

Rancho Seco

Final Status Survey Summary Report

October 29, 2007

Aux. Bldg (-) 20' El., Rm 50, Radwaste Air Supply Fan Room, Floor & Lower Walls

Survey Unit F8130681

Prepared By: *D. Anderson* Date: 10/29/2007

FSS Engineer

Reviewed By: *[Signature]* Date: 10/29/07

Lead FSS Engineer

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

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8130681, Aux. Bldg (-) 20' El, Rm 50, Radwaste Air Supply Fan Room, Floor & Lower Walls

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 66.04 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 50, Radwaste Air Supply Fan Room, Floor & Lower Walls
Survey Unit:	0681	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m²):	66.04	
Evaluator:	D. Anderson	
DCGL (dpm/100 cm²):	43,000	Gross Activity DCGL
Area Factor:	4.8	Class 1
Design DCGL_{emc} (dpm/100 cm²):	206,400	Class 1
LBGR (dpm/100 cm²):	21,500	Default = 50% DCGL
Design Sigma (dpm/100 cm²):	12,035	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	Used Co-60 area factor as conservative measure.
Sample Area (m²):	3.88	Class 1
Scan Area (m²):	66.04	
Scan Coverage (%):	100%	Class 1
Z_{1-α}:	1.645	
Z_{1-β}:	1.645	
Sign P:	0.955435	
Calculated Relative Shift:	1.7	
Relative Shift Used:	1.7	Uses 3.0 if Relative Shift is >3
N-Value:	14	
Design N-Value + 20%:	17	NUREG-1575 Table 5-5
Design Min Samples N:	17	Class 1
Grid Spacing L:	1.96	Class 1

Survey Results:

A total of 17 direct measurements were made in F8130681. 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 3,521 dpm/100 cm² to 42,350 dpm/100 cm² for floor, lower wall 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)
F8130681-C0001BD	10,795
F8130681-C0002BD	18,316
F8130681-C0003BD	4,171
F8130681-C0004BD	2,677
F8130681-C0005BD	3,242
F8130681-C0006BD	1,613
F8130681-C0007BD	2,075
F8130681-C0008BD	2,090
F8130681-C0009BD	1,629
F8130681-C0010BD	1,779
F8130681-C0011BD	1,608
F8130681-C0012BD	1,675
F8130681-C0013BD	1,712
F8130681-C0014BD	2,936
F8130681-C0015BD	2,298
F8130681-C0016BD	1,790
F8130681-C0017BD	1,727
Mean:	3,655
Median:	2,075
Standard Deviation:	4,370
Range:	1,608 – 18,316

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm²)
F8130681C0001SM	70.23
F8130681C0002SM	27.93
F8130681C0003SM	15.11
F8130681C0004SM	22.8
F8130681C0005SM	30.49
F8130681C0006SM	4.86
F8130681C0007SM	17.68
F8130681C0008SM	54.85
F8130681C0009SM	2.29
F8130681C0010SM	-0.27
F8130681C0011SM	4.86
F8130681C0012SM	6.14
F8130681C0013SM	-0.27
F8130681C0014SM	4.86
F8130681C0015SM	4.86
F8130681C0016SM	36.9
F8130681C0017SM	7.42
Mean:	18.28
Median:	7.42
Standard Deviation:	20.29
Range:	-0.27 to 70.23

Survey Unit Data Assessment:

The survey design required 17 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):	17	
Median (dpm/100 cm ²):	2,075	
Mean (dpm/100 cm ²):	3,655	
Direct Measurement Standard Deviation (dpm/100 cm ²):	4,370	Based on samples and backgrounds.
Total Standard Deviation (dpm/100 cm ²):	4,370	
Maximum (dpm/100 cm ²):	18,316	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	17	Class 1
S+ Value:	17	
Critical Value:	12	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGL_{me}:	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:

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.

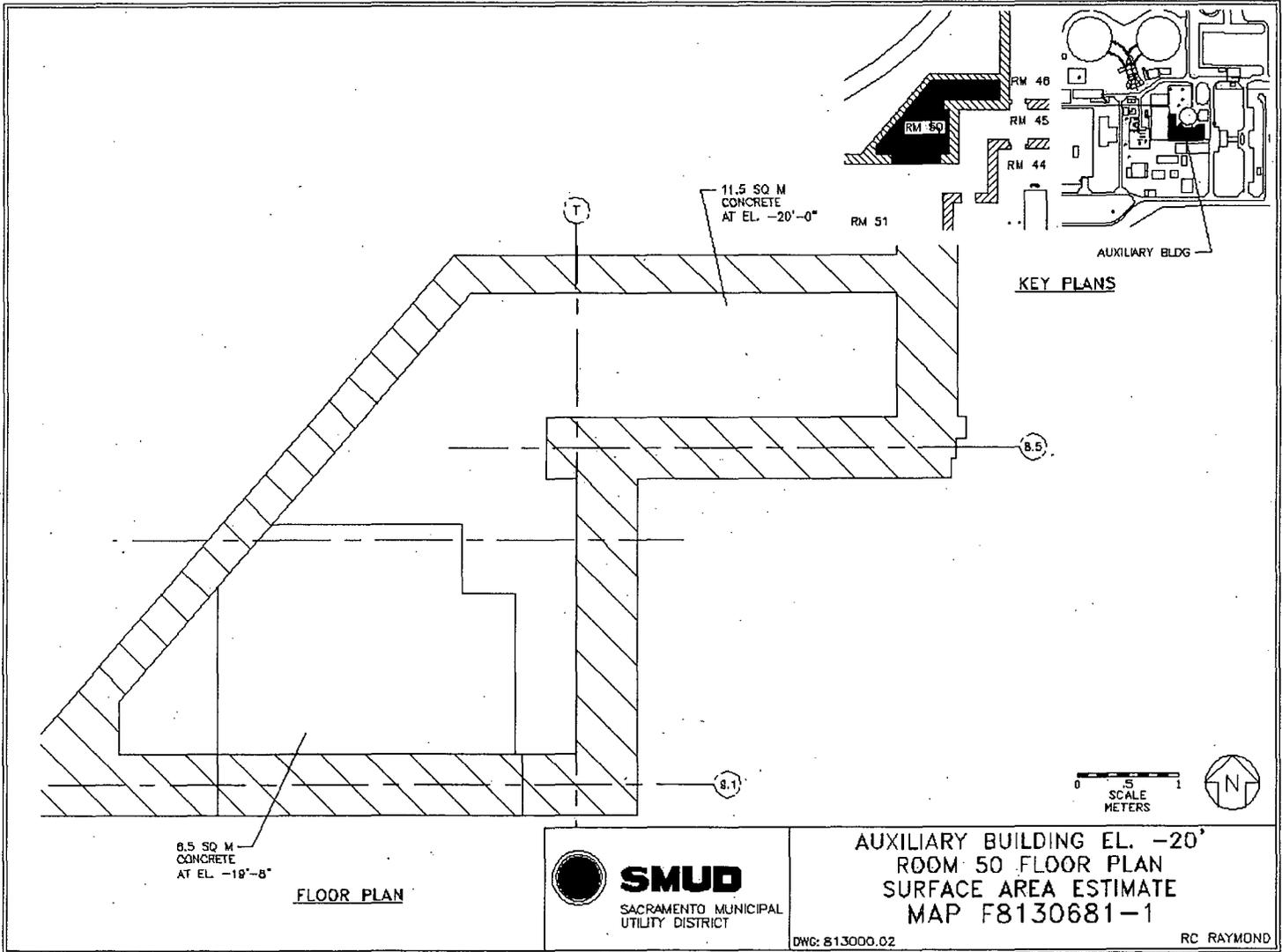
It is concluded that survey unit F8130681 meets the release criteria of 10CFR20.1402.

