

Rancho Seco
Final Status Survey Summary Report
March 31, 2008
Ion Exchanger Valve Area
Room 27
Survey Unit F8130361

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FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8130361, Room 27

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 283.9 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 | Ion Exchanger Valve Area Room 27 |
| Survey Unit: | 0361 | Structure Surface |
| Class: | 1 | LTP Table 5-4 |
| SU Area (m ²): | 283.9 | |
| Evaluator: | Erin L. Brown | |
| DCGL (dpm/100 cm ²): | 43000 | Gross Activity DCGL |
| Area Factor: | 3.3 | Class 1 |
| Design DCGL _{mc} (dpm/100 cm ²): | 142760 | Class 1 |
| LBGR (dpm/100 cm ²): | 21500 | Default = 50% DCGL |
| Design Sigma (dpm/100 cm ²): | 12035 | |
| Type I Error: | 0.05 | |
| Type II Error: | 0.05 | |
| Predominant Nuclide: | Cs-137 | |
| Sample Area (m ²): | 6.9 | Class 1 |
| Scan Area (m ²): | 283.9 | |
| 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: | 41 | Class 1 |
| Grid Spacing L: | 2.6 | Class 1 |

Survey Results:

A total of 43 direct measurements were made in F8130361. 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 1996 to 57103 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) |
|------------------|---|
| F8130361-C0001BD | 1935 |
| F8130361-C0002BD | 2111 |
| F8130361-C0003BD | 1924 |
| F8130361-C0004BD | 2262 |
| F8130361-C0005BD | 2007 |
| F8130361-C0006BD | 2127 |
| F8130361-C0007BD | 1795 |
| F8130361-C0008BD | 1873 |
| F8130361-C0009BD | 1873 |
| F8130361-C0010BD | 1675 |
| F8130361-C0011BD | 1592 |
| F8130361-C0012BD | 1899 |
| F8130361-C0013BD | 1634 |
| F8130361-C0014BD | 2018 |
| F8130361-C0015BD | 1795 |
| F8130361-C0016BD | 1748 |
| F8130361-C0017BD | 1603 |
| F8130361-C0018BD | 3548 |
| F8130361-C0019BD | 6790 |
| F8130361-C0020BD | 1940 |
| F8130361-C0021BD | 1852 |
| F8130361-C0022BD | 1971 |
| F8130361-C0023BD | 1982 |
| F8130361-C0024BD | 1982 |
| F8130361-C0025BD | 1821 |
| F8130361-C0026BD | 2018 |
| F8130361-C0027BD | 1987 |
| F8130361-C0028BD | 1613 |
| F8130361-C0029BD | 1546 |
| F8130361-C0030BD | 1650 |
| F8130361-C0031BD | 1727 |
| F8130361-C0032BD | 1753 |
| F8130361-C0033BD | 1992 |
| F8130361-C0034BD | 1899 |
| F8130361-C0035BD | 1852 |
| F8130361-C0036BD | 2096 |

| | |
|----------------------------|-------------|
| F8130361-C0037BD | 1966 |
| F8130361-C0038BD | 2215 |
| F8130361-C0039BD | 1945 |
| F8130361-C0040BD | 1976 |
| F8130361-C0041BD | 1924 |
| F8130361-C0042BD | 2044 |
| F8130361-C0043BD | 1976 |
| Mean: | 2045 |
| Median: | 1935 |
| Standard Deviation: | 800 |
| Range: | 1546 - 6790 |

