

**Rancho Seco**  
**Final Status Survey Summary Report**  
**March 27, 2008**  
**Main Circ Water Piping System**  
**Survey Unit F8990291**

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## FINAL STATUS SURVEY SUMMARY REPORT

### Survey Unit:

F8990291, Main Circ Water Piping System

### Survey Unit Description:

Operating History: This system transported clean water through the condenser and to the cooling towers in order to remove the latent heat of condensation. This system was known to be clean. Operating records and the HSA document one occurrence of radioactive contamination associated with this system piping.

Site Characterization: Direct measurements of the interior showed a mean gross activity level of 475 dpm/100 cm<sup>2</sup> and a maximum value of 614 dpm/100 cm<sup>2</sup>. Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the system was determined to be a Class 3 system.

HSA Events: PDQ-900085

### 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. The 90" I.D pipe constituted a confined space hazard to personnel so in situ gamma spectroscopy was used to preclude personnel entry into the pipe. An in situ measurement was obtained in each of four segments of the 90" diameter piping and 175 m<sup>2</sup> were surveyed for approximately 4% coverage. 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>	F899	Main Circ Water Piping System
<b>Survey Unit:</b>	0291	Piping
<b>Class:</b>	3	LTP Table 5-4
<b>SU Area (m<sup>2</sup>):</b>	4515	
<b>Evaluator:</b>	Erin L. Brown	
<b>DCGL (dpm/100 cm<sup>2</sup>):</b>	100000	Gross Activity DCGL
<b>Area Factor:</b>	N/A	Class 3
<b>Design DCGL<sub>emc</sub> (dpm/100 cm<sup>2</sup>):</b>	N/A	Class 3
<b>LBGR (dpm/100 cm<sup>2</sup>):</b>	50000	Default = 50% DCGL
<b>Design Sigma (dpm/100 cm<sup>2</sup>):</b>	99	
<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>	N/A	Class 3
<b>Scan Area (m<sup>2</sup>):</b>	175	
<b>Scan Coverage (%):</b>	4%	Class 3
<b>Z<sub>1-α</sub>:</b>	1.645	
<b>Z<sub>1-β</sub>:</b>	1.645	
<b>Sign P:</b>	0.99865	
<b>Calculated Relative Shift:</b>	505	
<b>Relative Shift Used:</b>	3	Uses 3.0 if Relative Shift is >3
<b>N-Value:</b>	11	
<b>Design N-Value + 20%:</b>	14	NUREG-1575 Table 5-5
<b>Design Min Samples N:</b>	14	Class 3
<b>Grid Spacing L:</b>	N/A	Class 3

### Survey Results:

A total of 4 measurements were made in F8990291 which covered 100% of the accessible pipe surface. 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 measurements indicated areas of elevated activity. Scan activity ranged from 148 to 216 dpm/100 cm<sup>2</sup>, based on the pipe detector efficiency.

**Table 2. Direct Measurement Results**

<b>Measurement ID</b>	<b>Gross Activity (dpm/100 cm<sup>2</sup>)</b>
F8990291-M0005GS	148
F8990291-M0006GS	165
F8990291-M0007GS	154
F8990291-M0008GS	216
<b>Mean:</b>	171
<b>Median:</b>	160
<b>Standard Deviation:</b>	31
<b>Range:</b>	148 - 216

**Survey Unit Data Assessment:**

The standard survey design would have required 14 direct measurements for the Sign Test. However, 4 measurements covering 100 percent of the accessible pipe surface were made instead. 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>	4		
<b>Median</b> (dpm/100 cm <sup>2</sup> ):	160		
<b>Mean</b> (dpm/100 cm <sup>2</sup> ):	171		
<b>Direct Measurement Standard Deviation</b> (dpm/100 cm <sup>2</sup> ):	31		
<b>Total Standard Deviation</b> (dpm/100 cm <sup>2</sup> ):	31		Based on samples and backgrounds.
<b>Maximum</b> (dpm/100 cm <sup>2</sup> ):	216		Background Subtract Not Applied
<b>Material Type:</b>	N/A		
<b>Sign Test Final N Value:</b>	4		
<b>S+ Value:</b>	4		
<b>Critical Value:</b>	4		
<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>mc</sub>:</b>	N/A	Class 3	
<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:**

No investigations were required 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 (i.e. the survey unit average activity 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 3 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. No potential areas of elevated activity were detected.

### **Conclusion:**

The FSS of this survey unit was properly designed as a Class 3 survey based on Table 5-4 of the LTP. The required number of direct measurements was made and the coverage met the requirement of Table 5-6 of the LTP. No direct measurements exceeded the DCGL of 100000 dpm/100 cm<sup>2</sup> or the grout limit of 21000dpm/100cm<sup>2</sup>. 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 F8990291 meets the release criteria of 10CFR20.1402.

