

Rancho Seco

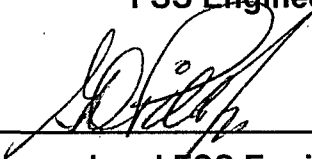
Final Status Survey Summary Report

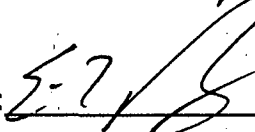
March 31, 2008

RHUT Trench

Survey Unit F8991091

Prepared By:  Date: 3/31/2008  
FSS Engineer

Reviewed By:  Date: 4/1/08  
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Approved By:  Date: 4-21-08  
Dismantlement Superintendent, Radiological

## FINAL STATUS SURVEY SUMMARY REPORT

### Survey Unit:

F8991091, RHUT Trench

### Survey Unit Description:

**Operating History:** The RHUT pipe collected contaminated water as part of the radioactive effluent system and transported it to the retention basins for discharge. Operating records and the HSA document occurrences of radioactive contamination associated with this system piping.

**Site Characterization:** Direct measurements were made of the interior surfaces of the system piping which confirmed the presence of plant-derived radionuclides. Direct measurements of the interior showed a mean gross activity level of 2590 dpm/100 cm<sup>2</sup> and a maximum value of 3158 dpm/100 cm<sup>2</sup>. Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the pipe was determined to be a Class 1 system and the trench was a Class 2.

HSA Events: HSA Report pg. 63.

### Survey Unit Design Information:

Approximately 1200 feet of the contaminated RHUT pipe was dug up and removed as part of site remediation. This survey covers the open trench following pipe removal in addition to the "as left" surface of the back filled trench in those areas that were subsequently paved over (see maps). The portions of the back filled trench that were not repaved are surveyed as part of the appropriate land areas.

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 1988 m<sup>2</sup> were scanned for approximately 129% coverage. Soil samples were collected at each direct measurement location and analyzed by HPGe detector. The instrumentation used for the survey along with the MDC values is 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>	F899	RHUT Trench
<b>Survey Unit:</b>	1091	Open Land Area
<b>Class:</b>	2	LTP Table 5-4
<b>SU Area (m<sup>2</sup>):</b>	1544	
<b>Evaluator:</b>	Gary Frank	
<b>DCGL for Cs-137 surrogate (pCi/g):</b>	52.6	
<b>DCGL for Co-60 (pCi/g):</b>	12.6	
<b>Area Factor:</b>	N/A	Class 2
<b>Design DCGL<sub>mc</sub> (pCi/g):</b>	N/A	Class 2
<b>LBGR (pCi/g):</b>	25.6	Adjusted
<b>Design Sigma (pCi/g):</b>	9.83	DTBD-06-001, Table 5-4A or B
<b>Type I Error:</b>	0.05	
<b>Type II Error:</b>	0.05	
<b>Sample Area (m<sup>2</sup>):</b>	102.9	Class 2
<b>Total Area Scanned (m<sup>2</sup>):</b>	1988	
<b>Scan Coverage (%):</b>	128.8%	Class 2
<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>	2.7	
<b>Relative Shift Used:</b>	2.7	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>	10.1	Class-2

### **Survey Results:**

A total of 53 direct measurements (soil samples) were made in F8991091. The results are shown in Table 2-1. Statistical data including the mean, median, and standard deviation are shown in Table 2-2. All of the direct measurements were less than Unity. None of the scan measurements indicated areas of elevated activity. Soil samples were counted to the MDCs shown in Table 2-1 of Attachment 2.

Additional scan measurements (93) were performed with 2350-1 and 44-10 for discrete particle detection in the trench and spoils pile with results below the investigation level of 9280 cpm with the exception of areas with sediment from the pipe. During the removal of the pipe, sediment fell out of the pipe into the trench. The material was removed and the trench sampled to ensure the release criteria were met.