Table 3. Removable Surface Activity Results

| Measurement ID | Surface Beta Activity (dpm/100 cm²) |
|-----------------------|---|
| F8130361C0001SM | -2.24 |
| F8130361C0002SM | -0.95 |
| F8130361C0003SM | 9.38 |
| F8130361C0004SM | 10.68 |
| F8130361C0005SM | -4.82 |
| F8130361C0006SM | -0.95 |
| F8130361C0007SM | -0.95 |
| F8130361C0008SM | -2.24 |
| F8130361C0009SM | 6.8 |
| F8130361C0010SM | 15.84 |
| F8130361C0011SM | 1.64 |
| F8130361C0012SM | 10.68 |
| F8130361C0013SM | 4.22 |
| F8130361C0014SM | 13.26 |
| F8130361C0015SM | 1.64 |
| F8130361C0016SM | -3.53 |
| F8130361C0017SM | 4.22 |
| F8130361C0018SM | 22.3 |
| F8130361C0019SM | 62.33 |
| F8130361C0020SM | 0.34 |
| F8130361C0021SM | 10.68 |
| F8130361C0022SM | 13.26 |
| F8130361C0023SM | -3.53 |
| F8130361C0024SM | 10.68 |
| F8130361C0025SM | 0.34 |
| F8130361C0026SM | 8.09 |
| F8130361C0027SM | 1.64 |
| F8130361C0028SM | -0.95 |
| F8130361C0029SM | -4.82 |
| F8130361C0030SM | 0.34 |
| F8130361C0031SM | 1.64 |
| F8130361C0032SM | -3.53 |
| F8130361C0033SM | -3.53 |
| F8130361C0034SM | -0.95 |
| F8130361C0035SM | 10.68 |
| F8130361C0036SM | -3.53 |
| F8130361C0037SM | -4.82 |
