

Rancho Seco

Final Status Survey Summary Report

April 6, 2008

Misc. Waste Tank Pump Room, Room 16

Survey Unit F8130181

Prepared By: Erin L. Brown Date: 4/6/2008

FSS Engineer

Reviewed By: [Signature] Date: 4/7/08

Lead FSS Engineer

Approved By: [Signature] Date: 5-13-08

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8130181, Misc. Waste Tank Pump Room, Room 16

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 114 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	Misc. Waste Tank Pump Room, Room 16
Survey Unit:	0181	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m²):	114	
Evaluator:	Erin L. Brown	
DCGL (dpm/100 cm²):	43000	Gross Activity DCGL
Area Factor:	3.4	Class 1
Design DCGL_{mc} (dpm/100 cm²):	146200	Class 1
LBGR (dpm/100 cm²):	21500	Default = 50% DCGL
Design Sigma (dpm/100 cm²):	12035	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m²):	6.6	Class 1
Scan Area (m²):	114	
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:	2.5	Class 1

Survey Results:

A total of 21 direct measurements were made in F8130181. The results including mean, median, standard deviation and range are shown in Table 2. All direct measurements were less than the DCGL. Three of the scan measurements indicated areas of elevated activity. Scan activity ranged from 1532 to 242239 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)
F8130181-C0001BD	1971
F8130181-C0002BD	1836
F8130181-C0003BD	1935
F8130181-C0004BD	2044
F8130181-C0005BD	1831
F8130181-C0006BD	2179
F8130181-C0007BD	2142
F8130181-C0008BD	2210
F8130181-C0009BD	2018
F8130181-C0010BD	23234
F8130181-C0011BD	10416
F8130181-C0012BD	1805
F8130181-C0013BD	1748
F8130181-C0014BD	2319
F8130181-C0015BD	5836
F8130181-C0016BD	4876
F8130181-C0017BD	2085
F8130181-C0018BD	1919
F8130181-C0019BD	5099
F8130181-C0020BD	1919
F8130181-C0021BD	1795
Mean:	3867
Median:	2044
Standard Deviation:	4907
Range:	1748 - 23234

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm²)
F8130181C0001SM	-2.24
F8130181C0002SM	-2.24
F8130181C0003SM	2.93
F8130181C0004SM	-0.95
F8130181C0005SM	9.38
F8130181C0006SM	8.09
F8130181C0007SM	17.13
F8130181C0008SM	-0.95
F8130181C0009SM	-3.53
F8130181C0010SM	26.17
F8130181C0011SM	46.84
F8130181C0012SM	1.64
F8130181C0013SM	0.34
F8130181C0014SM	9.38
F8130181C0015SM	24.88
F8130181C0016SM	11.97
F8130181C0017SM	2.93
F8130181C0018SM	-3.53
F8130181C0019SM	58.46
F8130181C0020SM	-3.53
F8130181C0021SM	-2.24
Mean:	9.57
Median:	2.93
Standard Deviation:	16.95
Range:	-3.53 to 58.46

Survey Unit Data Assessment:

The survey design required 21 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	
Ambient Background Used (dpm/100 cm ²):	N/A	Average Ambient BKG = 0
Actual Direct Measurements (N):	21	
Median (dpm/100 cm ²):	2044	
Mean (dpm/100 cm ²):	3867	
Direct Measurement Standard Deviation (dpm/100 cm ²):	4907	
Total Standard Deviation (dpm/100 cm ²):	4907	Based on samples and backgrounds.
Maximum (dpm/100 cm ²):	23234	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	21	
S+ Value:	21	
Critical Value:	14	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGL_{emc}:	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:

An investigation was required for three scan measurements as indicated in Attachment 3. Investigation of the areas resulted in the decision to perform additional remediation. The investigation results 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. Three potential areas of elevated activity were 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 three scan measurements 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.

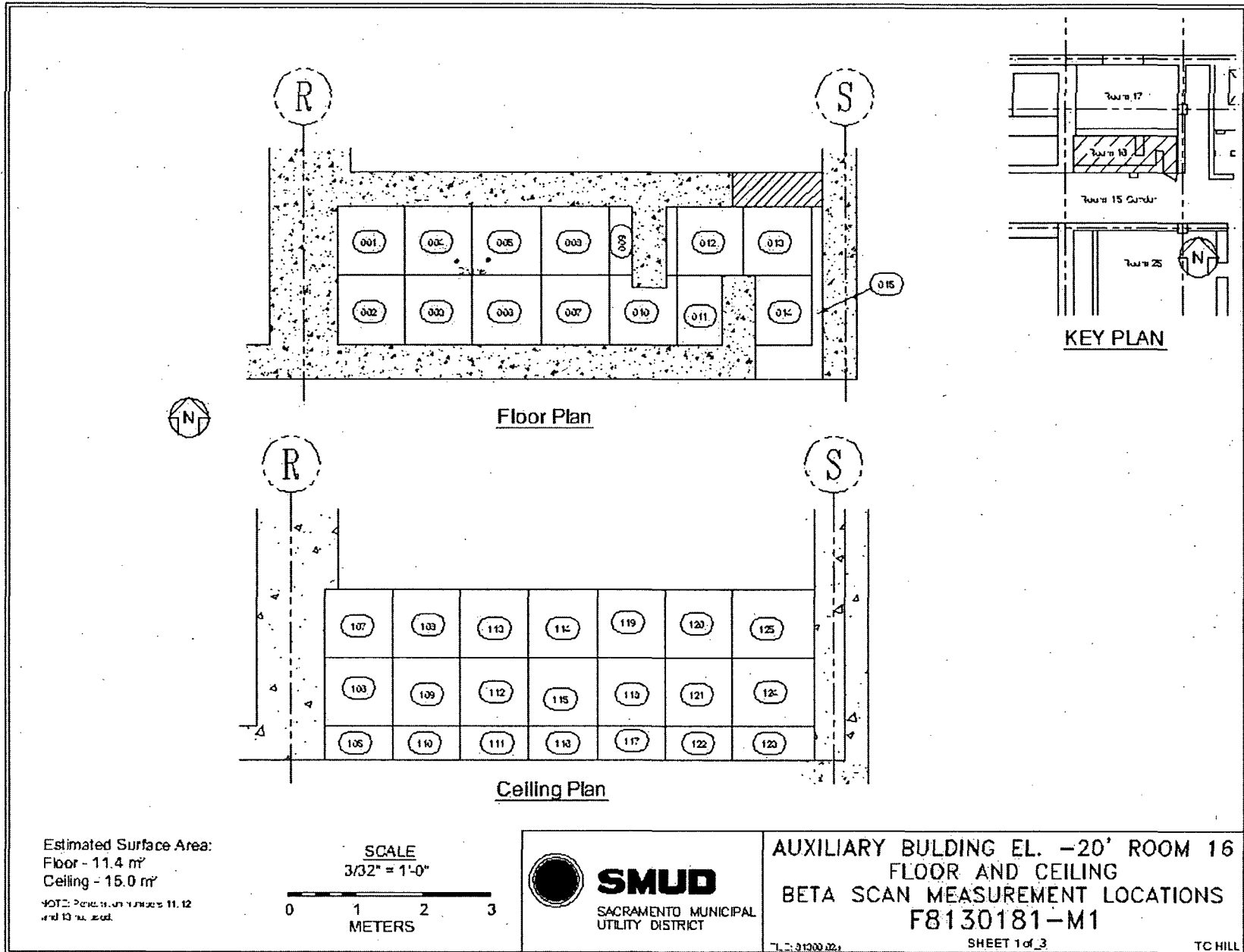
It is concluded that survey unit F8130181 meets the release criteria of 10CFR20.1402.