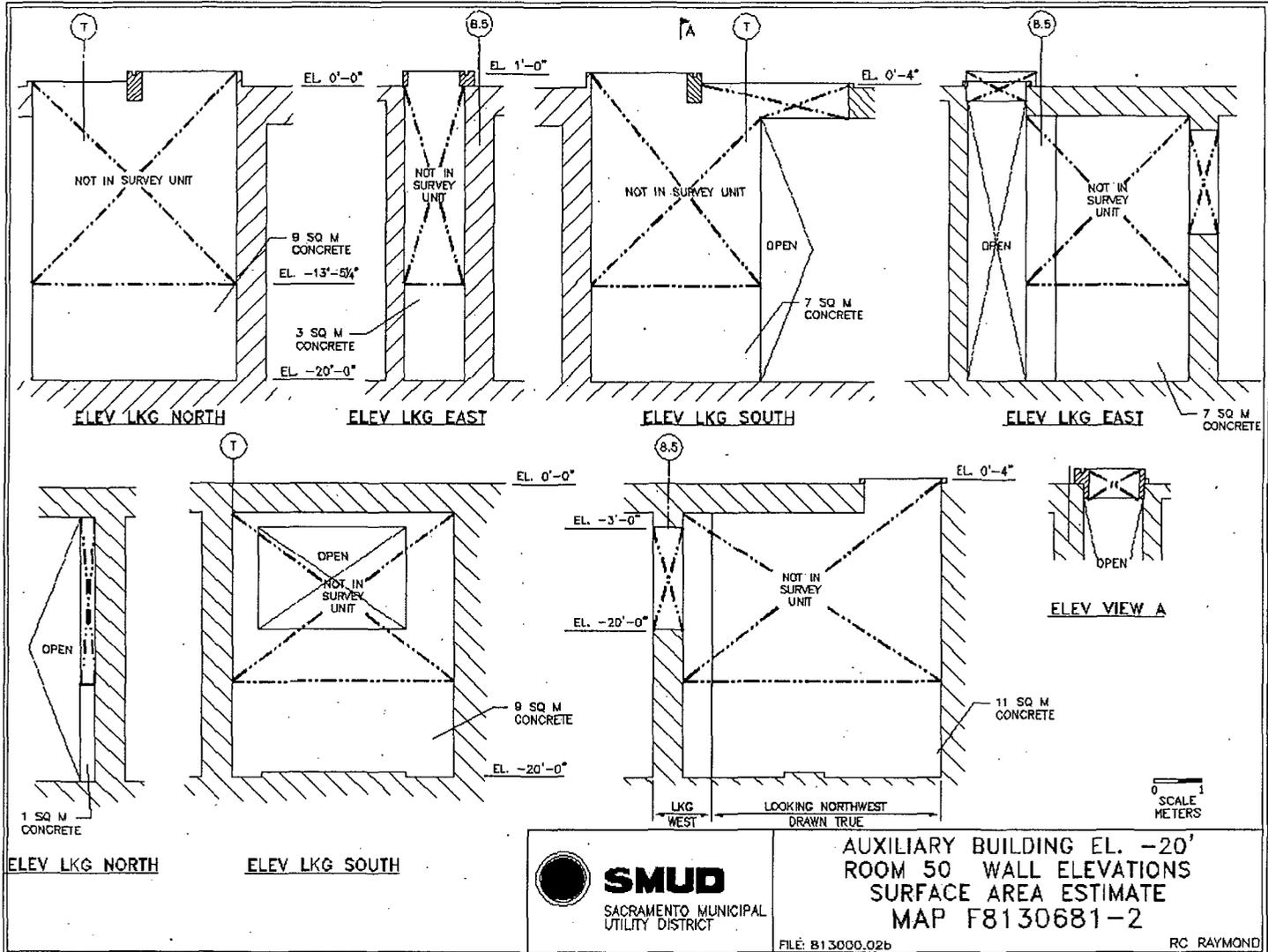
Attachment 1

Maps

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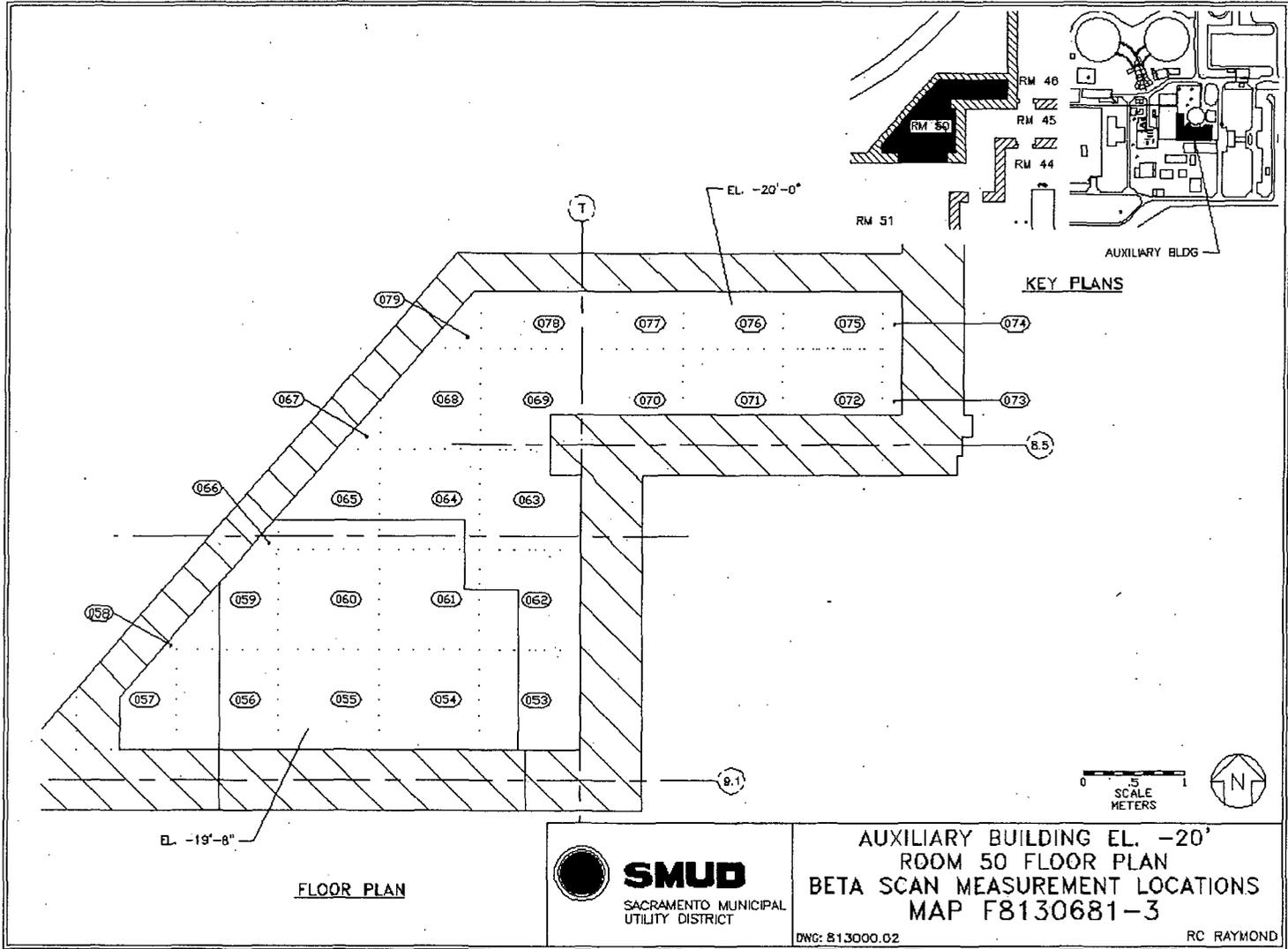
Survey Unit F8130681