| F8130361C0038SM | -4.82 |
| F8130361C0039SM | -2.24 |
| F8130361C0040SM | -4.82 |
| F8130361C0041SM | -6.11 |
| F8130361C0042SM | -2.24 |
| F8130361C0043SM | 2.93 |
| Mean: | 3.77 |
| Median: | 0.34 |
| Standard Deviation: | 11.38 |
| Range: | -6.11 to 62.33 |

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): | 1935 | |
| Mean (dpm/100 cm ²): | 2045 | |
| Direct Measurement Standard Deviation (dpm/100 cm ²): | 800 | |
| Total Standard Deviation (dpm/100 cm ²): | 800 | Based on samples and backgrounds. |
| Maximum (dpm/100 cm ²): | 6790 | Background Subtract Not Applied |
| Material Type: | N/A | |
| Sign Test Final N Value: | 43 | Class 1 |
| S+ Value: | 43 | |
| Critical Value: | 27 | |
| Sufficient Samples Collected: | Yes | |
| Maximum Value < DCGL: | Yes | |
| 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:

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.

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. 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.

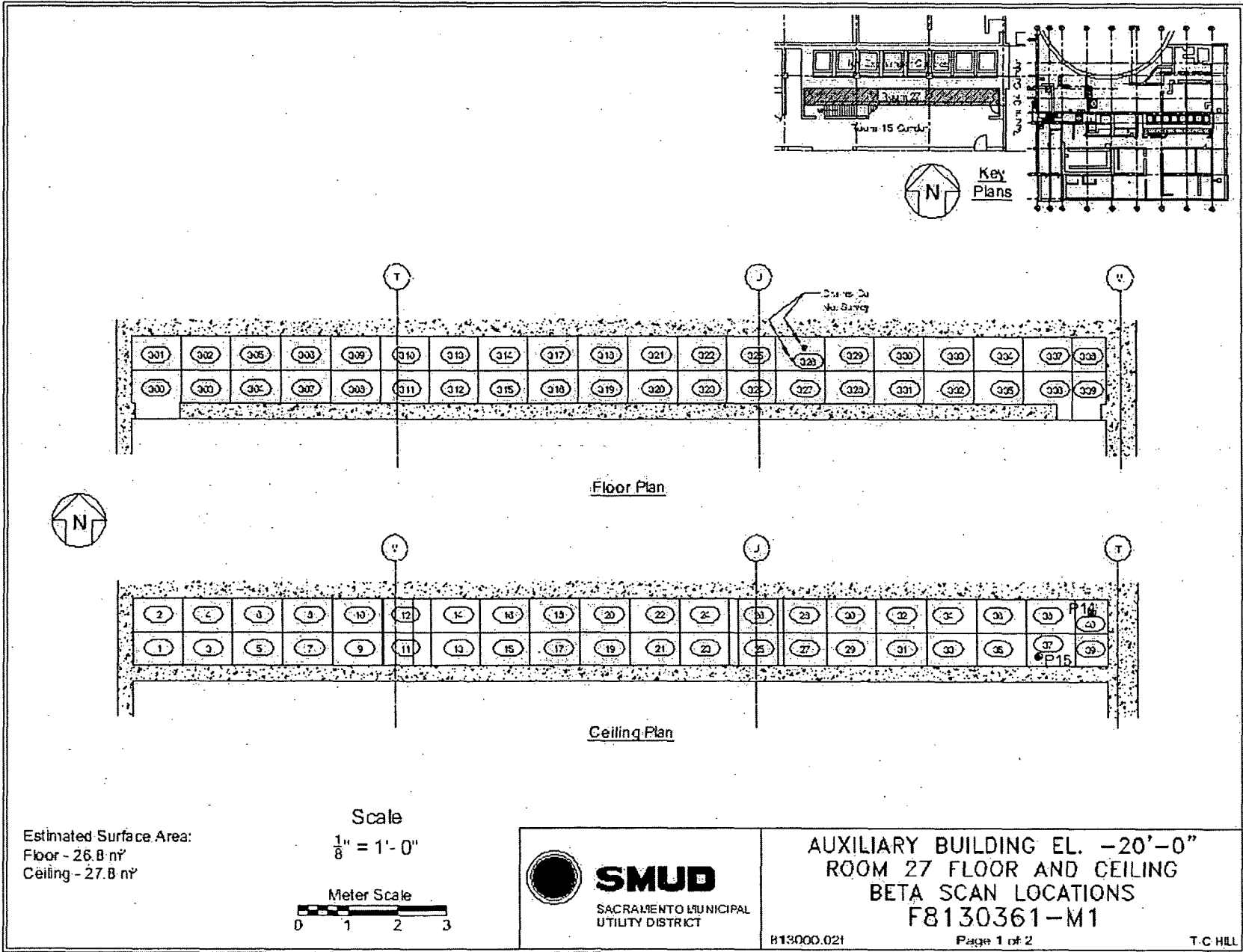
It is concluded that survey unit F8130361 meets the release criteria of 10CFR20.1402.

