Rancho Seco

Final Status Survey Summary Report

September 29, 2008

Railway External to the IA

Survey Unit F8340021

Prepared By: Dan A. Tallman _____ Date: September 29, 2008

FSS Engineer

Reviewed By: _____ Date: 11/17/08

Lead FSS Engineer

Approved By: _____ Date: 3-3-09

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8340021, Railway External to the IA

Survey Unit Description:

Operating History: The rail spur passes through two sections of the Non-Impacted portion of the site before entering the Industrial Area. 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 and no documented, operational surveys showing evidence of contamination along the rail spur external to the Industrial Area.

Site Characterization: Soil samples were collected along the rail line and analyzed by gamma spectroscopy on site. The mean value was 0.073 pCi/g Cs-137 and the maximum was 0.114 pCi/g. Based on classification procedure (DSIP-0020) and the characterization survey data, the rail spur was classified as Class 3.

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 randomly determined and 728 m^2 were scanned for approximately 12% coverage. Gamma Direct measurements were taken at each direct measurement location and analyzed with ISOCS / GAA. 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:	F834	Railway External to the IA
Survey Unit:	0021	Open Land Area
Class:	3	LTP Table 5-4
SU Area (m^2)**:**	5990	
Evaluator:	D.A.Tallman	
DCGL Cs137 surrogate (pCi/g)**:**	51.2	
Area Factor:	N/A	Class 3
Design DCGLemc (pCi/g)**:**	N/A	Class 3
LBGR (pCi/g)**:**	51.1	Adjusted
Design Sigma (pCi/g)**:**	0.018	DTBD-06-001, Table 5-4B
Type I Error:	0.05	
Type II Error:	0.05	
Nuclide:	Cs137	
Sample Area (m^2)**:**	N/A	Class 3
Total Area Scanned (m^2)**:**	728	
Scan Coverage (%):	12.2%	Class 3
$Z_{1-\alpha}$ **:**	1.645	
$Z_{1-\beta}$ **:**	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	5.5	
Relative Shift Used:	3	Uses 3.0 if Rel Shift >3
N-Value:	11	
Design N-Value + 20%:	14	NUREG-1575 Table 5-5
Grid Spacing L:	N/A	Class 3

Survey Results:

A total of 16 direct measurements were made in F8340021. The results including mean, median, standard deviation and range are shown in Table 2. All of the direct measurements were less than the DCGL. None of the scan measurements indicated areas of elevated activity with observed activity below the MDA (0.225 pCi/g Co60, 0.299 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
Mean:		8.47E-01	
Median:		8.55E-01	
Standard Deviation:		7.66E-02	
Range:	6.11E-01 to 9.19E-01		
F8340021 R0001GD	9.09E-01	< 9.09E-01	
F8340021 R0002GD	8.82E-01	< 8.82E-01	
F8340021 R0003GD	9.19E-01	< 9.19E-01	
F8340021 R0004GD	9.17E-01	< 9.17E-01	
F8340021 R0005GD	9.09E-01	< 9.09E-01	
F8340021 R0006GD	6.11E-01	< 6.11E-01	
F8340021 R0007GD	8.28E-01	< 8.28E-01	
F8340021 R0008GD	8.88E-01	< 8.88E-01	
F8340021 R0009GD	8.72E-01	< 8.72E-01	
F8340021 R0010GD	9.04E-01	< 9.04E-01	
F8340021 R0011GD	8.24E-01	< 8.24E-01	
F8340021 R0012GD	8.28E-01	< 8.28E-01	
F8340021 R0013GD	8.38E-01	< 8.38E-01	
F8340021 R0014GD	8.25E-01	< 8.25E-01	
F8340021 R0015GD	8.23E-01	< 8.23E-01	
F8340021 R0016GD	7.73E-01	< 7.73E-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 greater than the design standard deviation however, both values result in a relative shift greater then 3.0 so no additional samples were required.

Table 3. Data Assessment Results

Survey Results Parameter	Value	Comment
Actual Direct Measurements (N):	16	
Median (pCi/g)**:**	8.55E-01	
Mean (pCi/g)**:**	8.47E-01	
Standard Deviation (pCi/g)**:**	7.66E-02	
Maximum (pCi/g)**:**	9.19E-01	
Sign Test Final N Value:	16	
S+ Value:	16	
Critical Value:	11	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGLemc:	N/A	Class 3
Standard Deviation <= Sigma:	Investigate	Both values result in relative shifts greater than three therefore, no additional sample measurements necessary.
Pass the Sign Test?	Yes	
Reject the Null Hypothesis?	Yes	
The survey unit passes all conditions?	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 (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 3 land survey and the sample results are consistent with that classification. The variability of the survey results was greater than the characterization data used for survey design. Both values result in a relative shift greater than three, therefore no additional sample are required. 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 scan coverage met the requirement of Table 5-6 of the LTP. All of the direct measurements were less than 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.