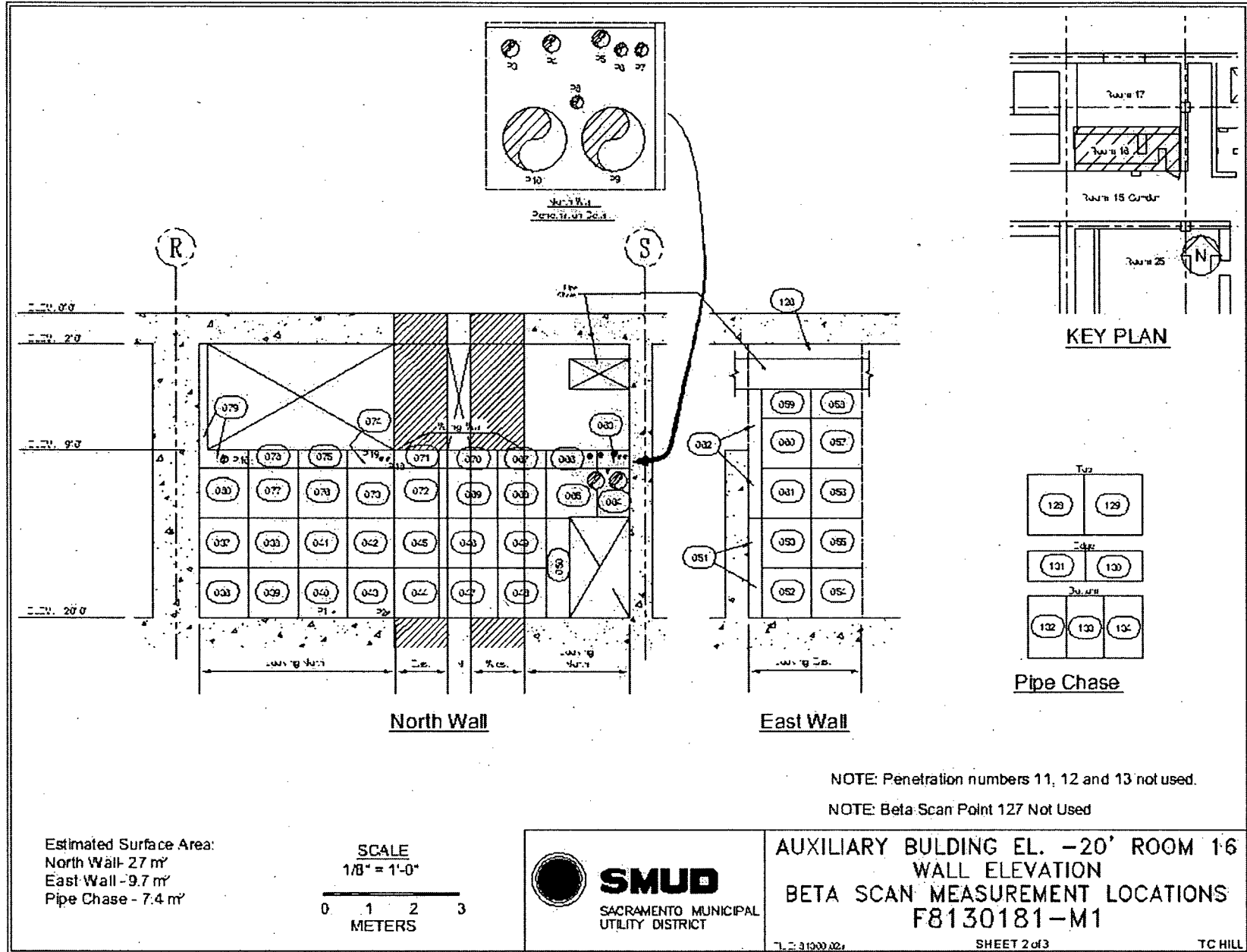
Attachment 1

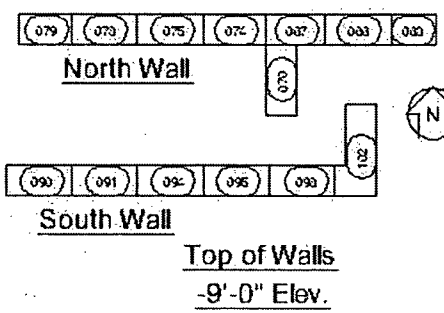
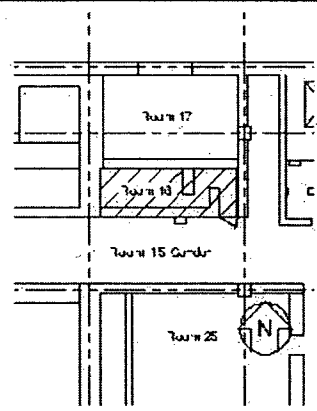
