Rancho Seco

Final Status Survey Summary Report

March 10, 2008

Nitrogen Gas System Piping

Survey Unit F8990321

Prepared By: Erin L. Brown Date: 3/11/08

FSS Engineer

Reviewed By: _____ Date: 3/11/08

Lead FSS Engineer

Approved By: _____ Date: 4-8-08

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8990321, Nitrogen Gas System Piping

Survey Unit Description:

Operating History: This system distributed nitrogen gas to various primary tanks and systems to maintain an inert cover gas. This system was designed to be clean but had become contaminated by operational events that contaminated the piping. Operating records and the HSA document several 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 radioactivity above background levels. Direct measurements of the interior showed a mean gross activity level of 19,096 dpm/100 cm^2 and a maximum value of 33,208 dpm/100 cm^2. Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the system was determined to be a Class 2 system.

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 spaced at 15cm and 2.6 m^2 were scanned for approximately 11% 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

Survey Design Parameter	Value	Comment
Survey Area:	F899	Nitrogen Gas System Piping
Survey Unit:	0321	Structure Surface
Class:	2	LTP Table 5-4
SU Area (m^2)**:**	24.7	
Evaluator:	Erin L. Brown	
DCGL (dpm/100 cm^2)**:**	100000	Gross Activity DCGL
Area Factor:	N/A	Class 2
Design DCGLemc (dpm/100 cm^2)**:**	N/A	Class 2
LBGR (dpm/100 cm^2)**:**	50000	Default = 50% DCGL
Design Sigma (dpm/100 cm^2)**:**	9677	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m^2)**:**	N/A	Class 2
Scan Area (m^2)**:**	2.6	
Scan Coverage (%):	11%	Class 2
$Z_{1-\alpha}$ **:**	1.645	
$Z_{1-\beta}$ **:**	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	5.2	
Relative Shift Used:	3	Uses 3.0 if Relative Shift is >3
N-Value:	11	
Design N-Value + 20%:	14	NUREG-1575 Table 5-5
Design Min Samples N:	14	Class 2
Grid Spacing L:	N/A	Class 2

Survey Results:

A total of 109 direct measurements were made in F8990321. 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. Measurements ranged from 2384 to 4376 dpm/100 cm², based on the pipe detector efficiency.

Table 2. Direct Measurement Results

Measurement ID	Gross Activity (dpm/100 cm^2)
F8990321-M0001GI	2722
F8990321-M0002GI	2645
F8990321-M0003GI	2476
F8990321-M0004GI	3280
F8990321-M0005GI	3194
F8990321-M0006GI	3584
F8990321-M0007GI	3589
F8990321-M0008GI	3579
F8990321-M0009GI	3666
F8990321-M0010GI	3728
F8990321-M0011GI	3714
F8990321-M0012GI	3213
F8990321-M0013GI	3064
F8990321-M0014GI	3329
F8990321-M0015GI	3603
F8990321-M0016GI	3430
F8990321-M0017GI	3155
F8990321-M0018GI	3232
F8990321-M0019GI	3141
F8990321-M0020GI	2717
F8990321-M0021GI	2726
F8990321-M0022GI	2476
F8990321-M0023GI	2779
F8990321-M0024GI	2611
F8990321-M0025GI	2616
F8990321-M0026GI	2413
F8990321-M0027GI	2693
F8990321-M0028GI	3015
F8990321-M0029GI	3434
F8990321-M0030GI	3646
F8990321-M0031GI	3242
F8990321-M0032GI	3401
F8990321-M0033GI	3613
F8990321-M0034GI	3391
F8990321-M0035GI	3565
F8990321-M0036GI	3656
F8990321-M0037GI	3430
F8990321-M0038GI	3107
F8990321-M0039GI	2601
F8990321-M0040GI	2461