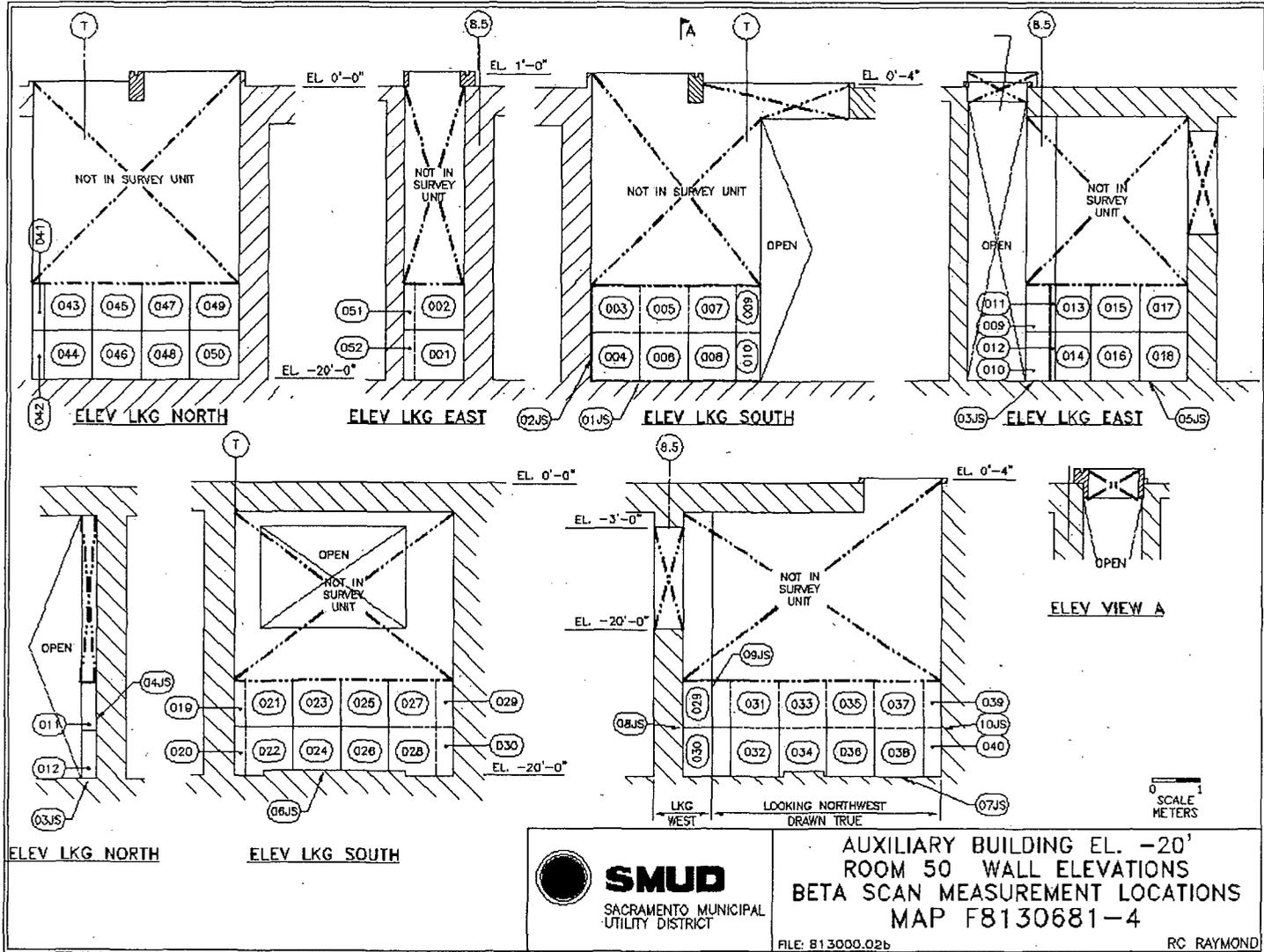


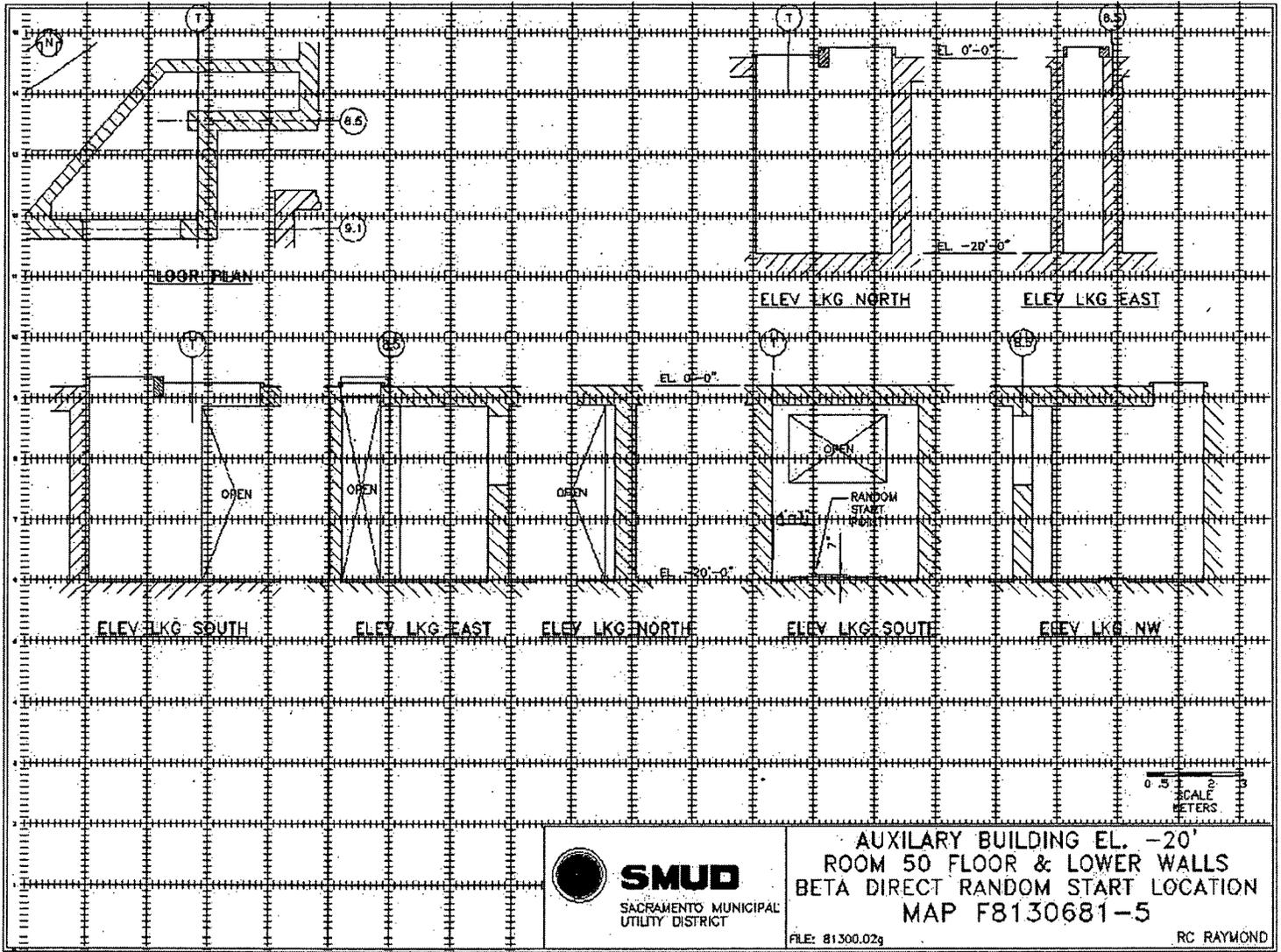


SMUD
SACRAMENTO MUNICIPAL
UTILITY DISTRICT

