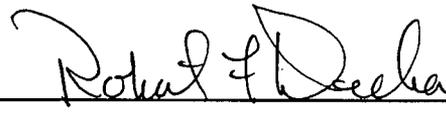
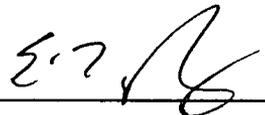


Rancho Seco  
Final Status Survey Summary Report  
October 29, 2008  
Industrial Area Railway  
Survey Unit F8340011

Prepared By: Dan A. Tallman  Date: October 30, 2008  
FSS Engineer

Reviewed By:  Date: 11/5/08  
Lead FSS Engineer

Approved By:  Date: 3-3-09  
Dismantlement Superintendent, Radiological

## FINAL STATUS SURVEY SUMMARY REPORT

### Survey Unit:

F8340011, Industrial Area Railway

### Survey Unit Description:

The rail system was used to transport radioactive material from the site to the out of state waste disposal facilities. Even though the packages met DOT requirements for shipment, there is the potential for a small amount of contamination to be deposited along the rail right of way. There were no reports of rail contamination in the HSA however, during characterization surveys; documented evidence of contamination along the rail spur near the Turbine building was discovered. A gas proportional detector was used to survey the asphalt surrounding the rail spur within the IA. The mean value for paved surfaces was 3,653 dpm/100 cm<sup>2</sup> with one isolated area discovered by scan to be contaminated to 43 pCi/g Cs-137. This contaminated area (~3 by 4 meters) was located approximately 15 meters west of the north turbine laydown area (826025). A 10 by 10 meter boundary has been established surrounding this area of discovery and serves as the boundary for 8340011. Based on the classification procedure (DSIP-0020) and levels of activity reported, the area was determined to be a Class 1 survey unit.

### 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 100 m<sup>2</sup> were scanned for 100% coverage. Direct Gamma measurements were collected at each direct measurement location and analyzed by the Genie 2000 Gamma Analyst. 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>	F834	Industrial Area Railway
<b>Survey Unit:</b>	0011	Open Land Area - PAVED
<b>Class:</b>	1	LTP Table 5-4
<b>SU Area (m<sup>2</sup>):</b>	100	
<b>Evaluator:</b>	D.A.Tallman	
<b>DCGL Cs137 surrogate (pCi/g):</b>	51.2	
<b>Area Factor:</b>	3	Class 1
<b>Design DCGL<sub>emc</sub> (pCi/g):</b>	154	Class 1
<b>LBGR (pCi/g):</b>	25.6	Default = 50% DCGL
<b>Design Sigma (pCi/g):</b>	10.2	DTBD-06-001, Table 5-4D
<b>Type I Error:</b>	0.05	
<b>Type II Error:</b>	0.05	
<b>Nuclide:</b>	Cs137	
<b>Sample Area (m<sup>2</sup>):</b>	6.6	Class 1
<b>Total Area Scanned (m<sup>2</sup>):</b>	100	
<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>	0.99379	
<b>Calculated Relative Shift:</b>	2.5	
<b>Relative Shift Used:</b>	2.5	Uses 3.0 if Rel Shift >3
<b>N-Value:</b>	12	
<b>Design N-Value + 20%:</b>	15	NUREG-1575 Table 5-5
<b>Grid Spacing L:</b>	2.6	Class 1

## Survey Results:

A total of 16 direct measurements were made in F8340011. The results including mean, median, standard deviation and range are shown in Table 2. All of the direct measurements were less than the DCGL. Two (07 & 08) of the Discrete Particle (DP) scan measurements indicated areas of elevated activity. Observed activity from the DP scans ranged from 6819 – 9323 cpm, while the activity observed from the ISOCS scan measurements were reported at  $\leq 0.24$  pCi/g Co60 (MDA) and  $< 0.204$  pCi/g Cs137. Gamma Direct measurements were counted to the MDC shown in Table 2-1 of Attachment 2.