F8990321-M0041GI	2384
F8990321-M0042GI	2567
F8990321-M0043GI	2958
F8990321-M0044GI	2948
F8990321-M0045GI	3382
F8990321-M0046GI	3536
F8990321-M0047GI	3608
F8990321-M0048GI	3603
F8990321-M0049GI	3223
F8990321-M0050GI	3377
F8990321-M0051GI	3319
F8990321-M0052GI	3579
F8990321-M0053GI	3319
F8990321-M0054GI	3757
F8990321-M0055GI	3637
F8990321-M0056GI	3738
F8990321-M0057GI	3743
F8990321-M0058GI	3560
F8990321-M0059GI	3521
F8990321-M0060GI	3449
F8990321-M0061GI	3690
F8990321-M0062GI	3406
F8990321-M0063GI	3487
F8990321-M0064GI	3593
F8990321-M0065GI	3796
F8990321-M0066GI	3743
F8990321-M0067GI	4090
F8990321-M0068GI	3781
F8990321-M0069GI	3656
F8990321-M0070GI	3309
F8990321-M0071GI	2972
F8990321-M0072GI	3184
F8990321-M0073GI	3434
F8990321-M0074GI	3651
F8990321-M0075GI	3497
F8990321-M0076GI	3724
F8990321-M0077GI	3685
F8990321-M0078GI	3849
F8990321-M0079GI	3897
F8990321-M0080GI	3540
F8990321-M0081GI	3579
F8990321-M0082GI	3762
F8990321-M0083GI	4041
F8990321-M0084GI	3810
F8990321-M0085GI	3897
F8990321-M0086GI	3945
F8990321-M0087GI	3815
F8990321-M0088GI	4022
F8990321-M0089GI	3762
F8990321-M0090GI	3776
F8990321-M0091GI	3492
F8990321-M0092GI	3907
F8990321-M0093GI	3950
F8990321-M0094GI	3632
F8990321-M0095GI	3699
F8990321-M0096GI	3719

F8990321-M0097GI	3656
F8990321-M0098GI	3762
F8990321-M0099GI	3719
F8990321-M0100GI	3613
F8990321-M0101GI	3473
F8990321-M0102GI	4092
F8990321-M0103GI	3577
F8990321-M0104GI	3725
F8990321-M0105GI	4089
F8990321-M0106GI	3610
F8990321-M0107GI	4019
F8990321-M0108GI	3748
F8990321-M0109GI	4376
Mean:	3444
Median:	3579
Standard Deviation:	430
Range:	2384 - 4376

Survey Unit Data Assessment:

The survey design required 109 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

Survey Results Parameter	Value	Comment
Material Background Used (dpm/100 cm²):	N/A	
Ambient Background Used (dpm/100 cm²):	N/A	Average Ambient BKG = 0
Actual Direct Measurements (N):	109	
Median (dpm/100 cm²):	3579	
Mean (dpm/100 cm²):	3444	
Direct Measurement Standard Deviation (dpm/100 cm²):	430	
Total Standard Deviation (dpm/100 cm²):	430	Based on samples and backgrounds.
Maximum (dpm/100 cm²):	4376	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	109	
S+ Value:	109	
Critical Value:	63	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGLemc:	N/A	Class 2
Total Standard Deviation <= Sigma:	Yes	
Pass the Sign Test?	Yes	
Reject the Null Hypothesis?	Yes	
Does the Survey Unit Pass All Criteria?	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 2 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 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. No direct measurements exceeded the DCGL of 100000 dpm/100 cm^2 or the grout limit of 21000dpm/100cm^2. 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.