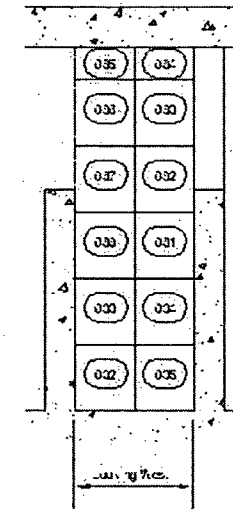
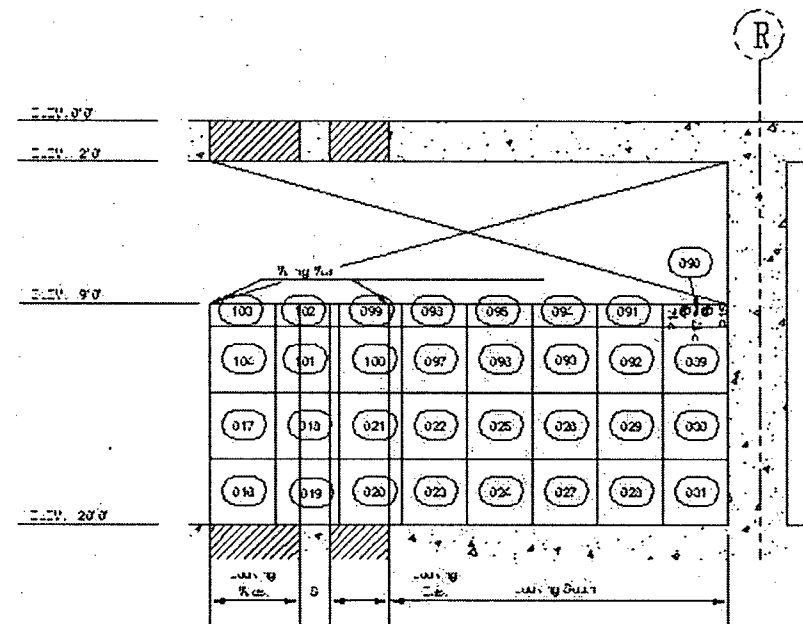
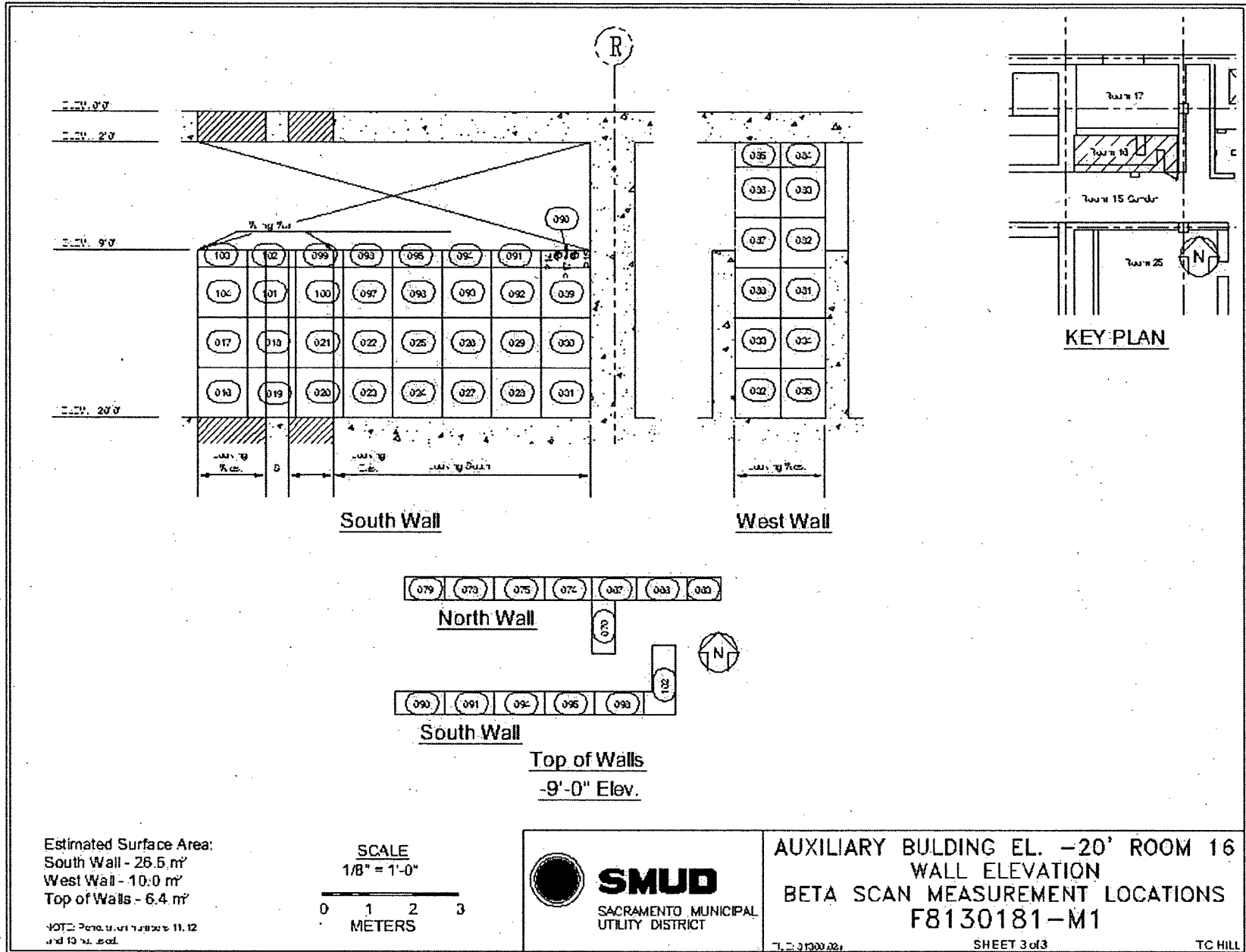
Maps