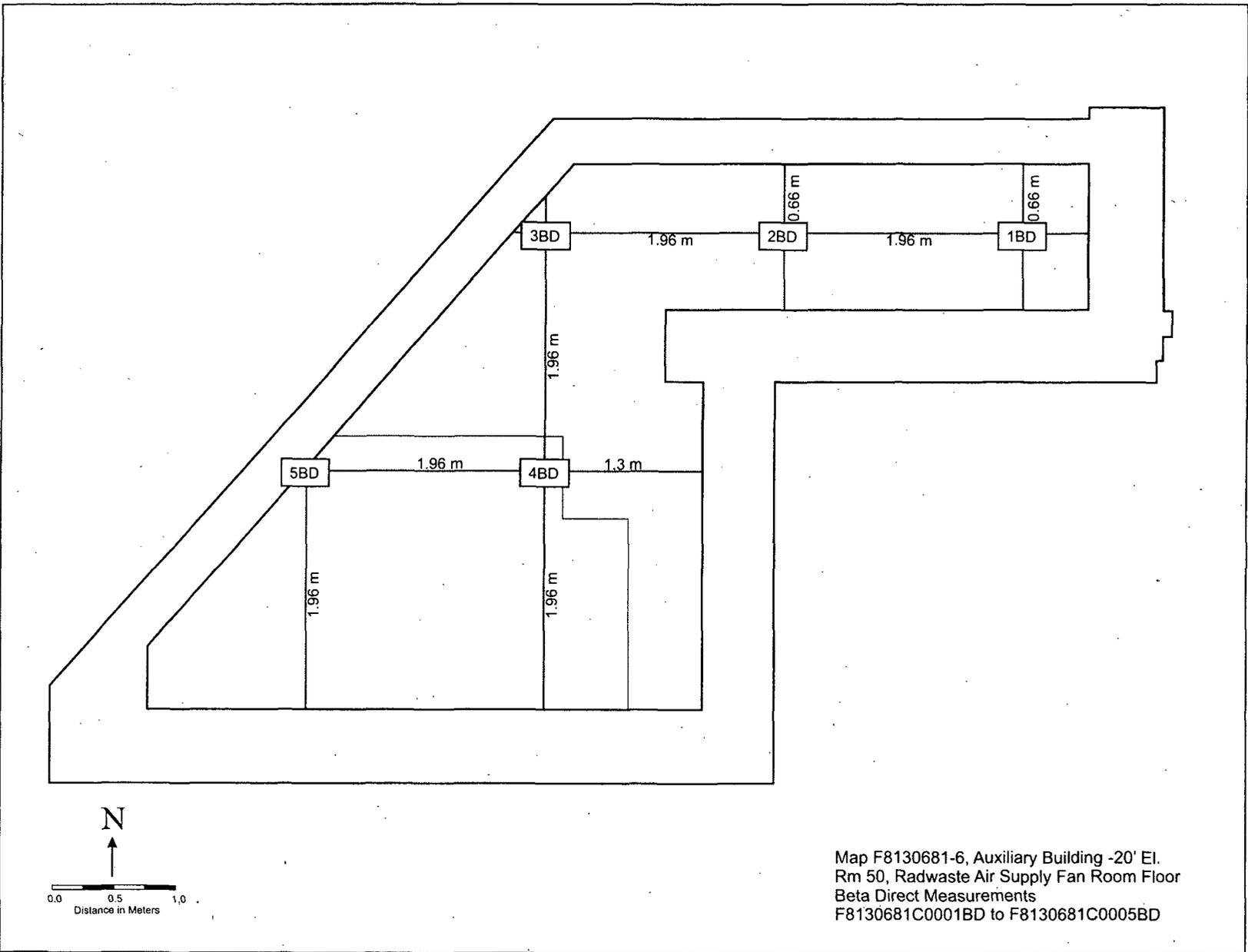
AUXILIARY BUILDING EL. -20'
ROOM 50 WALL ELEVATIONS
SURFACE AREA ESTIMATE
MAP F8130681-2
FILE: B13000.02b
RC RAYMOND



