

Rancho Seco

Final Status Survey Summary Report

June 26, 2008

West Heat Removal Cooler Room East of Column N, Room 052 Floor and
Lower Walls

Survey Unit F8130761

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FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8130761, West Heat Removal Cooler Room East of Column N, Room 052 Floor and Lower Walls

Survey Unit Description:

Operating History: The West Heat Removal Cooler Room is located on the -20' elevation of the Auxiliary Building. The Auxiliary Building is a reinforced concrete structure that, during power operations, contained the Radwaste processing and supporting systems. The building has six main elevations. Residual levels of surface radioactivity were detected on all interior elevations of the building. Operating records and the HSA document several events with the potential for a release of radioactivity inside this structure.

Site Characterization: Direct measurements were taken on each interior elevation of the Auxiliary Building. These measurements confirmed the presence of plant-derived radionuclides. Direct measurements taken 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. Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the interior surfaces of the Auxiliary Building were determined primarily to be a Class 1 for the floors and lower walls (bottom 2 meters of the walls), and Class 2 for the upper walls and ceiling. Inside the West Heat Removal Cooler Room there were a number of areas on the floor and lower walls where the gross surface activity levels were higher than the DCGI prior to remediation. Therefore, a Class 1 final status survey was performed on the floor and lower walls of the West Heat Removal Cooler Room East of Column N, Room 052.

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 150 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 | West Heat Removal Cooler Room East of Column N, Room 052 Floor and Lower Walls |
| Survey Unit: | 0761 | Structure Surface |
| Class: | 1 | LTP Table 5-4 |
| SU Area (m²): | 150 | |
| Evaluator: | Michael Stein | |
| DCGL (dpm/100 cm²): | 43000 | Gross Activity DCGL |
| Area Factor: | 3.6 | Class 1 |
| Design DCGL_{emc} (dpm/100 cm²): | 154800 | 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): | 6.8 | Class 1 |
| Scan Area (m²): | 150 | |
| 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: | 22 | Class 1 |
| Grid Spacing L: | 2.6 | Class 1 |

Survey Results:

A total of 22 direct measurements were made in F8130761. The results including mean, median, standard deviation and range are shown in Table 2. All direct measurements were less than the DCGL. Two of the beta scan measurement locations indicated areas of elevated activity. Beta scan activity ranged from 4,225 to 999,149 dpm/100 cm², based on a surveyor efficiency of 0.5 and no background subtracted. One of the gamma scan measurements indicated an area of elevated activity. Gamma scan activity ranged from 22,973 to 164,032 dpm/100 cm² Cs-137. One of the measurements detected 6,190 dpm/100 cm² Co-60. The MDCs for the gamma scan measurements were 4,090 to 5,250 dpm/100 cm² for Co-60 and 4,260 to 5,210 dpm/100 cm² for Cs-137. Scan measurement locations for both beta and gamma emissions are identified in Attachment 1 of this report. 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) |
|---------------------|--|
| F8130761-C0001BD | 1810 |
| F8130761-C0002BD | 1816 |
| F8130761-C0003BD | 2007 |
| F8130761-C0004BD | 2044 |
| F8130761-C0005BD | 3470 |
| F8130761-C0006BD | 2106 |
| F8130761-C0007BD | 2749 |
| F8130761-C0008BD | 1919 |
| F8130761-C0009BD | 2002 |
| F8130761-C0010BD | 2153 |
| F8130761-C0011BD | 1982 |
| F8130761-C0012BD | 2350 |
| F8130761-C0013BD | 1556 |
| F8130761-C0014BD | 1572 |
| F8130761-C0015BD | 1551 |
| F8130761-C0016BD | 1847 |
| F8130761-C0017BD | 2412 |
| F8130761-C0018BD | 1634 |
| F8130761-C0019BD | 2308 |
| F8130761-C0020BD | 1525 |
| F8130761-C0021BD | 1992 |
| F8130761-C0022BD | 1592 |
| Mean: | 2018 |
| Median: | 1987 |
| Standard Deviation: | 455 |
| Range: | 1525 - 3470 |