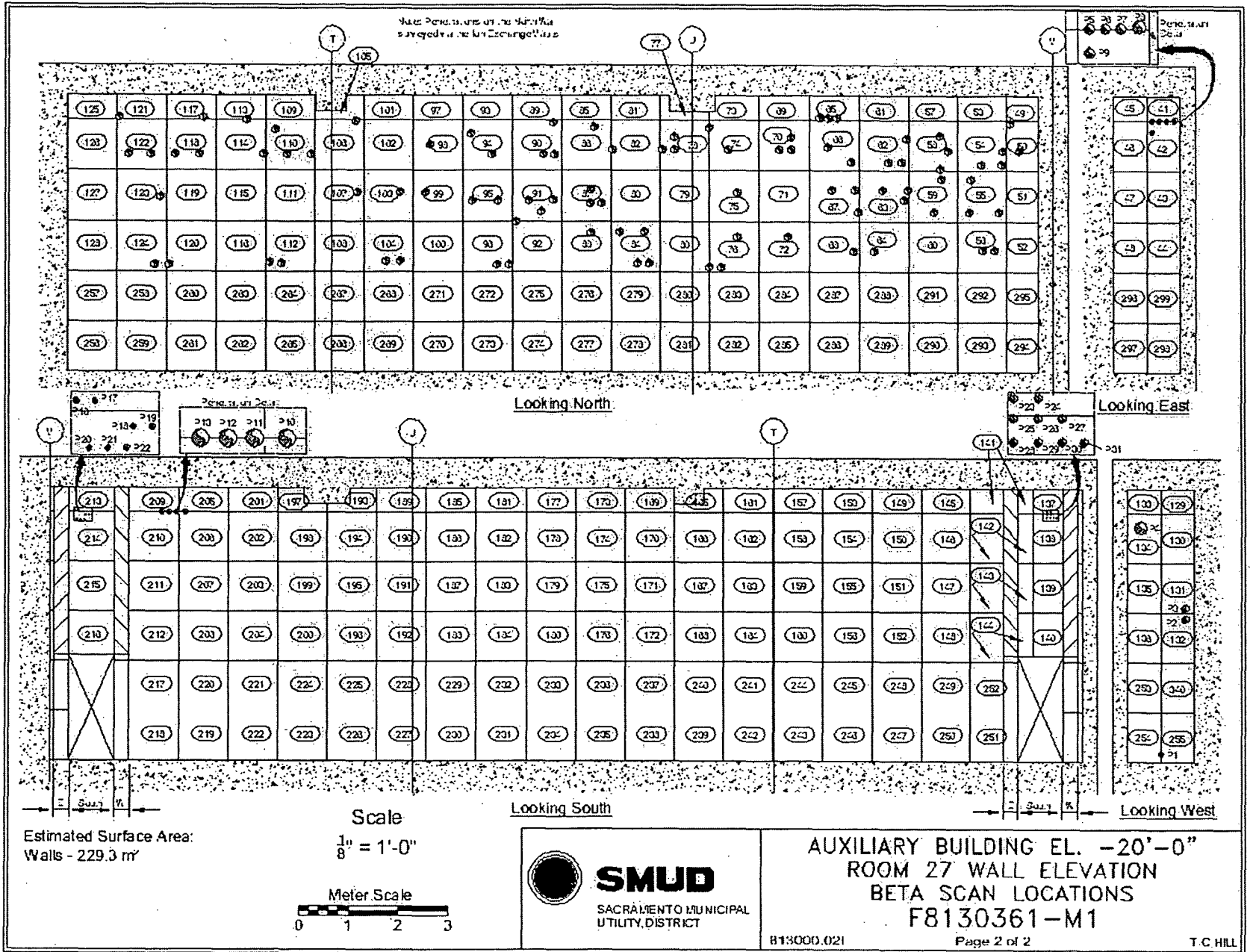
Attachment 1

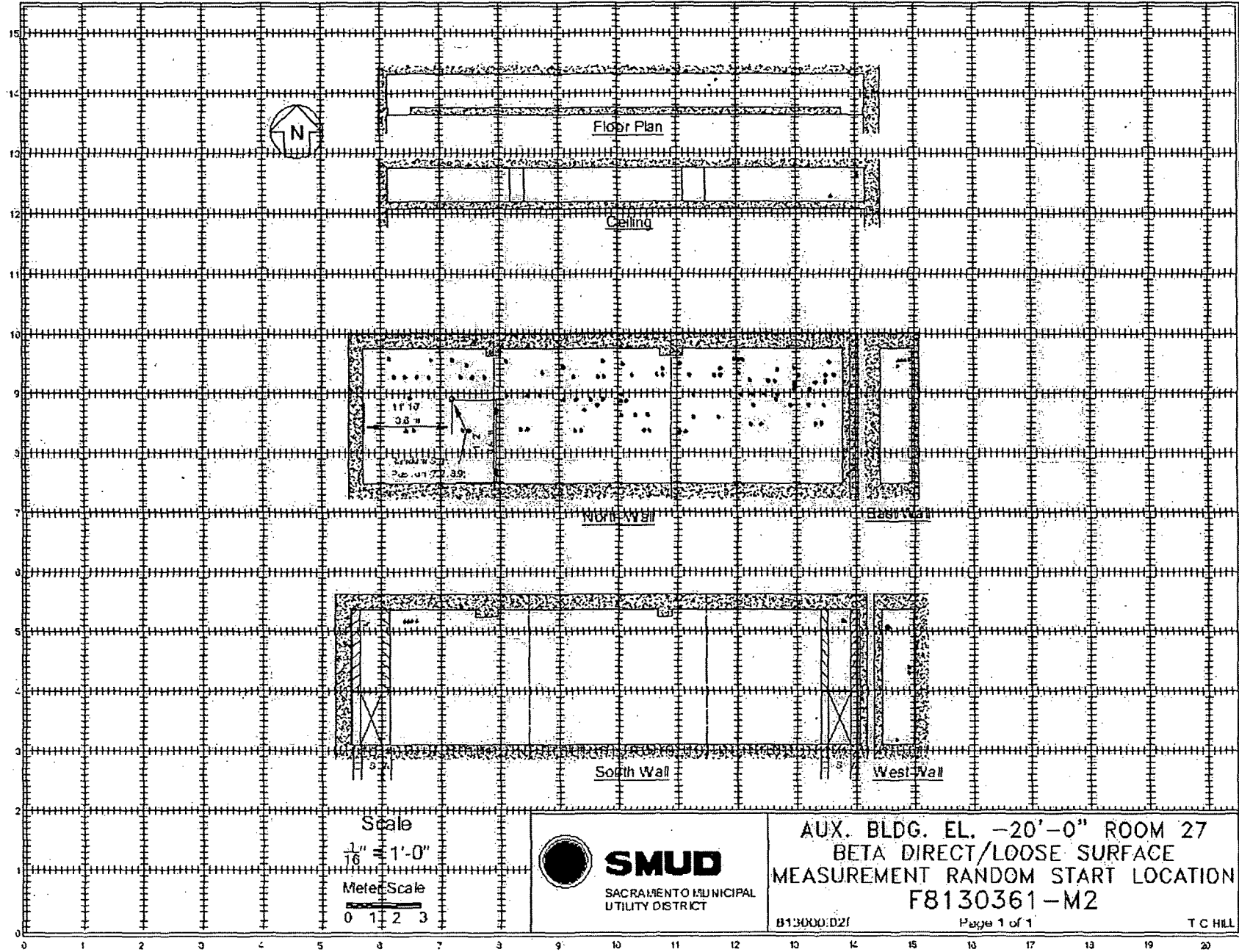