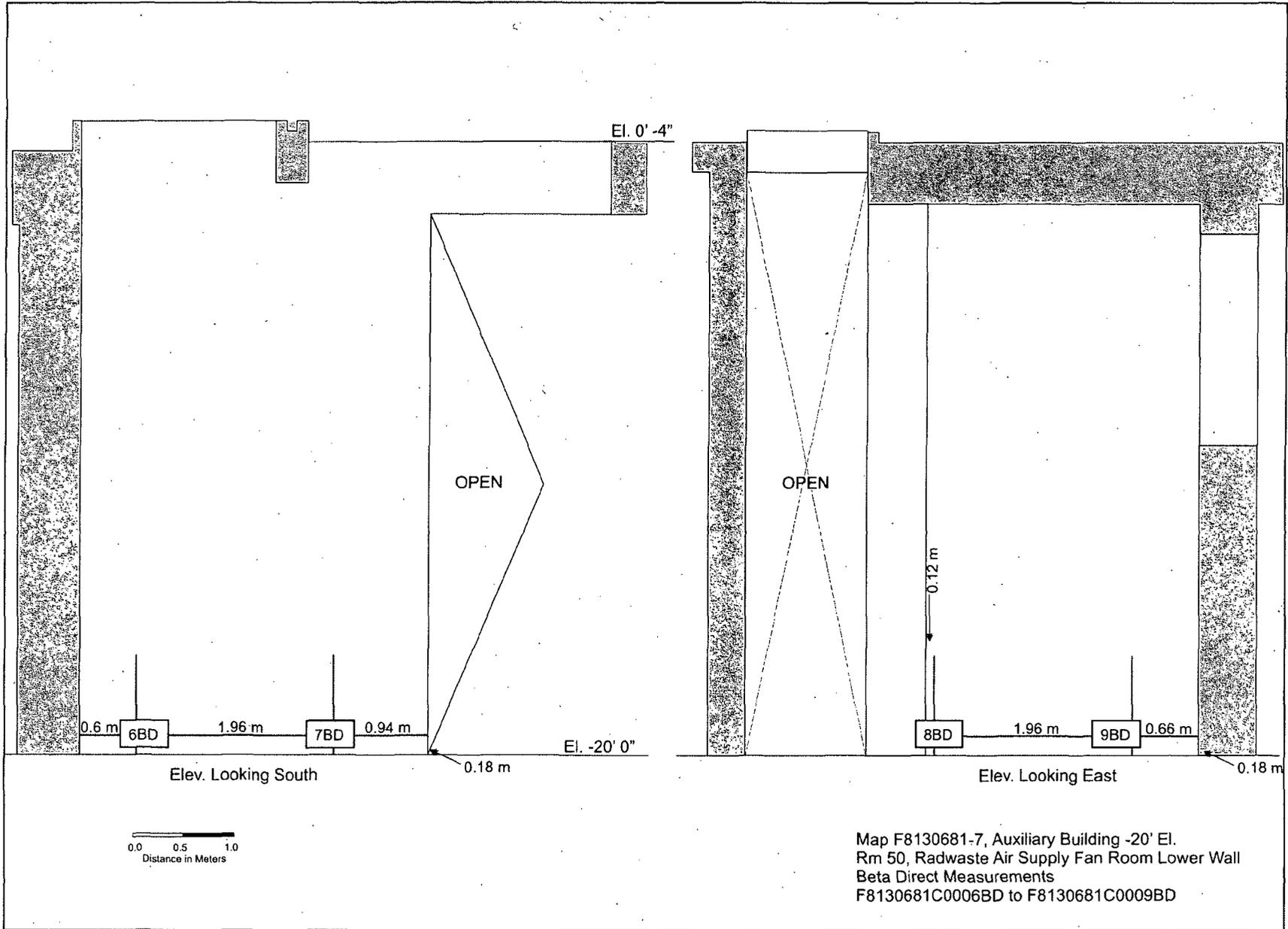


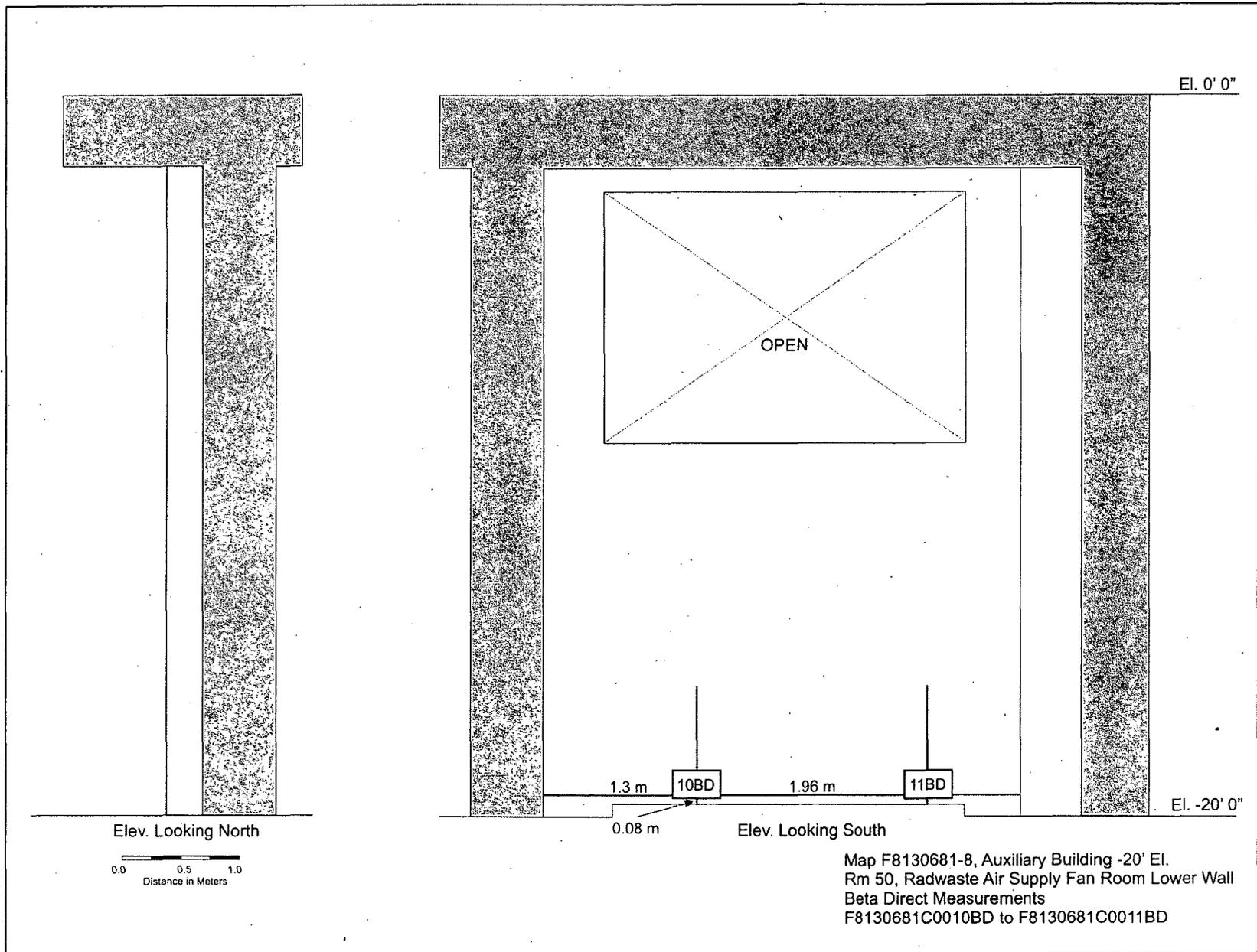


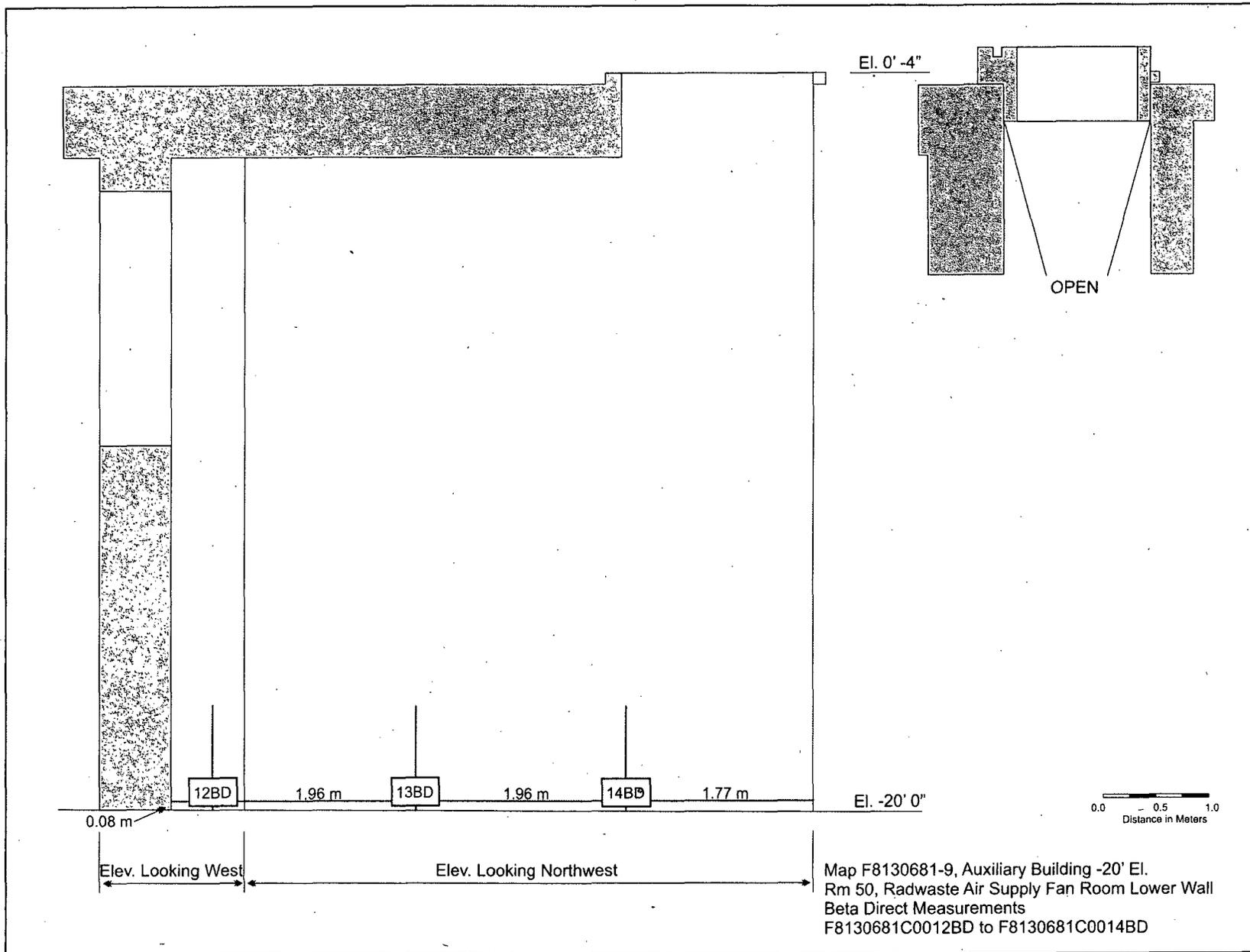
AUXILIARY BUILDING EL. -20'
ROOM 50 FLOOR & LOWER WALLS
BETA DIRECT RANDOM START LOCATION
MAP F8130681-5
FILE: 81300.02g RC RAYMOND

