

Rancho Seco

Final Status Survey Summary Report

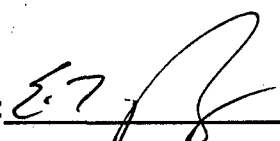
June 3, 2008

AB + 40' Primary Sample Station Room 319 floor/lower walls

Survey Unit F8131781

Prepared By: Dan A. Tallman  Date: June 5, 2008
FSS Engineer

Reviewed By: Robert F. Decker  Date: 6/18/08
Lead FSS Engineer

Approved By: E. J. [Signature]  Date: 7-30-08
Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8131781, AB + 40' Primary Sample Station Room 319 floor/lower walls

Survey Unit Description:

Operating History: The Auxiliary Building is a reinforced concrete structure that 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.

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 +40' elevation showed a mean gross activity level of 3,288 dpm/100 cm² and a maximum value of 24,781 dpm/100 cm. Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the Primary Sample station within the interior of the auxiliary building was determined to be a Class 1 area.

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 85 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	AB + 40' Primary Sample
Survey Unit:	1781	Station Room 319
Class:	1	floor/lower walls
SU Area (m²):	85	Structure Surface
Evaluator:	D.A.Tallman	LTP Table 5-4
DCGL (dpm/100 cm²):	43000	Gross Activity DCGL
Area Factor:	3.9	Class 1
Design DCGL_{mc} (dpm/100 cm²):	167703	Class 1
LBGR (dpm/100 cm²):	21500	Default = 50% DCGL
Design Sigma (dpm/100 cm²):	3627	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m²):	6	Class 1
Scan Area (m²):	85	
Scan Coverage (%):	100%	Class 1
Z_{1-α}:	1.645	
Z_{1-β}:	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	6	
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:	2.4	Class 1

Survey Results:

A total of 21 direct measurements were made in F8131781. The results including mean, median, standard deviation and range are shown in Table 2. All direct measurements were less than the DCGL. Multiple scan measurements indicated areas of elevated activity, the evaluation of which is presented in Attachment 3. Scan activity ranged from 1532 to 731990 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)
F8131781-C0001BD	2739
F8131781-C0002BD	2168
F8131781-C0003BD	1738
F8131781-C0004BD	1561
F8131781-C0005BD	3309
F8131781-C0006BD	1701
F8131781-C0007BD	1401
F8131781-C0008BD	1816
F8131781-C0009BD	1733
F8131781-C0010BD	1421
F8131781-C0011BD	1541
F8131781-C0012BD	1292
F8131781-C0013BD	1271
F8131781-C0014BD	1261
F8131781-C0015BD	1255
F8131781-C0016BD	1375
F8131781-C0017BD	1551
F8131781-C0018BD	13902
F8131781-C0019BD	1458
F8131781-C0020BD	1484
F8131781-C0021BD	1193
Mean:	2246
Median:	1541
Standard Deviation:	2720
Range:	1193 - 13902

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm ²)
F8131781C0001SM	2.93
F8131781C0002SM	-2.24
F8131781C0003SM	0.34
F8131781C0004SM	-2.24
F8131781C0005SM	6.8
F8131781C0006SM	11.97
F8131781C0007SM	-3.53
F8131781C0008SM	0.34
F8131781C0009SM	2.93
F8131781C0010SM	0.34
F8131781C0011SM	0.34
F8131781C0012SM	2.93
F8131781C0013SM	-3.53
F8131781C0014SM	-0.95
F8131781C0015SM	0.34
F8131781C0016SM	-4.82
F8131781C0017SM	-3.53
F8131781C0018SM	6.8
F8131781C0019SM	0.34
F8131781C0020SM	-3.53
F8131781C0021SM	0.34
F8131781C0004SM	2.93
F8131781C0010SM	-3.53
Mean:	0.51
Median:	0.34
Standard Deviation:	4.05
Range:	-4.82 to 11.97