**Table 2-1. Direct Measurement Results**  
(all activity values in pCi/g)

Sample ID	Cs137				Co60				Unity Total
	MDA	Activity	Uncertainty	Unity Value	MDA	Activity	Uncertainty	Unity Value	
F8991091S0041SS	6.22E-02	3.88E-01	6.62E-02	0.0074	5.95E-02	<5.95E-02		0.0047	0.0121
F8991091S0042SS	8.52E-02	1.63E00	1.30E-01	0.031	5.45E-02	3.94E-01	5.64E-02	0.0313	0.0623
F8991091S0043SS	5.46E-02	<5.46E-02		0.001	6.55E-02	<6.55E-02		0.0052	0.0062
F8991091S0044SS	3.99E-02	3.28E-01	5.33E-02	0.0062	6.76E-02	<6.76E-02		0.0054	0.0116
F8991091S0045SS	4.55E-02	6.93E-02	3.34E-02	0.0013	5.45E-02	<5.45E-02		0.0043	0.0056
F8991091S0050SS	4.02E-02	1.17E-01	3.57E-02	0.0022	5.13E-02	<5.13E-02		0.0041	0.0063
F8991091S0053SS	6.20E-02	1.02E-01	4.64E-02	0.0019	7.02E-02	<7.02E-02		0.0056	0.0075
F8991091S0054SS	5.95E-02	8.40E-02	4.24E-02	0.0016	6.62E-02	<6.62E-02		0.0053	0.0069
F8991091S0057SS	5.35E-02	<5.35E-02		0.001	3.67E-02	<3.67E-02		0.0029	0.0039
F8991091S0058SS	3.43E-02	2.58E-01	4.60E-02	0.0049	6.55E-02	<6.55E-02		0.0052	0.0101
F8991091S0059SS	5.29E-02	2.53E-01	5.33E-02	0.0048	5.33E-02	<5.33E-02		0.0042	0.009
F8991091S0060SS	4.09E-02	<4.09E-02		0.0008	4.29E-02	<4.29E-02		0.0034	0.0042
F8991091S0061SS	4.85E-02	1.76E-01	4.45E-02	0.0033	5.07E-02	<5.07E-02		0.004	0.0074
F8991091S0063SS	5.75E-02	<5.75E-02		0.0011	4.13E-02	<4.13E-02		0.0033	0.0044
F8991091S0064SS	3.83E-02	9.50E-02	3.26E-02	0.0018	4.37E-02	<4.37E-02		0.0035	0.0053
F8991091S0065SS	6.59E-02	<6.59E-02		0.0013	5.09E-02	<5.09E-02		0.004	0.0053
F8991091S0066SS	6.13E-02	4.96E-01	7.24E-02	0.0094	5.63E-02	<5.63E-02	2.84E-02	0.0045	0.0139
F8991091S0067SS	5.05E-02	<5.05E-02		0.001	5.36E-02	<5.36E-02		0.0043	0.0052
F8991091S0068SS	5.90E-02	1.88E-01	4.96E-02	0.0036	6.03E-02	<6.03E-02		0.0048	0.0084
F8991091S0069SS	4.30E-02	<4.30E-02		0.0008	3.97E-02	<3.97E-02		0.0032	0.004
F8991091S0070SS	5.57E-02	3.06E-01	5.75E-02	0.0058	6.02E-02	<6.02E-02		0.0048	0.0106
F8991091S0071SS	5.43E-02	2.52E-01	5.33E-02	0.0048	5.99E-02	<5.99E-02		0.0048	0.0095
F8991091S0072SS	5.07E-02	<5.07E-02		0.001	4.10E-02	<4.10E-02		0.0033	0.0042
F8991091S0073SS	5.79E-02	1.76E-01	4.94E-02	0.0033	6.89E-02	<6.89E-02		0.0055	0.0088
F8991091S0074SS	4.72E-02	2.04E-01	4.73E-02	0.0039	6.02E-02	<6.02E-02		0.0048	0.0087
F8991091S0075SS	6.67E-02	<6.67E-02		0.0013	4.94E-02	<4.94E-02		0.0039	0.0052
F8991091S0076SS	5.02E-02	<5.02E-02		0.001	5.46E-02	<5.46E-02		0.0043	0.0053
F8991091S0077SS	6.57E-02	<6.57E-02		0.0012	4.03E-02	<4.03E-02		0.0032	0.0044
F8991091S0078SS	6.09E-02	1.63E-01	4.93E-02	0.0031	4.29E-02	<4.29E-02		0.0034	0.0065
F8991091S0079SS	5.02E-02	7.32E-02	3.62E-02	0.0014	5.53E-02	<5.53E-02		0.0044	0.0058
F8991091S0080SS	5.61E-02	<5.61E-02		0.0011	4.60E-02	<4.60E-02		0.0037	0.0047