Table 3. Removable Surface Activity Results

| Measurement ID | Surface Beta Activity (dpm/100 cm²) |
|-----------------------|---|
| F8130761C0001SM | 17.13 |
| F8130761C0002SM | 35.21 |
| F8130761C0003SM | 26.17 |
| F8130761C0004SM | 22.3 |
| F8130761C0005SM | 17.13 |
| F8130761C0006SM | 35.21 |
| F8130761C0007SM | 9.38 |
| F8130761C0008SM | 22.3 |
| F8130761C0009SM | 17.13 |
| F8130761C0010SM | 27.46 |
| F8130761C0011SM | 15.84 |
| F8130761C0012SM | 5.51 |
| F8130761C0013SM | 2.93 |
| F8130761C0014SM | 9.38 |
| F8130761C0015SM | 8.09 |
| F8130761C0016SM | 9.38 |
| F8130761C0017SM | 26.17 |
| F8130761C0018SM | 31.34 |
| F8130761C0019SM | 54.59 |
| F8130761C0020SM | 6.8 |
| F8130761C0021SM | 18.42 |
| F8130761C0022SM | 2.93 |
| Mean: | 19.13 |
| Median: | 17.13 |
| Standard Deviation: | 12.73 |
| Range: | 2.93 to 54.59 |

Survey Unit Data Assessment:

The survey design required 22 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): | 22 | |
| Median (dpm/100 cm ²): | 1987 | |
| Mean (dpm/100 cm ²): | 2018 | |
| Direct Measurement Standard Deviation | 455 | Based on samples and backgrounds. |
| (dpm/100 cm ²): | | |
| Total Standard Deviation (dpm/100 cm ²): | 455 | |
| Maximum (dpm/100 cm ²): | 3470 | Background Subtract Not Applied |
| Material Type: | N/A | |
| Sign Test Final N Value: | 22 | Class 1 |
| S+ Value: | 22 | |
| Critical Value: | 15 | |
| Sufficient Samples Collected: | Yes | |
| Maximum Value < DCGL: | Yes | |
| Median Value < DCGL: | Yes | |
| Mean Value < DCGL: | Yes | |
| Maximum Value < DCGL_{emc}: | 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 two beta scan measurements (C0099BS and C0136BS) and one gamma scan measurement (C0001GS) as indicated in Attachment 3.

Investigation of the beta scan measurement areas resulted in the decision to perform additional remediation. The investigation results in Attachment 3 represent the residual radioactivity levels achieved after additional remediation. No additional remediation was performed at the elevated gamma scan measurement location. The EMC unity rule was not exceeded as shown in Table 3-1.

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.

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.

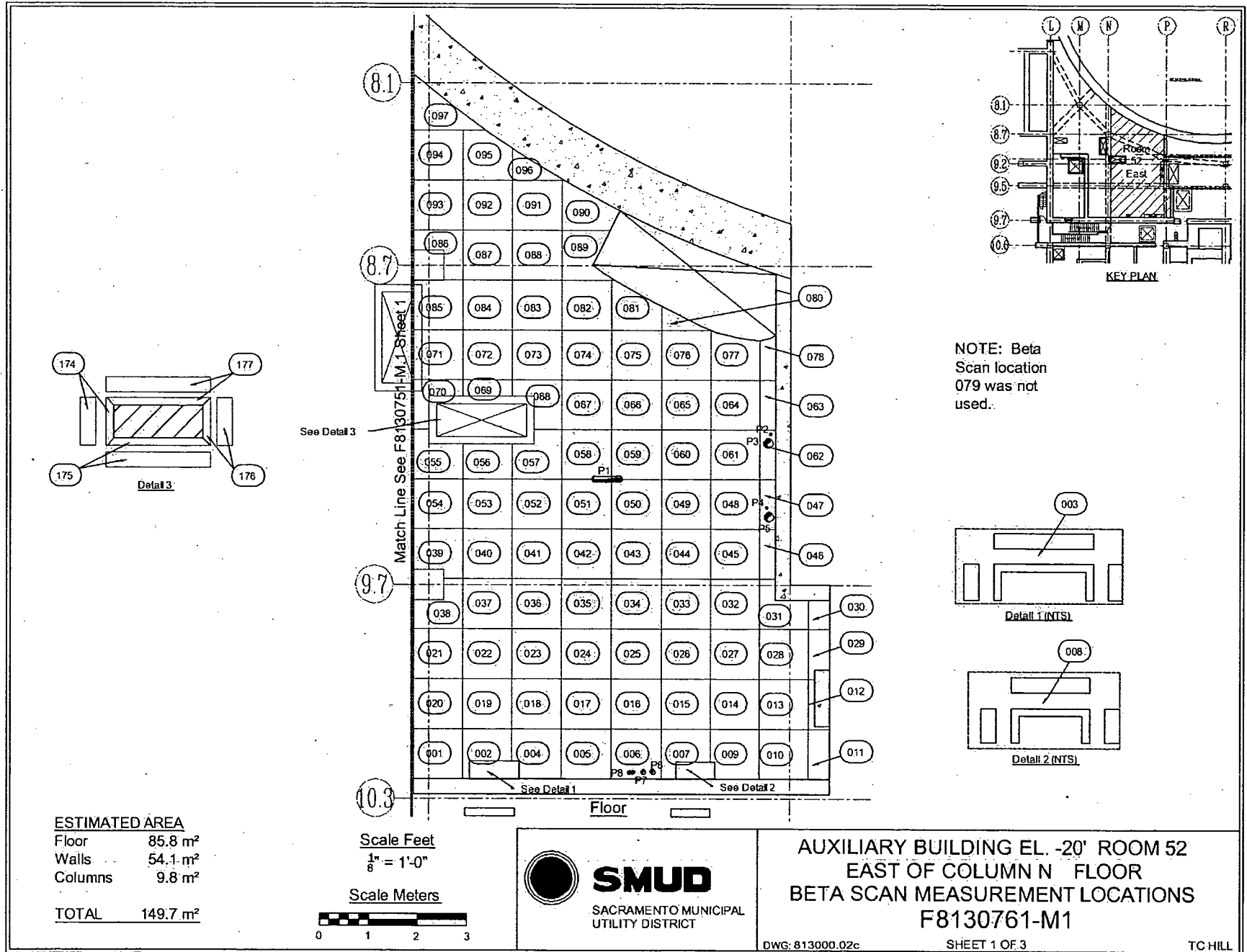
It is concluded that survey unit F8130761 meets the release criteria of 10CFR20.1402.