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	Average Ambient BKG = 0
Ambient Background Used (dpm/100 cm ²):	N/A	
Actual Direct Measurements (N):	21	
Median (dpm/100 cm ²):	1541	
Mean (dpm/100 cm ²):	2246	
Direct Measurement Standard Deviation (dpm/100 cm ²):	2720	Based on samples and backgrounds.
Total Standard Deviation (dpm/100 cm ²):	2720	
Maximum (dpm/100 cm ²):	13902	
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	Class 1
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:

8 investigations (scan grids 89, 92, & 92, plus penetrations 2,5,9,14,&15) were required for the scan measurements and the results are reported in Attachment 3. 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. Several potential areas of elevated activity were detected and evaluated as shown in Attachment 3, demonstrating that 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 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.

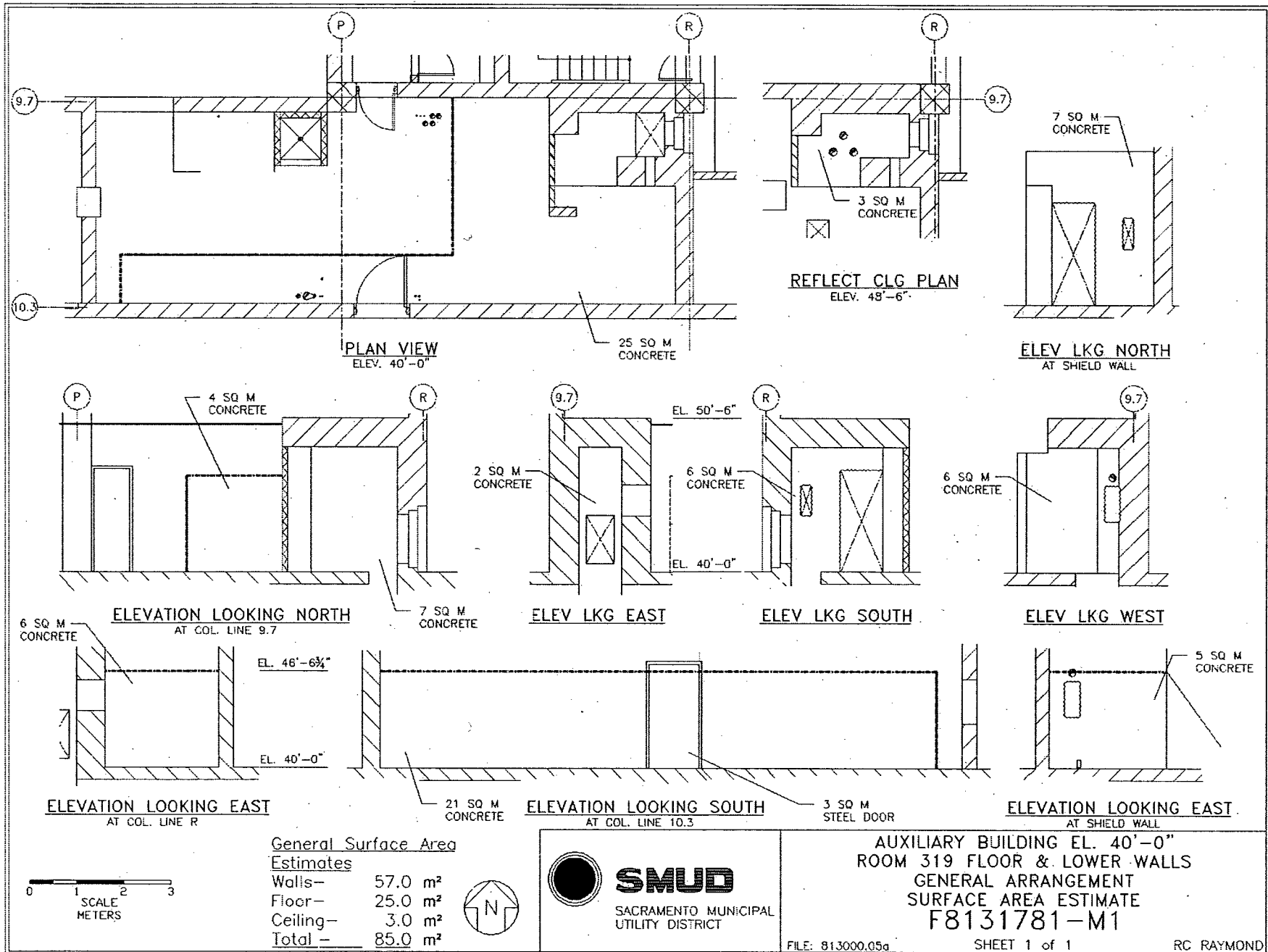
It is concluded that survey unit F8131781 meets the release criteria of 10CFR20.1402.