**Table 2. Direct Measurement Results**  
(all activity values in pCi/g)

Measurement ID	Cs137 MDA	Cs137 Activity	Uncertainty
<b>Mean:</b>		9.68E-01	
<b>Median:</b>		9.73E-01	
<b>Standard Deviation:</b>		3.30E-02	
<b>Range:</b>	8.93E-01 to 1.02E00		
F8340011 A0001GD	9.22E-01	< 9.22E-01	
F8340011 A0002GD	9.31E-01	< 9.31E-01	
F8340011 A0003GD	1.02E00	< 1.02E00	
F8340011 A0004GD	9.98E-01	< 9.98E-01	
F8340011 A0005GD	9.56E-01	< 9.56E-01	
F8340011 A0006GD	9.65E-01	< 9.65E-01	
F8340011 A0007GD	8.93E-01	< 8.93E-01	
F8340011 A0008GD	9.74E-01	< 9.74E-01	
F8340011 A0009GD	9.92E-01	< 9.92E-01	
F8340011 A0010GD	1.01E00	< 1.01E00	
F8340011 A0011GD	9.91E-01	< 9.91E-01	
F8340011 A0012GD	9.77E-01	< 9.77E-01	
F8340011 A0013GD	9.78E-01	< 9.78E-01	
F8340011 A0014GD	9.49E-01	< 9.49E-01	
F8340011 A0015GD	9.72E-01	< 9.72E-01	
F8340011 A0016GD	9.67E-01	< 9.67E-01	

**Survey Unit Data Assessment:**

The survey design required 16 direct measurements for the Sign Test. The critical value and the results of the Sign Test are presented in Table 3. 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 3. Data Assessment Results**

<b>Survey Results Parameter</b>	<b>Value</b>	<b>Comment</b>
<b>Actual Direct Measurements (N):</b>	16	
<b>Median (pCi/g):</b>	9.73E-01	
<b>Mean (pCi/g):</b>	9.68E-01	
<b>Standard Deviation (pCi/g):</b>	3.30E-02	
<b>Maximum (pCi/g):</b>	1.02E00	
<b>Sign Test Final N Value:</b>	16	
<b>S+ Value:</b>	16	
<b>Critical Value:</b>	11	
<b>Sufficient Samples Collected:</b>	Yes	
<b>Maximum Value &lt; DCGL:</b>	Yes	
<b>Median Value &lt; DCGL:</b>	Yes	
<b>Mean Value &lt; DCGL:</b>	Yes	
<b>Maximum Value &lt; DCGL<sub>emc</sub>:</b>	Yes	Class 1
<b>Standard Deviation &lt;= Sigma:</b>	Yes	
<b>Pass the Sign Test?</b>	Yes	
<b>Reject the Null Hypothesis?</b>	Yes	
<b>The survey unit passes all conditions?</b>	Yes	

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

Two investigations (DP scan grids 07 & 08) 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 land 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. Two potential areas of elevated activity were detected and 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. All of the direct measurements were less than the DCGL. Two 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.