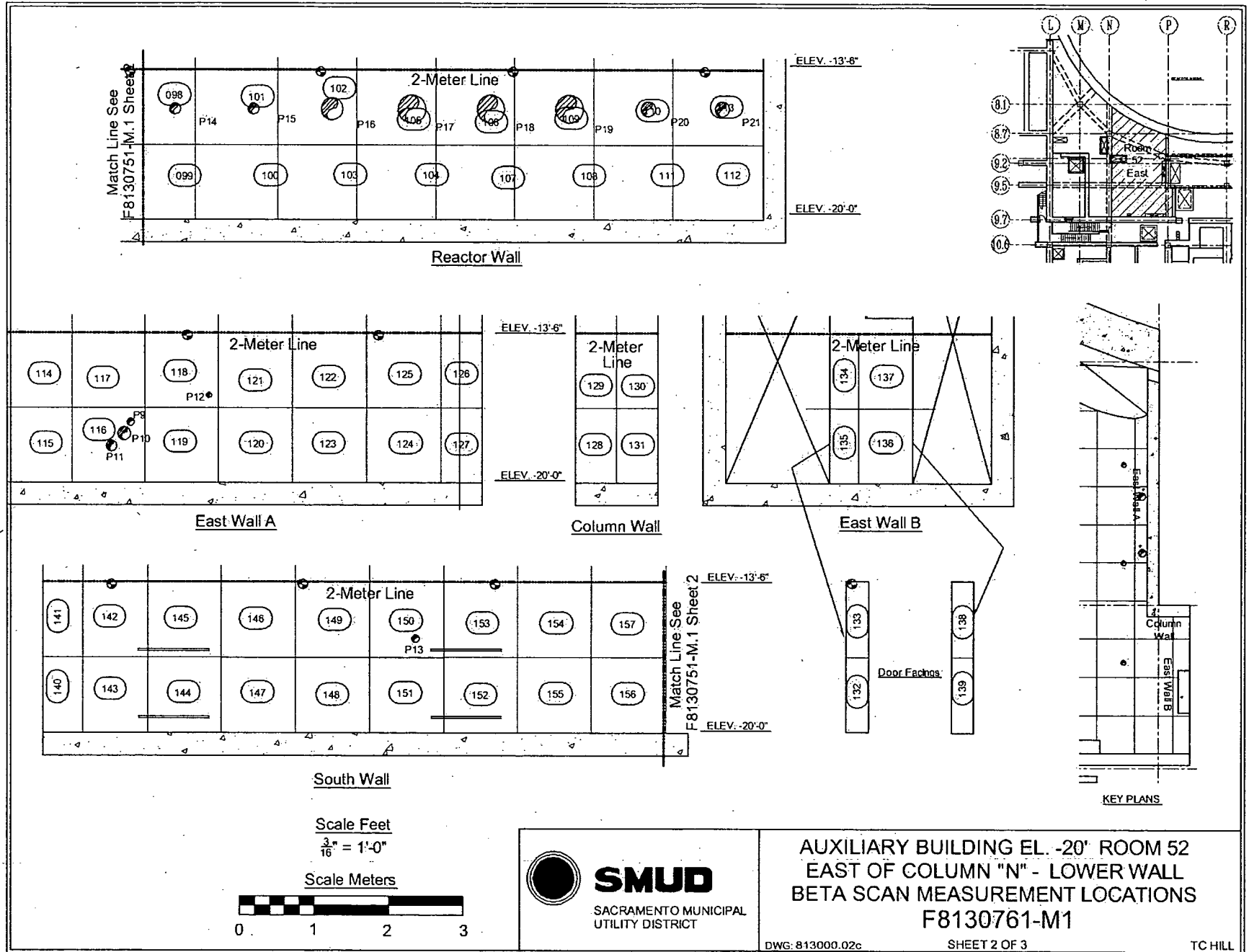
Attachment 1

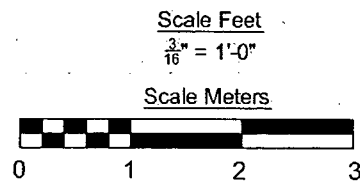
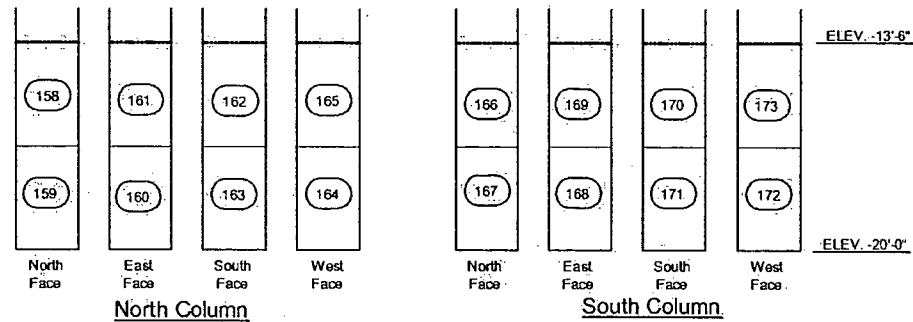
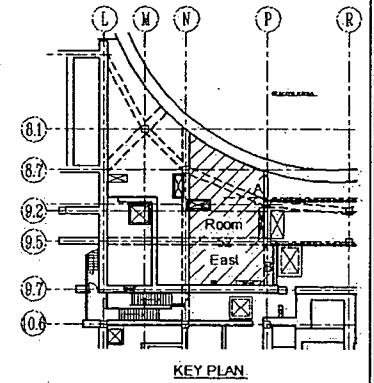
Maps