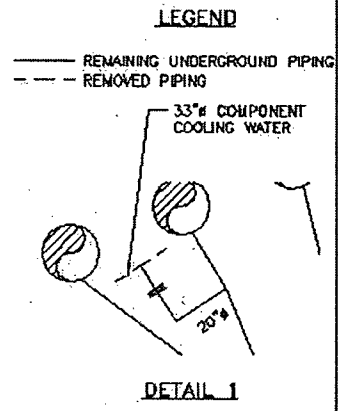
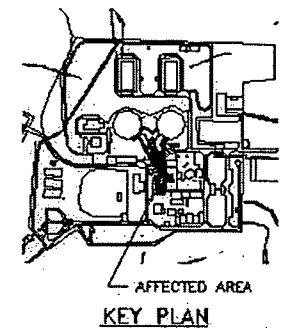
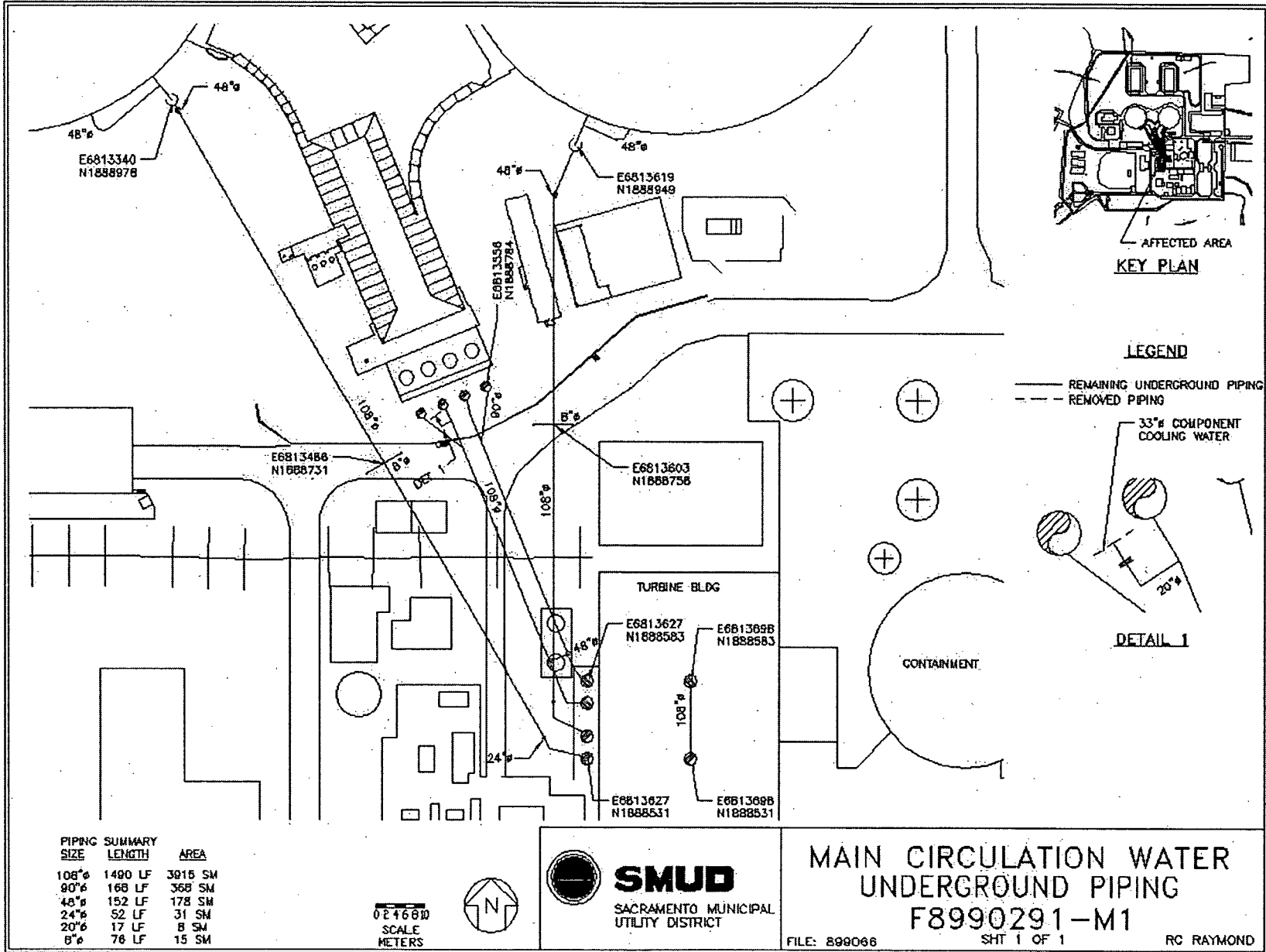
**Attachment 1**

**Maps**

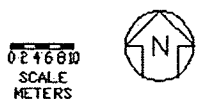
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PIPE SIZE	SUMMARY LENGTH	AREA
108"	1490 LF	3915 SM
90"	160 LF	365 SM
48"	152 LF	178 SM
24"	52 LF	31 SM
20"	17 LF	8 SM
8"	76 LF	15 SM



**SMUD**  
SACRAMENTO MUNICIPAL  
UTILITY DISTRICT

**MAIN CIRCULATION WATER  
UNDERGROUND PIPING**  
F8990291-M1

FILE: 899066 SHT 1 OF 1 RC RAYMOND

**Attachment 2**

**Instrumentation**

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**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; ISOCS	HPGe; 1983920	103 (Co <sup>60</sup> )	N/A
M2350; ISOCS	HPGe; 1983920	113 (Cs <sup>137</sup> )	N/A

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

<b>Parameter</b>	<b>Value (dpm/100 cm<sup>2</sup>)</b>
Investigation Criteria - Direct	50000
Investigation Criteria - Scan	N/A
DCGL <sub>W</sub>	100000
DCGL <sub>EMC</sub>	N/A

**Attachment 3**

**Investigation**

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**(none required)**

**Attachment 4**

**Data Assessment**

**March 27, 2008**

**Survey Unit F8990291**

