

Rancho Seco

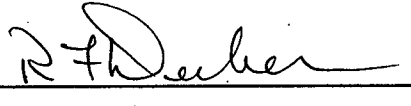
Final Status Survey Summary Report

November 5, 2008

West Decay Heat Removal Pump Room - Ceiling

Survey Unit F8130022

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

Reviewed By:  Date: 11/13/08  
Lead FSS Engineer

Approved By:  Date: 2-6-09  
Dismantlement Superintendent, Radiological

## **FINAL STATUS SURVEY SUMMARY REPORT**

### **Survey Unit:**

F8130022, West Decay Heat Removal Pump Room - Ceiling

### **Survey Unit Description:**

**Operating History:** The Auxiliary Building was 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 -47' elevation showed a mean gross activity level of 320,071 dpm/100 cm<sup>2</sup> and a maximum value of 5,720,000 dpm/100 cm<sup>2</sup>. Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the Ceiling of the West Decay Heat Removal Pump Room in 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 95 m<sup>2</sup> 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**

<b>Survey Design Parameter</b>	<b>Value</b>	<b>Comment</b>
<b>Survey Area:</b>	F813	West Decay Heat Removal
<b>Survey Unit:</b>	0022	Pump Room - Ceiling
<b>Class:</b>	1	Structure Surface
<b>SU Area (m<sup>2</sup>):</b>	95	LTP Table 5-4
<b>Evaluator:</b>	D.A.Tallman	
<b>DCGL (dpm/100 cm<sup>2</sup>):</b>	43000	Gross Activity DCGL
<b>Area Factor:</b>	3.78	Class 1
<b>Design DCGL<sub>me</sub></b>	162540	Class 1
<b>(dpm/100 cm<sup>2</sup>):</b>		
<b>LBGR (dpm/100 cm<sup>2</sup>):</b>	21500	Default = 50% DCGL
<b>Design Sigma (dpm/100 cm<sup>2</sup>):</b>	9976	
<b>Type I Error:</b>	0.05	
<b>Type II Error:</b>	0.05	
<b>Predominant Nuclide:</b>	Cs-137	
<b>Sample Area (m<sup>2</sup>):</b>	6.3	Class 1
<b>Scan Area (m<sup>2</sup>):</b>	95	
<b>Scan Coverage (%):</b>	100%	Class 1
<b>Z<sub>1-α</sub> :</b>	1.645	
<b>Z<sub>1-β</sub> :</b>	1.645	
<b>Sign P:</b>	0.97725	
<b>Calculated Relative Shift:</b>	2.2	
<b>Relative Shift Used:</b>	2.2	Uses 3.0 if Relative Shift is >3
<b>N-Value:</b>	12	
<b>Design N-Value + 20%:</b>	15	NUREG-1575 Table 5-5
<b>Design Min Samples N:</b>	15	Class 1
<b>Grid Spacing L:</b>	2.5	Class 1

## Survey Results:

A total of 19 direct measurements were made in F8130022. 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 1310 to 2450 dpm/100 cm<sup>2</sup>, based on In-Situ gamma spec results for the licensed radioactive material detected. 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 <sup>2</sup> )
F8130022-C0001BD	1369
F8130022-C0002BD	1432
F8130022-C0003BD	1250
F8130022-C0004BD	1302
F8130022-C0005BD	1452
F8130022-C0006BD	1385
F8130022-C0007BD	1810
F8130022-C0008BD	1535
F8130022-C0009BD	1416
F8130022-C0010BD	1608
F8130022-C0011BD	1603
F8130022-C0012BD	1484
F8130022-G0013BD	2526
F8130022-C0014BD	1790
F8130022-C0015BD	3994
F8130022-C0016BD	1286
F8130022-C0017BD	1650
F8130022-C0018BD	1369
F8130022-C0019BD	1499
Mean:	1672
Median:	1484
Standard Deviation:	630
Range:	1250 - 3994

**Table 3. Removable Surface Activity Results**

Measurement ID	Surface Beta Activity (dpm/100 cm <sup>2</sup> )
F8130022C0001SM	7.42
F8130022C0002SM	16.39
F8130022C0003SM	88.18
F8130022C0004SM	18.96
F8130022C0005SM	20.24
F8130022C0006SM	18.96
F8130022C0007SM	125.36
F8130022C0008SM	57.41
F8130022C0009SM	29.21
F8130022C0010SM	6.14
F8130022C0011SM	20.24
F8130022C0012SM	7.42
F8130022C0013SM	4.86
F8130022C0014SM	4.86
F8130022C0015SM	7.42
F8130022C0016SM	4.86
F8130022C0017SM	6.14
F8130022C0018SM	21.52
F8130022C0019SM	7.42
Mean:	24.9
Median:	16.39
Standard Deviation:	32.06
Range:	4.86 to 125.36