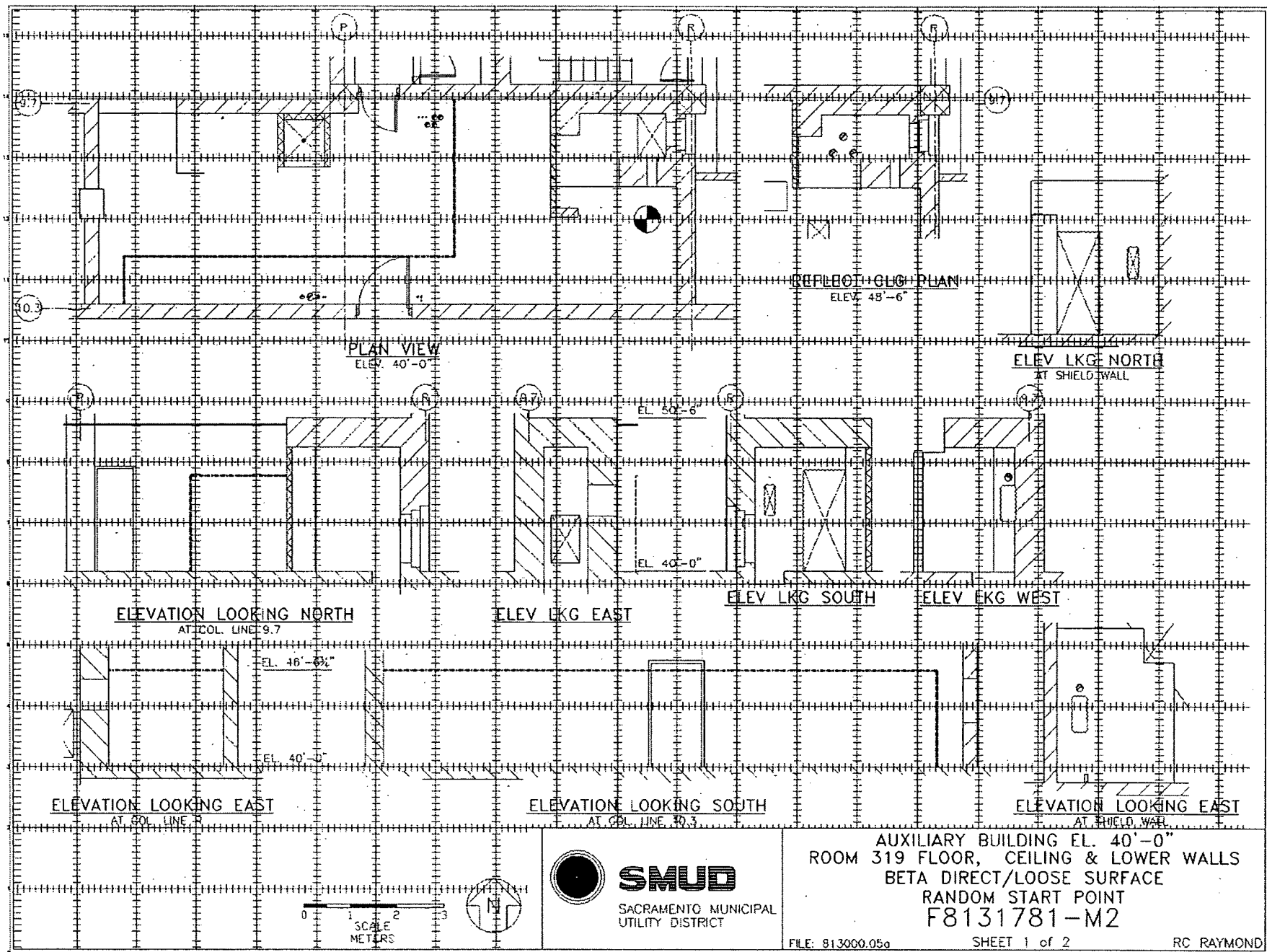
Attachment 1