June 26, 2008

Survey Unit F8130761







SMUD

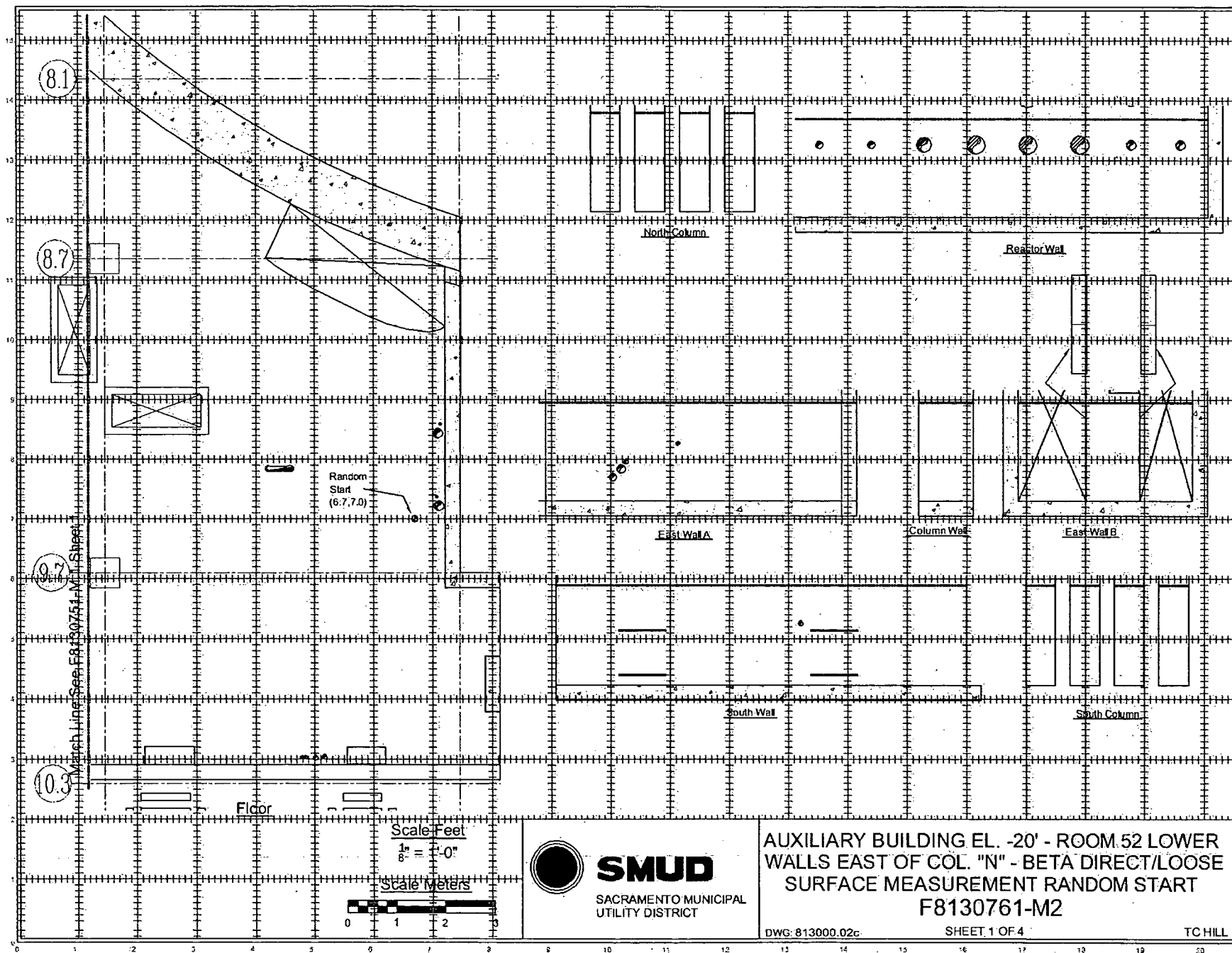
SACRAMENTO MUNICIPAL
UTILITY DISTRICT