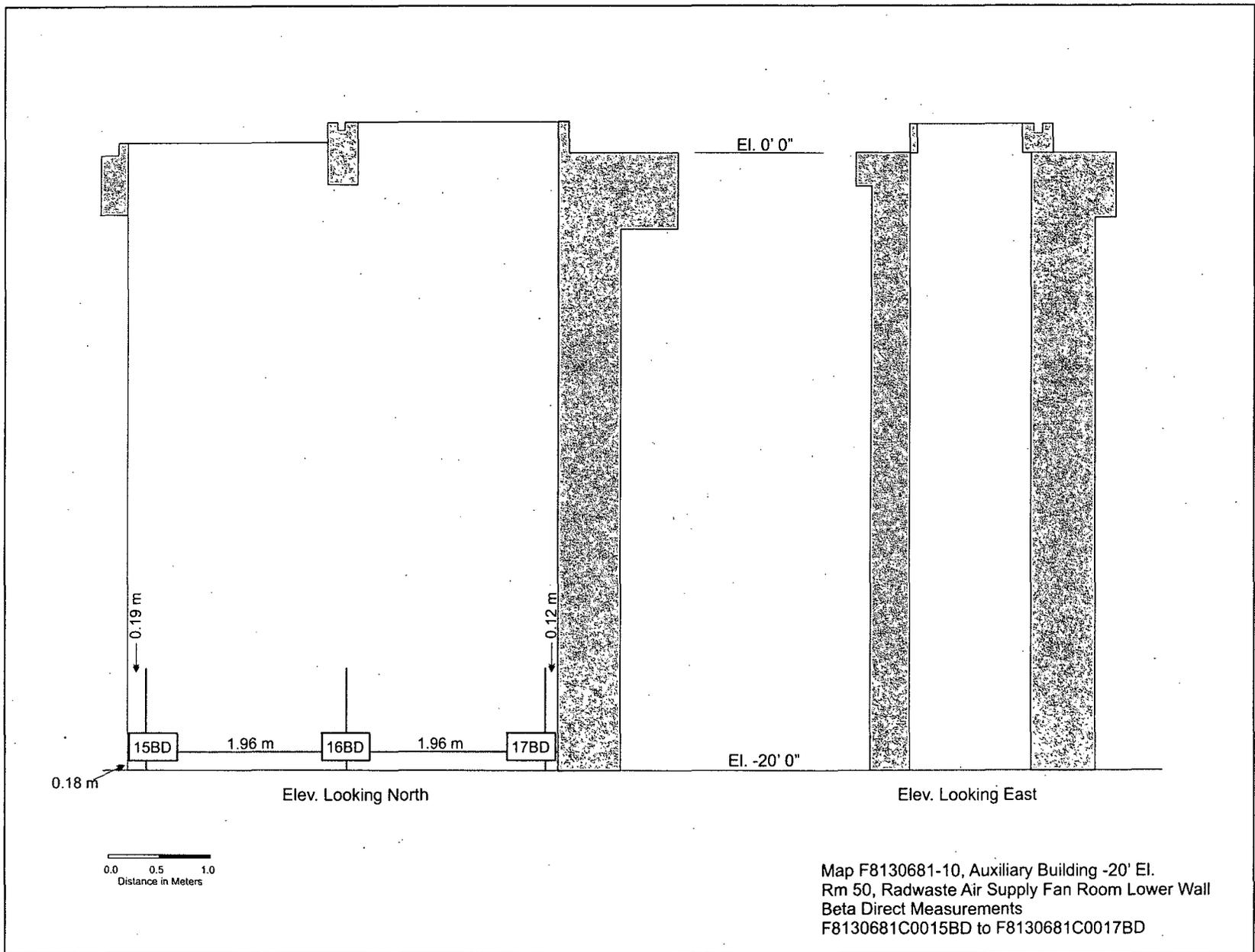


Map F8130681-6, Auxiliary Building -20' El.
Rm 50, Radwaste Air Supply Fan Room Floor
Beta Direct Measurements
F8130681C0001BD to F8130681C0005BD

