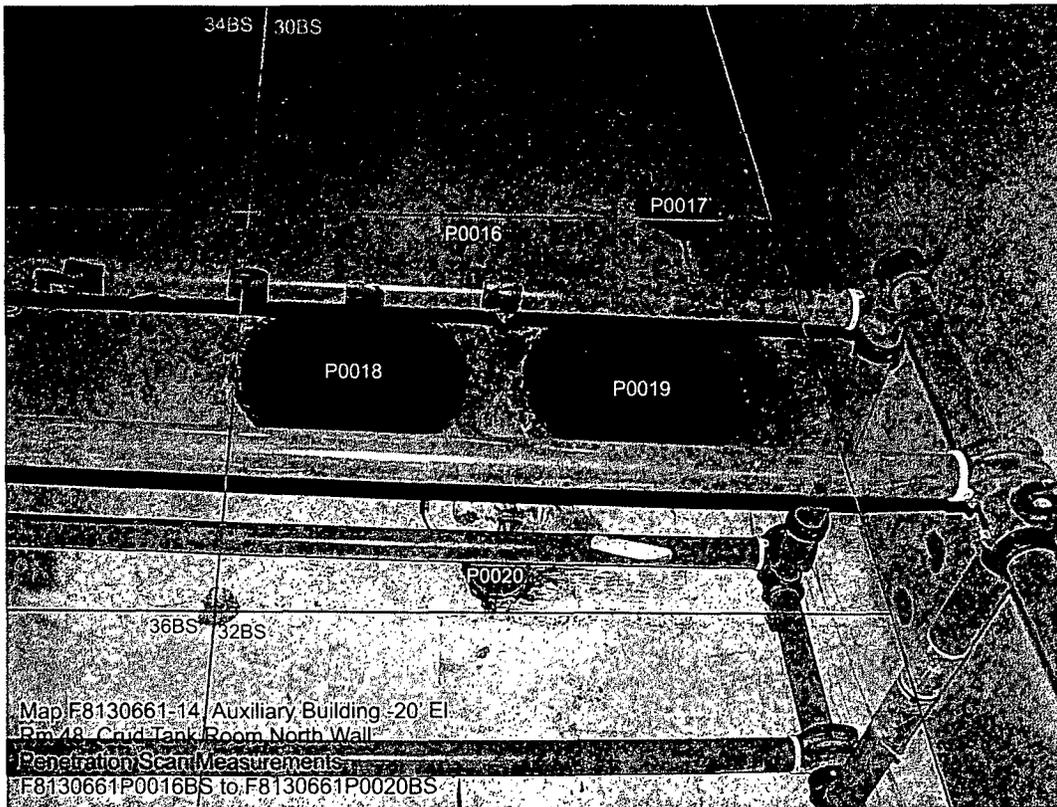






Map F8130661-12, Auxiliary Building - 20, El
 Rm 48, Crud Tank Room South Wall
 Penetration Scan Measurements
 F8130661P0001BS to F8130661P0002BS, and
 F8130661P0005BS to F8130661P0011BS
 Juncture Scan Measurements
 F8130661C0020JS to F8130661C0022JS





Attachment 2

Instrumentation

October 24, 2007

Survey Unit F8130661

Table 2-1. Survey Unit Instrumentation

Instrument Model; Serial No.	Detector Model; Serial No.	MDC Static	MDC Scan
M2350; 142514	43-98; 148639	1,400	2,520
M2350; 180733	43-94; 148620	2,630	4,580
M2350; 193700	43-68B; 190294 ¹	433	1,033
M2350; 193700	43-68B; 190294 ²	257	612
M2350; 149794	43-68/5B; 149103	433	1,033
M2350; 149794	43-51B; 190167 ³	990	2,313
M2350; 149794	43-116-1B; 216072 ⁴	491	739
M2350; 149794	43-116-1B; 216072 ⁵	796	5,895
M2350; 149794	43-116-1B; 216072 ⁶	472	3,492
Tennelec; 0401171	N/A	5 dpm α , 11 dpm β	N/A

¹43-68B Concrete surfaces

²43-68B Metal surfaces

³43-51B Concrete junctures

⁴43-116-1B Concrete junctures

⁵43-116-1B Concrete penetrations

⁶43-116-1B Metal penetrations

Instrument	Detector Serial No.	MDC (dpm/100 cm²)
ISOCS	2983947	1,100 dpm/100 cm ² Cs-137 1,320 dpm/100 cm ² Co-60

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	193,500
Investigation Criteria – Scan	193,500
DCGL _w	43,000
DCGL _{EMC}	193,500

Instrument	Parameter	Value (dpm/100 cm²) To detect a 100 cm² hot spot at the EMC Criterion within the detector field of view
ISOCS	Investigation Criteria - -Scan	Concrete – 225,000 dpm/100 cm ² Cs-137 75,000 dpm/100 cm ² Co-60

Attachment 3

Investigation

October 24, 2007

Survey Unit F8130661

(none required)

Attachment 4

Data Assessment

October 24, 2007

Survey Unit F8130661