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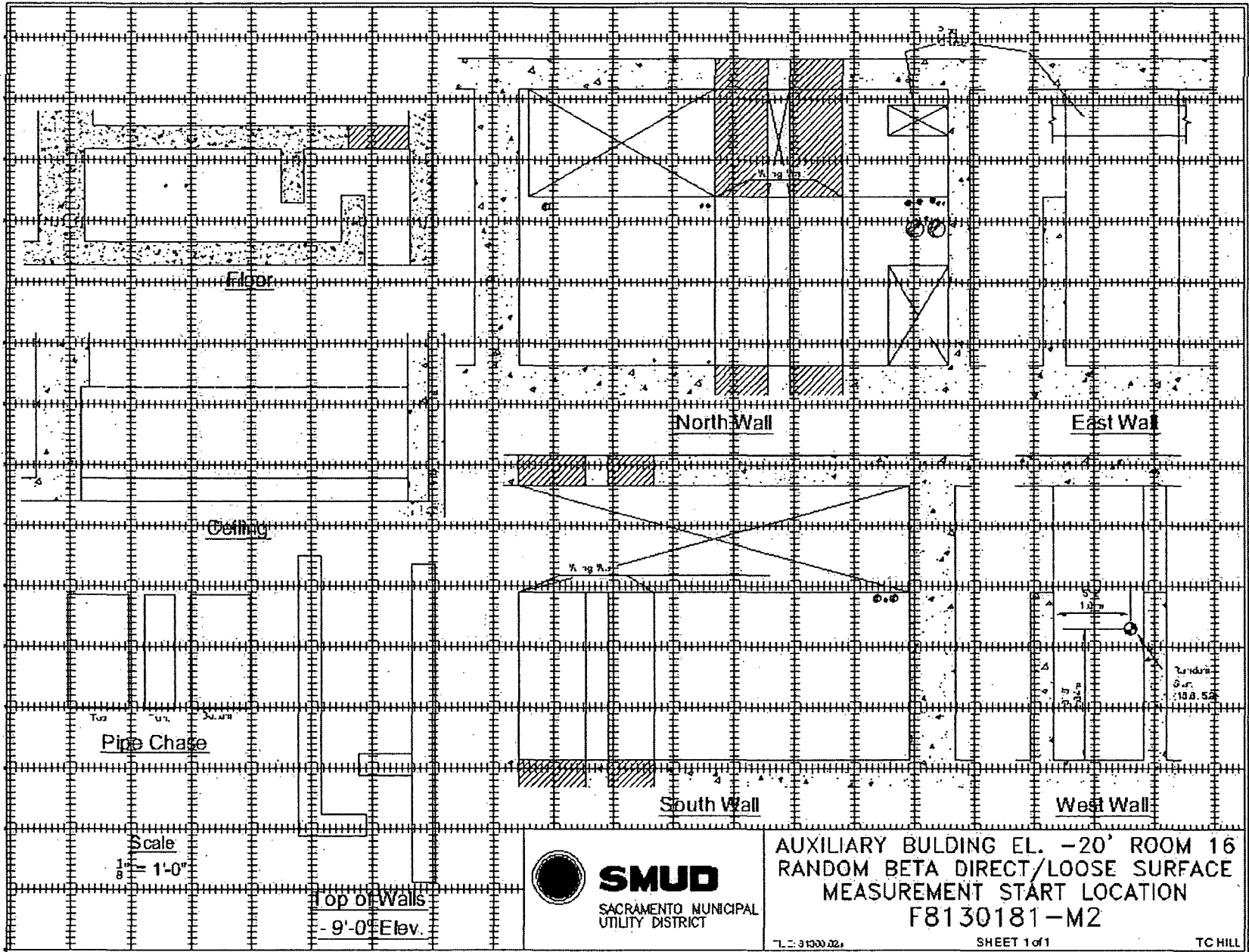
Survey Unit F8130181