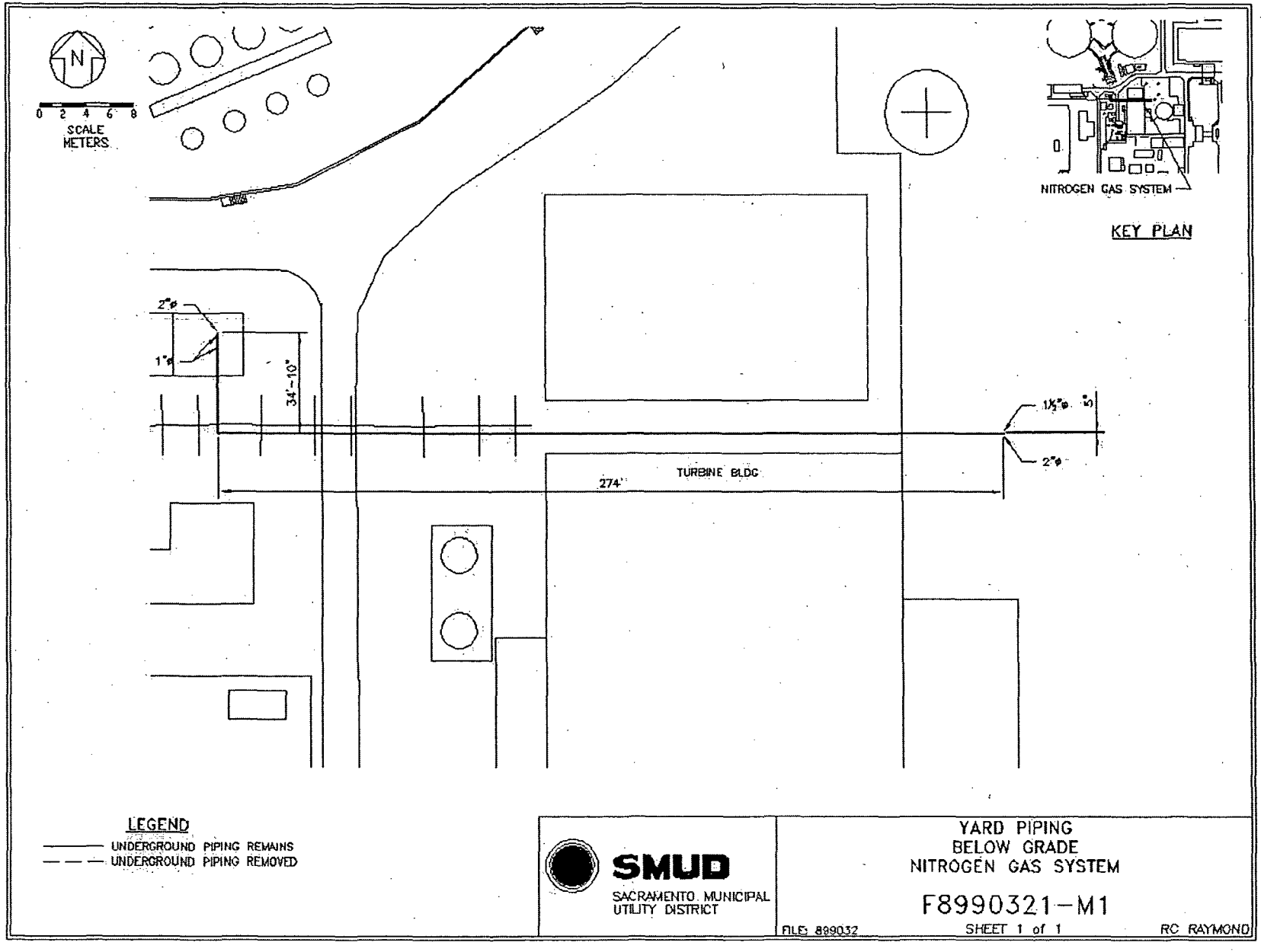
It is concluded that survey unit F8990321 meets the release criteria of 10CFR20.1402.