F8991091S0081SS	5.57E-02	<5.57E-02		0.0011	4.41E-02	<4.41E-02		0.0035	0.0046
F8991091S0082SS	4.74E-02	<4.74E-02		0.0009	5.06E-02	<5.06E-02		0.004	0.0049
F8991091S0083SS	4.69E-02	<4.69E-02		0.0009	4.34E-02	<4.34E-02		0.0034	0.0043
F8991091S0084SS	5.47E-02	6.75E-01	8.26E-02	0.0128	1.06E-01	<1.06E-01		0.0084	0.0212
F8991091S0085SS	5.55E-02	2.46E-01	5.51E-02	0.0047	7.49E-02	<7.49E-02		0.0059	0.0106
F8991091S0086SS	4.73E-02	<4.73E-02		0.0009	4.04E-02	<4.04E-02		0.0032	0.0041
F8991091S0087SS	4.76E-02	<4.76E-02		0.0009	6.07E-02	<6.07E-02		0.0048	0.0057
F8991091S0089SS	5.66E-02	3.89E-01	6.54E-02	0.0074	6.79E-02	<6.79E-02		0.0054	0.0128
F8991091S0090SS	5.65E-02	<5.65E-02		0.0011	5.12E-02	<5.12E-02		0.0041	0.0051
F8991091S0091SS	5.93E-02	<5.93E-02		0.0011	4.11E-02	<4.11E-02		0.0033	0.0044
F8991091S0092SS	3.45E-02	4.03E-02	2.47E-02	0.0008	5.09E-02	<5.09E-02		0.004	0.0048
F8991091S0093SS	6.06E-02	<6.06E-02		0.0012	4.89E-02	<4.89E-02		0.0039	0.005
F8991091S0094SS	7.72E-02	<7.72E-02		0.0015	5.68E-02	<5.68E-02		0.0045	0.006
F8991091S0095SS	6.11E-02	<6.11E-02		0.0012	4.80E-02	<4.80E-02		0.0038	0.005
F8991091S0096SS	5.68E-02	2.74E-01	5.36E-02	0.0052	6.05E-02	<6.05E-02		0.0048	0.01
F8991091S0097SS	3.90E-02	<3.90E-02		0.0007	4.64E-02	<4.64E-02		0.0037	0.0044
F8991091S0098SS	4.55E-02	1.63E-01	4.21E-02	0.0031	5.09E-02	<5.09E-02		0.004	0.0071
F8991091S0099SS	5.89E-02	6.53E-02	3.96E-02	0.0012	5.75E-02	<5.75E-02		0.0046	0.0058
F8991091S0100SS	6.30E-02	3.48E-01	6.33E-02	0.0066	7.43E-02	<7.43E-02		0.0059	0.0125
F8991091S0101SS	6.30E-02	3.48E-01	6.33E-02	0.0066	7.43E-02	<7.43E-02		0.0059	0.0125
F8991091S0102SS	6.88E-02	<6.88E-02		0.0013	5.56E-02	<5.56E-02		0.0044	0.0057
F8991091S0103SS	5.58E-02	2.34E-01	5.15E-02	0.0044	5.38E-02	<5.38E-02		0.0043	0.0087

**Table 2-2. Direct Measurements Results Summary**

	<b>Cs137 Activity</b> (pCi/g)	<b>Co60 Activity</b> (pCi/g)	<b>Cs137 Unity</b>	<b>Co60 Unity</b>	<b>Unity Total</b>
<b>DCGLw</b>	52.6	12.6			
<b>Mean</b>	1.79E-01	6.15E-02	0.0034	0.0049	0.0083
<b>Median</b>	7.32E-02	5.38E-02	0.0014	0.0043	0.0058
<b>Standard Deviation</b>	2.45E-01	4.81E-02	0.0047	0.0038	0.0083
<b>Cs137 Activity Range</b> (pCi/g)	3.90E-02 to 1.63E00				
<b>Co60 Activity Range</b> (pCi/g)	3.67E-02 to 3.94E-01				
<b>Cs137 Unity Range</b>	0.0007 to 0.031				
<b>Co60 Unity Range</b>	0.0029 to 0.0313				
<b>Total Unity Range</b>	0.0039 to 0.0623				
<b>Sample Count</b>	53				