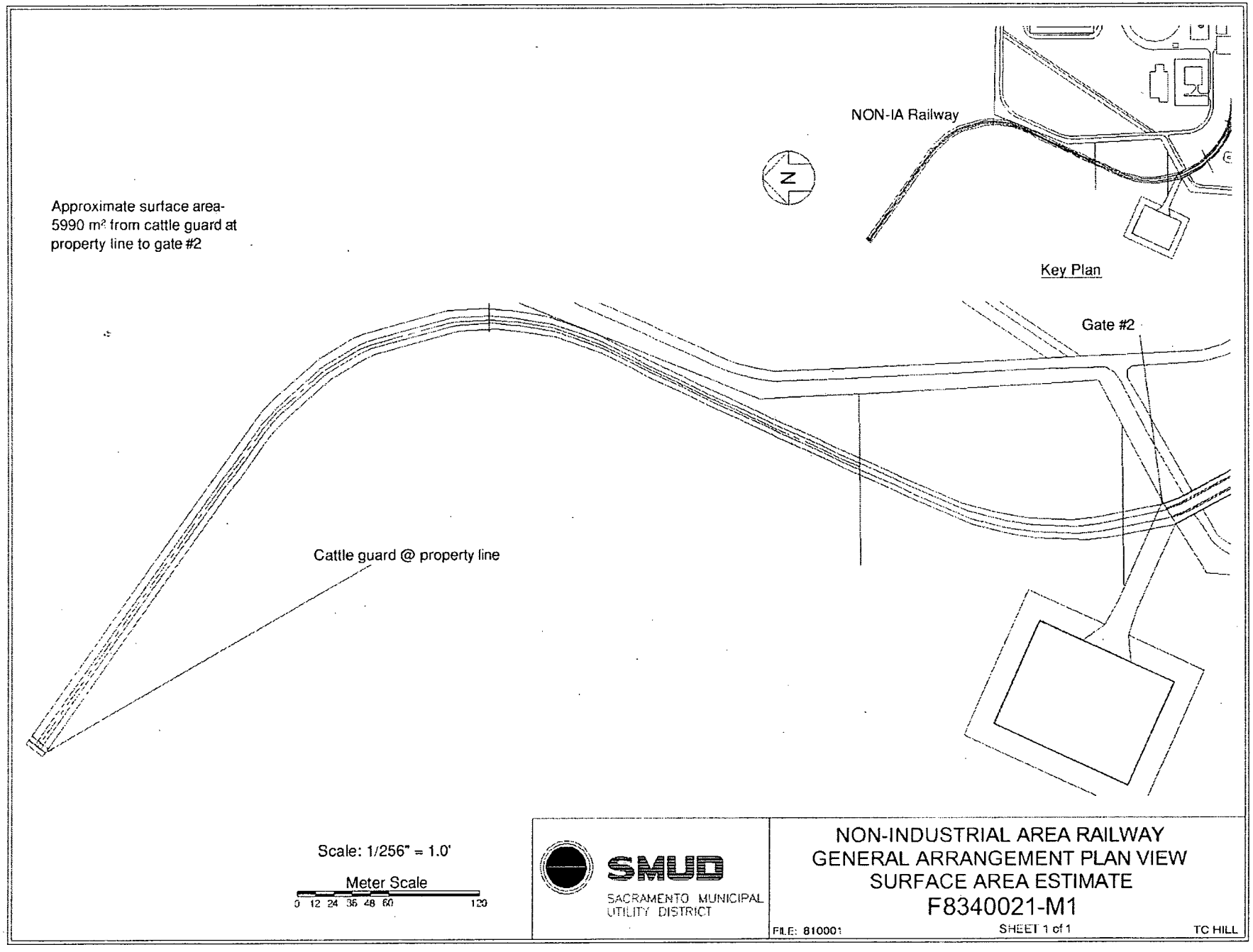
It is concluded that survey unit F8340021 meets the release criteria of 10CFR20.1402.