**Survey Unit Data Assessment:**

The survey design required 19 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**

<b>Survey Results Parameter</b>	<b>Value</b>	<b>Comment</b>
<b>Material Background Used</b> (dpm/100 cm <sup>2</sup> ):	N/A	Average Ambient BKG = 0
<b>Ambient Background Used</b> (dpm/100 cm <sup>2</sup> ):	N/A	
<b>Actual Direct Measurements (N):</b>	19	
<b>Median</b> (dpm/100 cm <sup>2</sup> ):	1484	
<b>Mean</b> (dpm/100 cm <sup>2</sup> ):	1672	
<b>Direct Measurement Standard Deviation</b> (dpm/100 cm <sup>2</sup> ):	630	Based on samples and backgrounds.
<b>Total Standard Deviation</b> (dpm/100 cm <sup>2</sup> ):	630	
<b>Maximum</b> (dpm/100 cm <sup>2</sup> ):	3994	
<b>Material Type:</b>	N/A	Background Subtract Not Applied
<b>Sign Test Final N Value:</b>	19	
<b>S+ Value:</b>	19	
<b>Critical Value:</b>	13	
<b>Sufficient Samples Collected:</b>	Yes	
<b>Maximum Value &lt; DCGL:</b>	Yes	Class 1
<b>Median Value &lt; DCGL:</b>	Yes	
<b>Mean Value &lt; DCGL:</b>	Yes	
<b>Maximum Value &lt; DCGL<sub>emc</sub>:</b>	Yes	
<b>Total Standard Deviation &lt;= Sigma:</b>	Yes	
<b>Pass the Sign Test?</b>	Yes	
<b>Reject the Null Hypothesis?</b>	Yes	
<b>Does the Survey Unit Pass All Criteria?</b>	Yes	

### **Survey Unit Investigations and Results:**

Three investigations (scan grids for penetrations 03, 06, & 08) were required for the scan measurements of the referenced penetrations 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. Three potential areas of elevated activity were detected in penetrations within the survey unit. These areas were evaluated as shown in Attachment 3. 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 43000 dpm/100 cm<sup>2</sup> and none of the removable surface activity measurements exceeded 10% of the DCGL. The required investigations were performed and evaluated.

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 F8130022 meets the release criteria of 10CFR20.1402.