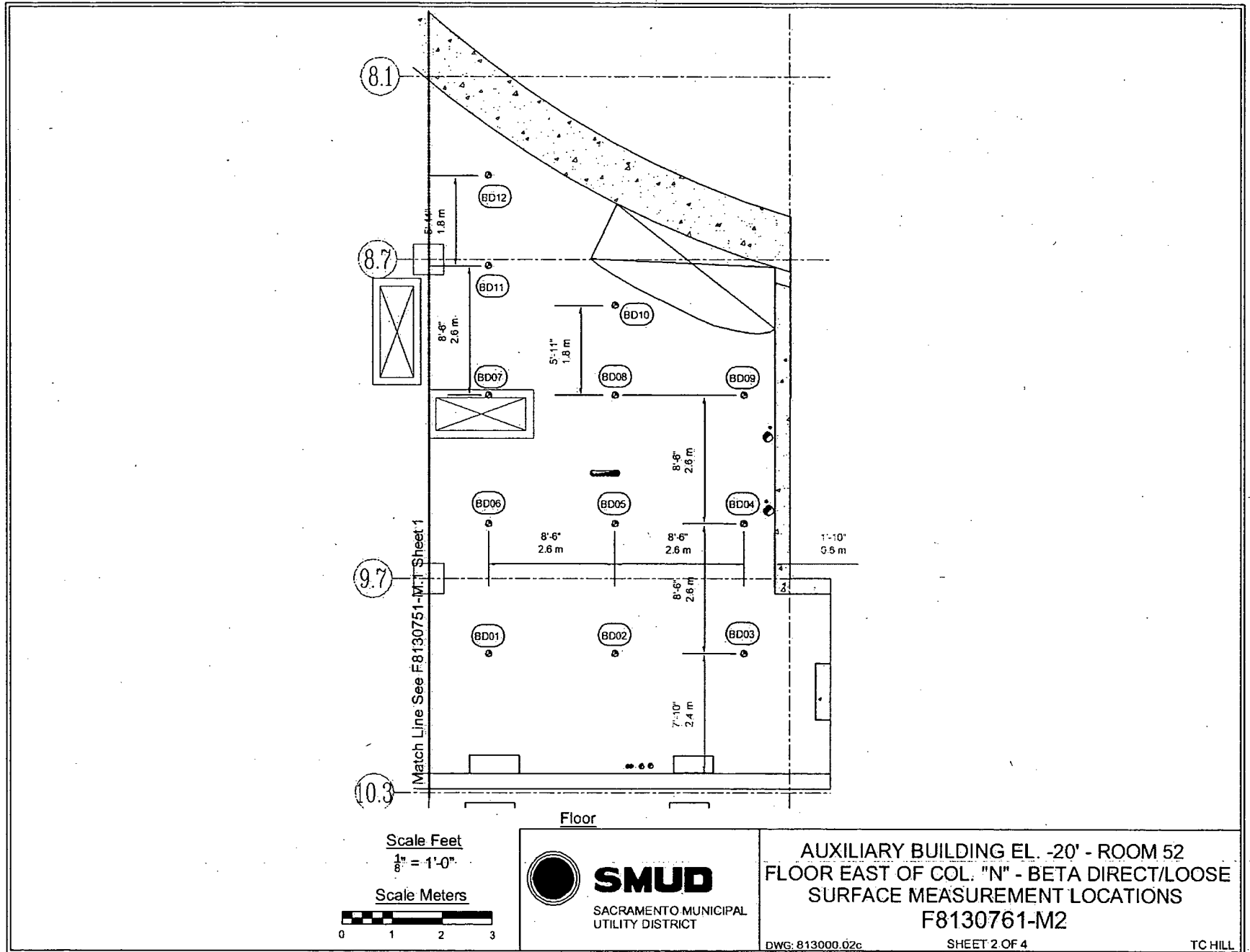
AUXILIARY BUILDING EL. -20' ROOM 52
EAST OF COLUMN "N" LOWER COLUMN
BETA SCAN MEASUREMENT LOCATIONS
F8130761-M1

