Rancho Seco

Final Status Survey Summary Report

February 16, 2009

Containment Interior Walls, (-) 27' El. to (+) 25' El.

Survey Unit F8110113

Prepared By: D. Anderson **Date:** 2/17/2009
FSS Engineer

Reviewed By: Robert F. Dreher **Date:** 2/23/09
Lead FSS Engineer

Approved By: [illegible] **Date:** 2-27-09
Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8110113, Containment Interior Walls, (-) 27' El. to (+) 25' El.

Survey Unit Description:

Operating History: The reinforced concrete structure contained the reactor and supporting systems. The building contained four main elevations. Residual radioactive material was known to be present on all levels of the interior of the building. Operating records and the HSA document several events with the potential for a release of radioactivity inside this structure. No events documenting exterior contamination were found.

Site Characterization: Direct measurements were made of each of the interior elevation surfaces as well as the exterior surfaces of the structure. These measurements confirmed the presence of plant-derived radionuclides. Direct measurements on the –27' elevation showed a mean gross activity level of 1,535,383 dpm/100 cm2 and a maximum value of 8,134,000 dpm/100 cm2. Direct measurements on the grade elevation showed a mean gross activity level of 201,670 dpm/100 cm2 and a maximum value of 370,000 dpm/100 cm2. Direct measurements on the +40' elevation showed a mean gross activity level of 51,521 dpm/100 cm2 and a maximum value of 99,150 dpm/100 cm2. Direct measurements on the +60' elevation showed a mean gross activity level of 20,110 dpm/100 cm2 and a maximum value of 46,660 dpm/100 cm2. Direct measurements on the exterior roof showed a mean gross activity level of 1,364 dpm/100 cm2 and a maximum value of 1,571 dpm/100 cm2. Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the interior of the reactor building was determined to be a Class 1 area and the exterior was a Class 3.

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 determined using a fixed grid pattern and 1,762 m² were scanned for 100% coverage. Samples of removable contamination were collected. 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:	F811	Containment Interior Walls, (-) 27' El. to (+) 25' El.
Survey Unit:	0113	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m^2)**:**	1,762	
Evaluator:	D. Anderson	
DCGL (dpm/100 cm^2)**:**	43,000	Gross Activity DCGL
Area Factor:	14.9	Class 1
Design DCGLemc (dpm/100 cm^2)**:**	640,700	Class 1
LBGR (dpm/100 cm^2)**:**	21,500	Default = 50% DCGL
Design Sigma (dpm/100 cm^2)**:**	33,040	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m^2)**:**	19.6	Class 1
Scan Area (m^2)**:**	1,762	
Scan Coverage (%):	100%	Class 1
$Z_{1-\alpha}$ **:**	1.645	
$Z_{1-\beta}$ **:**	1.645	
Sign P:	0.725747	
Calculated Relative Shift:	0.6	
Relative Shift Used:	0.6	Uses 3.0 if Relative Shift is >3
N-Value:	54	
Design N-Value + 20%:	65	NUREG-1575 Table 5-5
Design Min Samples N:	180	Class 1
Grid Spacing L:	N/A	Class 1

Survey Results:

A total of 180 direct measurements were made in F8110113. 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 ISOCS gamma measurements on the interior wall surfaces indicated areas of elevated activity. Co-60 was not identified above the MDC. Beta scan activity on the penetrations and horizontal surfaces ranged from 1,131 to 1,085,884 dpm/100 cm², based on a surveyor efficiency of 0.5 and no background subtracted. Samples for removable surface activity were all less than 10% of the DCGL as shown in Table 3. Removable surface activity samples were counted for alpha activity and none was detected at the MDC shown in Table 2-1 of Attachment 2.

Table 2. Direct Measurement Results

Measurement ID	Gross Activity (dpm/100 cm²)	Uncertainty (dpm/100 cm²)
F8110113-M0001GS	3,637	726
F8110113-M0002GS	2,456	587
F8110113-M0003GS	560	294
F8110113-M0004GS	< 635	
F8110113-M0005GS	< 726	
F8110113-M0006GS	< 752	
F8110113-M0007GS	< 642	
F8110113-M0008GS	789	318
F8110113-M0009GS	603	293
F8110113-M0010GS	1,632	455
F8110113-M0011GS	1,238	412
F8110113-M0012GS	1,379	424
F8110113-M0013GS	1,825	489
F8110113-M0014GS	2,186	527
F8110113-M0015GS	2,397	565
F8110113-M0016GS	1,395	423
F8110113-M0017GS	2,601	593
F8110113-M0018GS	4,422	820
F8110113-M0019GS	2,466	573
F8110113-M0020GS	1,236	397
F8110113-M0021GS	1,527	446
F8110113-M0022GS	4,284	816
F8110113-M0023GS	3,136	666
F8110113-M0024GS	1,164	385
F8110113-M0025GS	3,609	716
F8110113-M0026GS	3,491	706
F8110113-M0027GS	7,305	1189
F8110113-M0028GS	6,114	1036
F8110113-M0029GS	4,789	869
F8110113-M0030GS	1,198	384
F8110113-M0031GS	< 693	
F8110113-M0032GS	< 759	
F8110113-M0033GS	< 726	
F8110113-M0034GS	610	295
F8110113-M0035GS	723	329

Measurement ID	Gross Activity (dpm/100 cm^2)	Uncertainty (dpm/100 cm^2)
F8110113-M0036GS	1,683	459
F8110113-M0037GS	982	356
F8110113-M0038GS	1,236	408
F8110113-M0039GS	< 686	
F8110113-M0040GS	< 627	
F8110113-M0041GS	< 713	
F8110113-M0042GS	< 706	
F8110113-M0043GS	< 720	
F8110113-M0044GS	< 713	
F8110113-M0045GS	797	331
F8110113-M0046GS	2,459	569
F8110113-M0047GS	1,535	441
F8110113-M0048GS	1,364	427
F8110113-M0049GS	2,031	507
F8110113-M0050GS	2,461	577
F8110113-M0051GS	2,311	558
F8110113-M0052GS	2,592	593
F8110113-M0053GS	2,740	621
F8110113-M0054GS	3,232	677
F8110113-M0055GS	2,427	562
F8110113-M0056GS	1,494	440
F8110113-M0057GS	1,280	412
F8110113-M0058GS	4,502	849
F8110113-M0059GS	4,211	805
F8110113-M0060GS	1,137	394
F8110113-M0061GS	2,082	515
F8110113-M0062GS	3,876	766
F8110113-M0063GS	12,308	1802
F8110113-M0064GS	7,814	1250
F8110113-M0065GS	3,896	759
F8110113-M0066GS	895	340
F8110113-M0067GS	< 765	
F8110113-M0068GS	< 713	
F8110113-M0069GS	< 700	
F8110113-M0070GS	714	316
F8110113-M0071GS	< 836	
F8110113-M0072GS	1,082	374
F8110113-M0073GS	< 642	
F8110113-M0074GS	978	373
F8110113-M0075GS	< 700	
F8110113-M0076GS	< 619	
F8110113-M0077GS	< 819	
F8110113-M0078GS	< 706	
F8110113-M0079GS	< 726	
F8110113-M0080GS	602	303
F8110113-M0081GS	< 807	
F8110113-M0082GS	1,134	389
F8110113-M0083GS	1,776	496
F8110113-M0084GS	1,205	382
F8110113-M0085GS	2,069	535
F8110113-M0086GS	2,241	551
F8110113-M0087GS	852	331