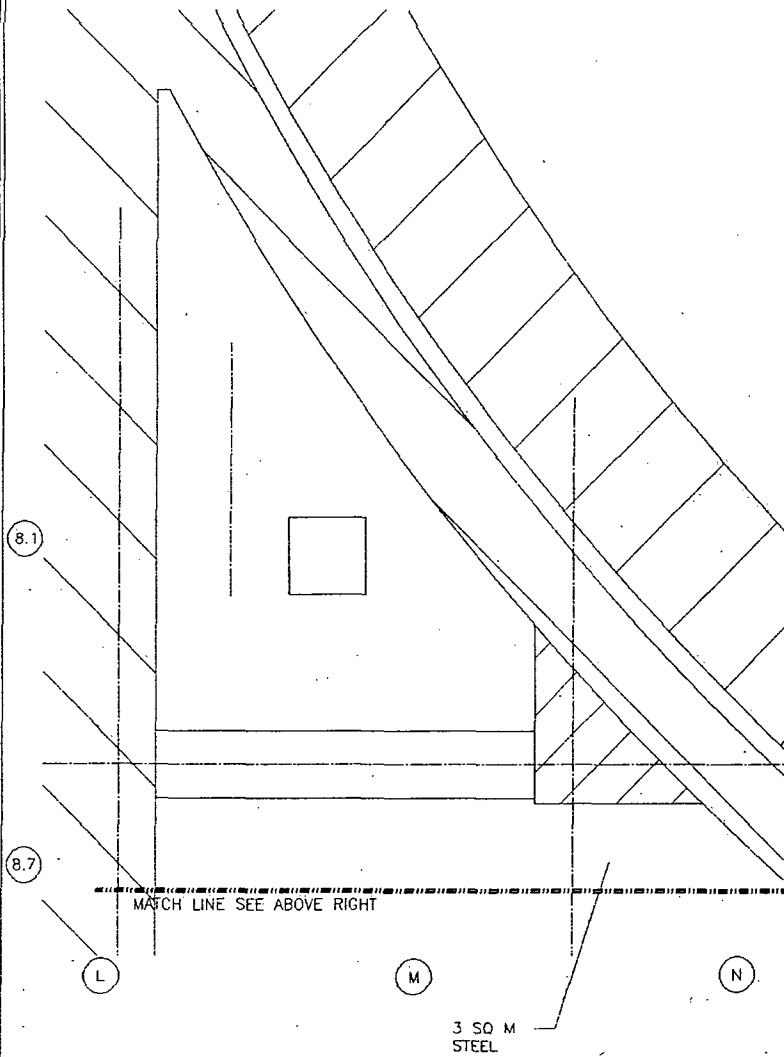


**Attachment 1**

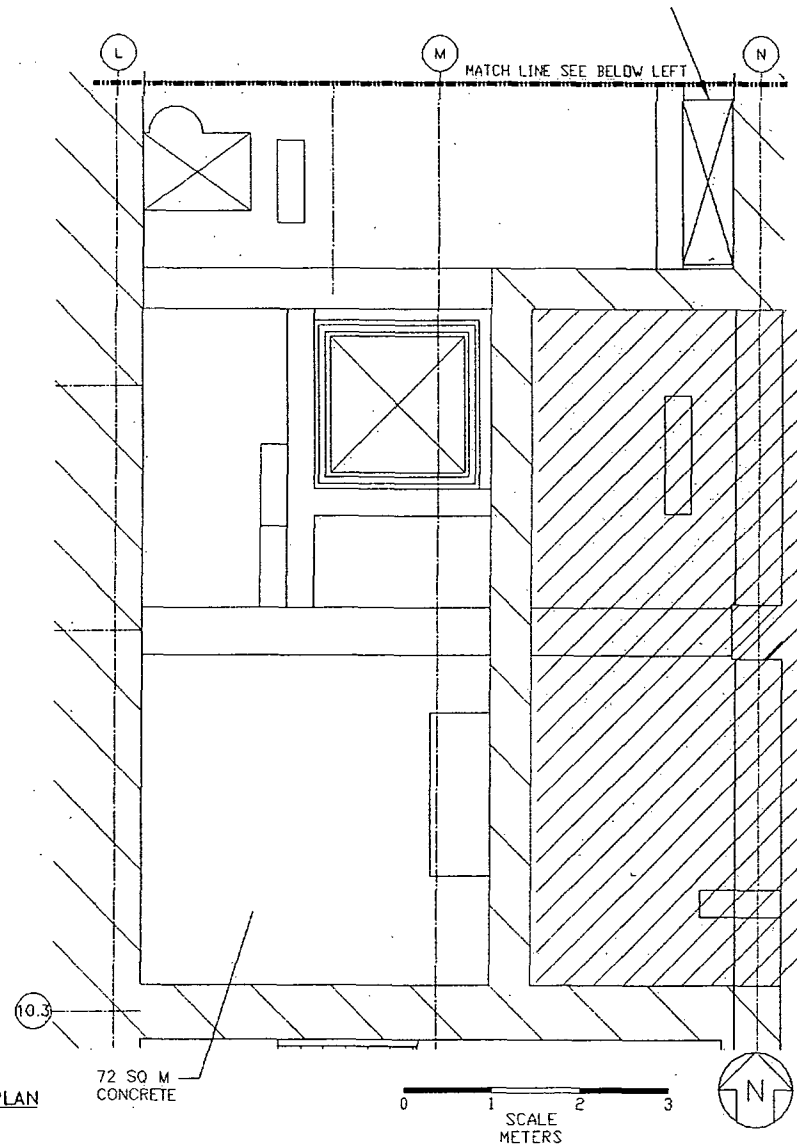
**Maps**

**November 5, 2008**

**Survey Unit F8130022**



CEILING PLAN