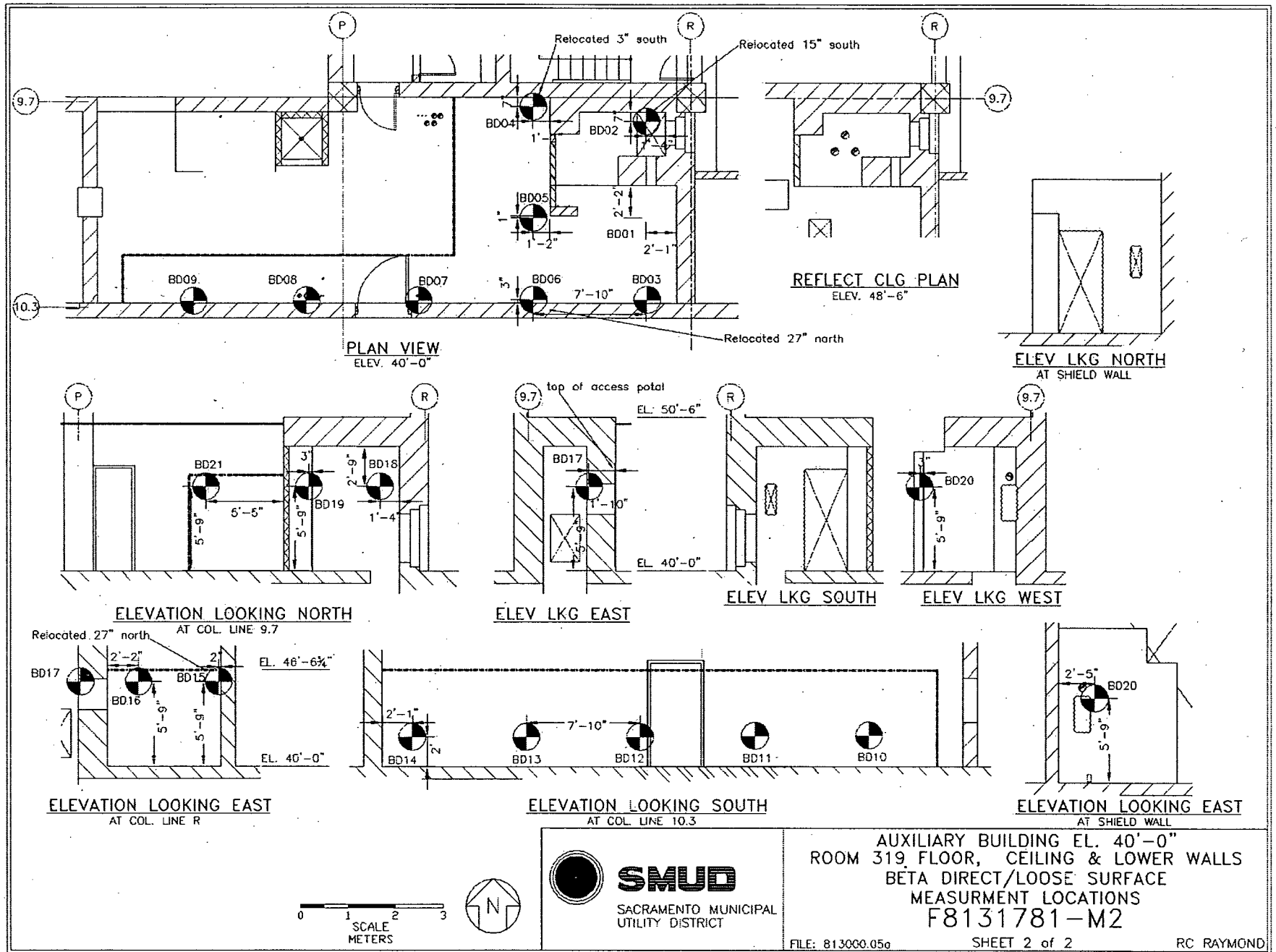
Maps

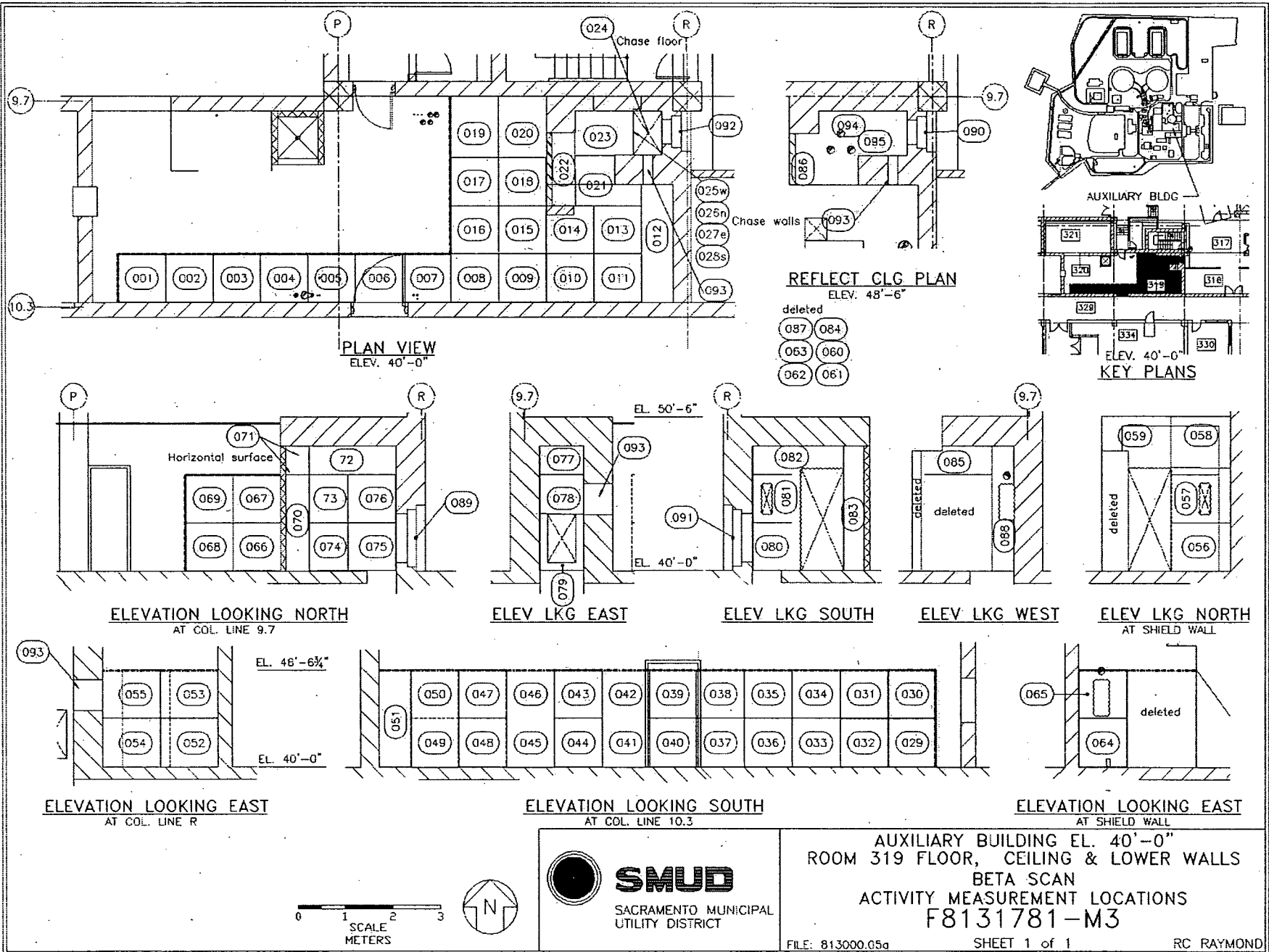