Measurement ID	Gross Activity (dpm/100 cm^2)	Uncertainty (dpm/100 cm^2)
F8110113-M0088GS	2,488	576
F8110113-M0089GS	4,437	840
F8110113-M0090GS	2,207	540
F8110113-M0091GS	1,891	501
F8110113-M0092GS	< 657	
F8110113-M0093GS	< 657	
F8110113-M0094GS	3,992	777
F8110113-M0095GS	3,703	745
F8110113-M0096GS	< 912	
F8110113-M0097GS	3,002	648
F8110113-M0098GS	5,510	964
F8110113-M0099GS	7,601	1229
F8110113-M0100GS	2,889	626
F8110113-M0101GS	2,585	605
F8110113-M0102GS	867	354
F8110113-M0103GS	< 713	
F8110113-M0104GS	< 595	
F8110113-M0105GS	477	272
F8110113-M0106GS	695	335
F8110113-M0107GS	897	350
F8110113-M0108GS	< 830	
F8110113-M0109GS	< 693	
F8110113-M0110GS	671	310
F8110113-M0111GS	< 672	
F8110113-M0112GS	< 672	
F8110113-M0113GS	< 937	
F8110113-M0114GS	1,018	369
F8110113-M0115GS	< 700	
F8110113-M0116GS	790	340
F8110113-M0117GS	964	371
F8110113-M0118GS	975	370
F8110113-M0119GS	1,431	423
F8110113-M0120GS	1,414	436
F8110113-M0121GS	2,579	605
F8110113-M0122GS	2,468	581
F8110113-M0123GS	739	324
F8110113-M0124GS	1,133	375
F8110113-M0125GS	3,769	751
F8110113-M0126GS	< 752	
F8110113-M0127GS	504	273
F8110113-M0128GS	394	276
F8110113-M0129GS	1,034	375
F8110113-M0130GS	2,598	602
F8110113-M0131GS	3,278	680
F8110113-M0132GS	791	365
F8110113-M0133GS	3,002	637
F8110113-M0134GS	5,992	1021
F8110113-M0135GS	7,317	1188
F8110113-M0136GS	3,547	717
F8110113-M0137GS	2,754	611
F8110113-M0138GS	1,258	395
F8110113-M0139GS	807	321

Measurement ID	Gross Activity (dpm/100 cm^2)	Uncertainty (dpm/100 cm^2)
F8110113-M0140GS	< 739	
F8110113-M0141GS	1,316	400
F8110113-M0142GS	562	281
F8110113-M0143GS	942	346
F8110113-M0144GS	992	388
F8110113-M0145GS	939	355
F8110113-M0146GS	773	324
F8110113-M0147GS	< 630	
F8110113-M0148GS	615	314
F8110113-M0149GS	< 789	
F8110113-M0150GS	848	344
F8110113-M0151GS	1,338	424
F8110113-M0152GS	2,013	506
F8110113-M0153GS	< 969	
F8110113-M0154GS	2,909	634
F8110113-M0155GS	1,908	499
F8110113-M0156GS	2,373	557
F8110113-M0157GS	894	337
F8110113-M0158GS	1,523	429
F8110113-M0159GS	2,183	535
F8110113-M0160GS	2,809	618
F8110113-M0161GS	5,970	1022
F8110113-M0162GS	2,227	549
F8110113-M0163GS	2,425	579
F8110113-M0164GS	1,319	398
F8110113-M0165GS	3,569	721
F8110113-M0166GS	5,869	1014
F8110113-M0167GS	1,740	490
F8110113-M0168GS	2,468	583
F8110113-M0169GS	4,211	805
F8110113-M0170GS	6,954	1141
F8110113-M0171GS	3,440	698
F8110113-M0172GS	2,779	621
F8110113-M0173GS	4,372	827
F8110113-M0174GS	1,959	504
F8110113-M0175GS	1,222	405
F8110113-M0176GS	1,271	418
F8110113-M0177GS	1,968	492
F8110113-M0178GS	1,468	430
F8110113-M0179GS	2,450	583
F8110113-M0180GS	1,839	493
Mean:	2,004	
Median:	1,317	
Standard Deviation:	1,758	
Range:	394 to 12,308	

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm^2)
F8110113-M0001SM	16.50
F8110113-M0002SM	12.62
F8110113-M0003SM	37.16
F8110113-M0004SM	59.11
F8110113-M0005SM	16.50
F8110113-M0006SM	3.58
F8110113-M0007SM	19.08
F8110113-M0008SM	3.58
F8110113-M0009SM	28.12
F8110113-M0010SM	8.75
F8110113-M0011SM	22.95
F8110113-M0012SM	31.99
F8110113-M0013SM	43.62
F8110113-M0014SM	10.04
F8110113-M0015SM	3.58
F8110113-M0016SM	12.62
F8110113-M0017SM	12.62
F8110113-M0018SM	19.08
F8110113-M0019SM	24.24
F8110113-M0020SM	38.45
F8110113-M0021SM	145.64
F8110113-M0022SM	95.27
F8110113-M0023SM	78.49
F8110113-M0024SM	50.07
F8110113-M0025SM	42.33
F8110113-M0026SM	21.66
F8110113-M0027SM	2.29
F8110113-M0028SM	50.07
F8110113-M0029SM	1.00
F8110113-M0030SM	55.24
F8110113-M0031SM	33.28
F8110113-M0032SM	26.83
F8110113-M0033SM	37.16
F8110113-M0034SM	41.03
F8110113-M0035SM	48.78
F8110113-M0036SM	55.24
F8110113-M0037SM	30.70
F8110113-M0038SM	13.91
F8110113-M0039SM	25.54
F8110113-M0040SM	38.45
F8110113-M0041SM	30.70
F8110113-M0042SM	11.33
F8110113-M0043SM	55.24
F8110113-M0044SM	118.52
F8110113-M0045SM	30.70
F8110113-M0046SM	19.08
F8110113-M0047SM	29.41
F8110113-M0048SM	34.58

Measurement ID	Surface Beta Activity (dpm/100 cm^2)
F8110113-M0049SM	29.41
F8110113-M0050SM	35.87
F8110113-M0051SM	37.16
F8110113-M0052SM	19.08
F8110113-M0053SM	48.78
F8110113-M0054SM	70.74
F8110113-M0055SM	21.66
F8110113-M0056SM	10.04
F8110113-M0057SM	37.16
F8110113-M0058SM	21.66
F8110113-M0059SM	20.37
F8110113-M0060SM	1.00
F8110113-M0061SM	21.66
F8110113-M0062SM	16.50
F8110113-M0063SM	13.91
F8110113-M0064SM	17.79
F8110113-M0065SM	31.99
F8110113-M0066SM	19.08
F8110113-M0067SM	21.66
F8110113-M0068SM	48.78
F8110113-M0069SM	79.78
F8110113-M0070SM	21.66
F8110113-M0071SM	30.70
F8110113-M0072SM	41.03
Mean:	32.84
Median:	28.76
Standard Deviation:	25.59
Range:	1 to 145.64

Survey Unit Data Assessment:

The survey design required 180 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 cm^2):	N/A	
Ambient Background Used (dpm/100 cm^2):	N/A	Average Ambient BKG = 0
Actual Direct Measurements (N):	180	
Median (dpm/100 cm^2):	1,317	
Mean (dpm/100 cm^2):	2,004	
Direct Measurement Standard Deviation (dpm/100 cm^2):	1,758	
Total Standard Deviation (dpm/100 cm^2):	1,758	Based on samples and backgrounds.
Maximum (dpm/100 cm^2):	12,308	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	180	
S+ Value:	180	
Critical Value:	101	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGLemc:	Yes	Class 1
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:

Forty-four investigations (scan grids 70, 71, 102, 103, 108, 152, 176, 181, 185, 200, 202, P031 exterior, P033 exterior, P034 exterior, P035 exterior, P036 exterior, P041 interior and exterior, P042 exterior, P044 exterior, P047 interior and exterior, P052 exterior, P053 exterior, P054 exterior, P063 exterior, P064 exterior, P080 exterior, 271, 274, 277, 279, 285, 286, 287, 289, 290, 291, 294, 296, 299, 300, and 326) 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 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. Forty-four 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. No direct measurements exceeded the DCGL of 43,000 dpm/100 cm^2 and none of the removable surface activity measurements exceeded 10% of the DCGL. Forty-four 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.