**SMUD**

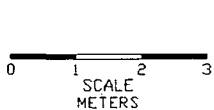
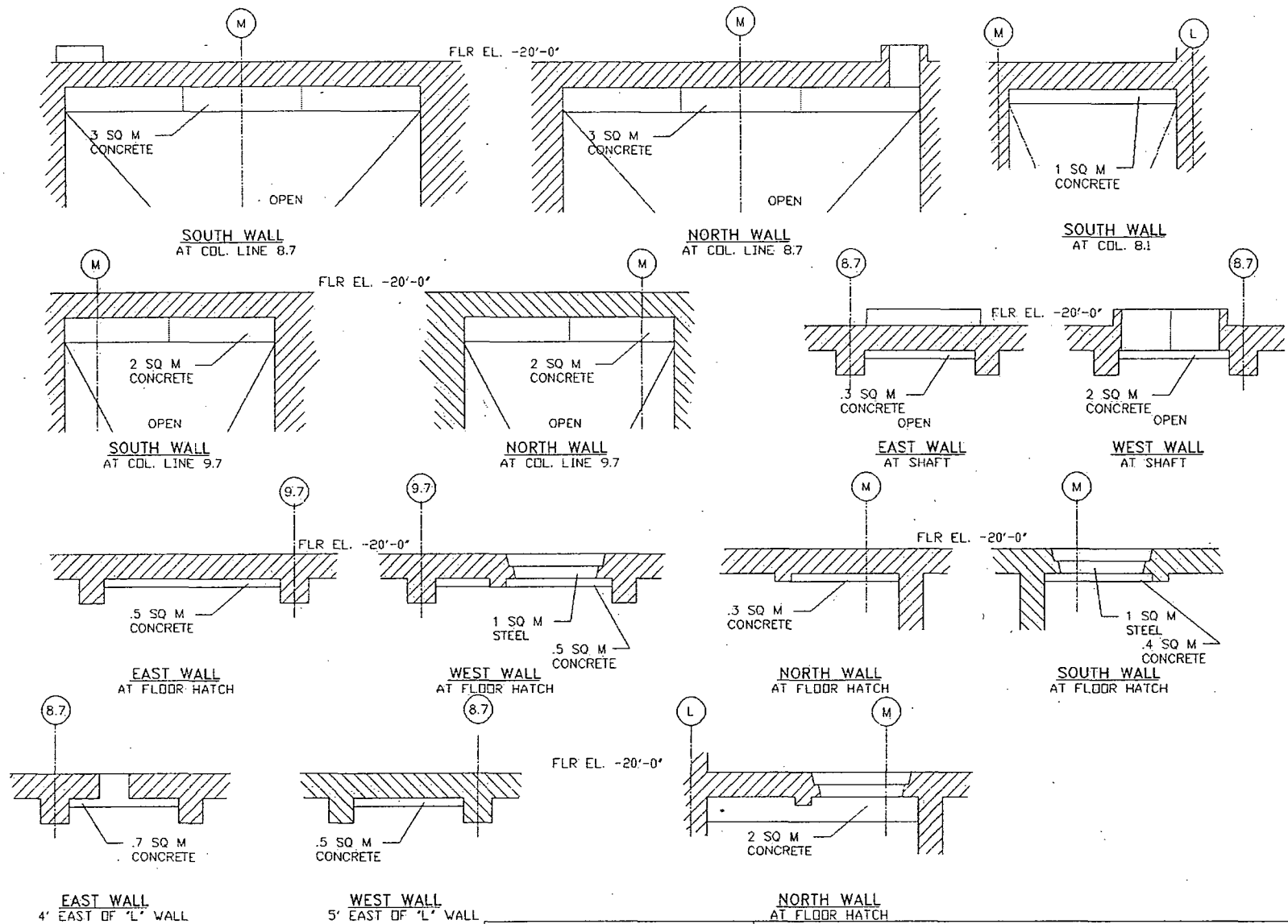
SACRAMENTO MUNICIPAL  
UTILITY DISTRICT