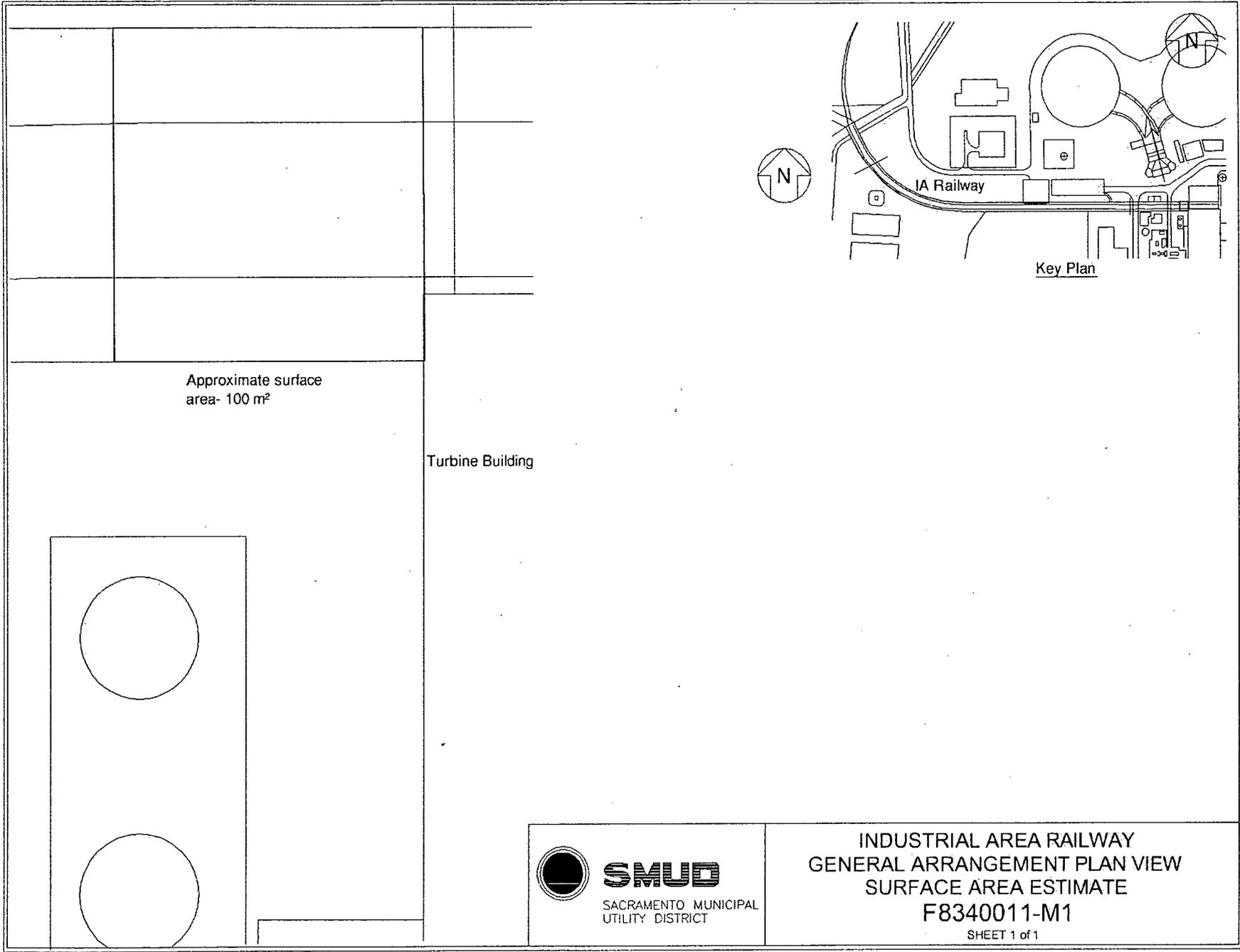
It is concluded that survey unit F8340011 meets the release criteria of 10CFR20.1402.