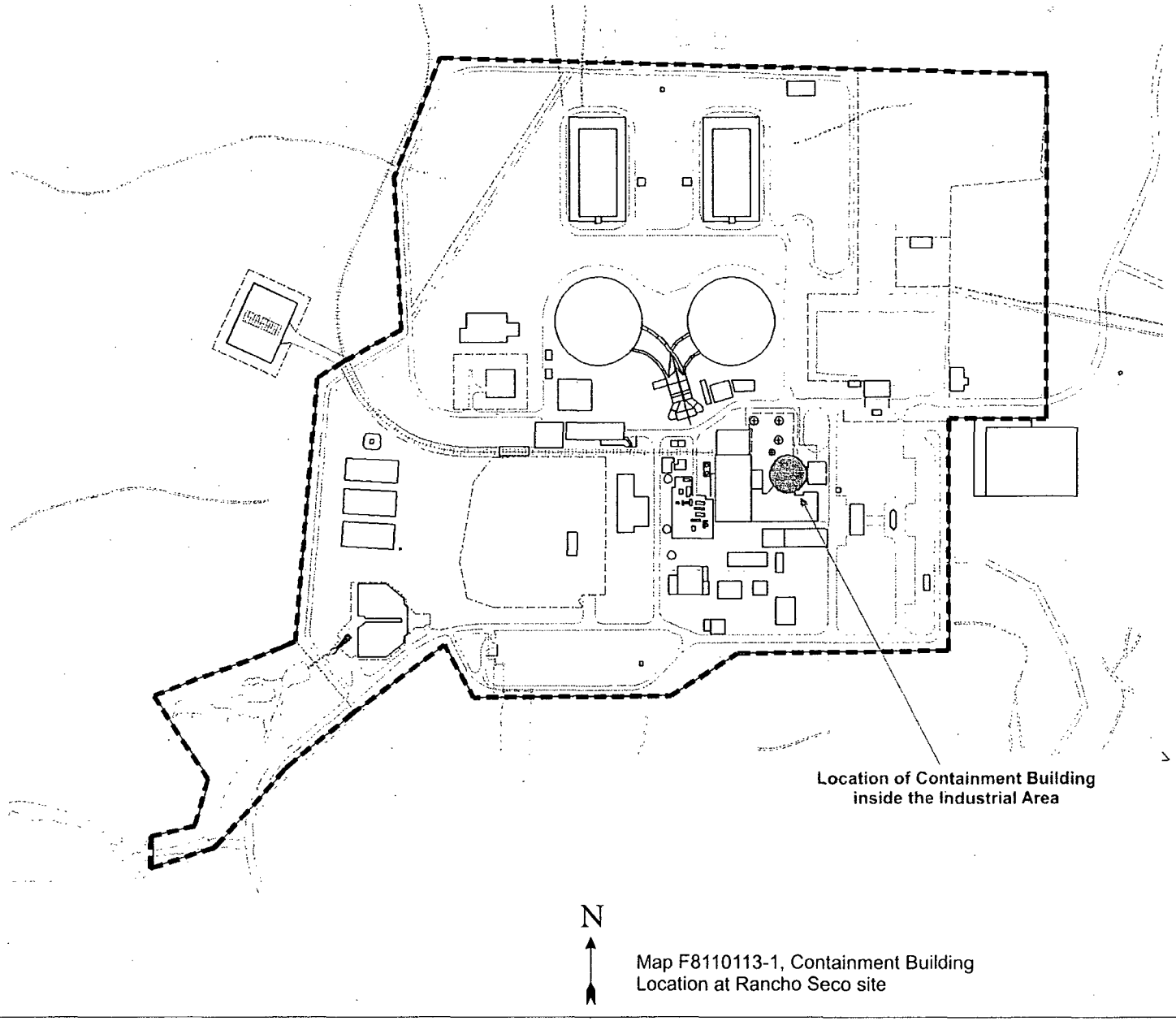
It is concluded that survey unit F8110113 meets the release criteria of 10CFR20.1402.