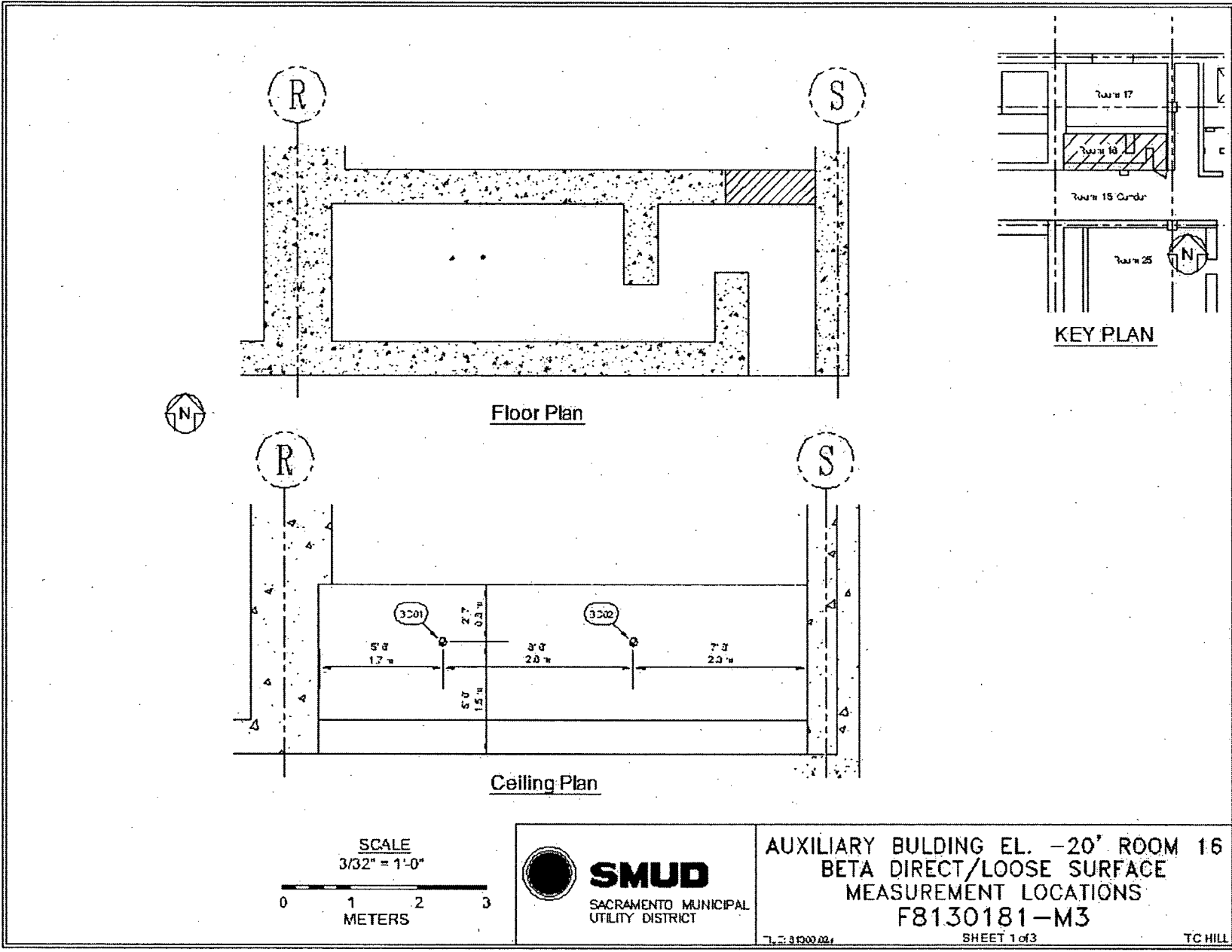


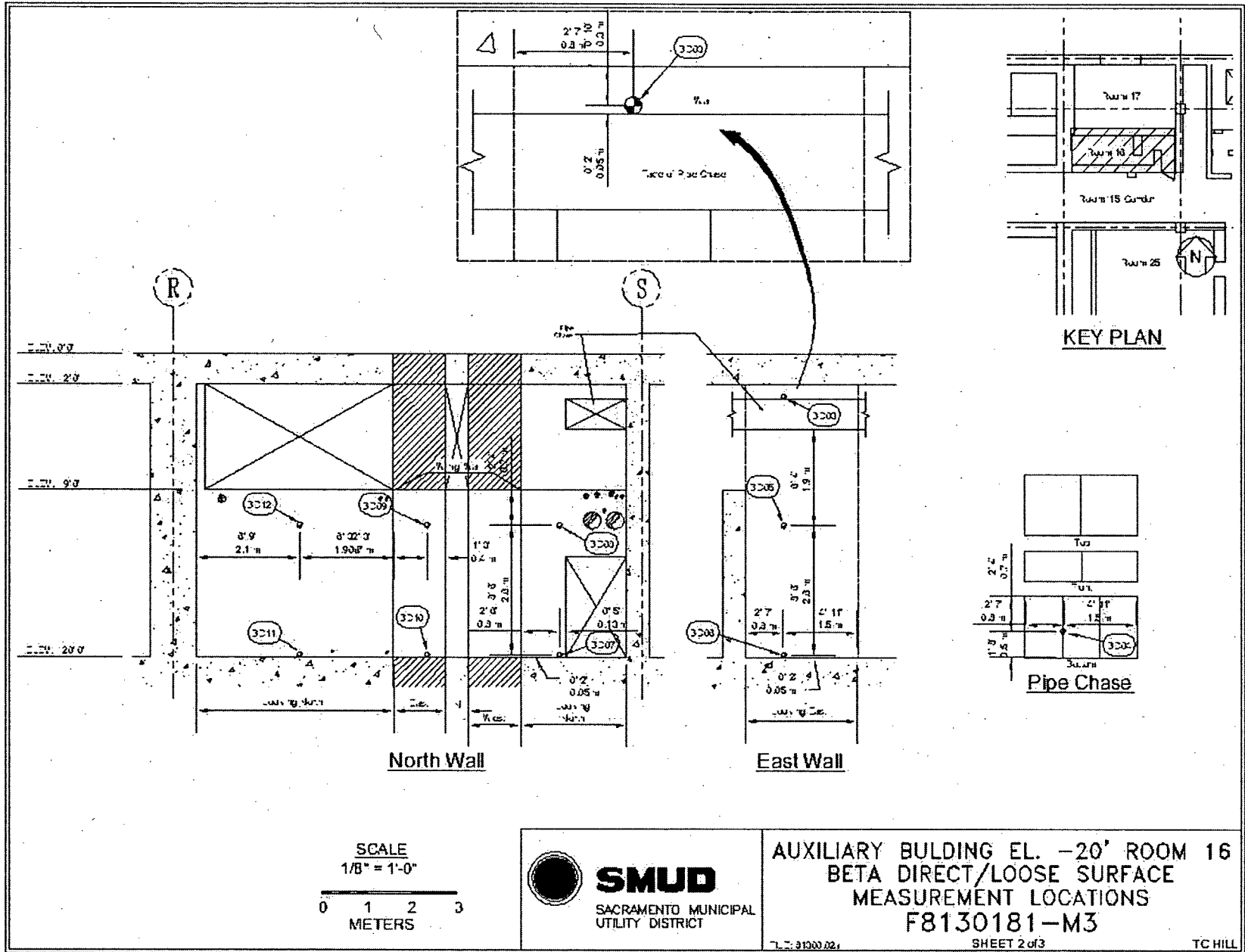


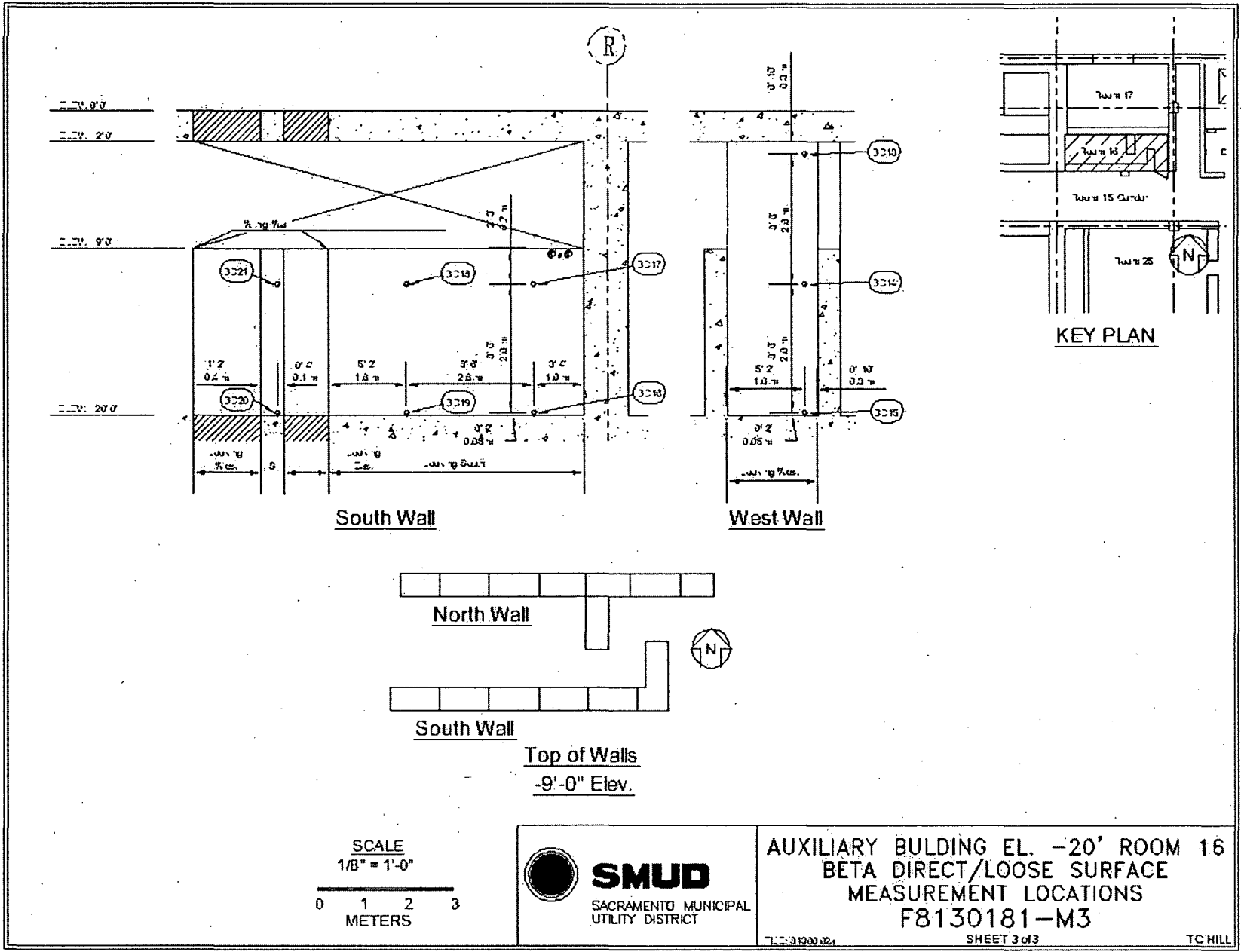


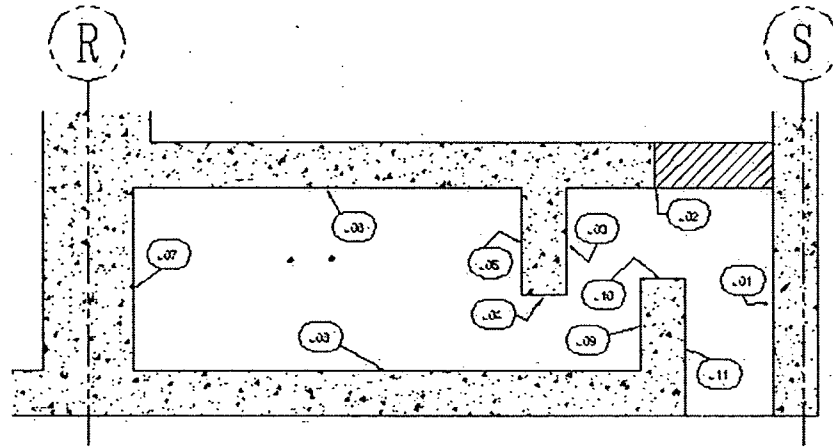
NOTE: Points 010, 011, 012 and 013 are not shown.