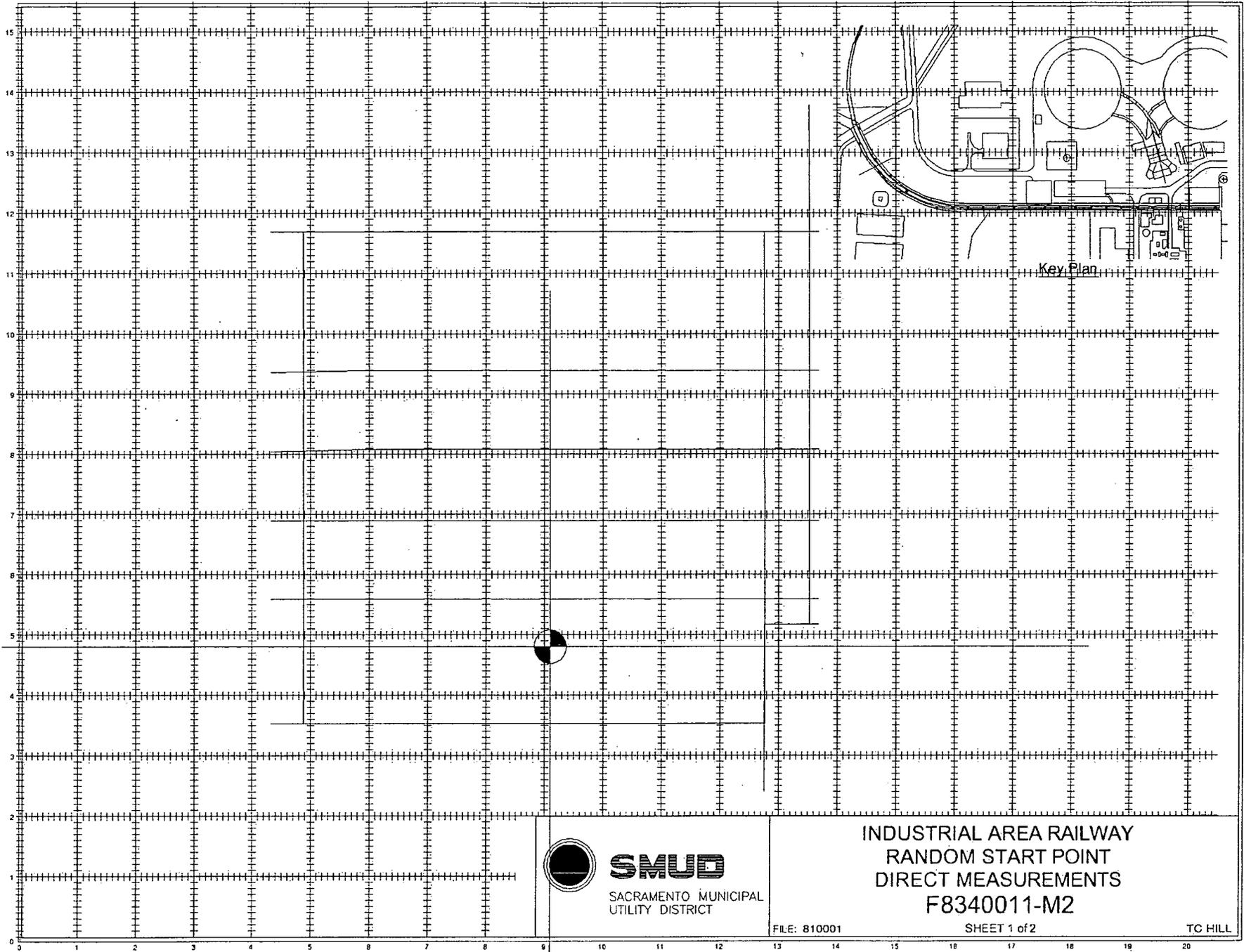
**Attachment 1**

**Maps**

**October 29, 2008**

**Survey Unit F8340011**





**SMUD**

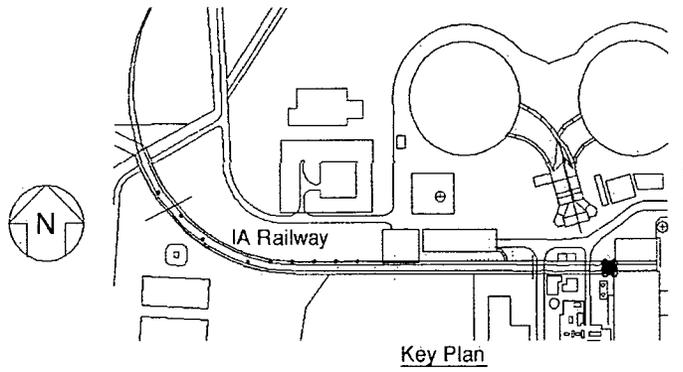
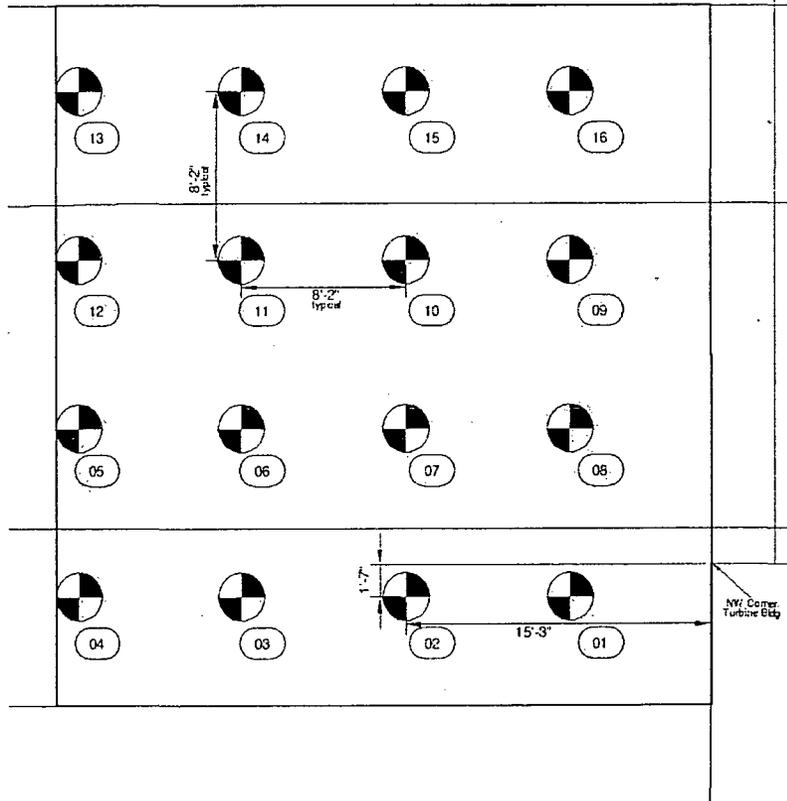
SACRAMENTO MUNICIPAL  
UTILITY DISTRICT