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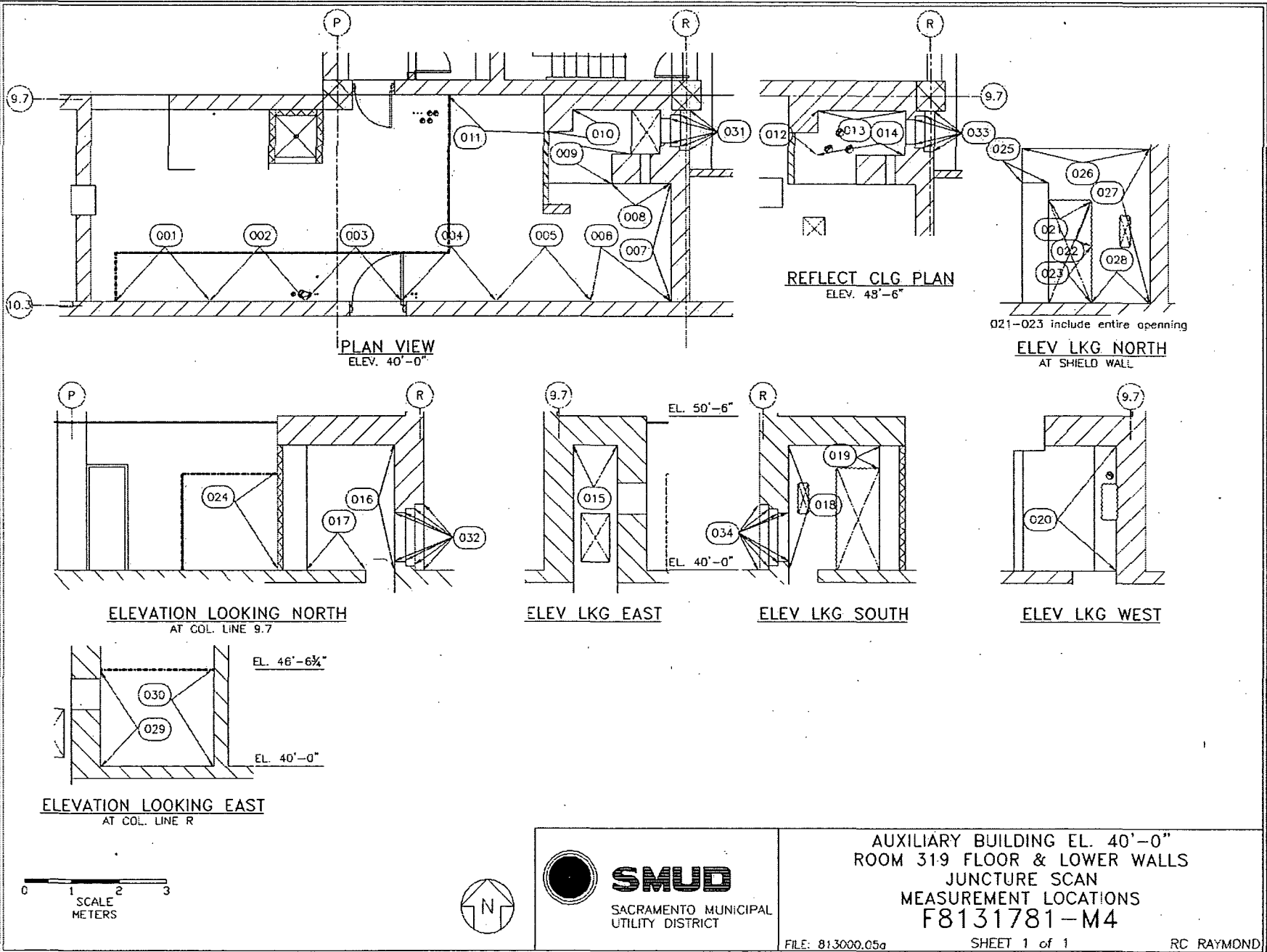
Survey Unit F8131781