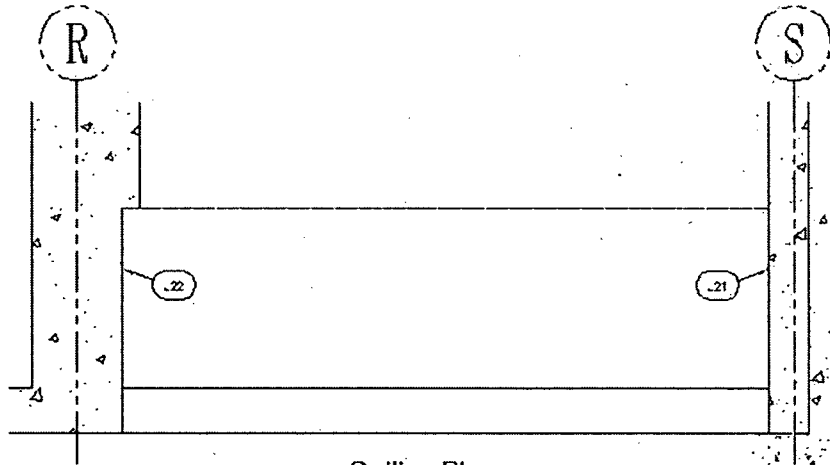




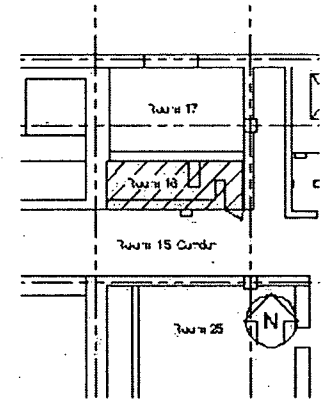




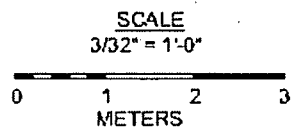
Floor Plan



Ceiling Plan



KEY PLAN



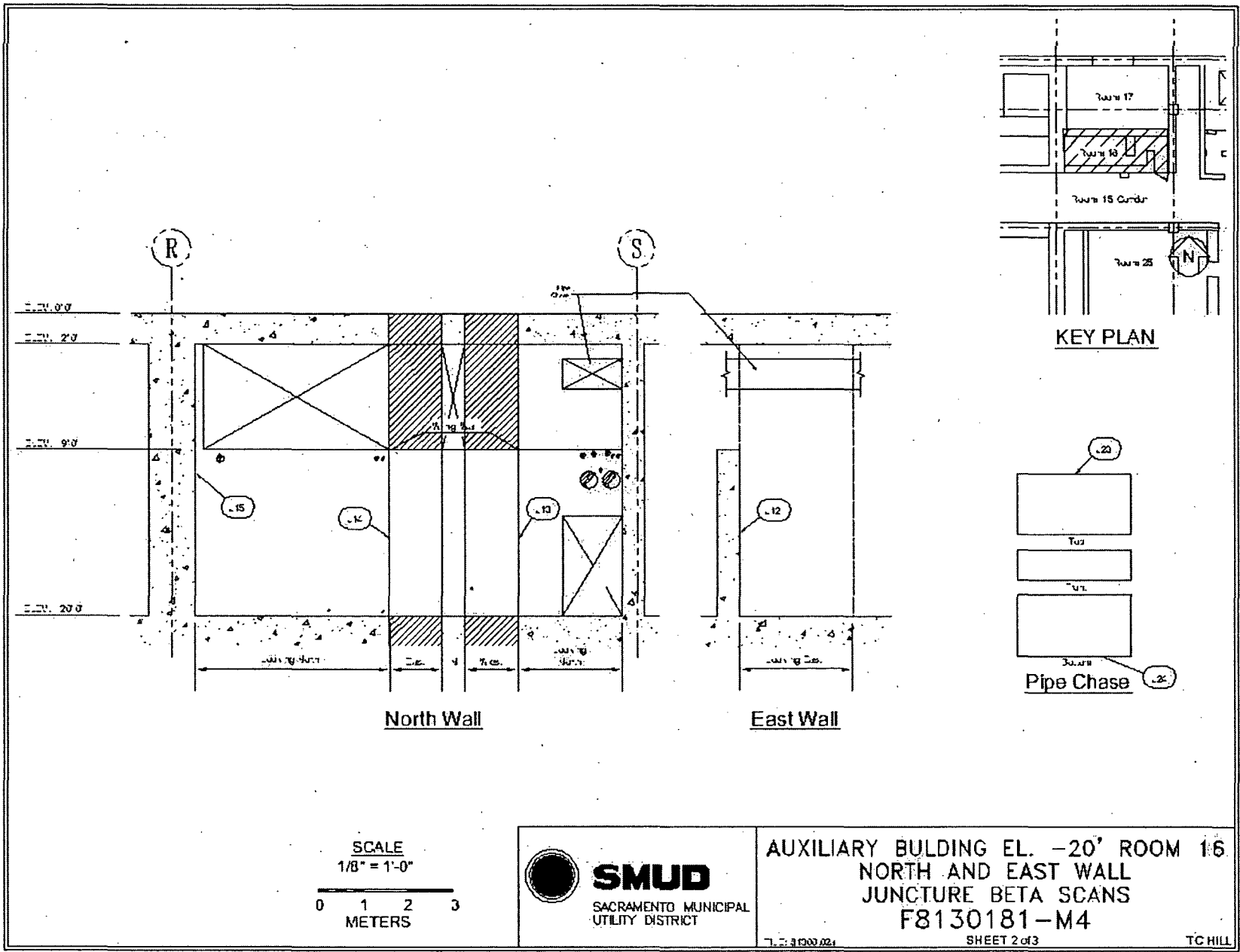
SMUD
SACRAMENTO MUNICIPAL
UTILITY DISTRICT