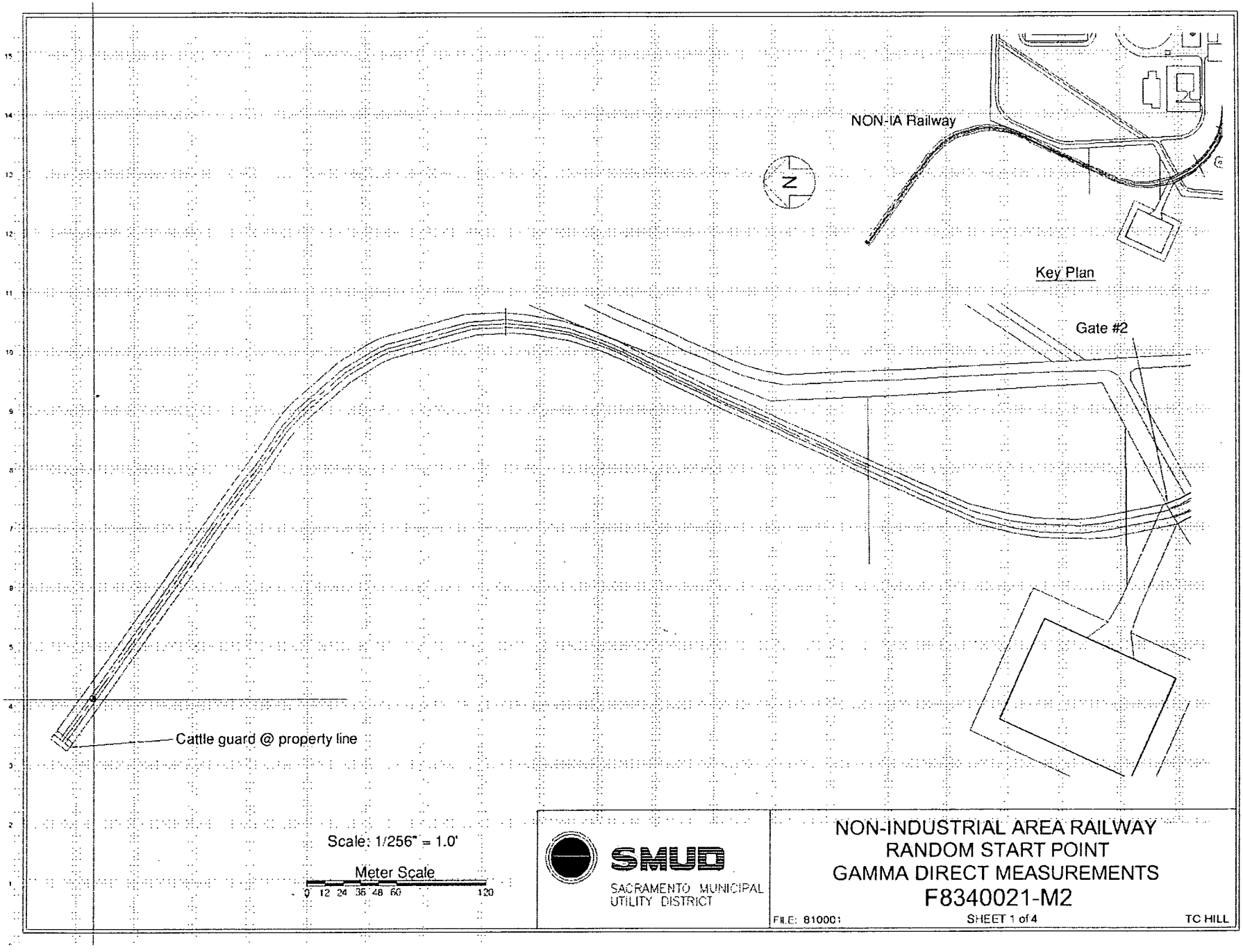
Attachment 1

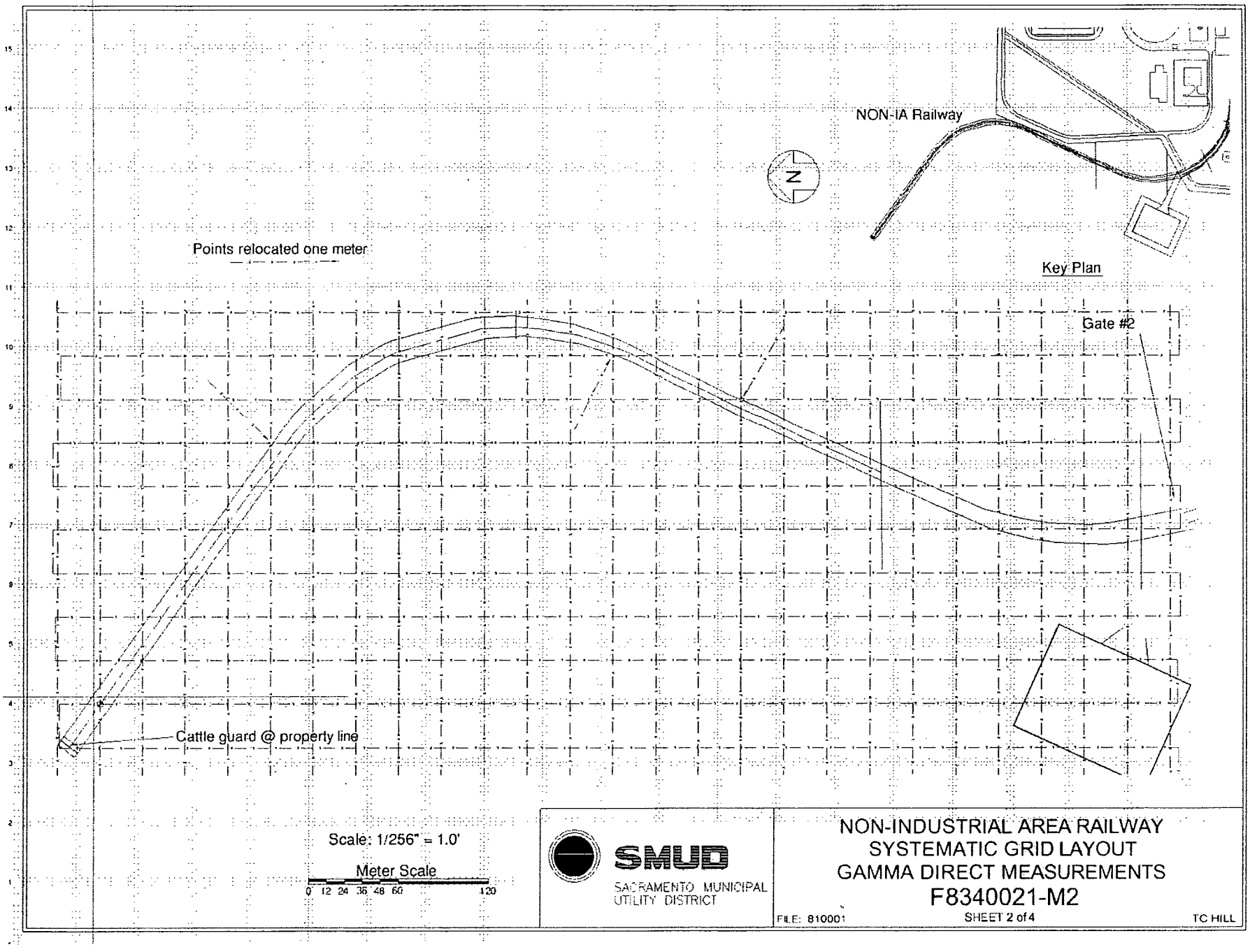
Maps

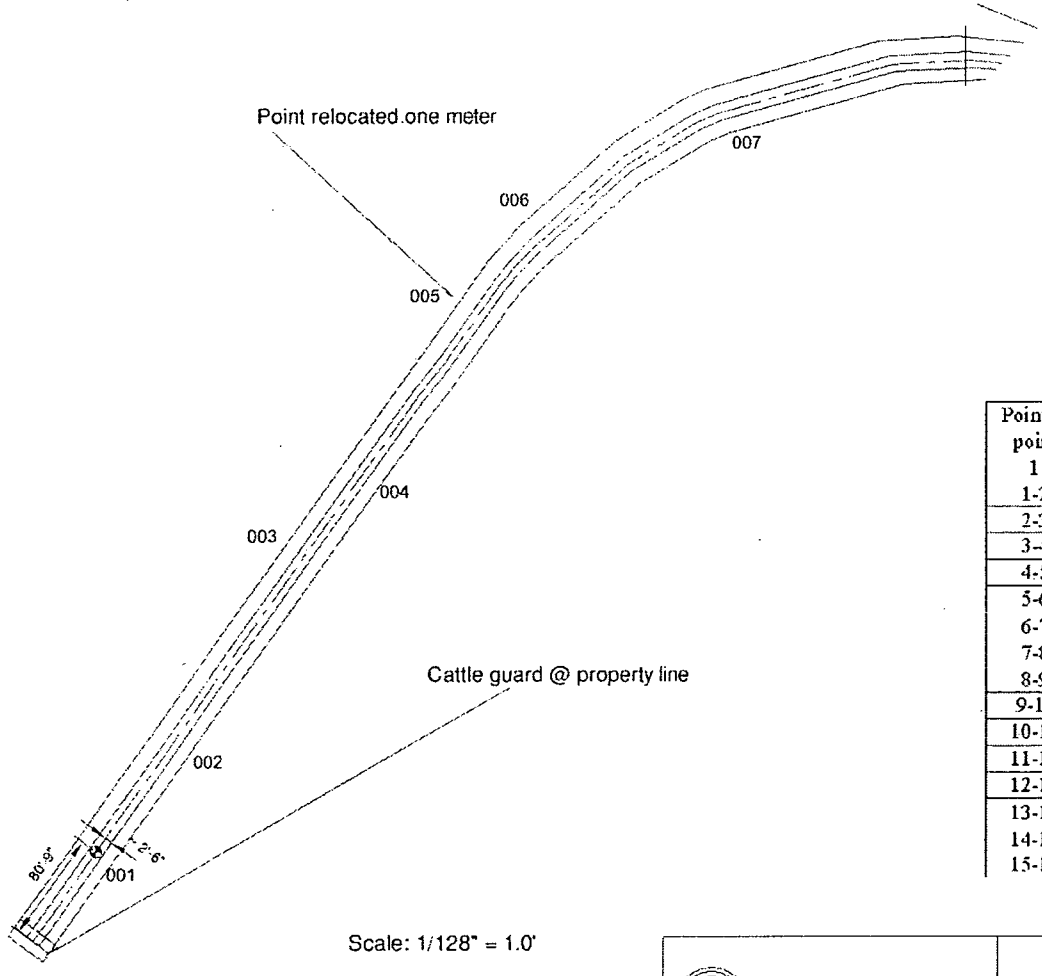
September 29, 2008

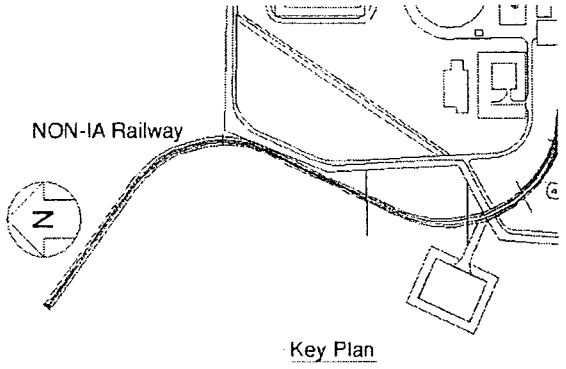
Survey Unit F8340021


NON-IA Railway
N
Approximate surface area-
5990 m² from cattle guard at
property line to gate #2
Key Plan
Gate #2
Cattle guard @ property line
Scale: 1/256" = 1.0'
Meter Scale
0 12 24 36 48 60 120
SMUD
SACRAMENTO MUNICIPAL
UTILITY DISTRICT
NON-INDUSTRIAL AREA RAILWAY
GENERAL ARRANGEMENT PLAN VIEW
SURFACE AREA ESTIMATE
F8340021-M1
FILE: 810001
SHEET 1 of 1
TC HILL


NON-IA Railway
N
Key Plan
Gate #2
Cattle guard @ property line
Scale: 1/256" = 1.0'
Meter Scale
0 12 24 36 48 60 120
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
NON-INDUSTRIAL AREA RAILWAY
RANDOM START POINT
GAMMA DIRECT MEASUREMENTS
F8340021-M2
FILE: 810001
SHEET 1 of 4
TC HILL


NON-IA Railway
N
Points relocated one meter
Key Plan
Gate #2
Cattle guard @ property line
Scale: 1/256" = 1.0'
Meter Scale
0 12 24 36 48 60 120
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
NON-INDUSTRIAL AREA RAILWAY
SYSTEMATIC GRID LAYOUT
GAMMA DIRECT MEASUREMENTS
F8340021-M2
FILE: 810001
SHEET 2 of 4
TC HILL





Point to point	North-South	East-West
1	See map M2.3	
1-2	64' S	64' E
2-3	64' S	128' E
3-4	64' S	64' E
4-5	64' S	128' E
5-6	64' S	64' E
6-7	128' S	64' E
7-8	320' S	0'
8-9	192' S	64' W
9-10	128' S	64' W
10-11	128' S	64' W
11-12	128' S	64' W
12-13	64' S	0'
13-14	64' S	0'
14-15	64' S	0'
15-16	64' S	0'

Scale: 1/128" = 1.0'