AUXILIARY BUILDING EL. -47'  
W DHR PMP RM CEILING PLAN  
SURFACE AREA ESTIMATE  
8130022-M1

FILE: 813000.01

SHEET 1 of 2

RC RAYMOND



W. DHR Pump Rm  
AB EL.-47, Ceiling Beams

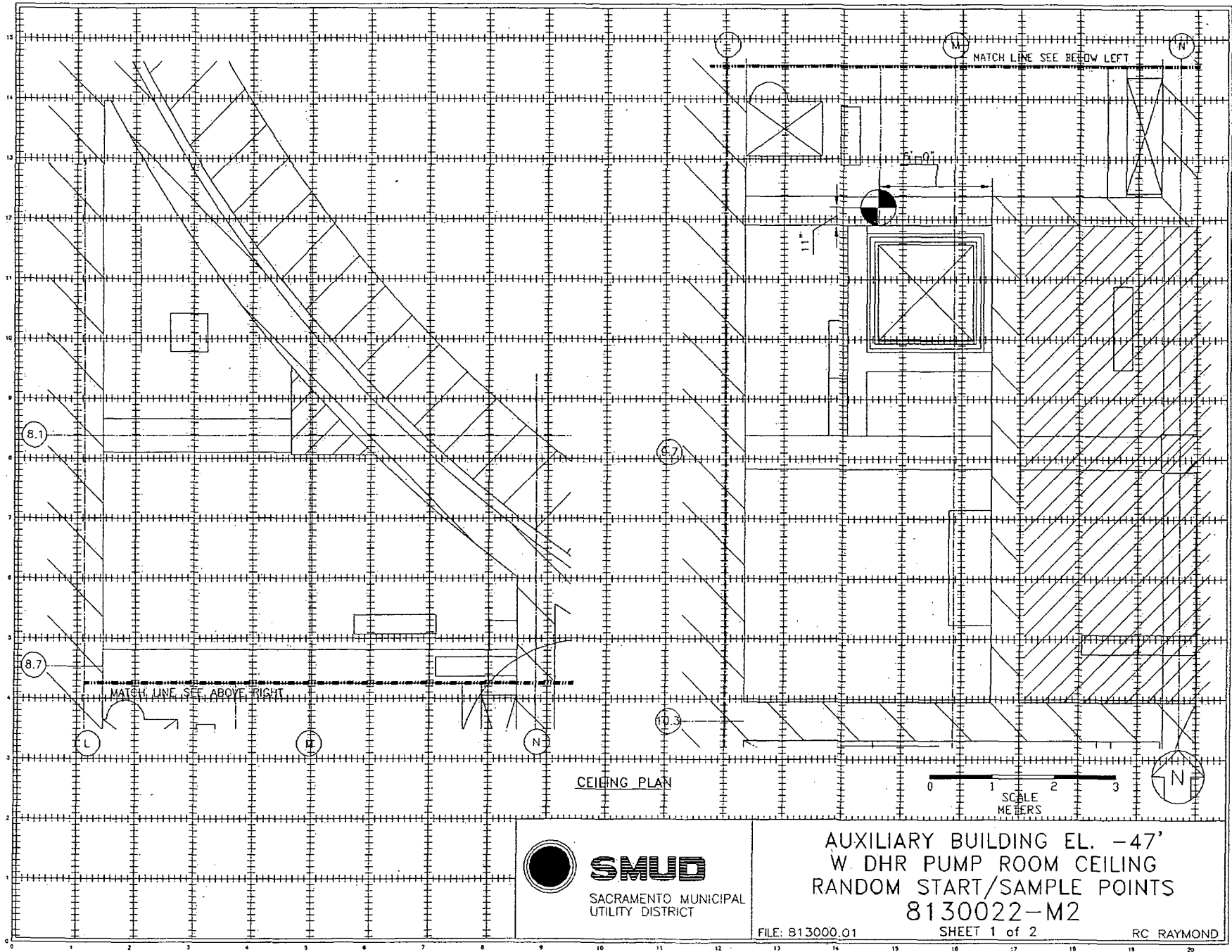