AUXILIARY BULDING EL. -20' ROOM 16
FLOOR AND CEILING
JUNCTURE BETA SCANS
F8130181-M4

T. 3: 9 1900 021

SHEET 1 of 3

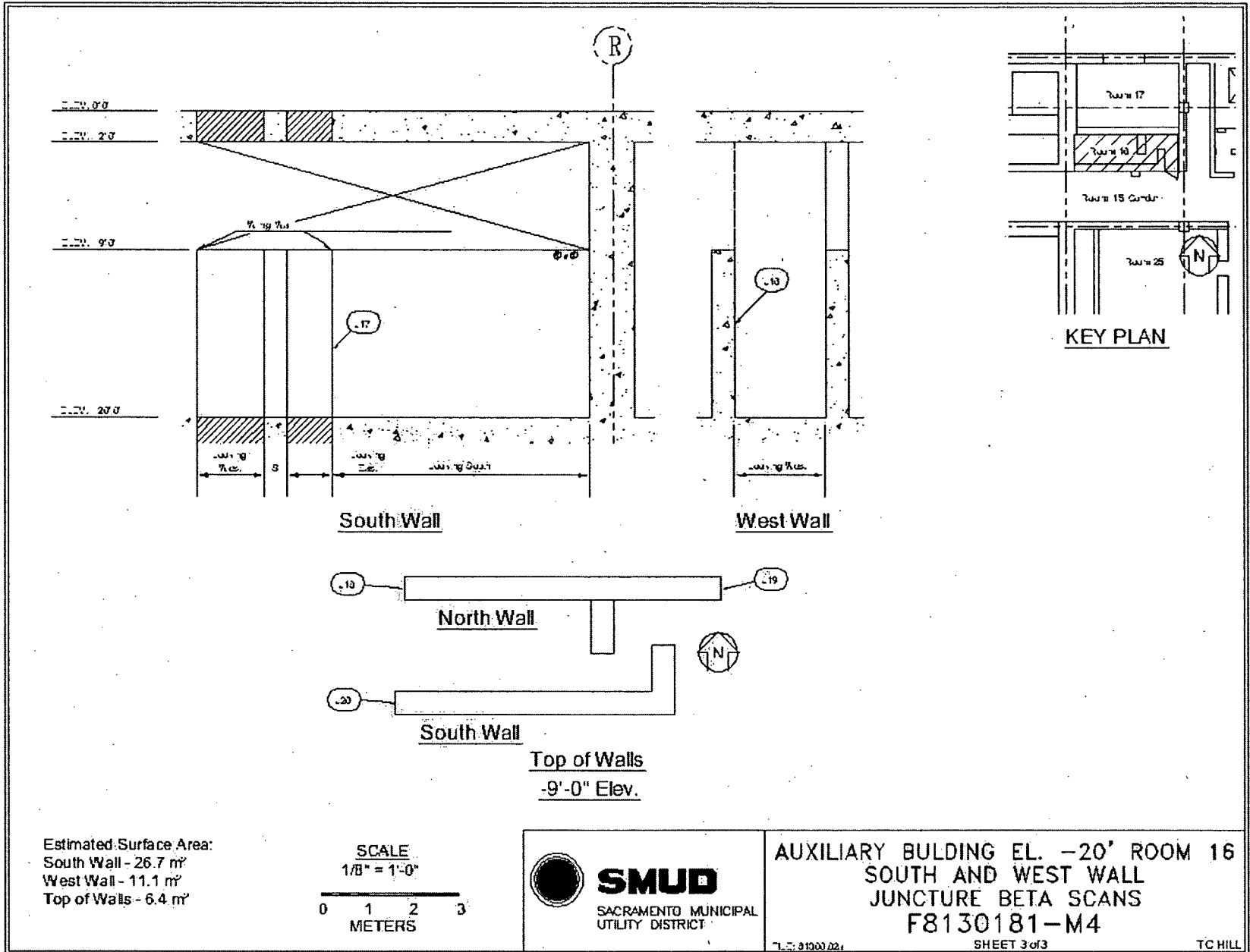
TC HILL



SCALE
 1/8" = 1'-0"
 0 1 2 3
 METERS

SMUD
 SACRAMENTO MUNICIPAL
 UTILITY DISTRICT

AUXILIARY BLDG EL. -20' ROOM 16
 NORTH AND EAST WALL
 JUNCTURE BETA SCANS
 F8130181-M4
 SHEET 2 of 3
 TCHILL



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; 180733	43-98B; 148638	N/A	820
M2350; 175834	43-68B; 190482	433	1033
M2350; 175834	43-116-1B; 190642	N/A	3258
Tennelec; 0401171	N/A	5.9 dpm α , 11.7 dpm β	N/A

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	146200
Investigation Criteria – Scan	146200
DCGL _W	43000
DCGL _{EMC}	146200

Attachment 3

Investigation

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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>
C0043BS	19,000	25,203	5,052	N/A	N/A	146,200	37,061	0
C0091BS	19,000	33,021	3,140	N/A	N/A	146,200	23,035	0
C0094BS	19,000	36,417	2,987	N/A	N/A	146,200	21,912	0
Survey Unit Remainder						DCGL = 43,000	SU Mean = 3867	0.09
EMC Unity Sum								0.09

All of the grids above were initially greater than DCGL_{emc}. Investigation of the areas resulted in the decision to perform additional remediation. The investigation results above represent the residual radioactivity levels after additional remediation.

Attachment 4

Data Assessment

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