Attachment 1

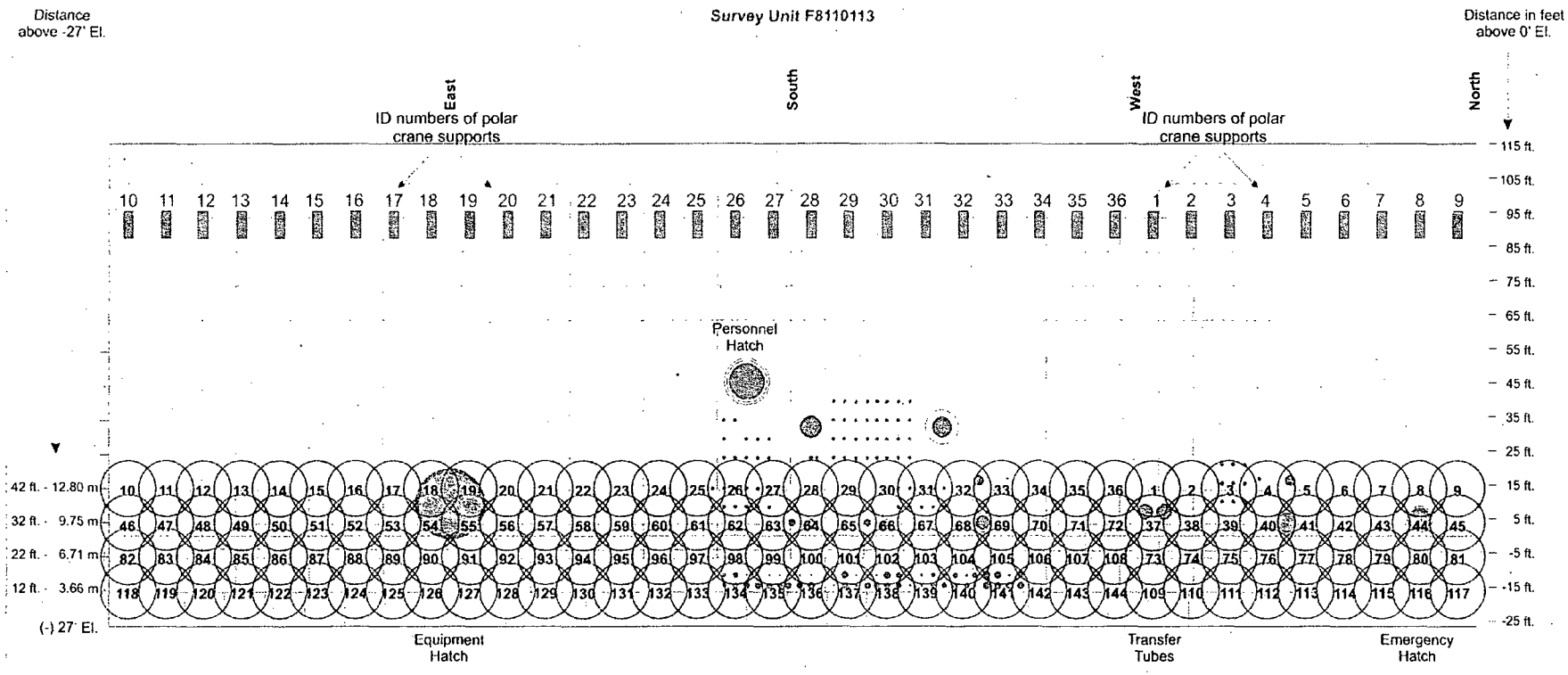
Maps

February 16, 2009

Survey Unit F8110113



Map F8110113-1, Containment Building
Location at Rancho Seco site



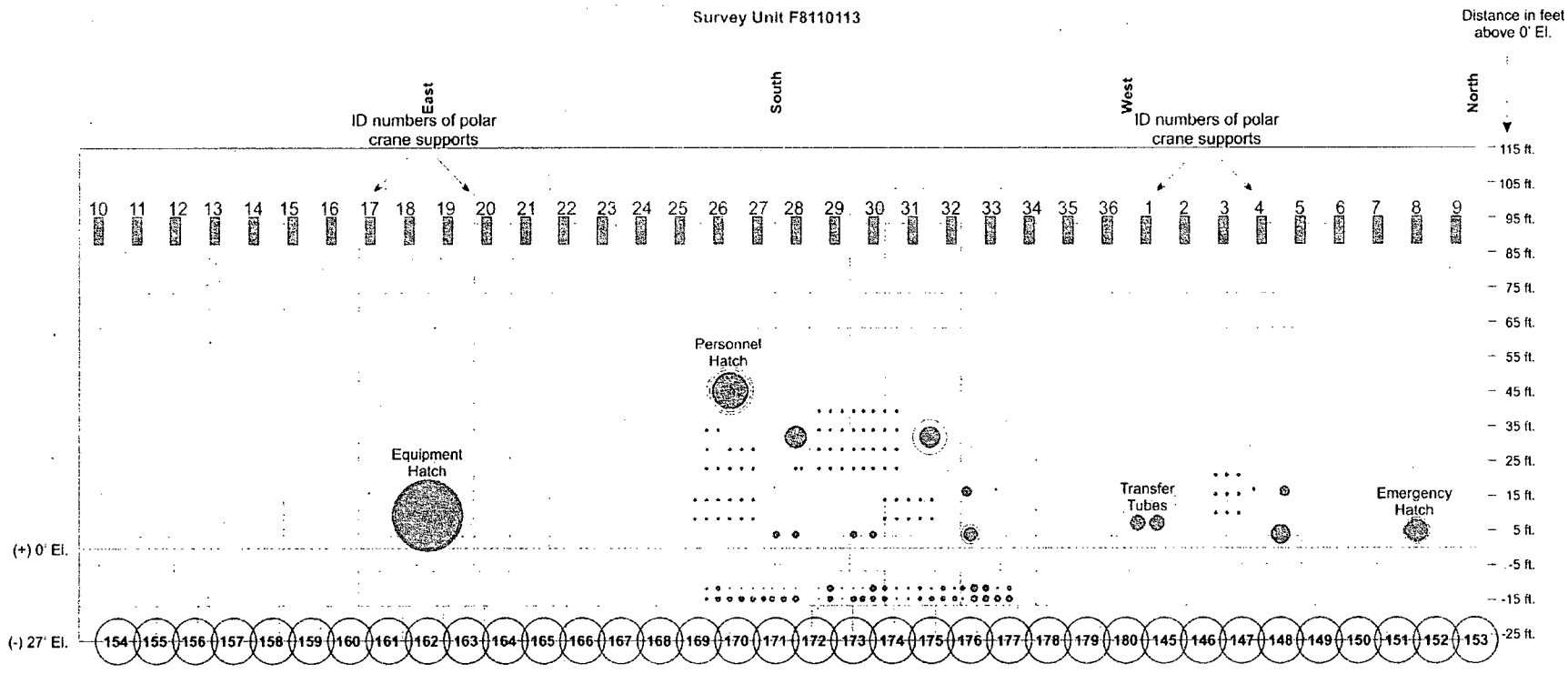
3.46 meters between horizontal centers
3.05 meters between vertical rows

NOTE: Polar Crane supports are located every 10 degrees, are numbered in red and will be used to index gamma measurements.

Total Scan Area is approximately 1,762 square meters (to floor/wall interface).

0 2 4 6 8
Distance in Meters

Map F8110113-2, Reactor Containment Interior Walls
ISOCS Gamma Scan Measurements
F8110113M0001GS to F8110113M0144GS
19.6 sq. meter field of view

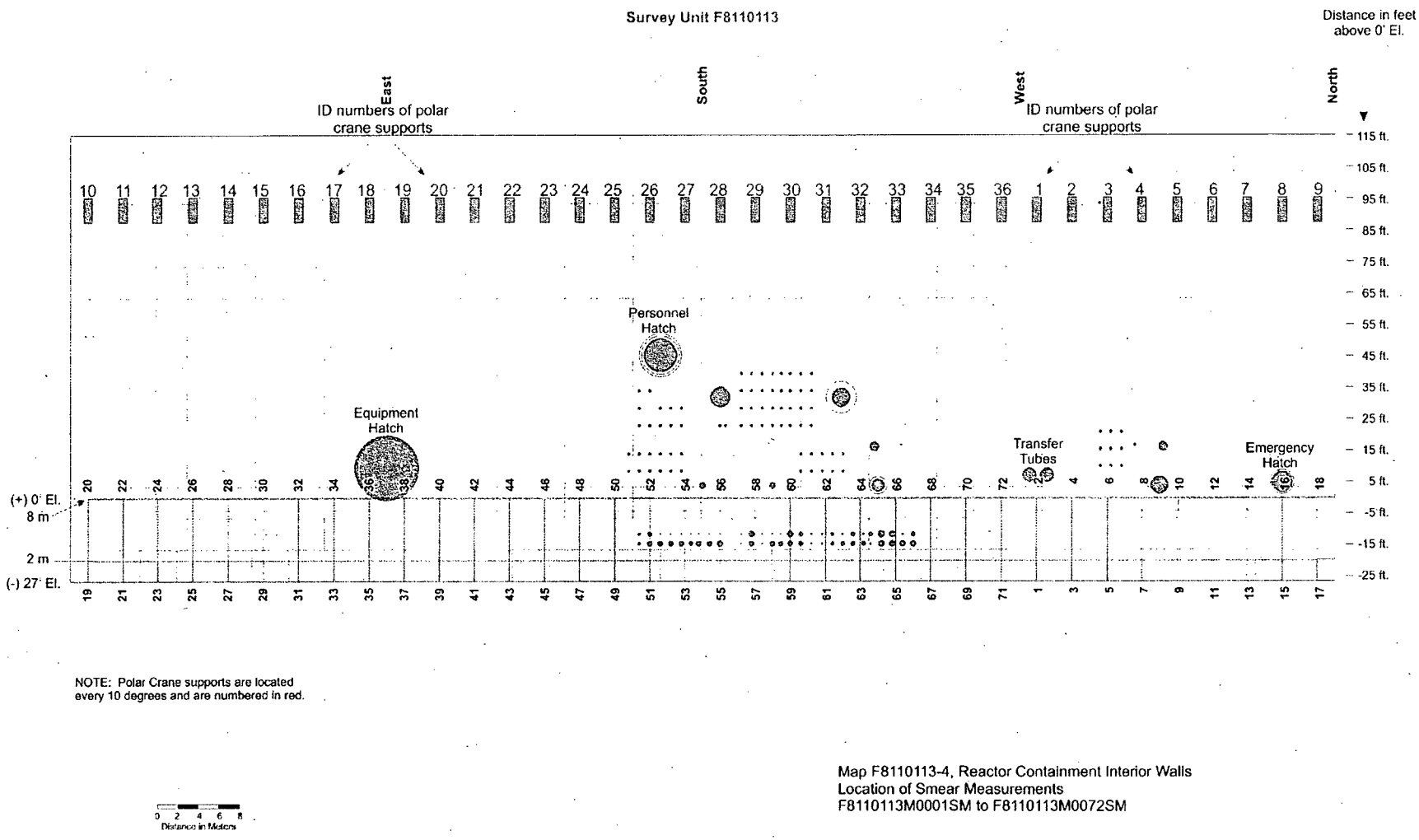


3.46 meters between horizontal centers
Measurements to be centered between polar crane supports and at floor/wall interface.