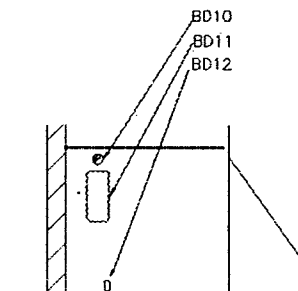
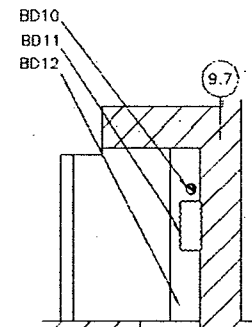
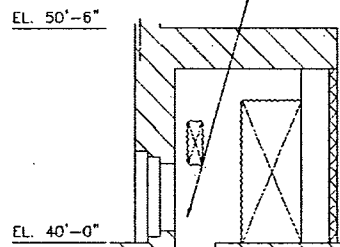
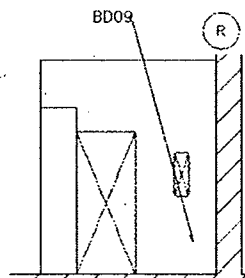
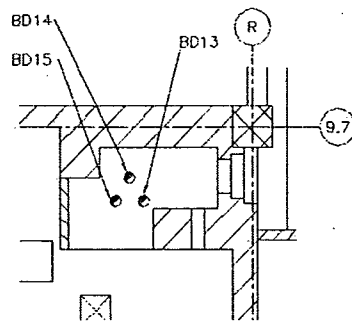
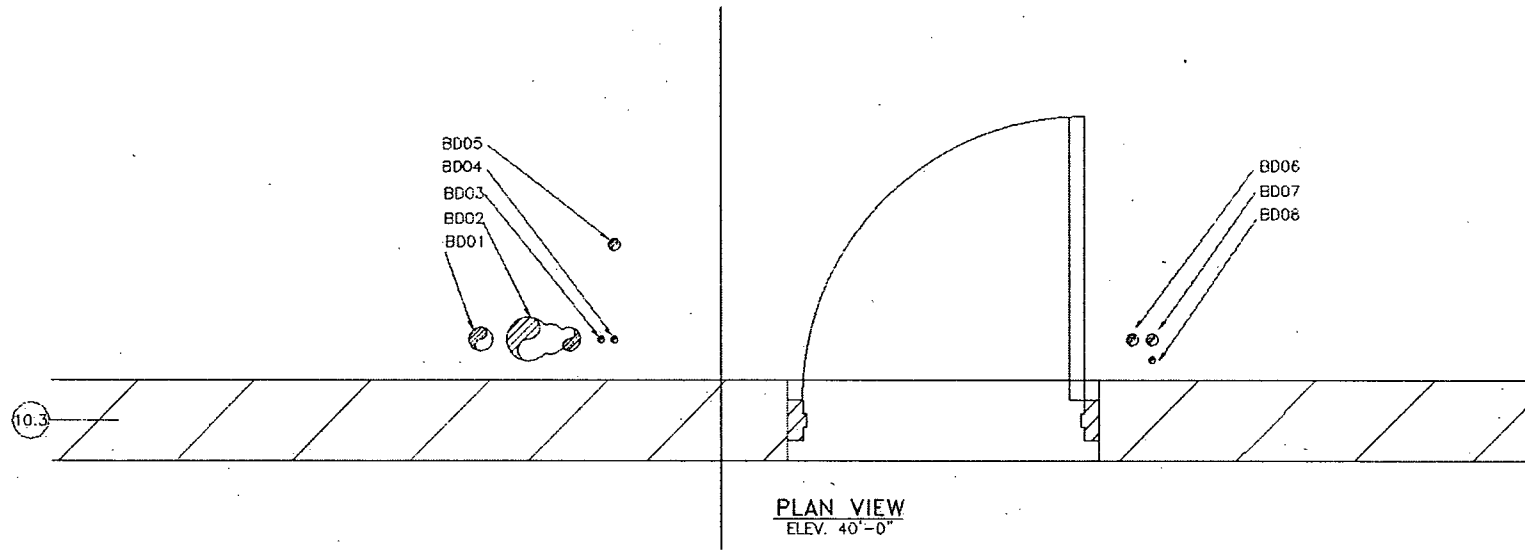