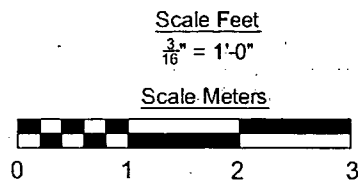
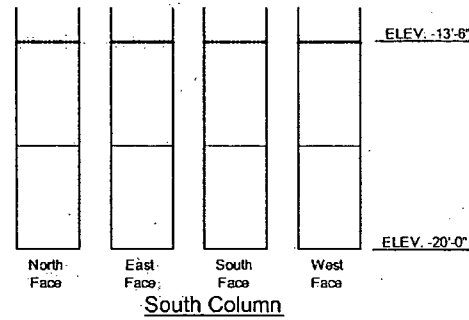
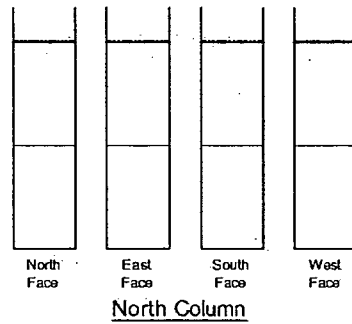
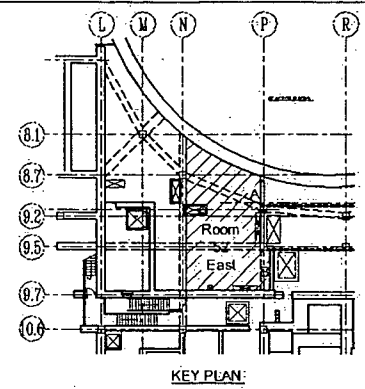
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SHEET 3 OF 3