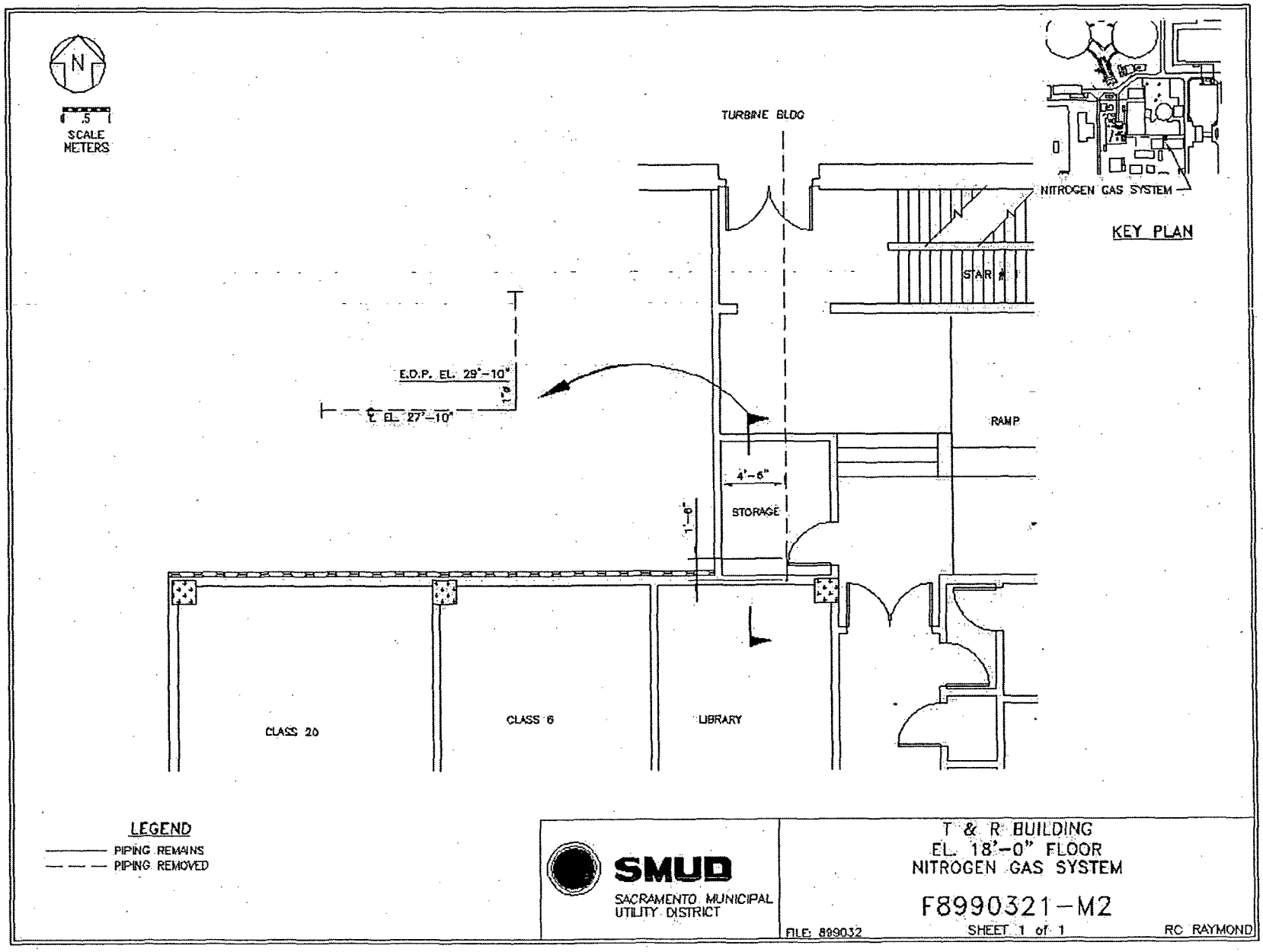
Attachment 1

Maps

March 10, 2008

Survey Unit F8990321


N
0 2 4 6 8
SCALE METERS
NITROGEN GAS SYSTEM
KEY PLAN
2"ø
1"ø
34'-10"
1½"ø
2"ø
274'
TURBINE BLDG
LEGEND
UNDERGROUND PIPING REMAINS
UNDERGROUND PIPING REMOVED
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
YARD PIPING
BELOW GRADE
NITROGEN GAS SYSTEM
F8990321-M1
FILE: 899032
SHEET 1 of 1
RC RAYMOND


N
0 .5 1
SCALE
METERS
TURBINE BLDG
NITROGEN GAS SYSTEM
KEY PLAN
STAIR #1
E.O.P. EL. 29'-10"
℄ EL. 27'-10"
1'-6"
RAMP
4'-6"
STORAGE
1'-6"
CLASS 20
CLASS 6
LIBRARY
LEGEND
PIPING REMAINS
PIPING REMOVED
SMUD
SACRAMENTO MUNICIPAL
UTILITY DISTRICT
T & R BUILDING
EL. 18'-0" FLOOR
NITROGEN GAS SYSTEM
F8990321-M2
FILE: 899032
SHEET 1 of 1
RC RAYMOND

Attachment 2

Instrumentation

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Table 2-1. Survey Unit Instrumentation

Instrument Model; Serial No.	Detector Model; Serial No.	MDC Static (dpm/100 cm²)	MDC Scan (dpm/100 cm²)
M2350; 142514	pipemon; B821Z	4680	N/A
M2350; 203484	44-159; 215855	5250	N/A

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm^2)
Investigation Criteria - Direct	50000
Investigation Criteria – Scan	N/A
$DCGL_W$	100000
$DCGL_{EMC}$	N/A

Attachment 3

Investigation

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(none required)