Maps

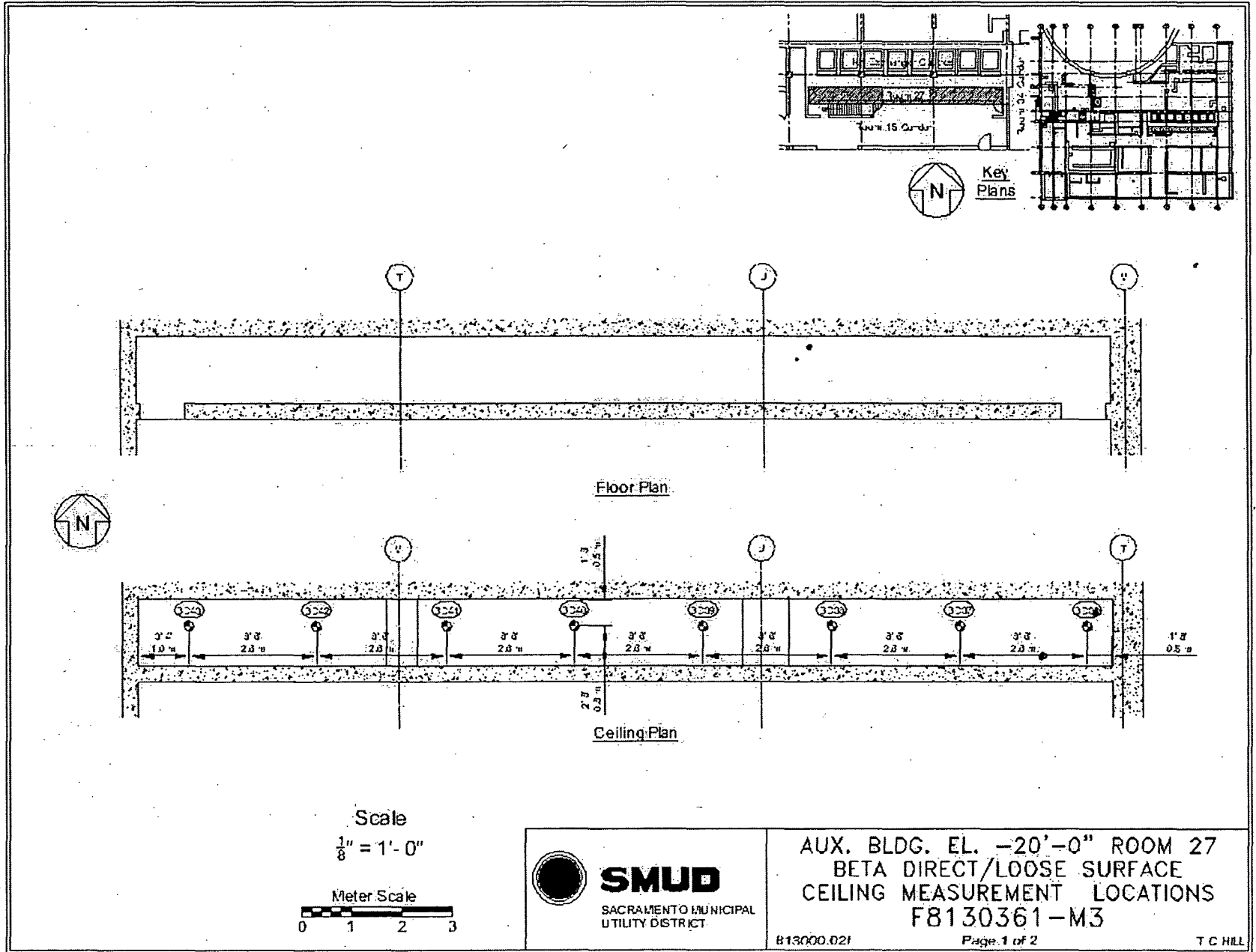
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