INDUSTRIAL AREA RAILWAY  
RANDOM START POINT  
DIRECT MEASUREMENTS  
F8340011-M2

FILE: 810001

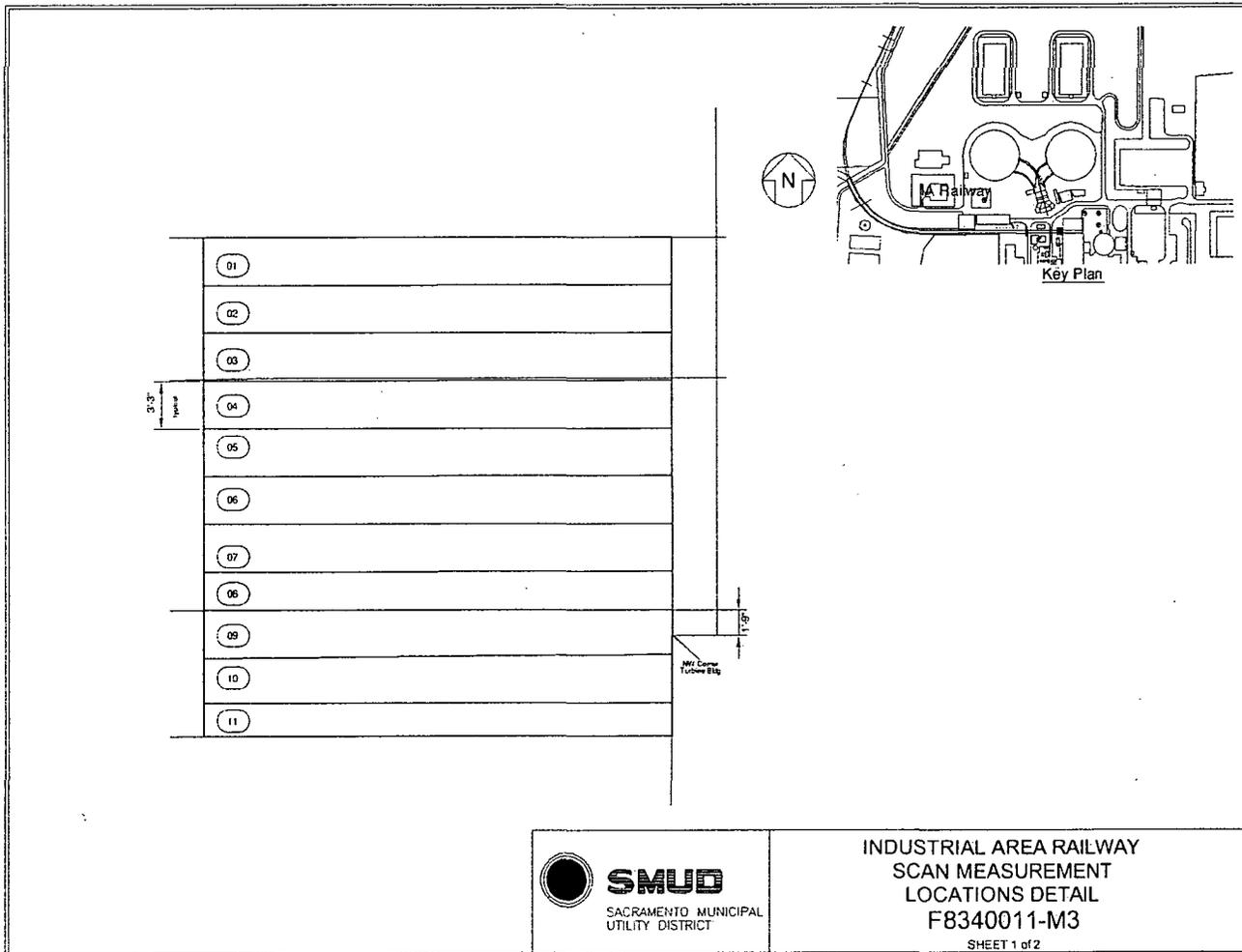