NOTE: Polar Crane supports are located every 10 degrees, are numbered in red and will be used to index gamma measurements.

0 2 4 6 8
Distance in Meters

Map F8110113-3, Reactor Containment Interior Walls
ISOCS Gamma Scan Measurements
F8110113M0145GS to F8110113M0180GS
12.6 sq. meter field of view



NOTE: Polar Crane supports are located every 10 degrees and are numbered in red.

Map F8110113-4, Reactor Containment Interior Walls
Location of Smear Measurements
F8110113M0001SM to F8110113M0072SM

2BS	3BS	6BS	7BS	10BS	11BS	14BS	15BS	18BS	19BS	22BS	23BS	26BS	27BS	30BS	31BS	34BS	35BS
1BS	4BS	5BS	8BS	9BS	12BS	13BS	16BS	17BS	20BS	21BS	24BS	25BS	28BS	29BS	32BS	33BS	36BS

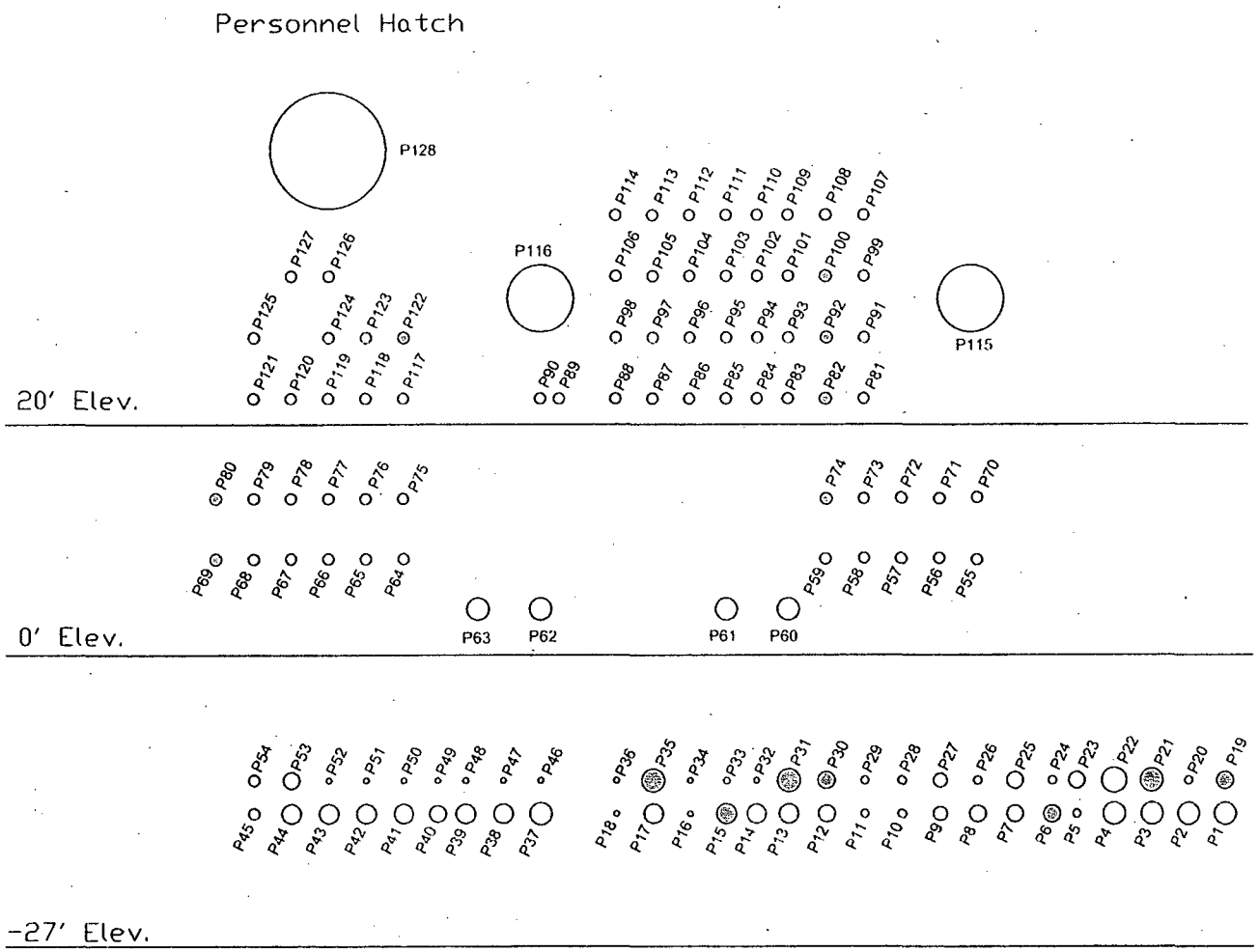
Equipment Hatch Interior Surfaces

40BS	41BS	44BS	45BS	48BS	49BS
39BS	42BS	43BS	46BS	47BS	50BS

Emergency Hatch Interior Surfaces

0 0.5 1.0 1.5 2.0
Distance in Meters

Map F8110113-5, Reactor Containment Interior Walls
Beta Scan Measurements
F8110113M0001BS to F8110113M0030BS,
F8110113C0031BS to F8110113C0036BS and
F8110113M0039BS to F8110113M0050BS



Penetrations to be surveyed under FSS Package F8110112

Penetrations to be surveyed under FSS Package F8110113

Penetrations to be surveyed under FSS Package F8110113

= Penetration CLOSED from Rx Side

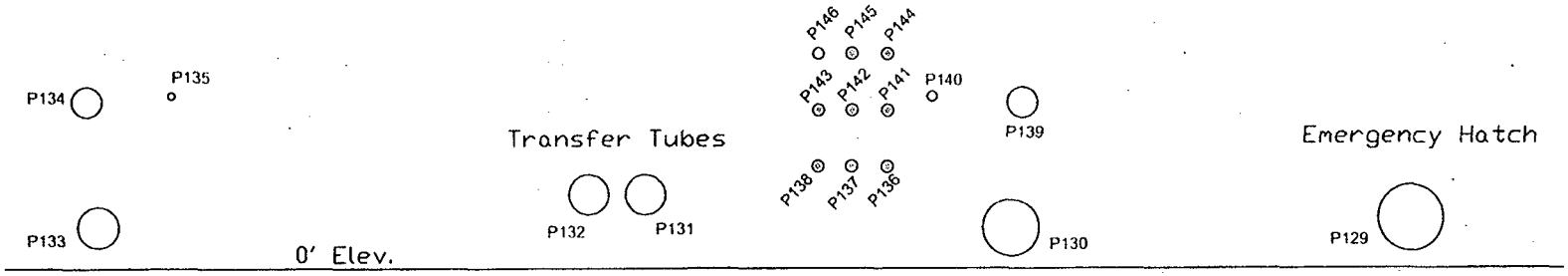
= Penetration OPEN from Rx Side

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT

Rx Bldg. Inside View
Penetrations
MEASUREMENT LOCATIONS
Map F8110113-6

FILE:

J Grinley



= Penetration CLOSED from Rx Side

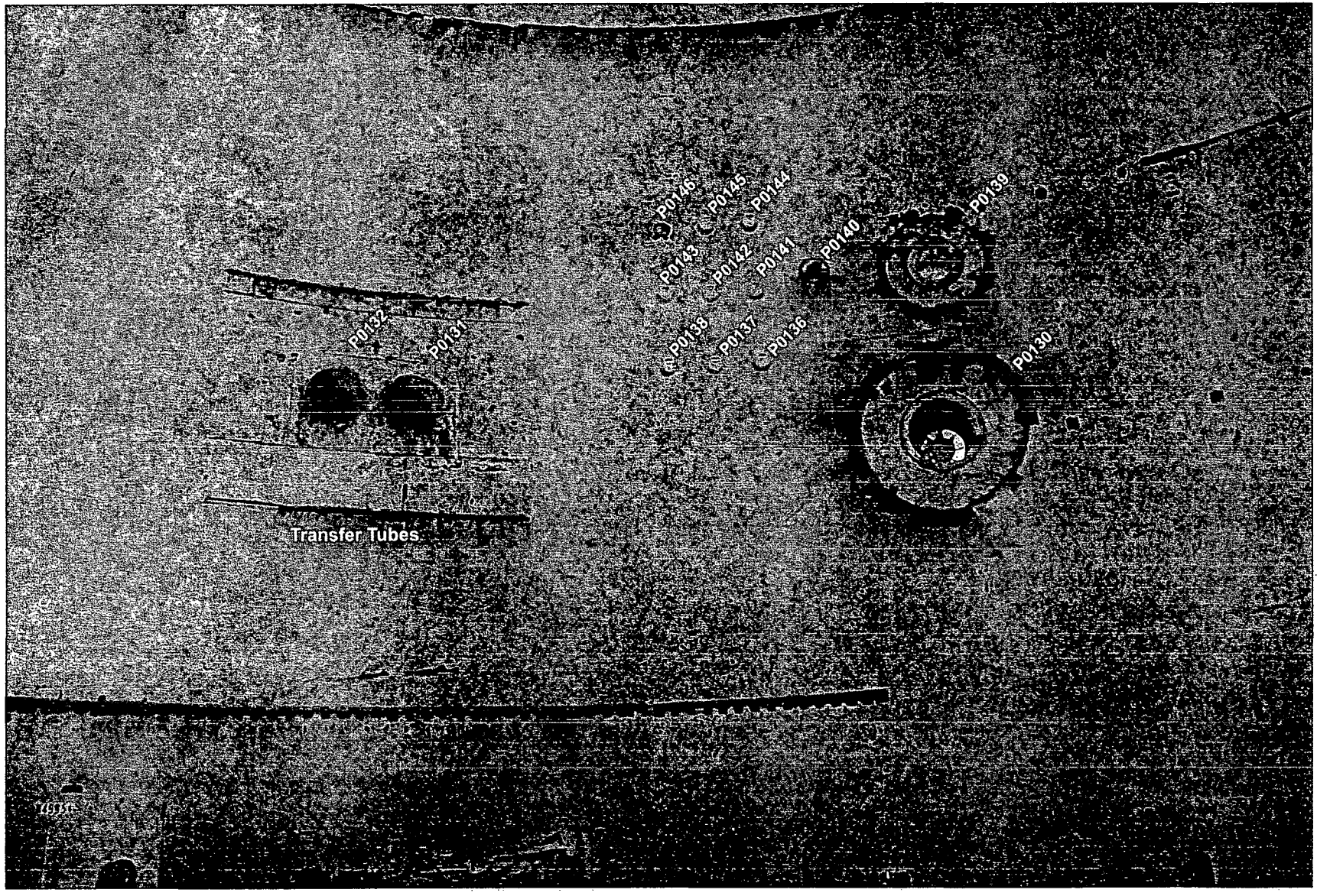
= Penetration OPEN from Rx Side

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT

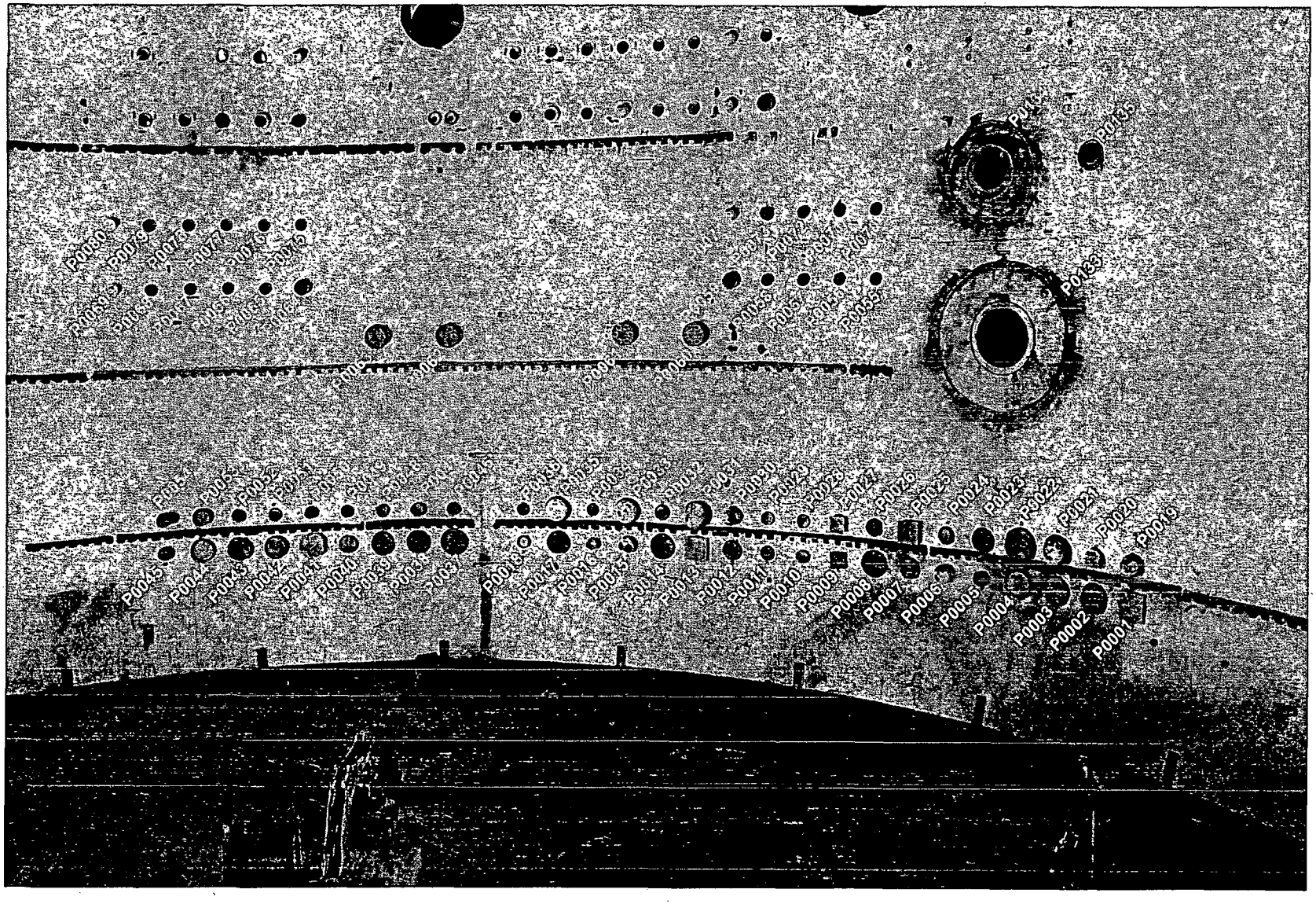
Inside Rx Bldg. View
Penetrations
MEASUREMENT LOCATIONS
Map F8110113-7

FILE:

J Grinley

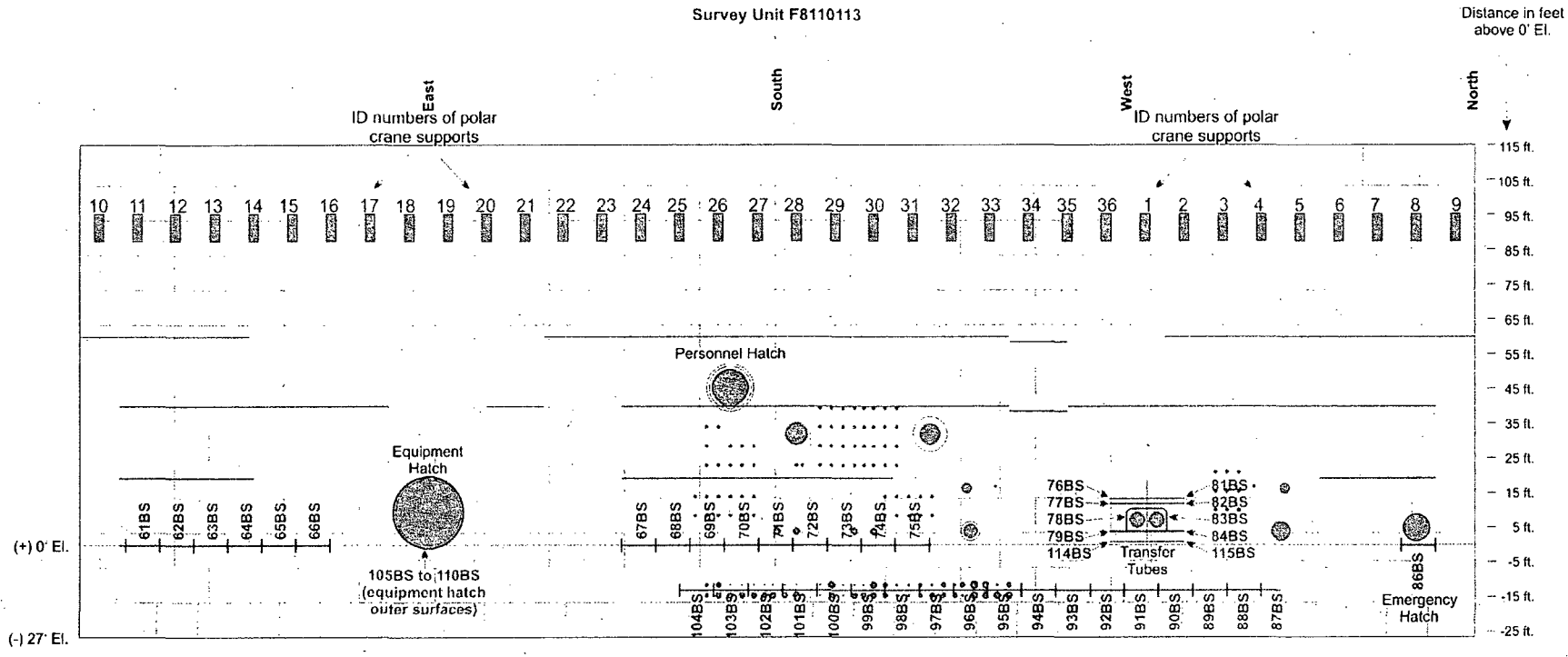


Map F8110113-8, Containment Interior Walls (-) 27' El. to (+) 25' El.
Beta Scan Measurements of Penetrations
F8110113P0130BS to F8110113P0132BS and
F8110113P0136BS to F8110113P0146BS



Map F8110113-9, Containment Interior Walls (-) 27' El. to (+) 25' El.
Beta Scan Measurements of Penetrations
F8110113P0001BS to F8110113P0080BS and
F8110113P0133BS to F8110113P0135BS

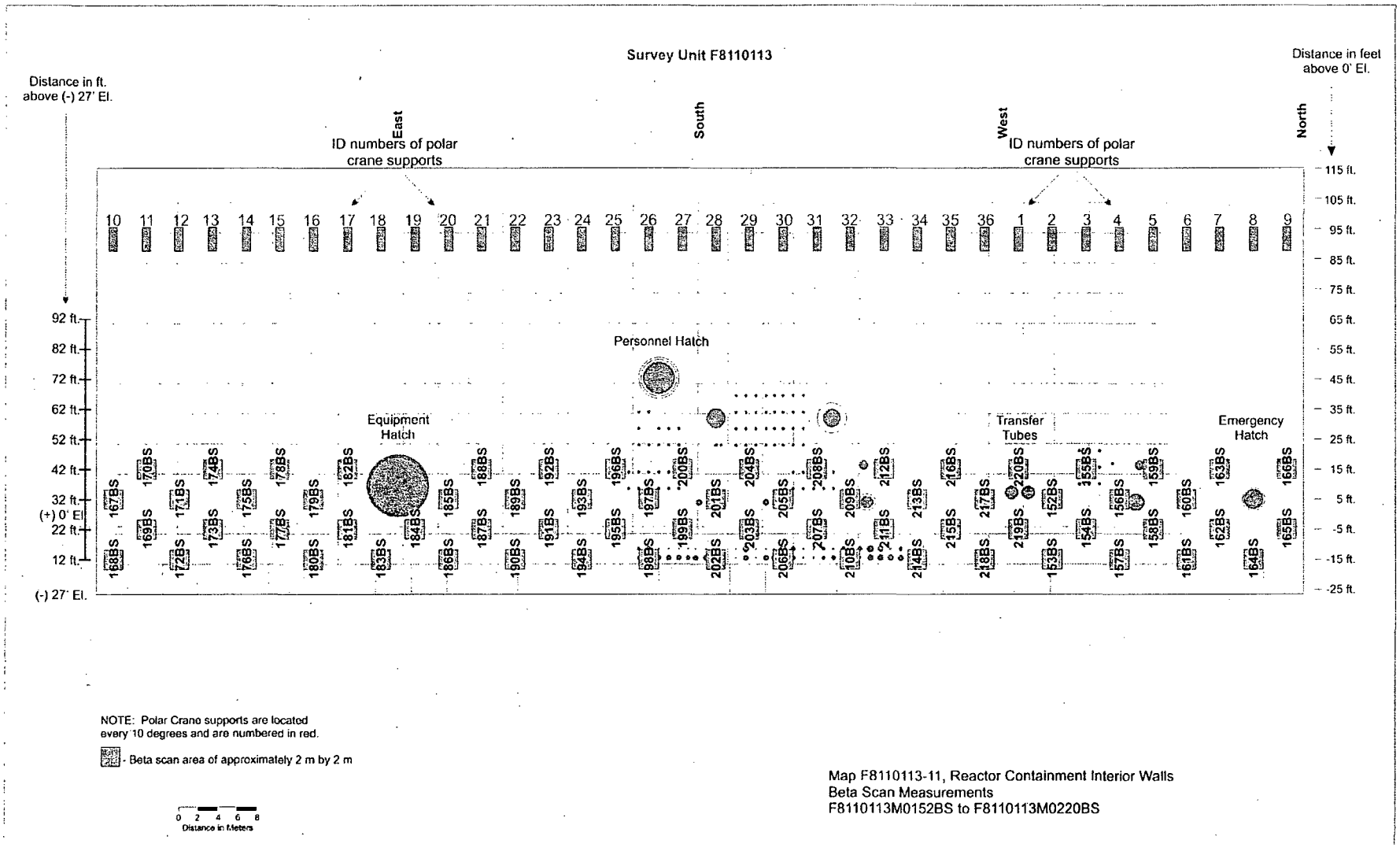
Survey Unit F8110113



NOTE: Polar Crane supports are located every 10 degrees and are numbered in red.