Meter Scale

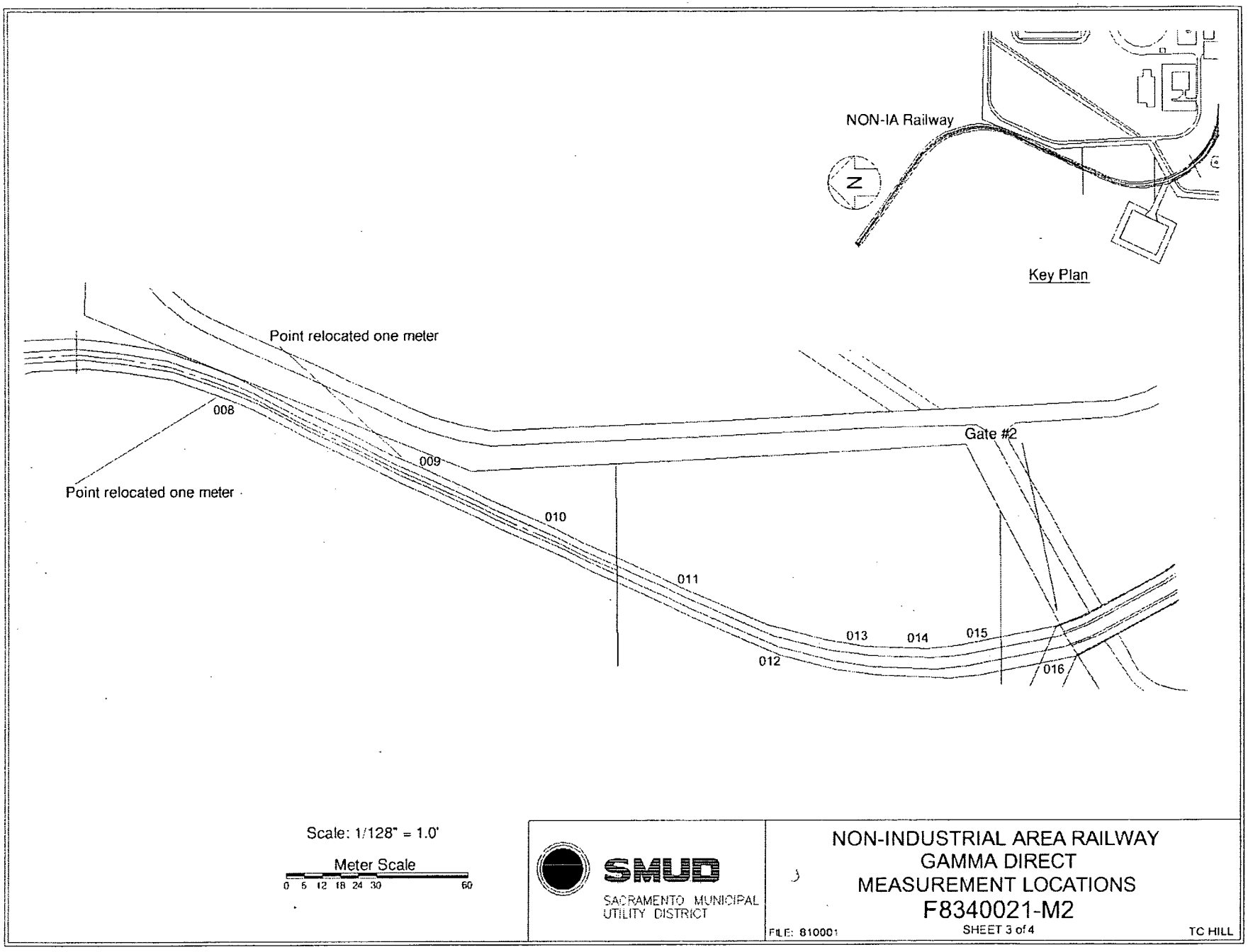
0 6 12 15 24 30 60

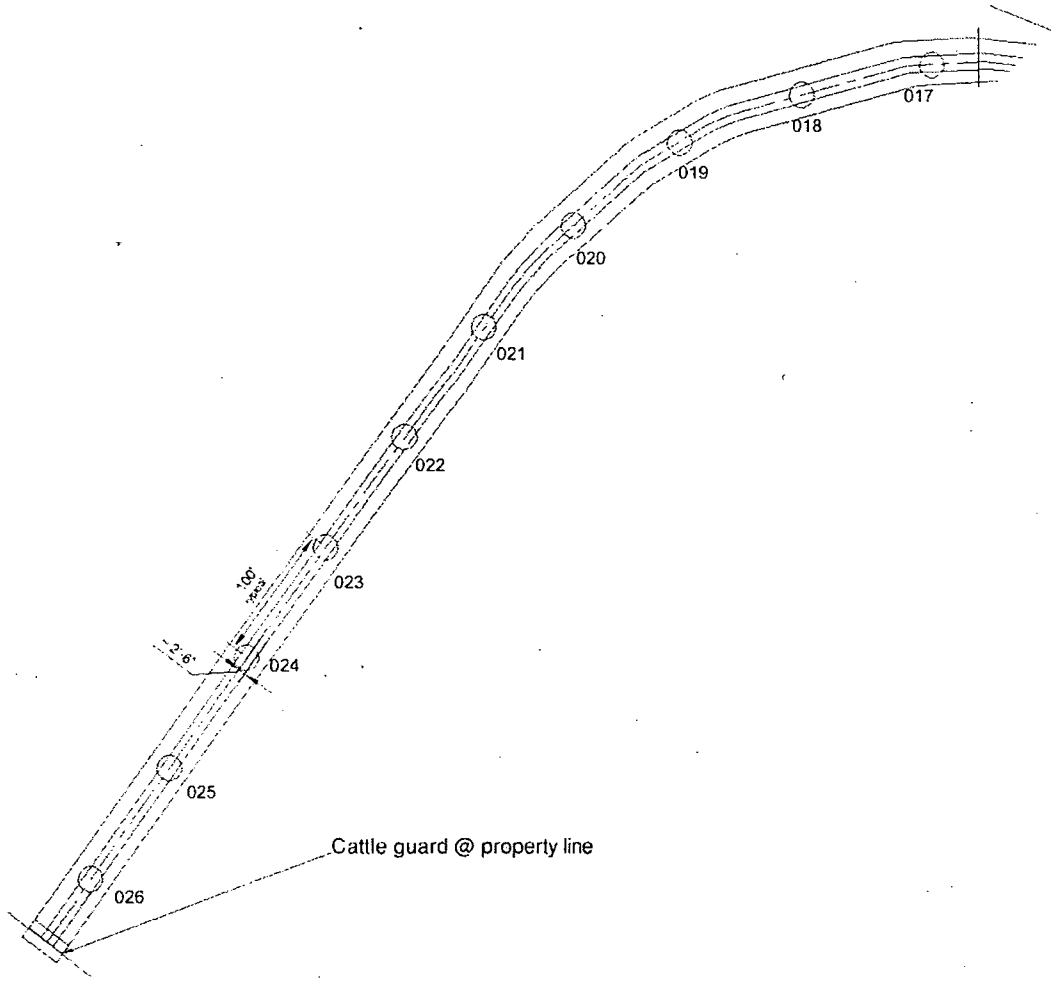
SMUD

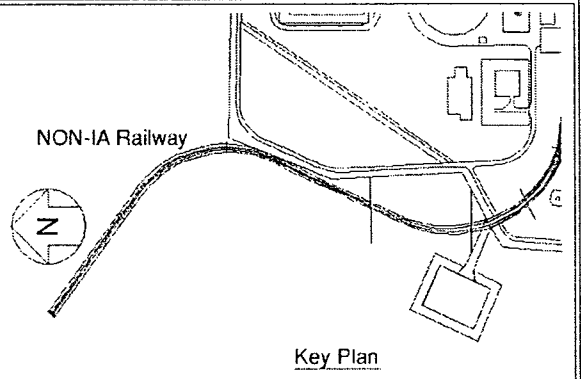
SACRAMENTO MUNICIPAL UTILITY DISTRICT

NON-INDUSTRIAL AREA RAILWAY
GAMMA DIRECT
MEASUREMENT LOCATIONS
F8340021-M2

FILE: 810001 SHEET 3 of 4 TC HILL


NON-IA Railway
N
Key Plan
Point relocated one meter
008
009
Point relocated one meter
010
011
012
013
014
015
016
Gate #2
Scale: 1/128" = 1.0'
Meter Scale
0 5 12 18 24 30 60
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
NON-INDUSTRIAL AREA RAILWAY
GAMMA DIRECT
MEASUREMENT LOCATIONS
F8340021-M2
FILE: 81000:
SHEET 3 of 4
TC HILL





Gamma Scan locations 17-26 will be located at 100' intervals - all scan locations will be centered between the rails.