Attachment 4

Data Assessment

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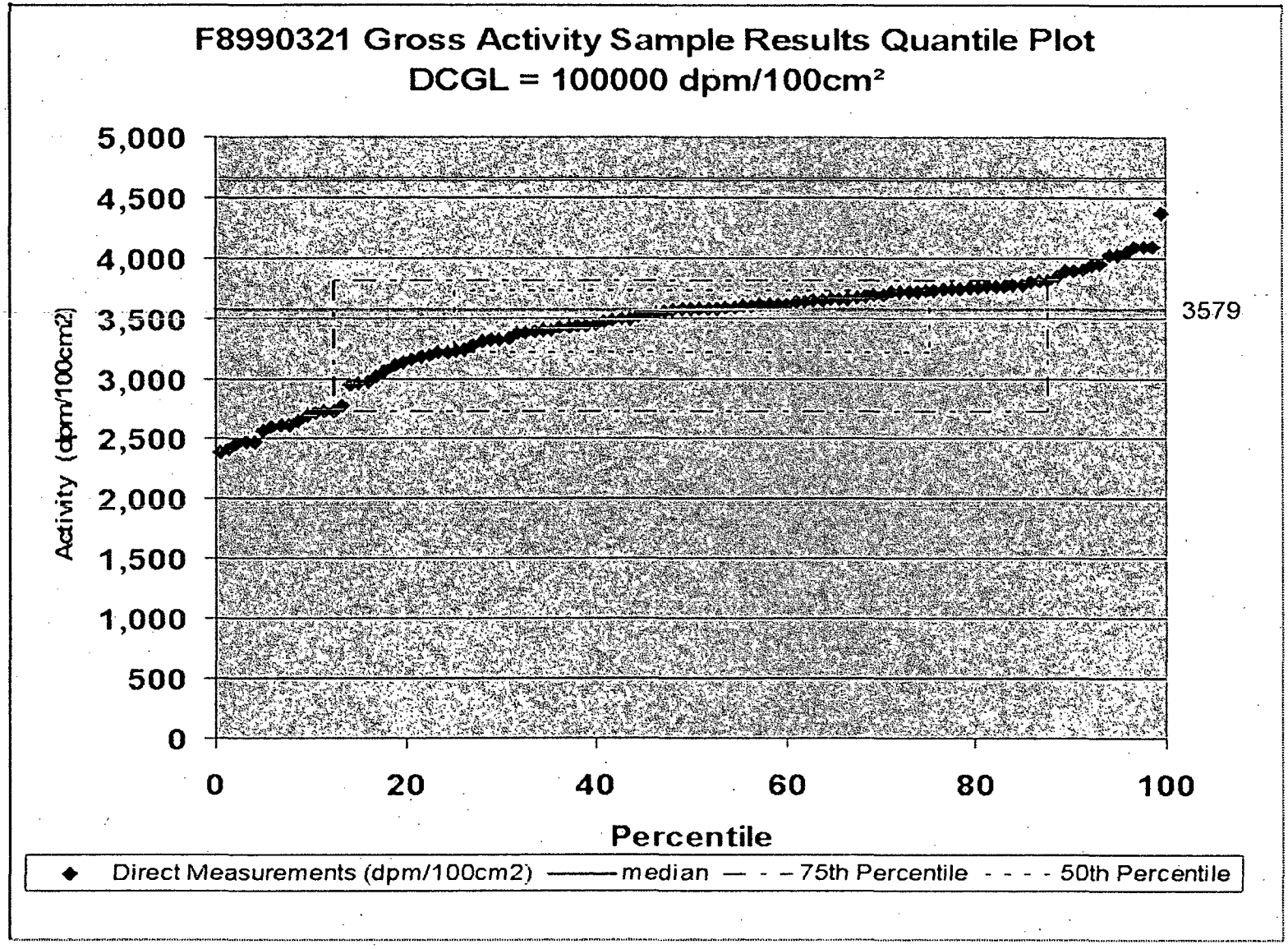
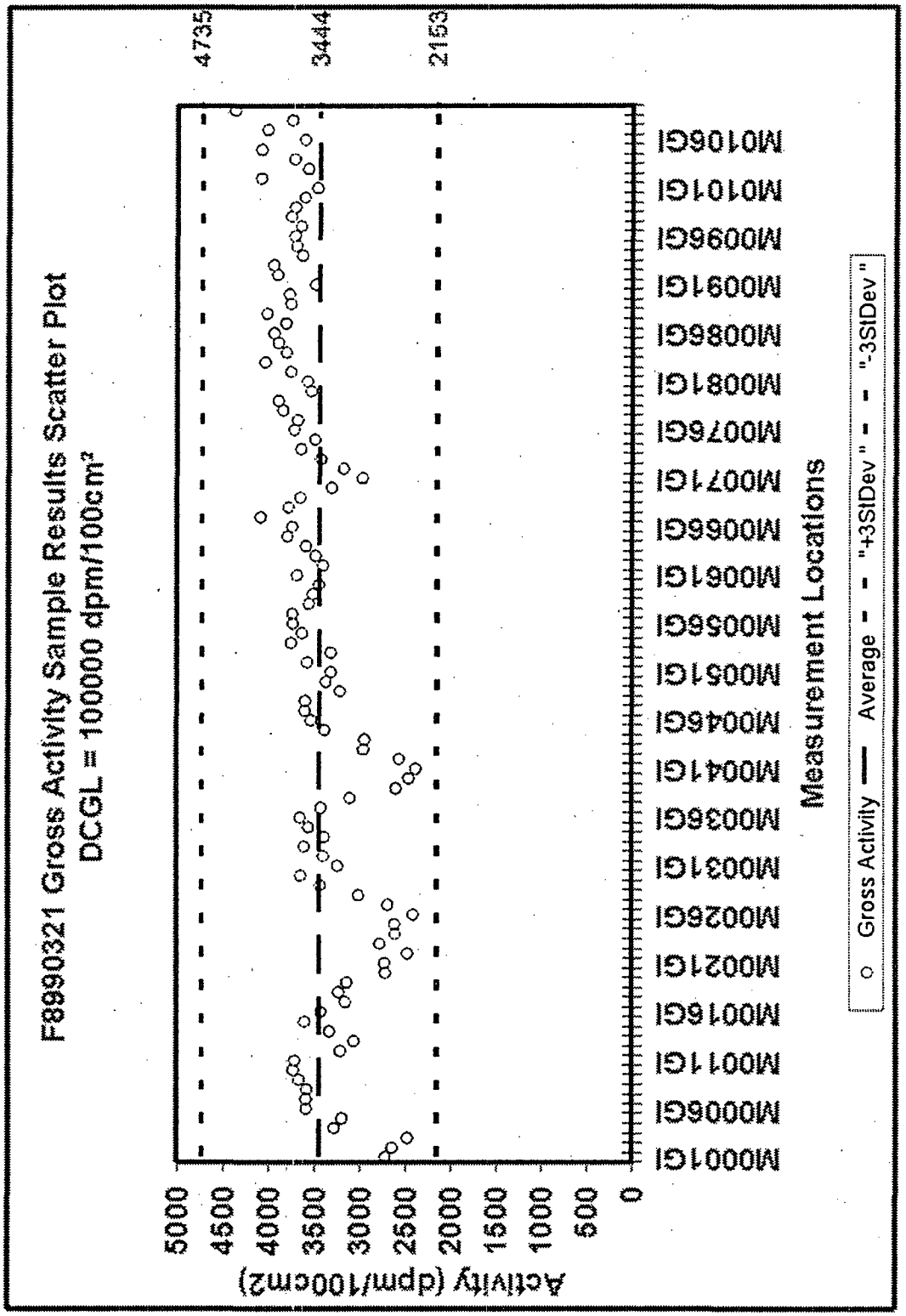
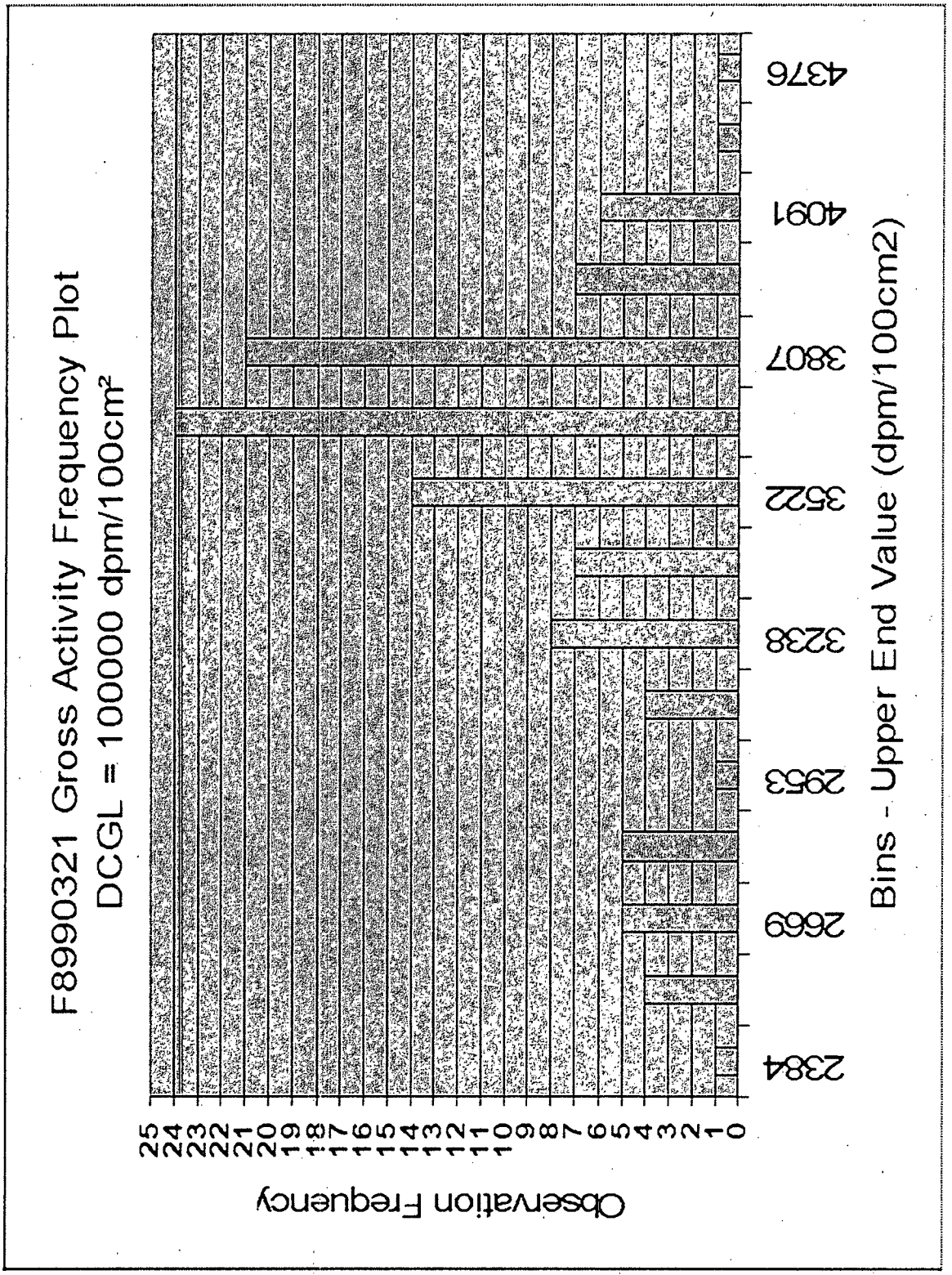
Survey Unit F8990321


F8990321 Gross Activity Sample Results Quantile Plot
DCGL = 100000 dpm/100cm²
Activity (dpm/100cm2)
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
3579
0
20
40
60
80
100
Percentile
Direct Measurements (dpm/100cm2)
median
75th Percentile
50th Percentile


F8990321 Gross Activity Sample Results Scatter Plot
DCGL = 100000 dpm/100cm²
4735
3444
2153
Activity (dpm/100cm2)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
M00016GI
M00066GI
M00116GI
M00166GI
M00216GI
M00266GI
M00316GI
M00366GI
M00416GI
M00466GI
M00516GI
M00566GI
M00616GI
M00666GI
M00716GI
M00766GI
M00816GI
M00866GI
M00916GI
M00966GI
M01016GI
M01066GI
Measurement Locations
Gross Activity
Average
"+3SIDev"
"-3SIDev"


F8990321 Gross Activity Frequency Plot
DCGL = 100000 dpm/100cm²
Observation Frequency
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
2384
2669
2953
3238
3522
3807
4091
4376
Bins - Upper End Value (dpm/100cm2)