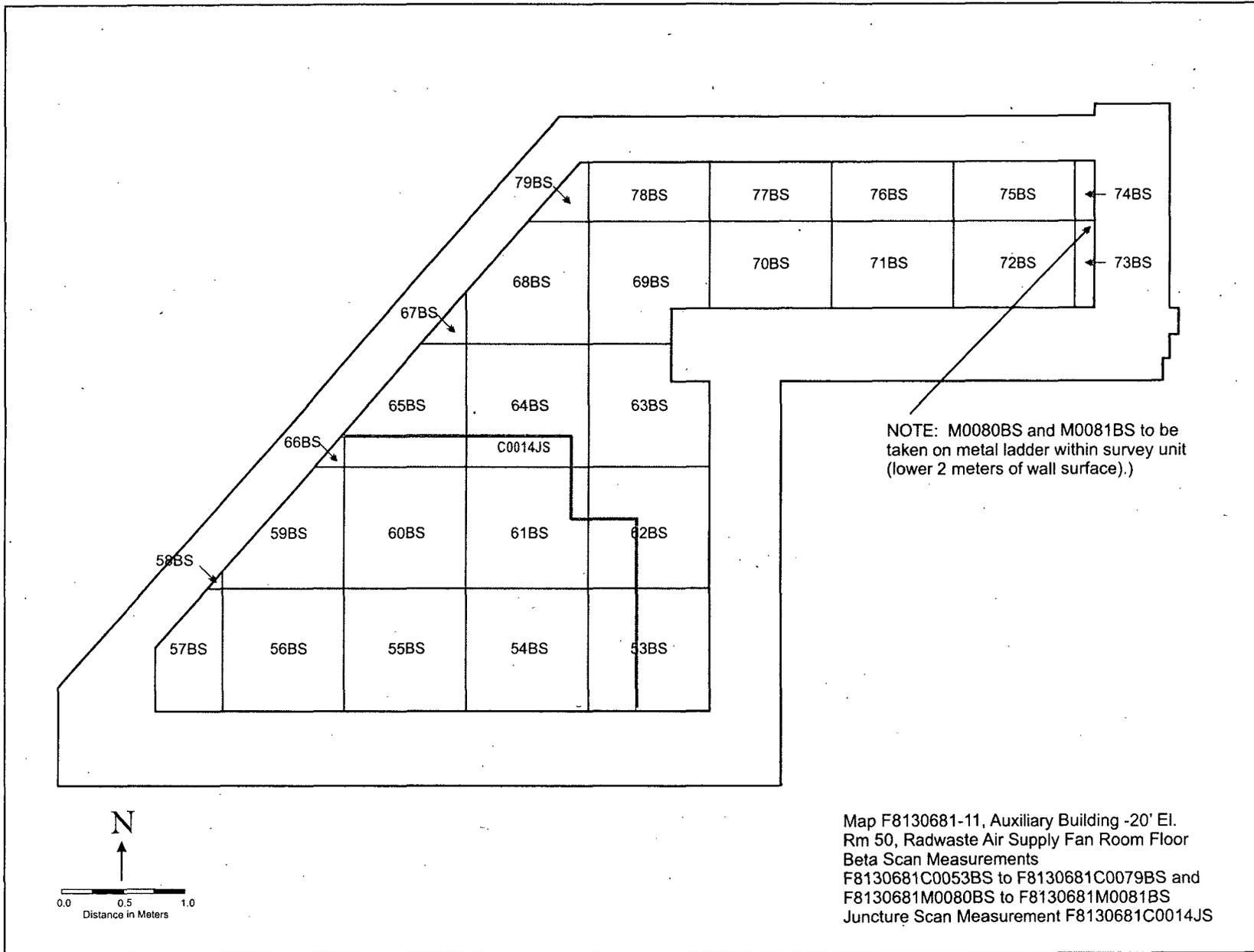






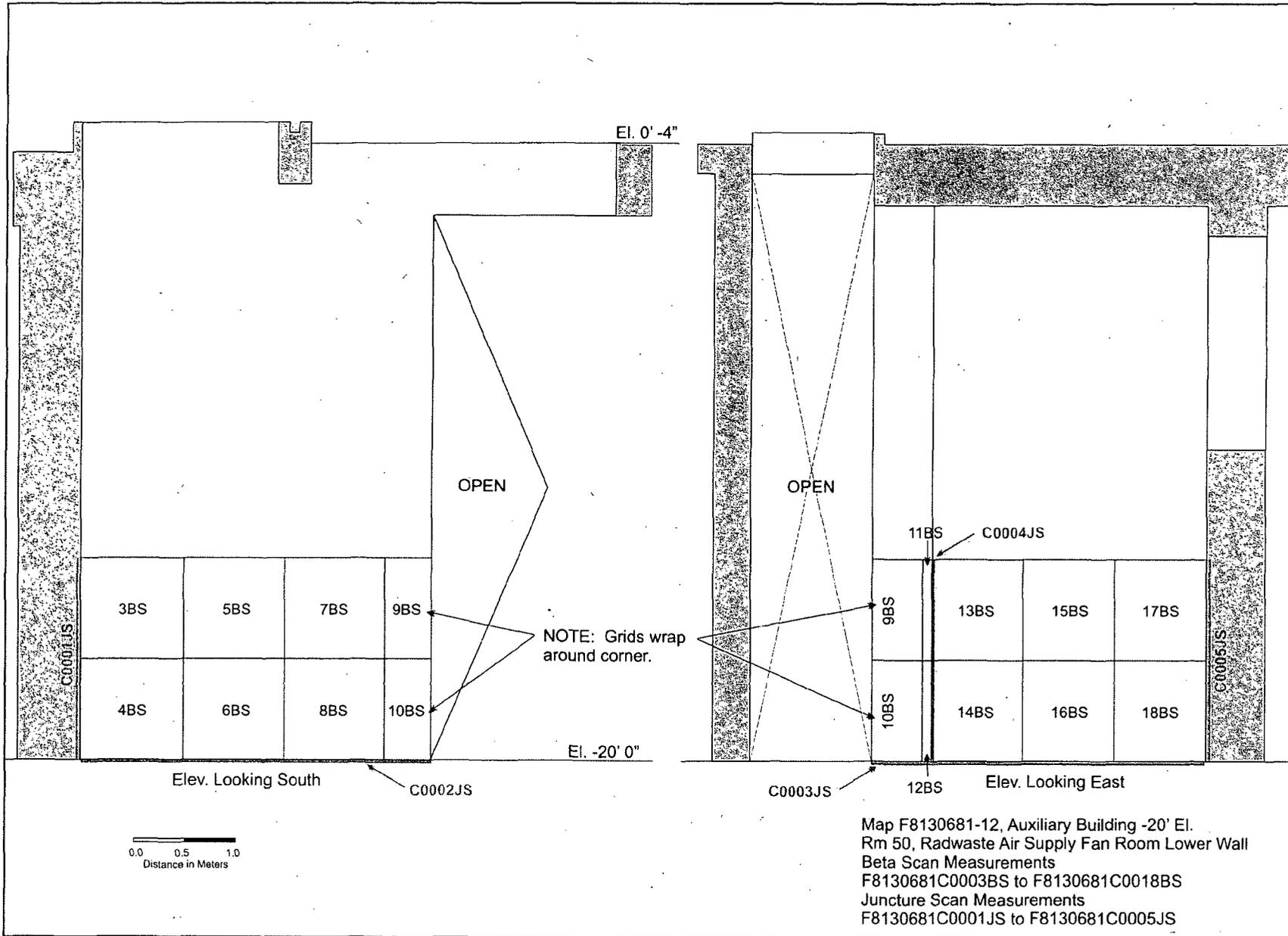


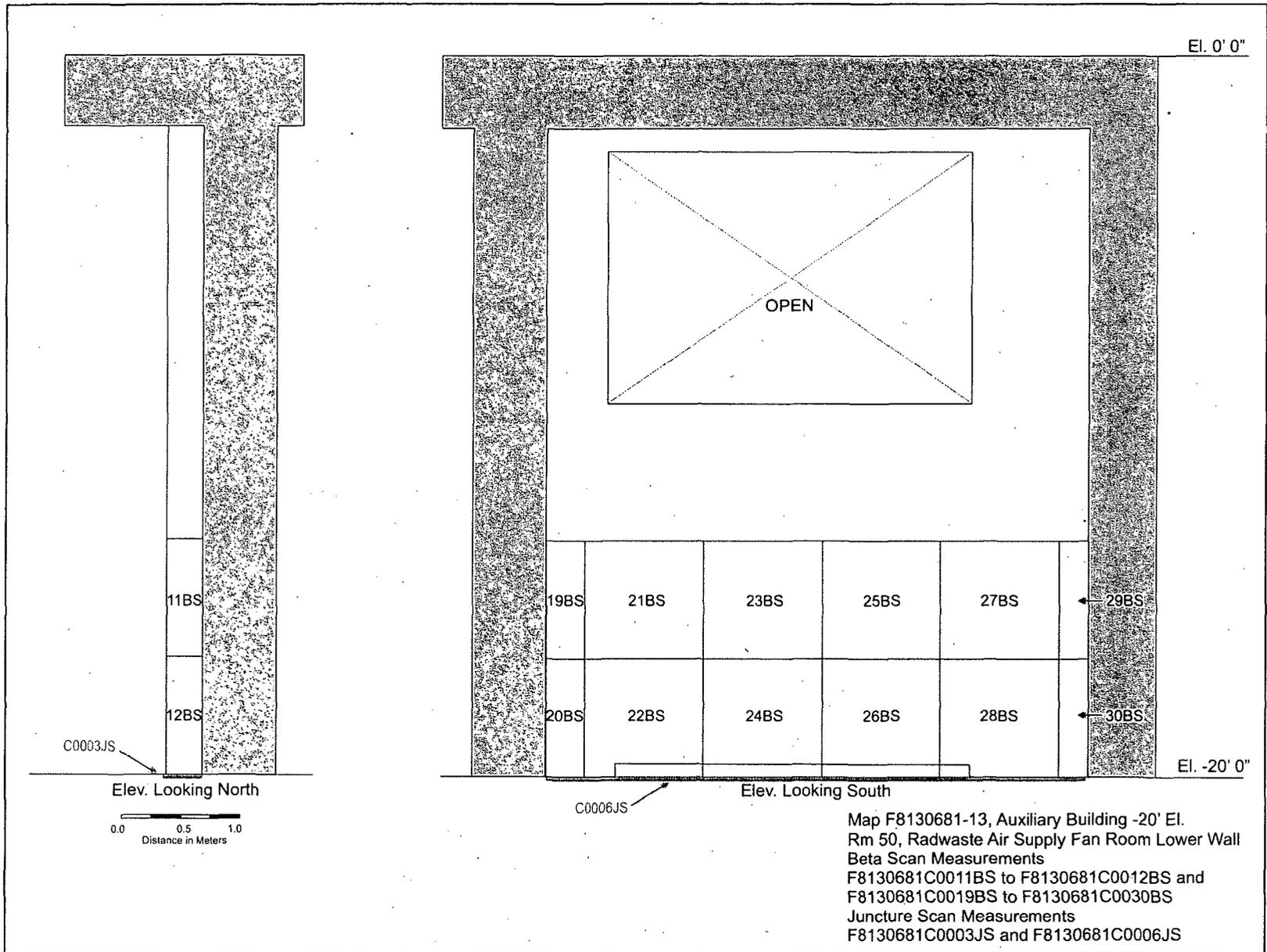
Map F8130681-10, Auxiliary Building -20' El.
Rm 50, Radwaste Air Supply Fan Room Lower Wall
Beta Direct Measurements
F8130681C0015BD to F8130681C0017BD