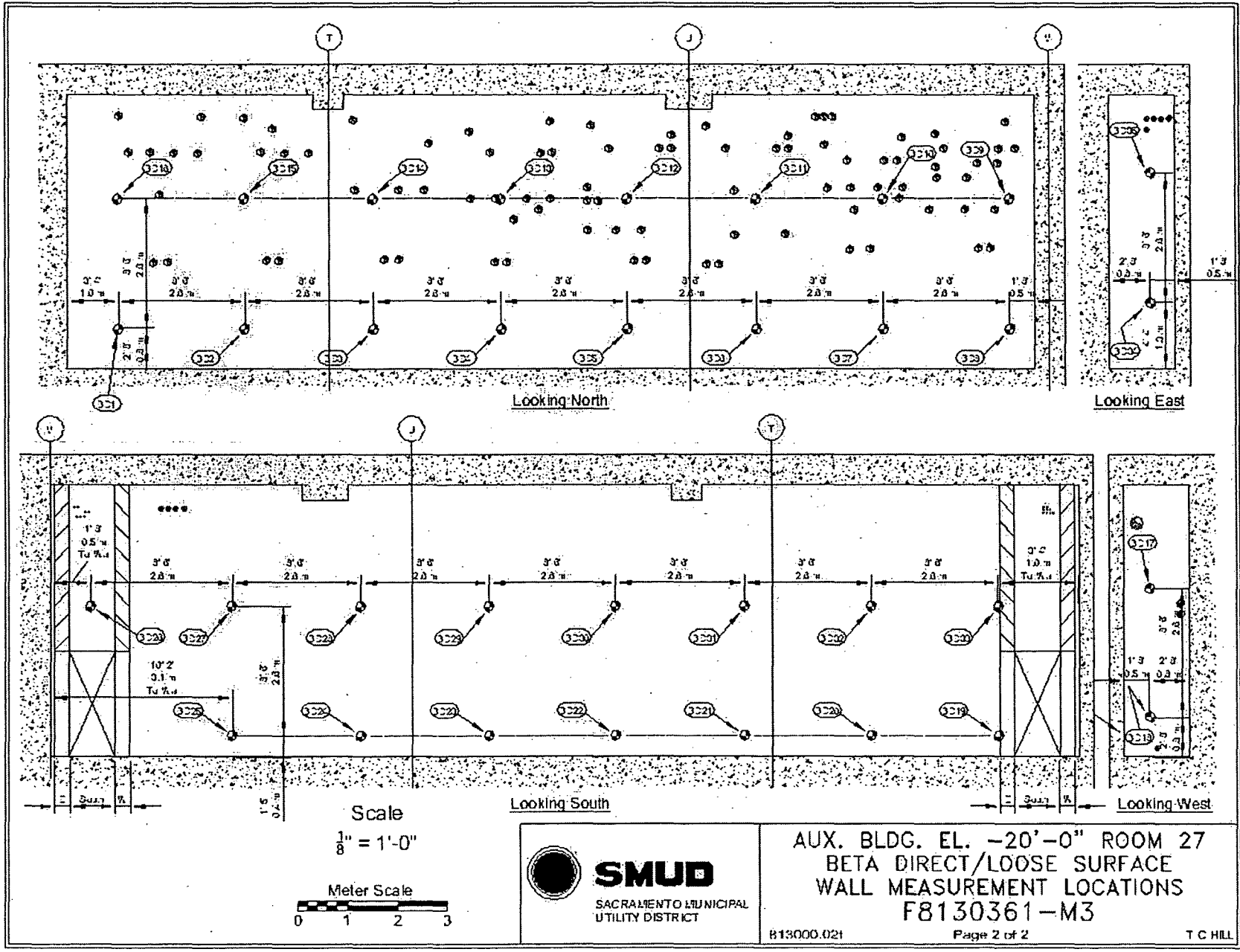
Survey Unit F8130361