AUXILIARY BUILDING EL. -47'  
W DHR PMP RM CEILINGS  
SURFACE AREA ESTIMATE  
8130022-M1

FILE: 813000.01

SHEET 2 of 2

RC. RAYMOND



**SMUD**

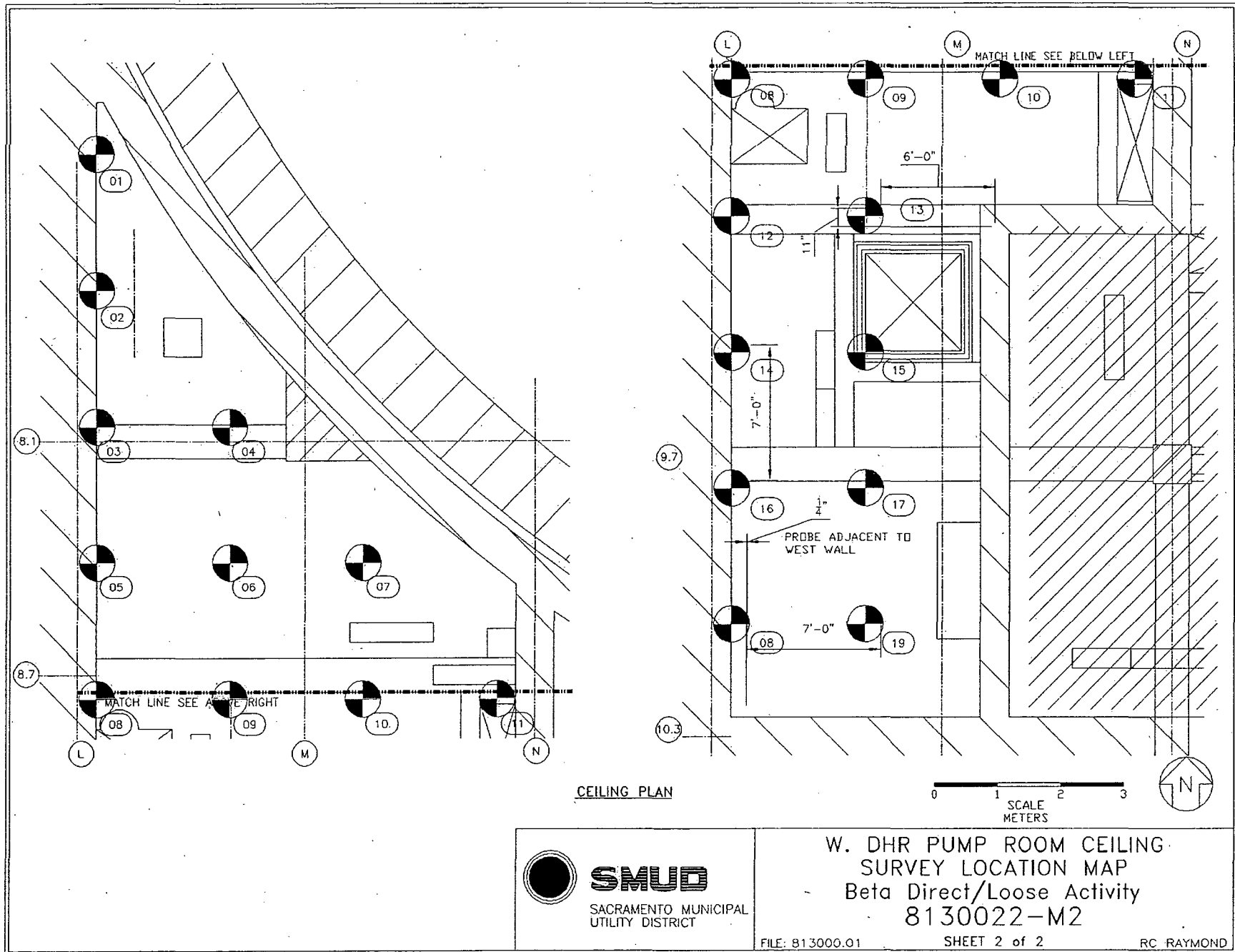
SACRAMENTO MUNICIPAL  
UTILITY DISTRICT