**Survey Unit Data Assessment:**

The survey design required 53 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>	53	
<b>Median (Unity):</b>	0.006	
<b>Mean (Unity):</b>	0.008	
<b>Direct Measurement Std Deviation (Unity):</b>	0.008	
<b>Maximum (Unity):</b>	0.062	
<b>Sign Test Final N Value:</b>	53	
<b>S+ Value:</b>	53	
<b>Critical Value:</b>	32	
<b>Sufficient Samples Collected:</b>	Yes	
<b>Maximum Value &lt; Unitized DCGL:</b>	Yes	
<b>Median Value &lt; Unitized DCGL:</b>	Yes	
<b>Mean Value &lt; Unitized DCGL:</b>	Yes	
<b>Maximum Value &lt; DCGL<sub>mc</sub> (Unity):</b>	N/A	Class 2
<b>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:**

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 the ALARA criterion has been met.

**Changes in Initial Survey Unit Assumptions:**

The survey unit was designed as a Class 2 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. No potential areas of elevated activity were detected.

**Conclusion:**

The FSS of this survey unit was properly designed as a Class 2 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 Unity. 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.

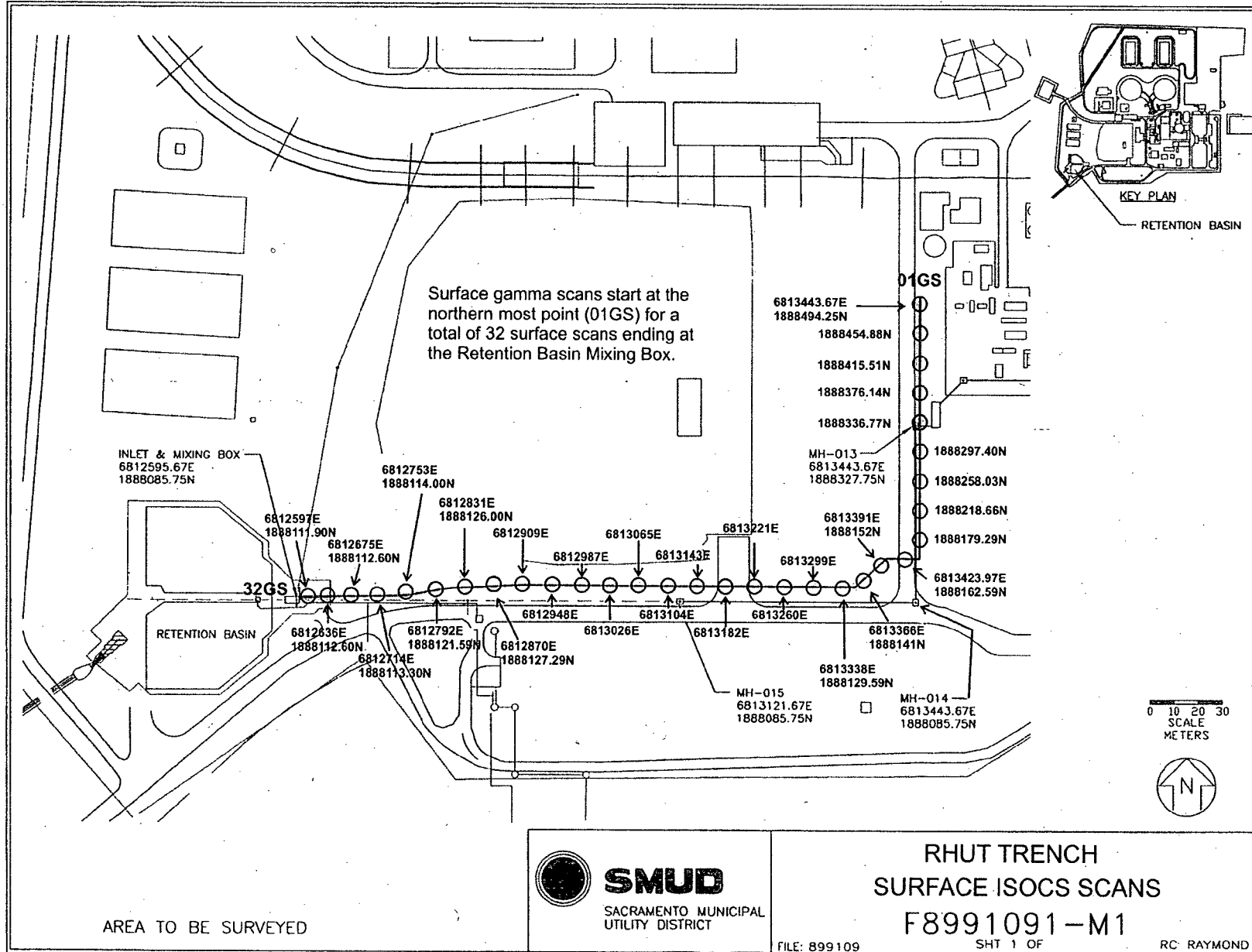
It is concluded that survey unit F8991091 meets the release criteria of 10CFR20.1402.