TC HILL







SMUD

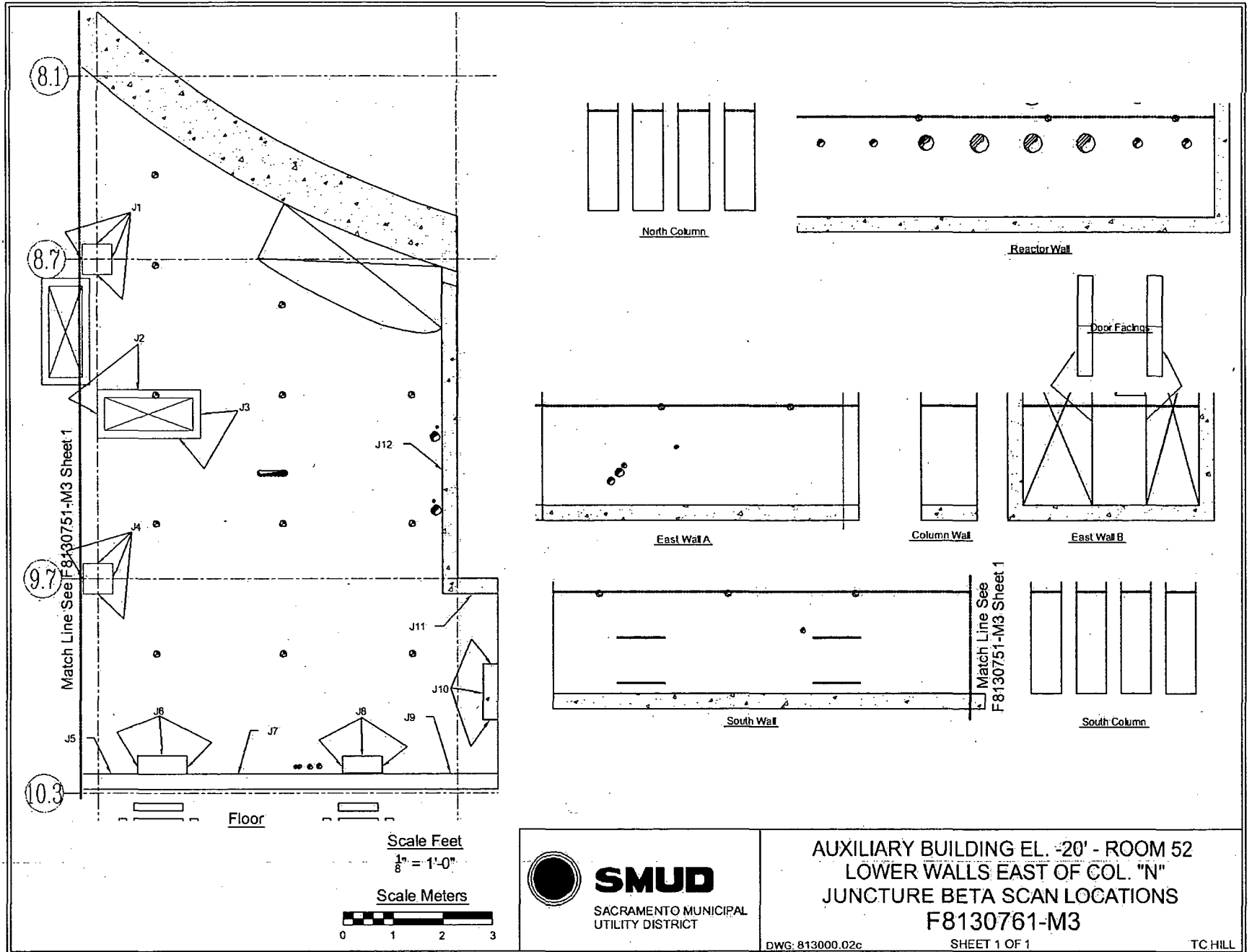
SACRAMENTO MUNICIPAL
 UTILITY DISTRICT

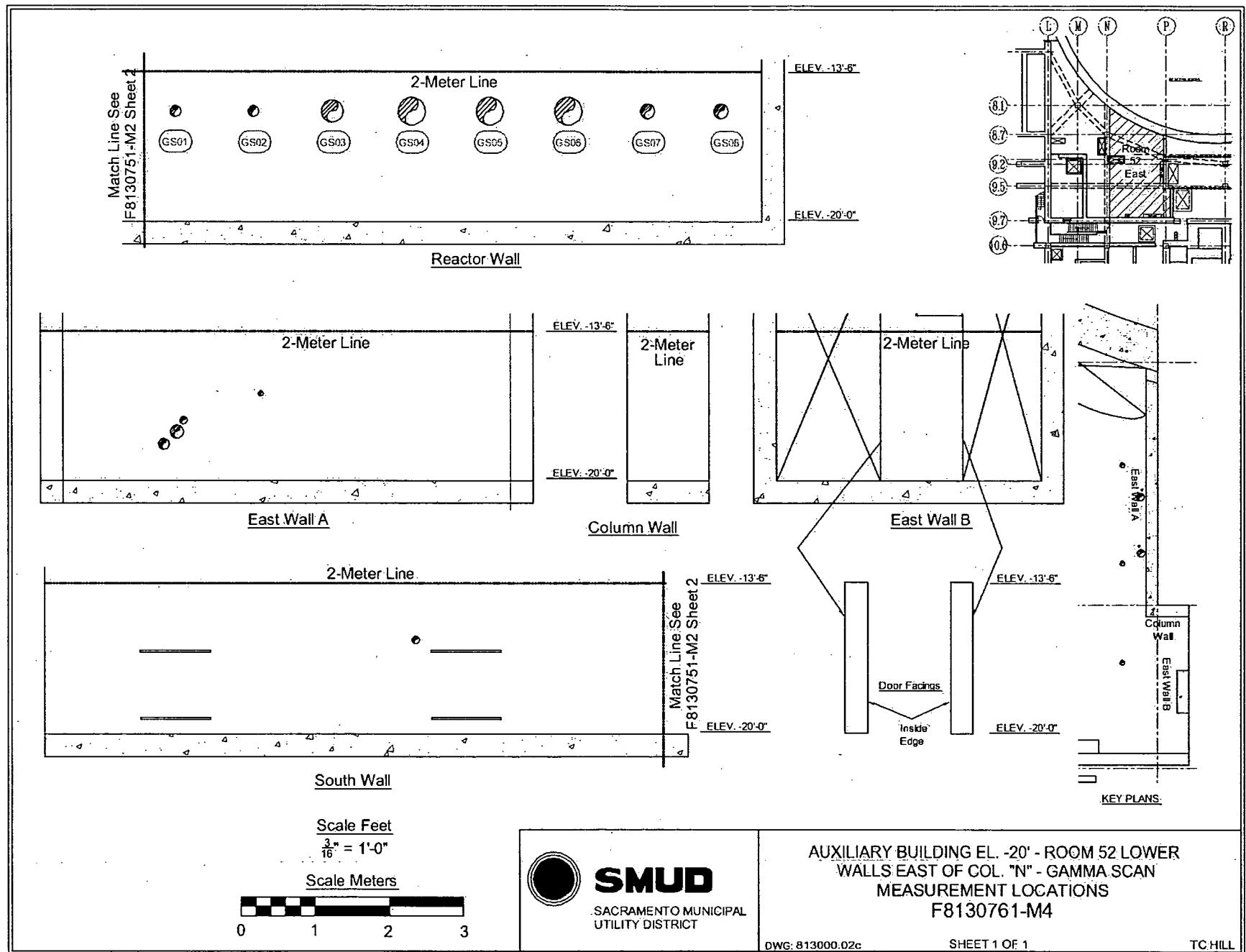
AUXILIARY BUILDING EL. -20' - ROOM 52 LOWER
 WALLS EAST OF COL. "N" - BETA DIRECT/LOOSE
 SURFACE MEASUREMENT LOCATIONS
 F8130761-M2