SHEET 1 of 2

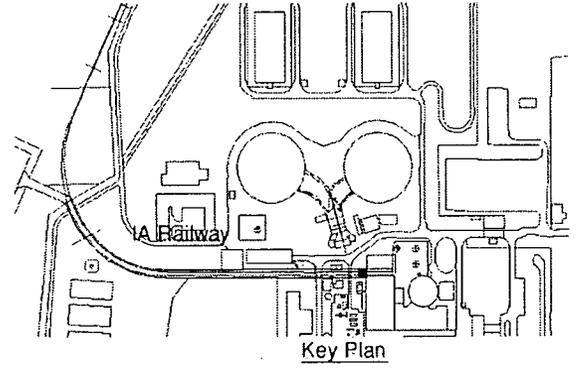
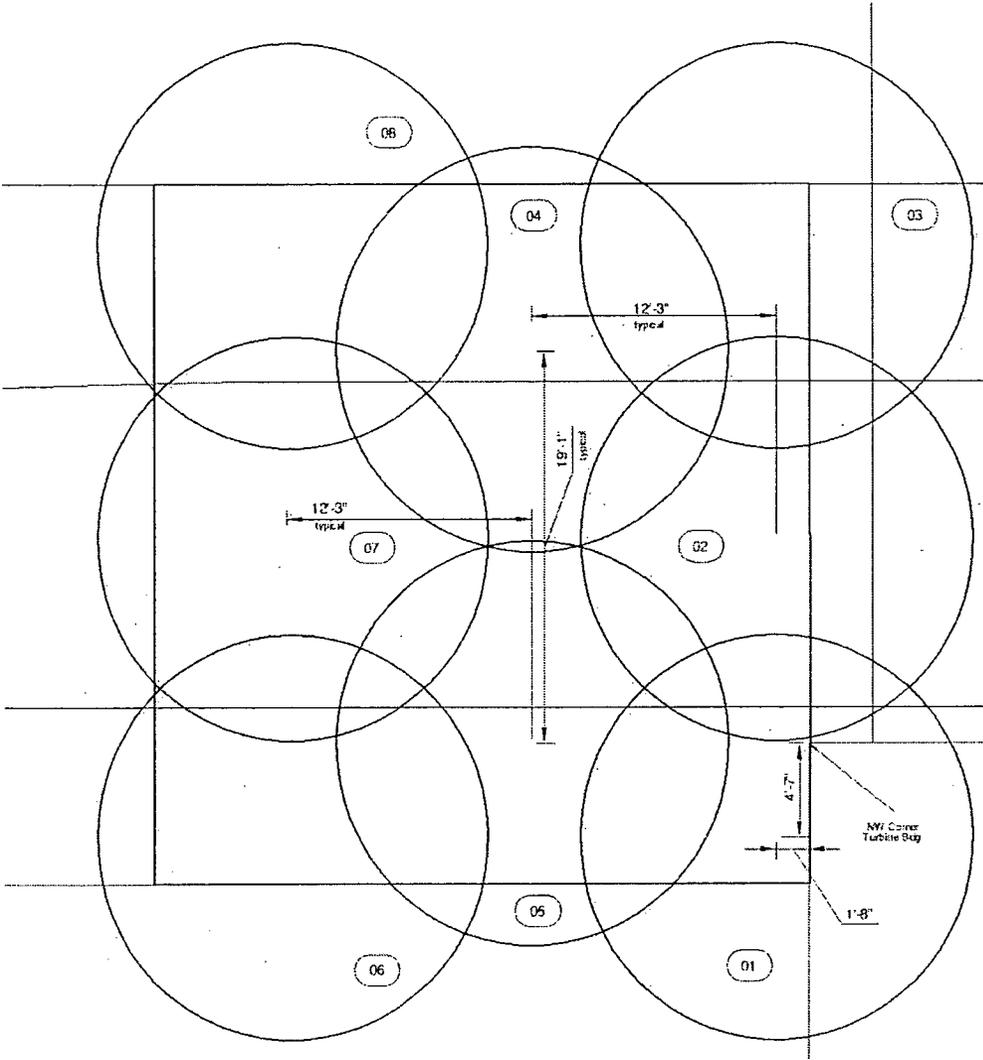
TC HILL