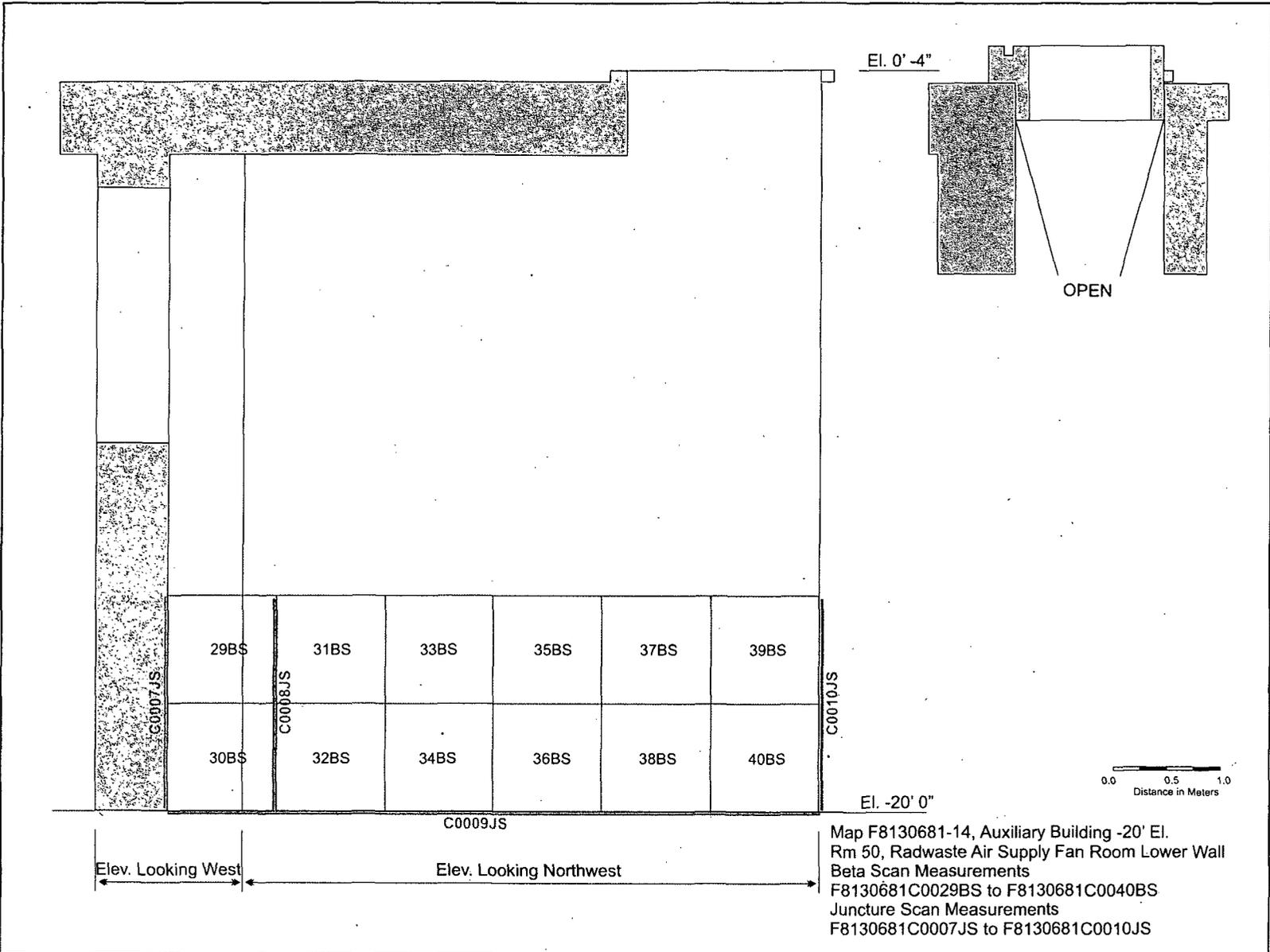


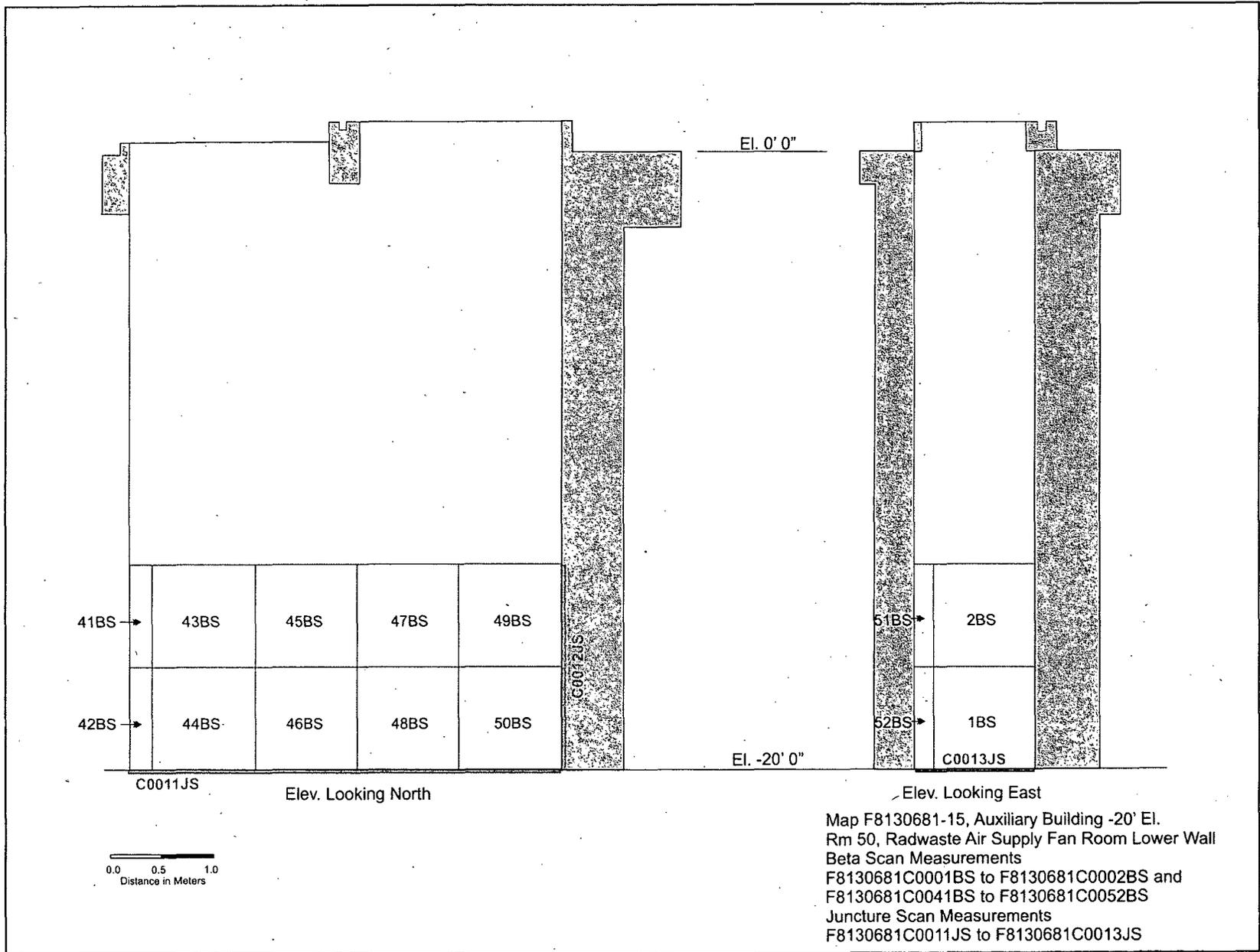
NOTE: M0080BS and M0081BS to be taken on metal ladder within survey unit (lower 2 meters of wall surface.)

Map F8130681-11, Auxiliary Building -20' El.
Rm 50, Radwaste Air Supply Fan Room Floor
Beta Scan Measurements
F8130681C0053BS to F8130681C0079BS and
F8130681M0080BS to F8130681M0081BS
Juncture Scan Measurement F8130681C0014JS









Attachment 2

Instrumentation

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Survey Unit F8130681

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; 193715	43-68B; 160703 ¹	433	1,033
M2350; 193700	43-68B; 160691 ¹		
M2350; 203486	43-51B; 190666 ²	990	2,313
M2350; 203486	43-51B; 190666 ³	784	2,660
M2350; 203486	43-51B; 190666 ⁴	1,324	4,494
Tennelec; 0401171	N/A	5 dpm α , 11 dpm β	N/A

¹43-68 Concrete surfaces

²43-51B Concrete junctures

³43-51B Metal surfaces

⁴43-51B Concrete surfaces

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	206,400
Investigation Criteria - Scan	206,400
DCGL _W	43,000
DCGL _{EMC}	206,400

Attachment 3

Investigation

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(none required)

Attachment 4

Data Assessment

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