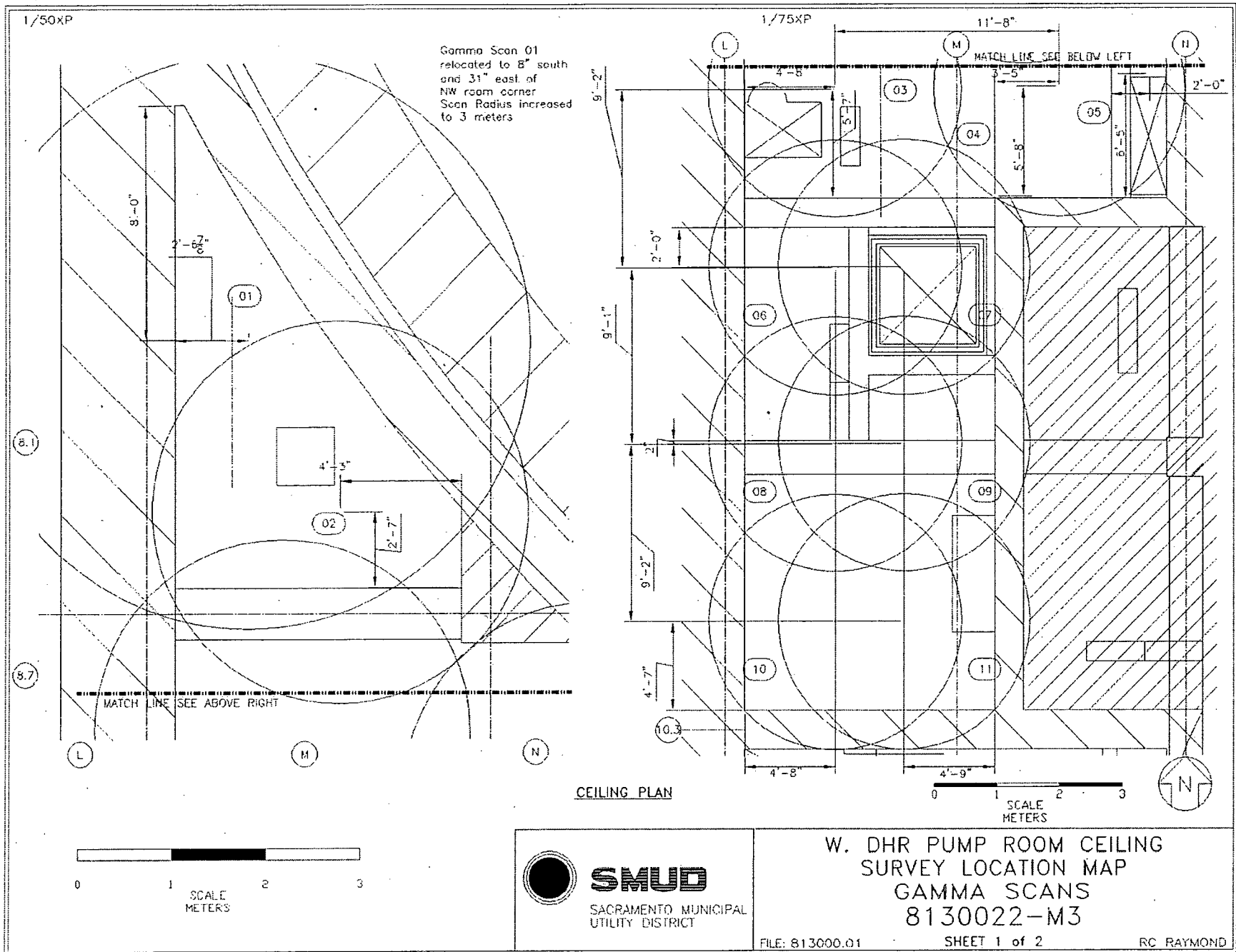
AUXILIARY BUILDING EL. -47'  
W. DHR PUMP ROOM CEILING  
RANDOM START/SAMPLE POINTS  
8130022-M2

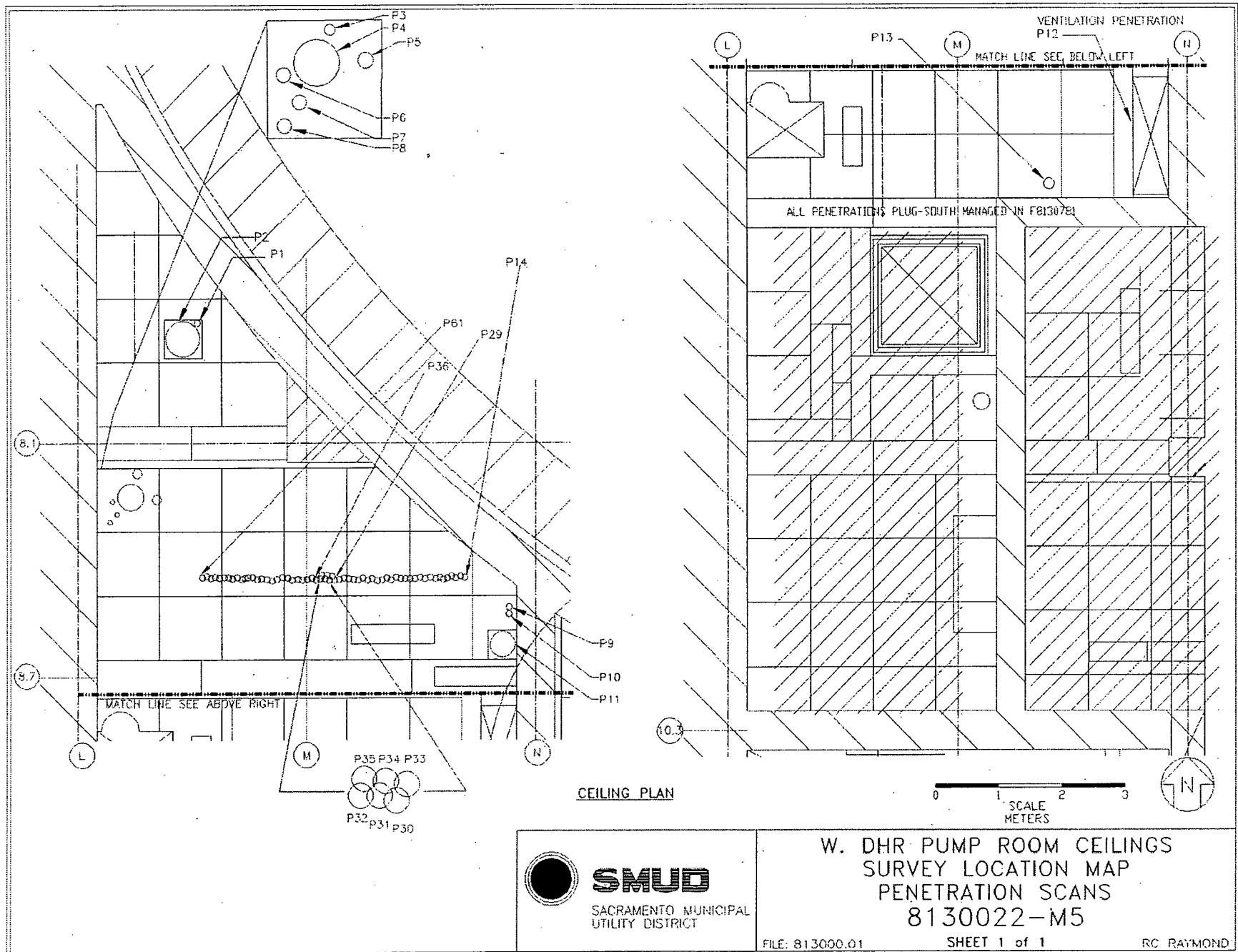
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SHEET 1 of 2