SMUD
SACRAMENTO MUNICIPAL
UTILITY DISTRICT

AUXILIARY BUILDING EL. 40'-0"
ROOM 319 FLOOR & LOWER WALLS
PENETRATION BETA SCAN
MEASUREMENT LOCATIONS
F8131781-M5.

FILE: 813000.05d

SHEET 1 of 1

RC. RAYMOND

Attachment 2

Instrumentation

June 3, 2008

Survey Unit F8131781

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	350 ¹	630 ¹
M2350; 180733	43-94B; 148620	350 ² 590 ³ 950 ⁴ 1610 ⁵	610 ² 1030 ³ 1660 ⁴ 2800 ⁵
M2350; 203486	43-68B; 190476	433 ⁶	1033 ⁶
M2350; 149789 M2350; 203486	43-116-1B; 256006 43-116-1B; 190173	472 ⁷ 796 ⁸ 491 ⁹	1930 ⁷ 3258 ⁸ 739 ⁹
Tennelec; 0401171	N/A	6 dpm α , 12 dpm β	N/A

¹ 43-98B – Metal Penetration – 2”

² 43-94B – Metal Penetration – 1”

³ 43-94B – Concrete Penetration – 1”

⁴ 43-94B – Metal Penetration – 2”

⁵ 43-94B – Concrete Penetration – 2”

⁶ 43-68B – Concrete Surface scan

⁷ 43-116-1B – Metal Surface scan

⁸ 43-116-1B – Concrete Surface scan

⁹ 43-116-1B – Juncture - Concrete

Instrument Model; Serial No.	Detector Model; Serial No.	MDC Static (dpm/100 cm²)
InSpector	08051294	477(dpm/100 cm ²) Cs137 433 (dpm/100 cm ²) Co60

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	43000 ^A
Investigation Criteria – Scan	43000 ^A
DCGL _W	43000
DCGL _{EMC}	167703

^A Conservatively set within survey instructions at DCGL_W

Attachment 3

Investigation

June 3, 2008

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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>
95BS	5,840	7,440	7,440	0.91	15.91	684,130	54,579	0.0765
92BS	5,840	99,782	3,507 ²	0.17	219.44	9,435,920	25,727	0.0025
89BS	5,840	11,248	5,848 ²	0.72	19.71	804,530	42,900	0.0505
P02	1,990	4,226	4,226	0.22	60.95	2,620,850	91,313	0.0340
P05	1,350 ¹	32,212	32,212	0.04	326.1	14,022,300	436,347	0.0310
P09	1,990	13,896	13,896	0.16	83.17	3,576,310	300,258	0.0833
P14	3,360 ³	3,567	3,567	0.32	42.69	1,835,670	45,631	0.0236
P15	3,360 ³	3,650	3,650	0.32	42.69	1,835,670	46,693	0.0242
Comments ¹ - Investigation level – detector/media/geometry specific – 43-98/2"/concrete penetration – 3180 ccpm ² - Post remediation survey results ³ - Metal								
Survey Unit Remainder						DCGL = 43,000	SU Mean = 2246	0.0522
EMC Unity Sum								0.3778

Attachment 4

Data Assessment

June 3, 2008

Survey Unit F8131781