Scale: 1/128" = 1.0'

Meter Scale

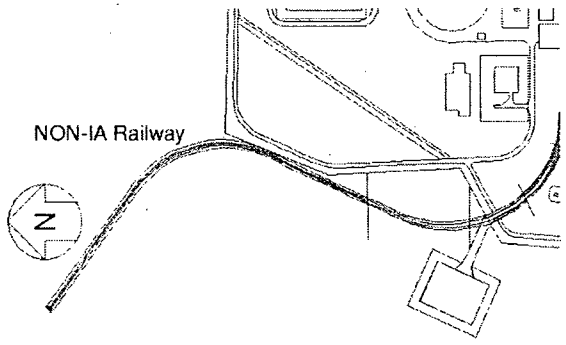
0 6 12 15 24 30 60

SMUD

SACRAMENTO MUNICIPAL UTILITY DISTRICT

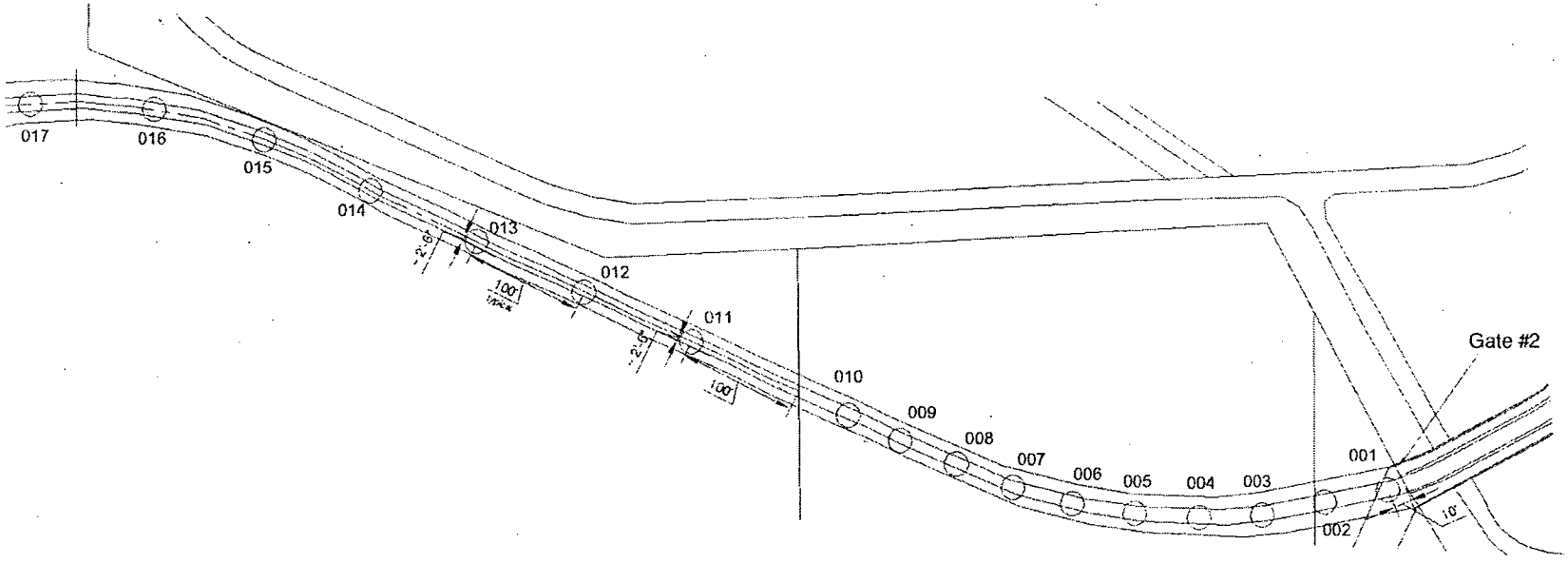
NON-INDUSTRIAL AREA RAILWAY
ISOCS GAMMA SCAN
MEASUREMENT LOCATIONS
F8340021-M3

FILE: 810001 SHEET 1 of 2 TC HILL



Key Plan

Gamma Scan locations 1-10 will be located at 50' intervals - scans 11-17 will be located at 100' intervals - all scan locations will be centered between the rails.



Scale: 1/128" = 1.0'

Meter Scale

0 5 12 18 24 30 60

SMUD

SACRAMENTO MUNICIPAL UTILITY DISTRICT

NON-INDUSTRIAL AREA RAILWAY
ISOCS GAMMA SCAN
MEASUREMENT LOCATIONS
F8340021-M3

FILE: 810001 SHEET 2 of 2 TC HILL

Attachment 2

Instrumentation

September 29, 2008

Survey Unit F8340021

Table 2-1. Survey Unit Instrumentation

Instrument	Detector Model No.	Detector Serial No.	MDC
Inspector	N/A	08051294	Soil – 0.919 pCi/g Cs-137 Soil – 0.919 pCi/g Co-60
ISOCS	N/A	1983920	Soil – 0.299 pCi/g Cs-137 Soil – 0.225 pCi/g Co-60

Table 2-2. Investigation Criteria and DCGL

Instrument	Parameter	Value
ISOCS	Investigation Criteria - Scan	Soil – 20 pCi/g Cs-137 Soil – 5 pCi/g Co-60
Inspector	Investigation Criteria - Direct	Soil – 51.2 pCi/g $Cs\text{-}137_{(surr.)}$
All	$DCGL_W$	51.2 Cs-137 12.6 Co-60
All	$DCGL_{EMC}$	N/A