DWG: 813000.02c

SHEET 4 OF 4

TC.HILL





Attachment 2

Instrumentation

June 26, 2008

Survey Unit F8130761

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 | 1400 | 2520 |
| M2350; 180733 | 43-94; 148620 | 1610 | 2800 |
| M2350; 149789 | 43-68B; 161397 | 433 | 1033 |
| M2350; 142507 | 43-68B; 160781 | 433 | 1033 |
| M2350; 193715 | 43-68B; 160703 | 433 | 1033 |
| M2350; 142509 | 43-68B; 160696 | 433 | 1033 |
| M2350; 193700 | 43-68B; 160691 | 433 | 1033 |
| M2350; 193715 | 43-116-1B; 190643 | 796 | 3258 |
| Tennelec; 0401171 | N/A | 5.9 dpm α , 11.7 dpm β | N/A |
| InSpector 1000 | 10054579 | N/A | 5210 Cs-137 5250 Co-60 |

The scan and static MDC's provided represent the most conservative MDC values for the survey conducted.

Table 2-2. Investigation Criteria and DCGL

| Parameter | Value (dpm/100 cm²) |
|---------------------------------|---------------------------------------|
| Investigation Criteria - Direct | 154800 |
| Investigation Criteria – Scan | 154800 |
| DCGL _W | 43000 |
| DCGL _{EMC} | 154800 |

Attachment 3

Investigation

June 26, 2008

Survey Unit F8130761

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> |
|-----------------------|--|--|---|--------------------------------------|--------------------|---------------------------|---|--|
| C0099BS | 21,024 | 30,979 | 3,011 | N/A | N/A | N/A | 22,088 | 0.00 |
| C0136BS | 21,024 | 136,200 | 1,042 | N/A | N/A | N/A | 7,644 | 0.00 |
| <i>Grid</i> | <i>Investigation Level (dpm/100cm²)</i> | <i>Initial Value (dpm/100cm²)</i> | <i>Investigation Result (dpm/100cm²)</i> | <i>Elevated Area (m²)</i> | <i>Area Factor</i> | <i>DCGL_{emc}</i> | <i>Investigation Result (dpm/100cm²)</i> | |
| C0001GS | 154,800 | 170,222 | 170,222 | <0.5 | 25.9 | 1,113,700 | 170,222 | 0.15 |
| | | | | | | | | |
| | | | | | | | | |
| Survey Unit Remainder | | | | | | DCGL = 43,000 | SU Mean = 2,018 | 0.05 |
| EMC Unity Sum | | | | | | | | 0.20 |

All of the grids above were initially greater than *DCGL_{emc}*. Investigation of grids C0099BS and C0136BS resulted in the decision to perform additional remediation. The investigation results above represent the residual radioactivity levels after additional remediation. No additional remediation was performed at the elevated gamma scan measurement location of C0001GS. The area factor for Co-60 was used in order to be conservative.

Attachment 4

Data Assessment

June 26, 2008

Survey Unit F8130761