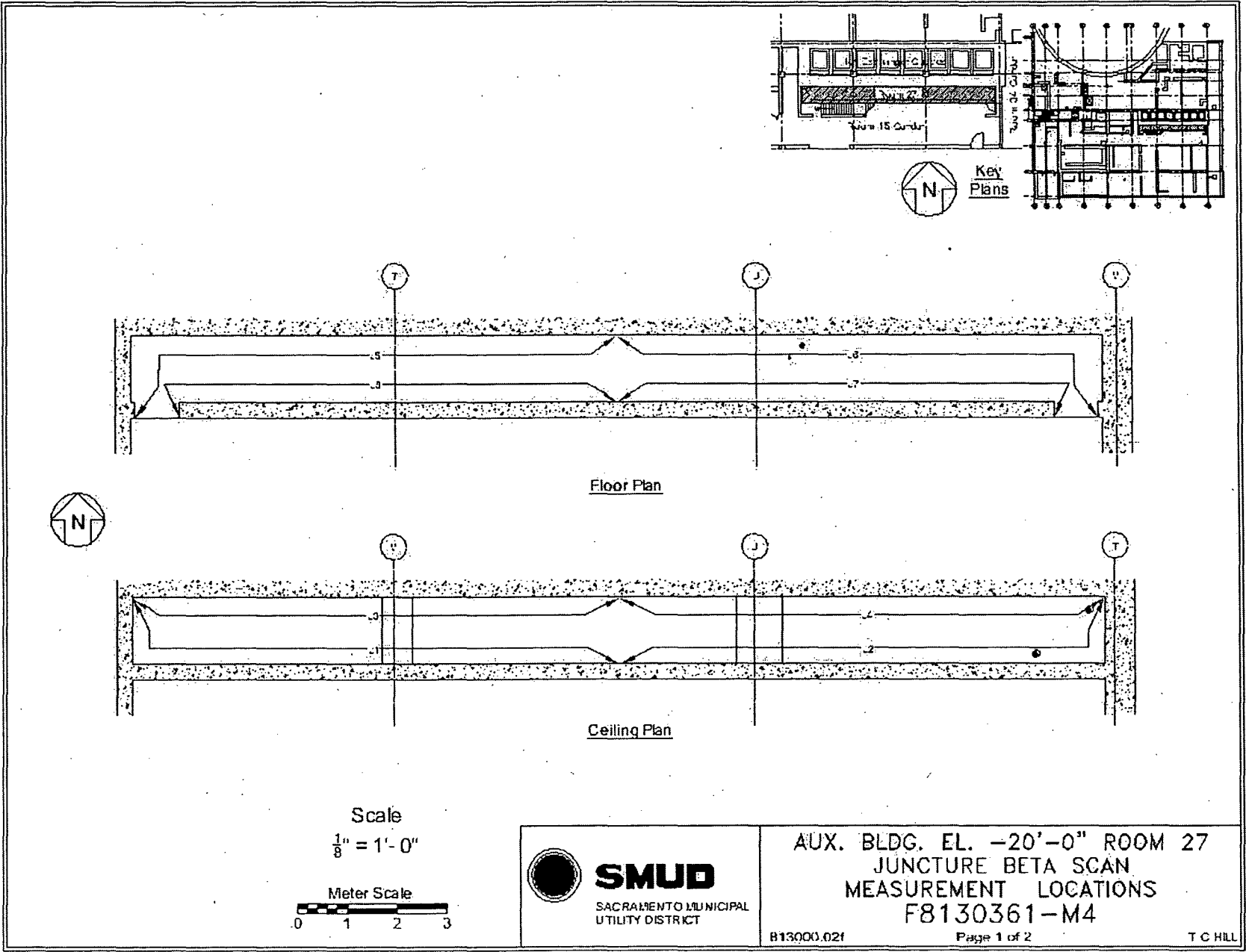


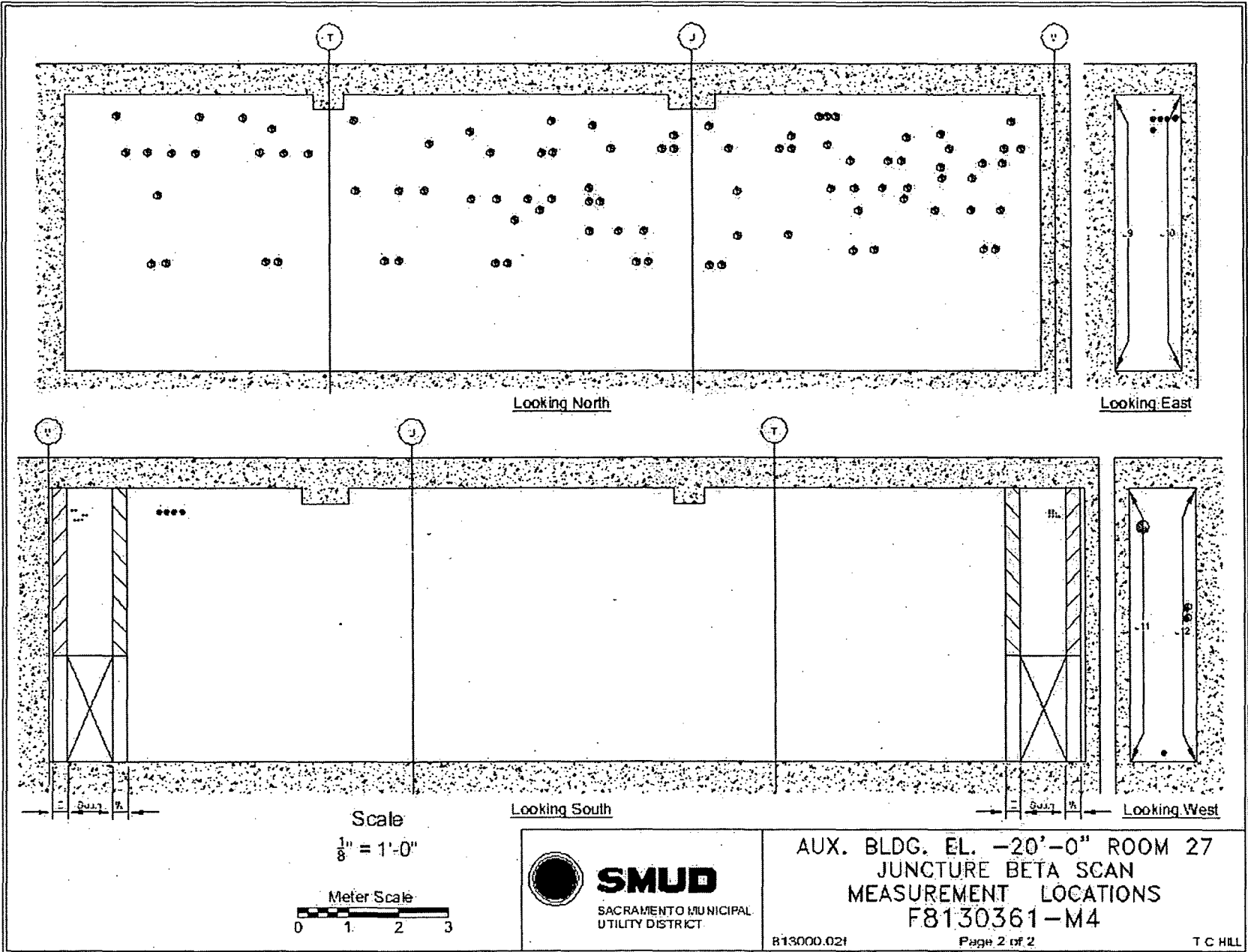






AUX. BLDG. EL. -20'-0" ROOM 27
 BETA DIRECT/LOOSE SURFACE
 WALL MEASUREMENT LOCATIONS
 F8130361-M3





Attachment 2
Instrumentation
March 31, 2008
Survey Unit F8130361

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 | 1490 |
| M2350; 180733 | 43-94; 148620 | N/A | 610 |
| M2350; 203486 | 43-68B; 161400 | 433 | 1033 |
| M2350; 193715 | 43-68B; 160703 | 433 | 1033 |
| M2350; 142509 | 43-68B; 160696 | 433 | 1033 |
| M2350; 193715 | 43-116-1B; 190643 | N/A | 3258 |
| M2350; 203486 | 43-116-1B; 190173 | N/A | 3258 |
| M2350; 180733 | 43-111B; 148641 | N/A | 1320 |
| 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 | 142760 |
| Investigation Criteria – Scan | 142760 |
| DCGL _w | 43000 |
| DCGL _{EMC} | 142760 |

Attachment 3

Investigation

March 31, 2008

Survey Unit F8130361

(none required)

Attachment 4

Data Assessment

March 31, 2008

Survey Unit F8130361