Attachment 3

Investigation

September 29, 2008

Survey Unit F8340021

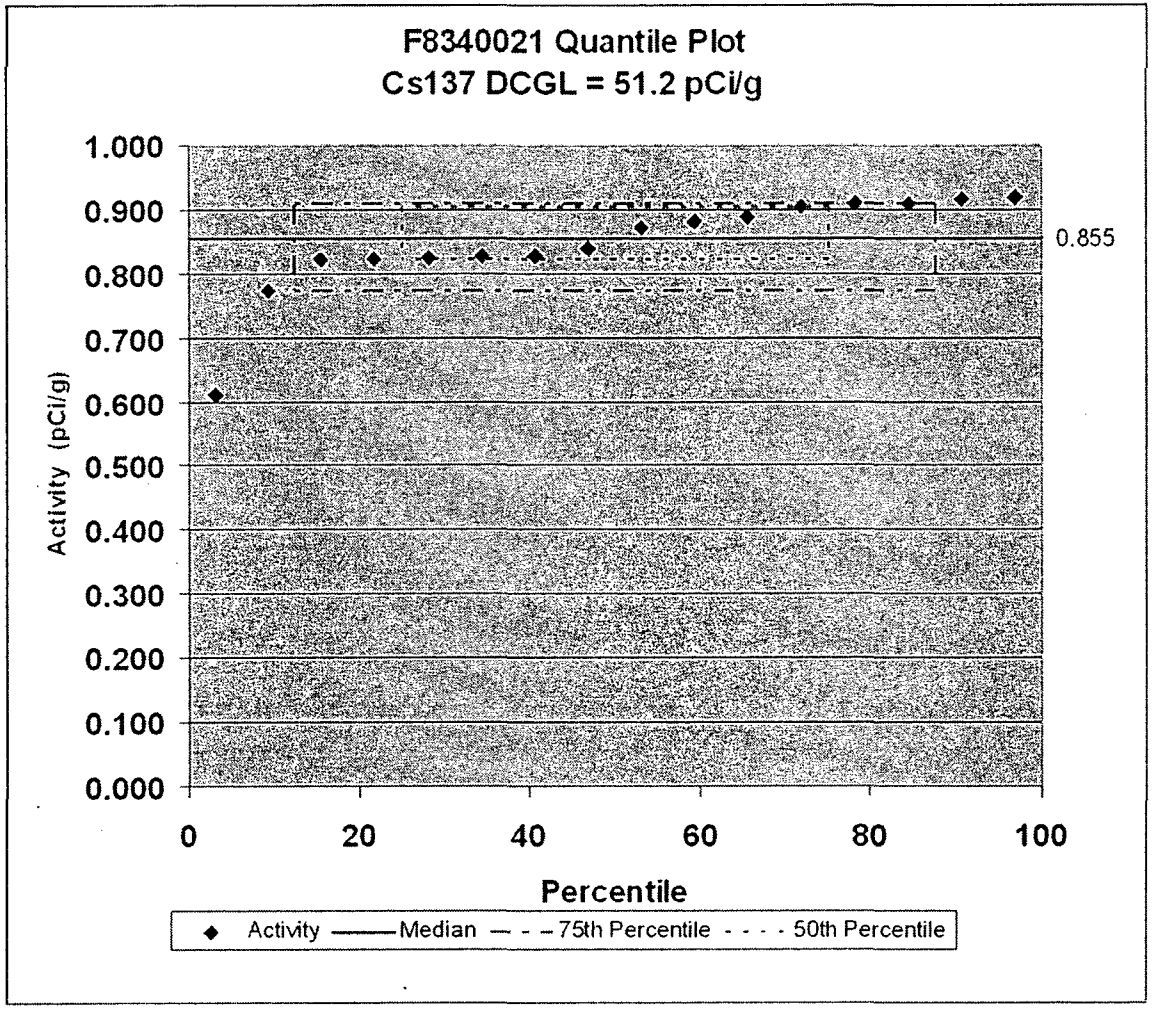
(none required)