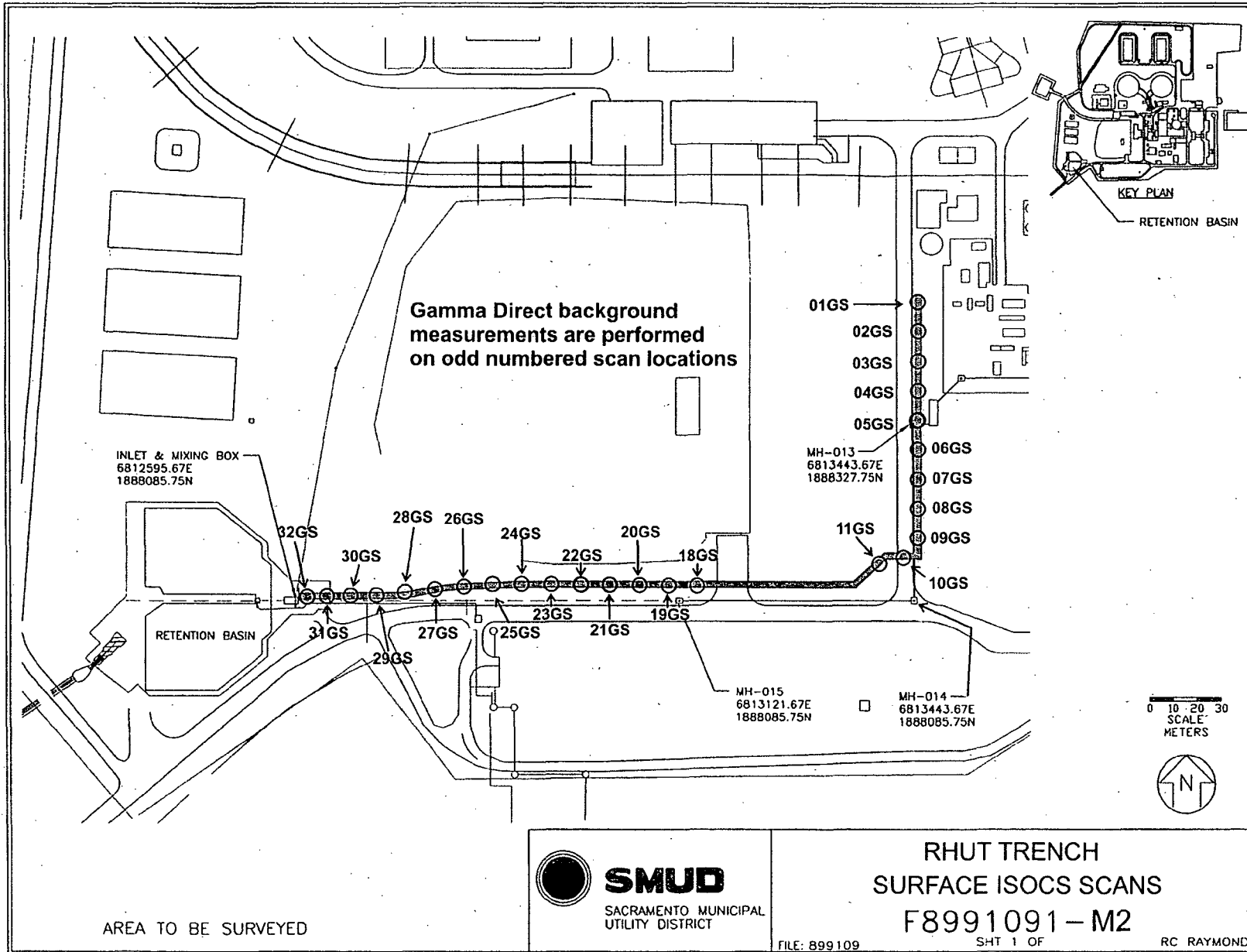
**Attachment 1**

**Maps**

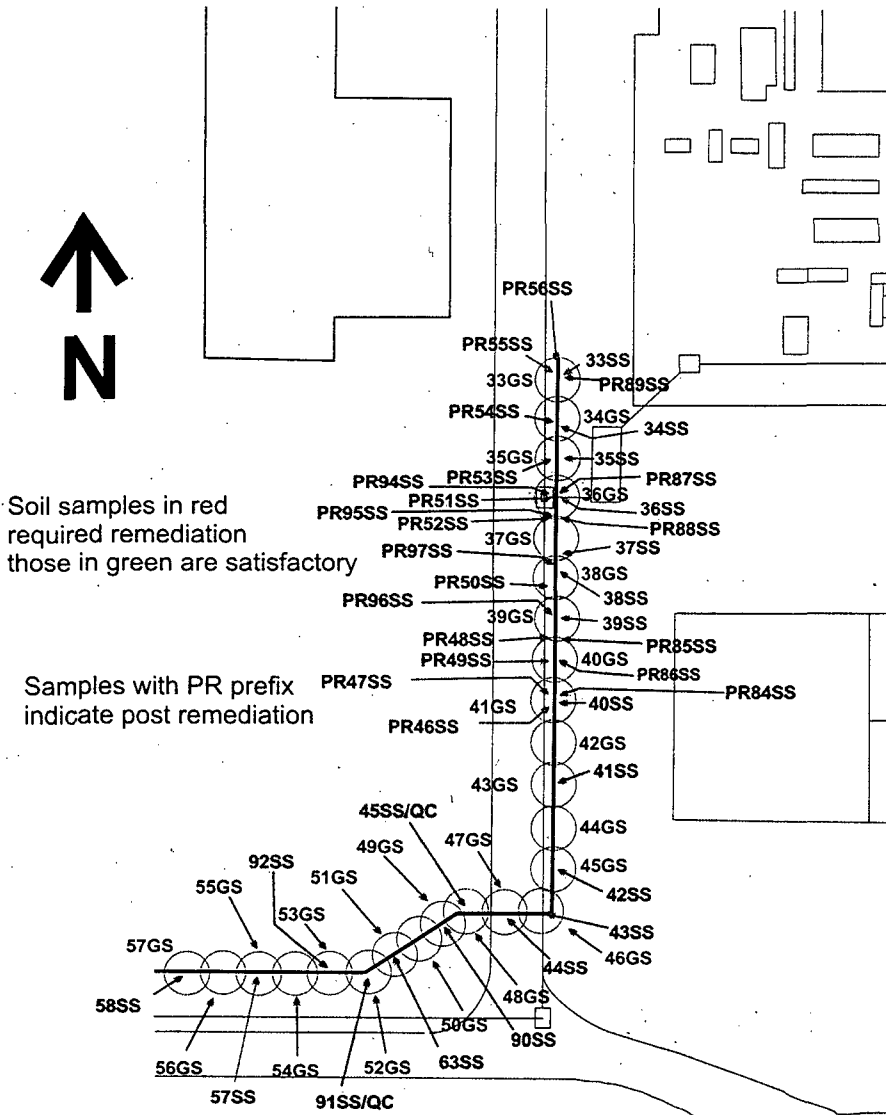
**March 31, 2008**

**Survey Unit F8991091**





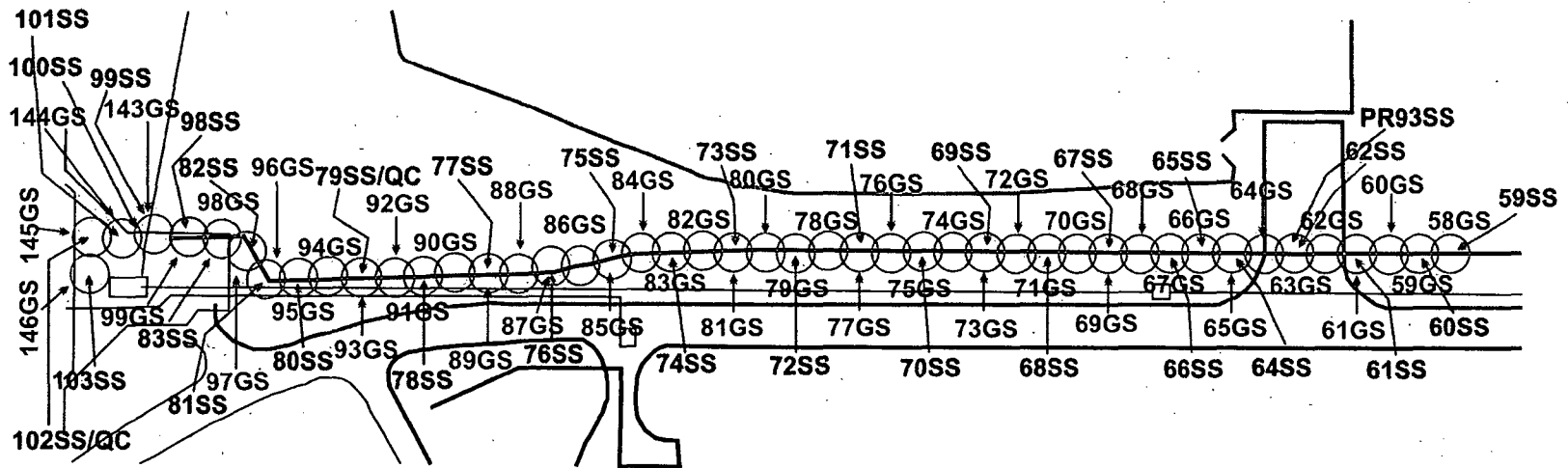
# RHUT Trench North Soil Sample



F8991091 - M3

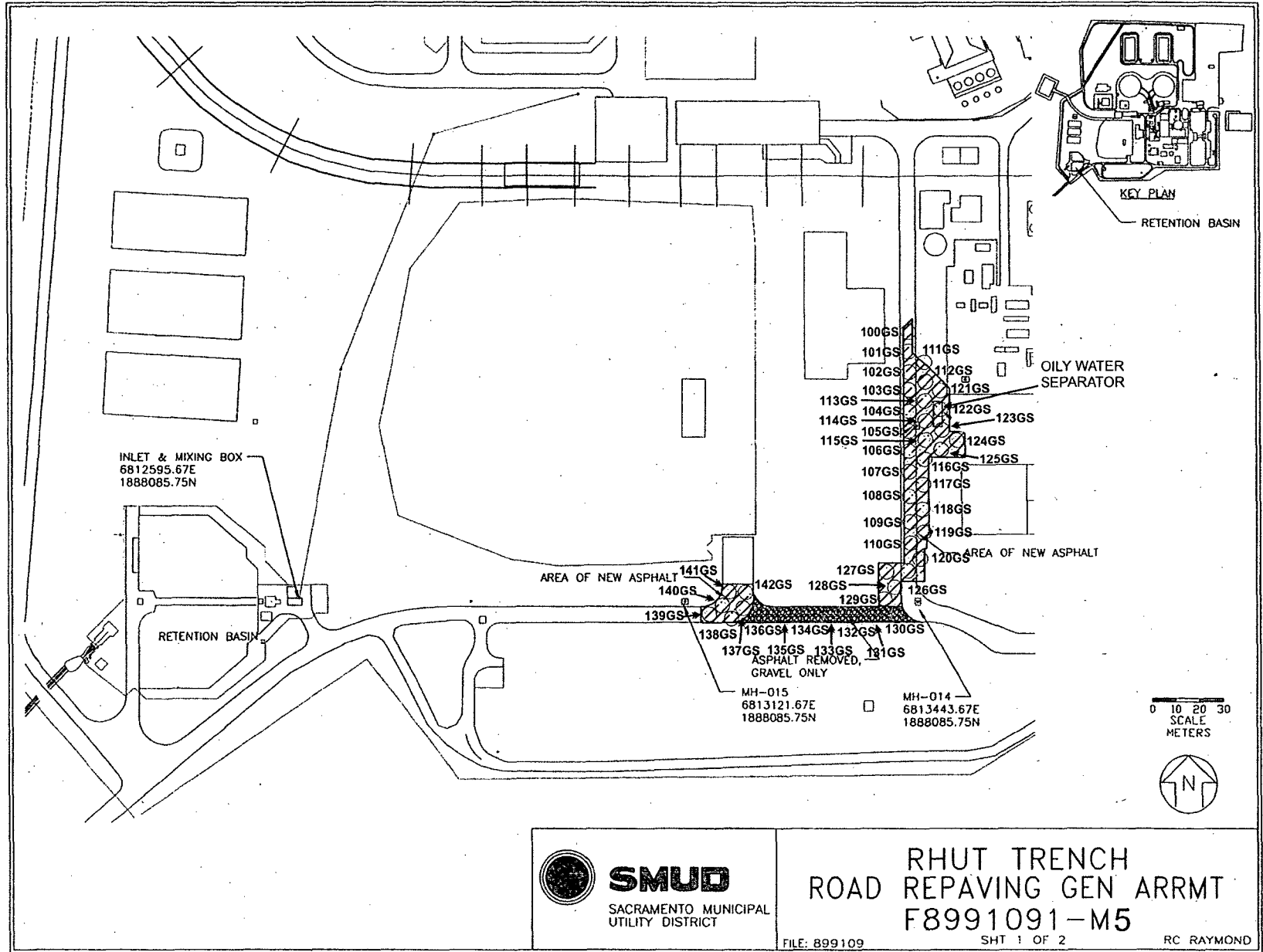


# RHUT Trench West Trench Scans



Retention Basin

F8991091 -M4