**SMUD**  
SACRAMENTO MUNICIPAL  
UTILITY DISTRICT

INDUSTRIAL AREA RAILWAY  
DIRECT MEASUREMENT  
LOCATIONS DETAIL  
F8340011-M2  
SHEET 2 of 2





**SMUD**

SACRAMENTO MUNICIPAL  
UTILITY DISTRICT

INDUSTRIAL AREA RAILWAY  
ISOCS SCAN MEASUREMENT  
LOCATION DETAIL  
F8340011-M3

SHEET 2 of 2

**Attachment 2**

**Instrumentation**

**October 29, 2008**

**Survey Unit F8340011**

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

Instrument	Detector Model No.	Detector Serial No.	MDC
Inspector	N/A	08051294	Asphalt – 1.02 pCi/g Cs-137 Asphalt – 0.95 pCi/g Co-60
ISOCS	N/A	1983920	Asphalt – 0.399 pCi/g Cs-137 Asphalt – 0.240 pCi/g Co-60
M2350 180738	44-10	190666	Asphalt – 6.4 pCi/g Cs-137 <sup>1</sup> <sub>(surr.)</sub>

<sup>1</sup> “DTBD 05-012 Eberline SPA-3 and Ludlum 44-10 Detector Sensitivity (MDC).”

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

Instrument	Parameter	Value
ISOCS	Investigation Criteria – Scan <sup>2</sup>	Asphalt – 20 pCi/g Cs-137 Asphalt – 5 pCi/g Co-60
InSpector	Investigation Criteria – Direct <sup>3</sup>	Asphalt – 154 pCi/g Cs-137 Asphalt – Detectable Co-60
M2350/44-10	Investigation Criteria – Scan <sup>4</sup>	8785 cpm <sup>4</sup>
All	DCGL <sub>w</sub>	51.2 Cs-137 12.6 Co-60
All	DCGL <sub>EMC</sub>	154.28 pCi/g Cs-137 <sub>(surr.)</sub>

<sup>2</sup> “DTBD 06-003, Use of In situ Gamma Spec for FSS” rounded down for conservatism for Cs137/Co60 respectively

<sup>3</sup> LTP Chapter 5, Table 5-7 (positive Co60 measurements will be investigated).

<sup>4</sup> DSIP-0510 encl 8.6 – and “Discrete Particle Detection Using the Ludlum 2350-1 and 5.08 by 5.08 NaI Detectors RFD 3/27/07”.

**Attachment 3**

**Investigation**

**October 29, 2008**

**Survey Unit F8340011**

**Table 3-1 Survey Unit Investigation**

<i>Grid</i>	<i>Investigation Level (cpm)</i>	<i>Initial Value (cpm)</i>	<i>Investigation Result (pCi/g)</i>	<i>Elevated Area (m<sup>2</sup>)</i>	<i>Area Factor</i>	<i>DCGL<sub>emc</sub></i>	<i>Investigation Result (pCi/g)</i>	<i>DCGL<sub>emc</sub> Unity Fraction</i>
(DP) 07GS	8785	9312	< MDA <sup>1</sup>	NA	NA	NA	<DCGL <sub>w</sub>	NA
(DP) 08GS	8785	9323	< MDA <sup>2</sup>	NA	NA	NA	<DCGL <sub>w</sub>	NA
Survey Unit Remainder						DCGL = 51.2	SU Mean = 0.968	0.019
<sup>1</sup> Co60 - 1.04 pCi/g / Cs137 - 1.10 pCi/g (InSpector 1000 w/ 2x2 NaI detector) <sup>2</sup> Co60 - 0.995 pCi/g / Cs137 - 1.10 pCi/g (InSpector 1000 w/ 2x2 NaI detector) DP Scan grids 07&08 exceeded IL of 8785 cpm. Investigation using the InSpector 1000 resulted in the Investigation activity results recorded above.								
EMC Unity Sum								NA

**Attachment 4**  
**Data Assessment**  
**October 29, 2008**  
**Survey Unit F8340011**