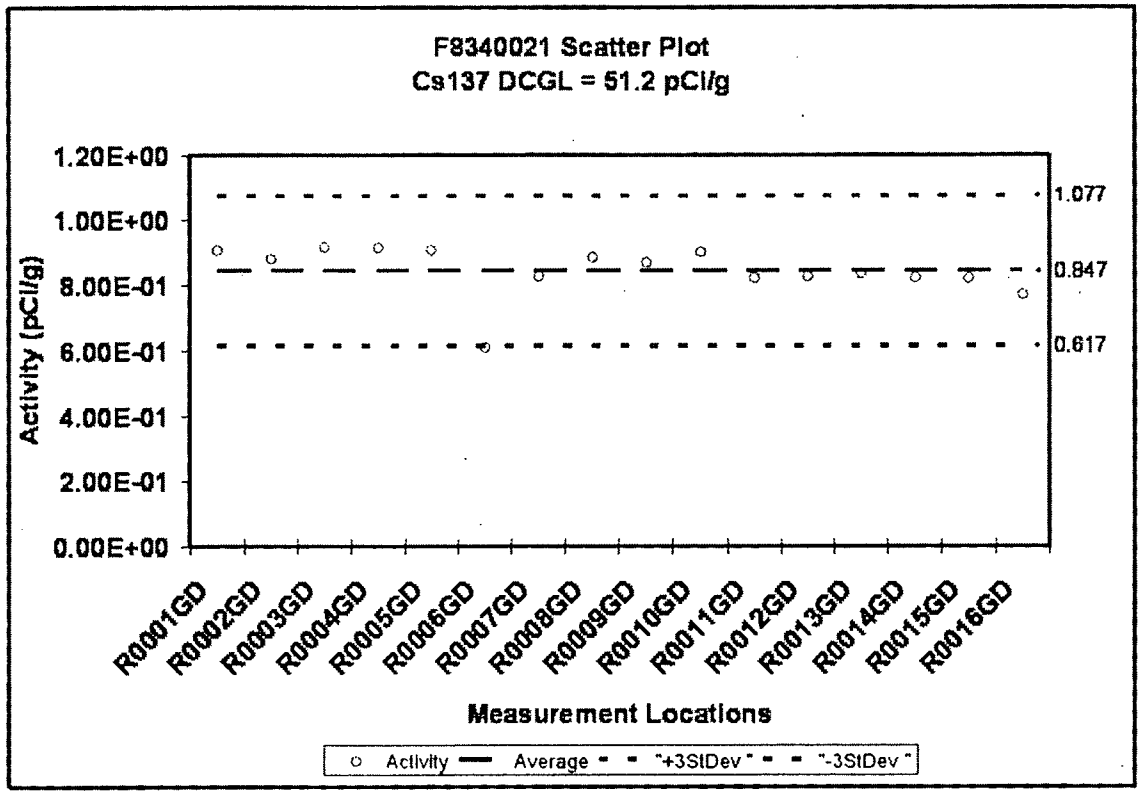
Attachment 4

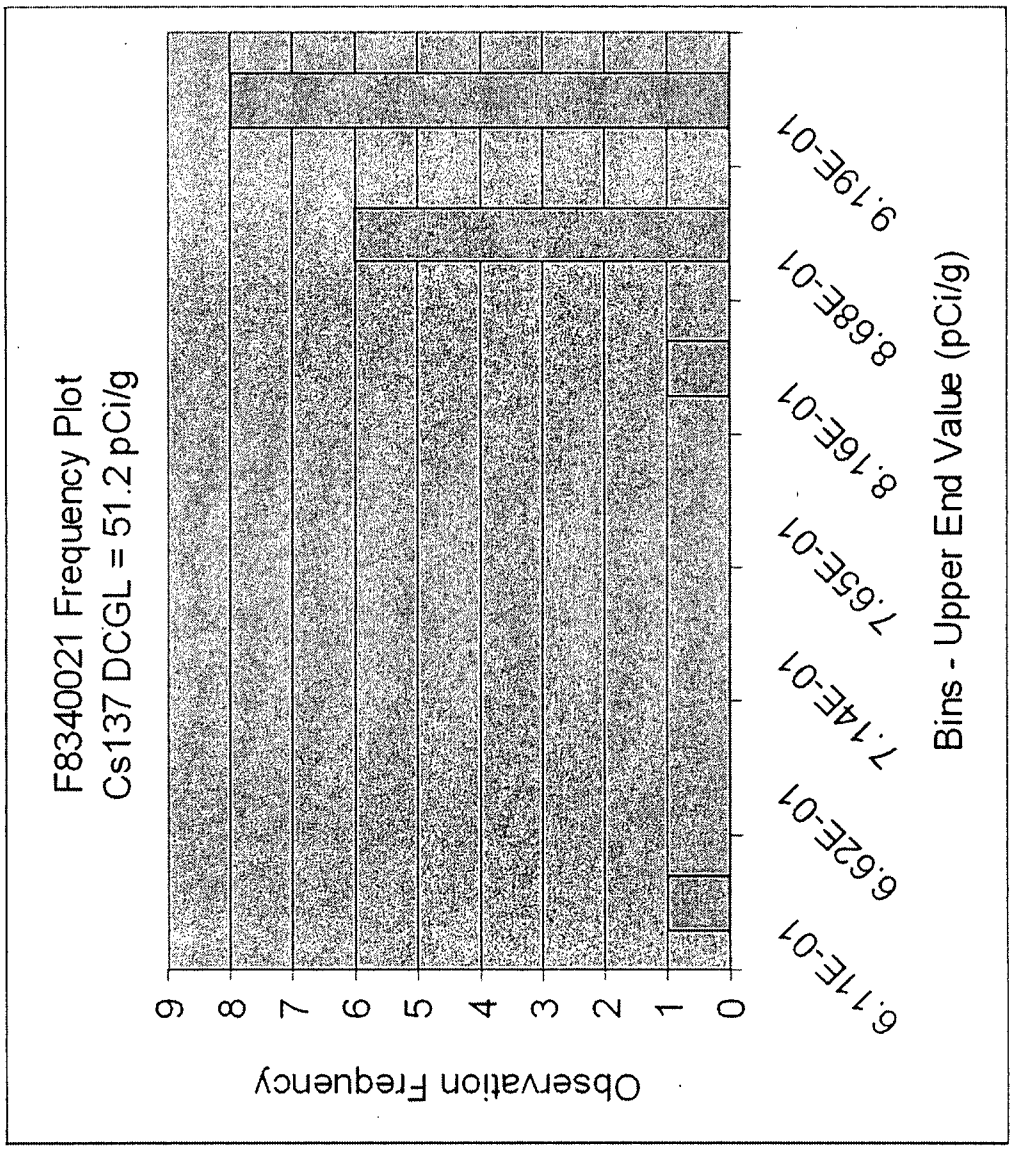
Data Assessment

September 29, 2008

Survey Unit F8340021


F8340021 Quantile Plot
Cs137 DCGL = 51.2 pCi/g
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Activity (pCi/g)
0.855
0
20
40
60
80
100
Percentile
Activity
Median
75th Percentile
50th Percentile


F8340021 Scatter Plot
Cs137 DCGL = 51.2 pCi/g
1.20E+00
1.00E+00
8.00E-01
6.00E-01
4.00E-01
2.00E-01
0.00E+00
Activity (pCi/g)
1.077
0.847
0.617
R0001GD
R0002GD
R0003GD
R0004GD
R0005GD
R0006GD
R0007GD
R0008GD
R0009GD
R0010GD
R0011GD
R0012GD
R0013GD
R0014GD
R0015GD
R0016GD
Measurement Locations
Activity
Average
"+3StDev"
"-3StDev"


F8340021 Frequency Plot
Cs137 DCGL = 51.2 pCi/g
Observation Frequency
0
1
2
3
4
5
6
7
8
9
6.17E-01
6.62E-01
7.14E-01
7.65E-01
8.16E-01
8.68E-01
9.19E-01
Bins - Upper End Value (pCi/g)