**SMUD**  
SACRAMENTO MUNICIPAL  
UTILITY DISTRICT

**RHUT TRENCH  
ROAD REPAVING GEN ARRMT  
F8991091-M5**

FILE: 899109 SHT 1 OF 2 RC RAYMOND

**Attachment 2**

**Instrumentation**

**March 31, 2008**

**Survey Unit F8991091**



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

<b>Instrument</b>	<b>Detector Model No.</b>	<b>Detector Serial No.</b>	<b>MDC</b>
HPGe	N/A	05047773	Soil – 0.059 pCi/g Cs-137
HPGe	N/A	05069128	Soil – 0.389 pCi/g Cs-137
ISOCS	N/A	2983947	Soil – 0.296 pCi/g Cs-137 Soil – 0.226 pCi/g Co-60 Asphalt – 0.314 pCi/g Cs-137
M2350-1	44-10	171995	Scan 5.2 pCi/g Cs-137

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

<b>Instrument</b>	<b>Parameter</b>	<b>Value</b>
ISOCS	Investigation Criteria - Scan	Soil – 26.3 pCi/g Cs-137 Soil – 6.3 pCi/g Co-60 Asphalt – 26.3 pCi/g Cs-137
NaI	Investigation Criteria – Scan	9280 cpm
All	DCGL <sub>W</sub>	52.6 Cs-137 12.6 Co-60
All	DCGL <sub>EMC</sub>	N/A

**Attachment 3**

**Investigation**

**March 31, 2008**

**Survey Unit F8991091**

**(none required)**

**Attachment 4**

**Data Assessment**

**March 31, 2008**

**Survey Unit F8991091**