RC RAYMOND







**Attachment 2**  
**Instrumentation**  
**November 5, 2008**  
**Survey Unit F8130022**



**Table 2-1. Survey Unit Instrumentation**

<b>Instrument Model; Serial No.</b>	<b>Detector Model; Serial No.</b>	<b>MDC Static (dpm/100 cm<sup>2</sup>)</b>	<b>MDC Scan (dpm/100 cm<sup>2</sup>)</b>
M2350; 180733	43-98B; 148638	550 metal pipe – 3"	990 metal pipe – 3"
M2350; 149789	43-68B; 161397	433 surface concrete 257 surface metal	1033 surface concrete 612 surface metal
M2350; 142515	43-68B; 148453		
M2350; 142515	43-116-1B; 256007	796 surface concrete 472 surface metal	3258 surface concrete 1930 surface metal
M2350; 149789	43-116-1B; 256006	491 juncture concrete	739 juncture concrete
M2350; 142514	43-111B; 148642	730 metal pipe – 2" 2290 metal pipe – 3"	1320 metal pipe – 2" 4160 metal pipe – 3"
Tennelec; 0401171	N/A	6 dpm $\alpha$ , 9 dpm $\beta$	N/A

**Table 2-2. Investigation Criteria and DCGL**

<b>Parameter</b>	<b>Value (dpm/100 cm<sup>2</sup>)</b>
Investigation Criteria - Direct	162540
Investigation Criteria – Scan	Variable <sup>1</sup>
DCGL <sub>w</sub>	43000
DCGL <sub>EMC</sub>	162540

<sup>1</sup> 43-68B	surface concrete	5840 cpm
43-68B	pipe-metal->14"	9880 cpm
43-116B	pipe-concrete-4"-14"	1990 cpm
43-116B	pipe-metal-4"-14"	3360 cpm
43-116B	junction concrete	4260 cpm
43-98B	pipe-metal-3"	3420 cpm
43-111B	pipe-metal-2"	920 cpm
43-111B	pipe-metal-3"	2900 cpm

**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 (m<sup>2</sup>)</i>	<i>Area Factor</i>	<i>DCGL<sub>emc</sub></i>	<i>Investigation Result (dpm/100cm<sup>2</sup>)</i>	<i>DCGL<sub>emc</sub> Unity Fraction</i>
P03	3420	45203	45203	0.11	119.9	5156130	563727	0.109
P06	920	973	973	0.11	119.9	5156130	45868	0.009
P08	920	2123	2123	0.13	99	4252700	100076	0.024
Survey Unit Remainder						DCGL = 43,000	SU Mean = 1672	0.039
EMC Unity Sum								0.181

**Attachment 4**

**Data Assessment**

**November 5, 2008**

**Survey Unit F8130022**