0 2 4 6 8
Distance in Meters

Map F8110113-10, Reactor Containment Interior Walls
Beta Scan Measurements of Horizontal Surfaces
F8110113M0061BS to F8110113M0079BS,
F8110113M0081BS to F8110113M0084BS,
F8110113M0086BS to F8110113M0110BS, and
F8110113M0114BS to F8110113M0115BS

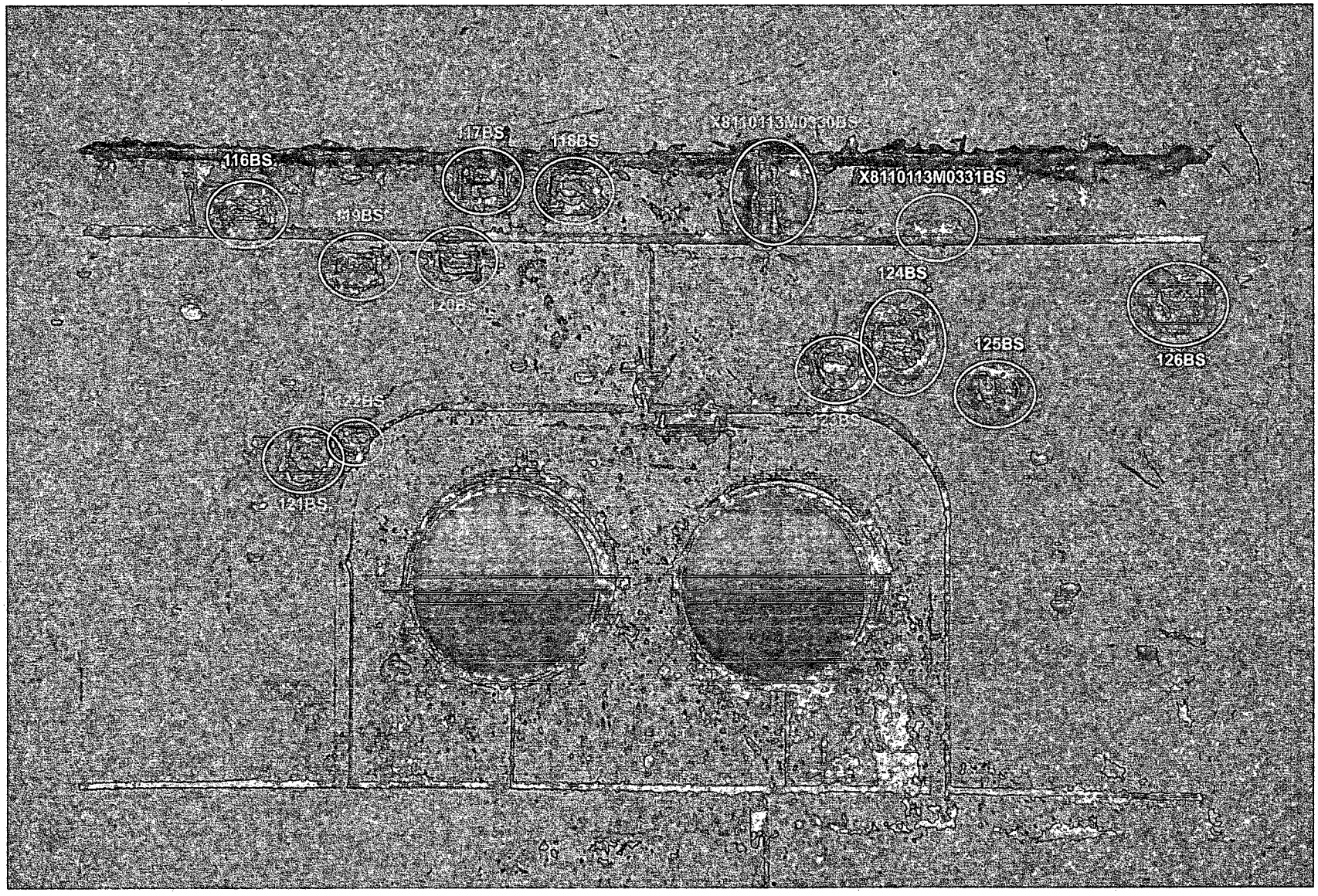


NOTE: Polar Crane supports are located every 10 degrees and are numbered in red.

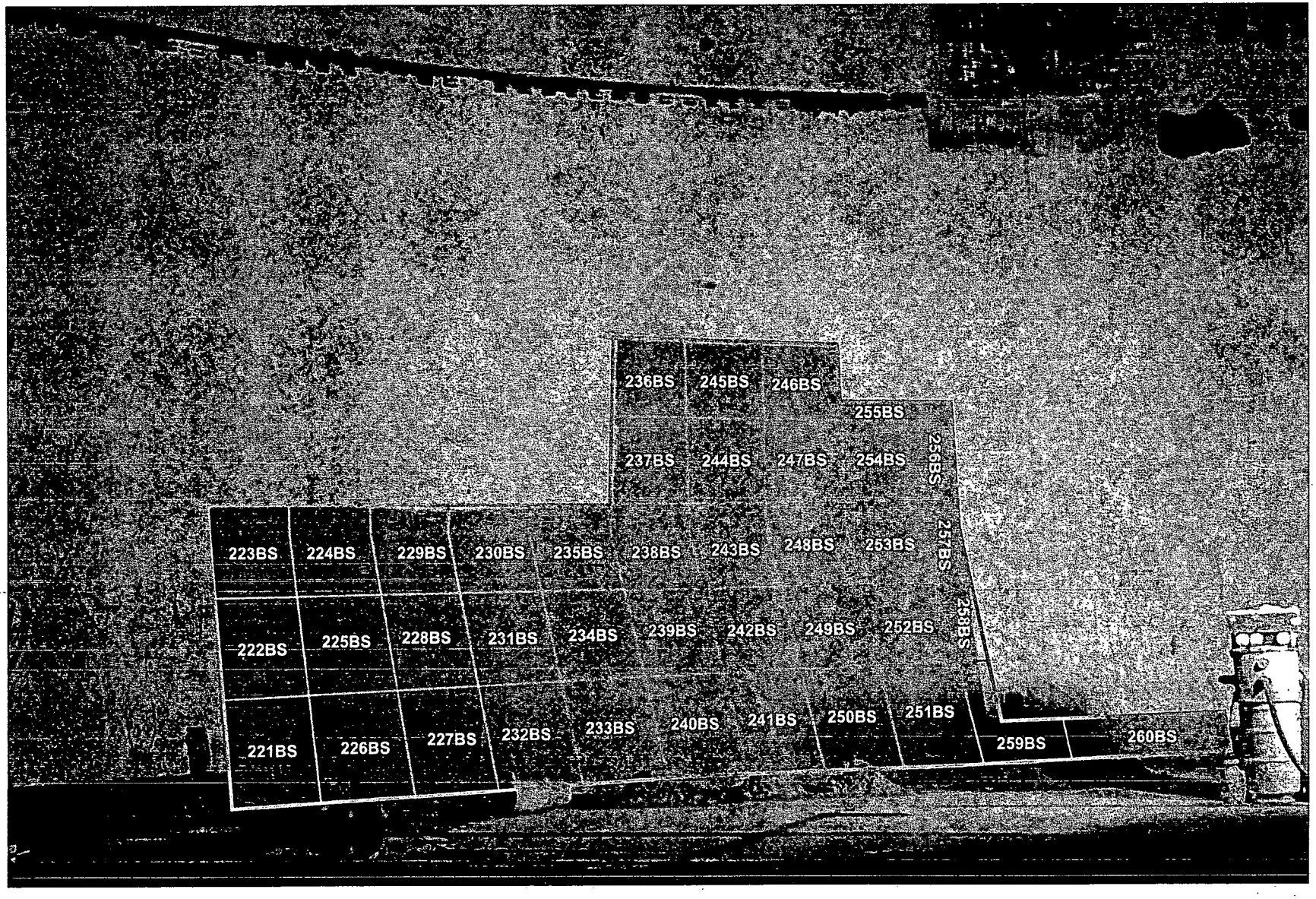
- Beta scan area of approximately 2 m by 2 m

0 2 4 6 8
Distance in Meters

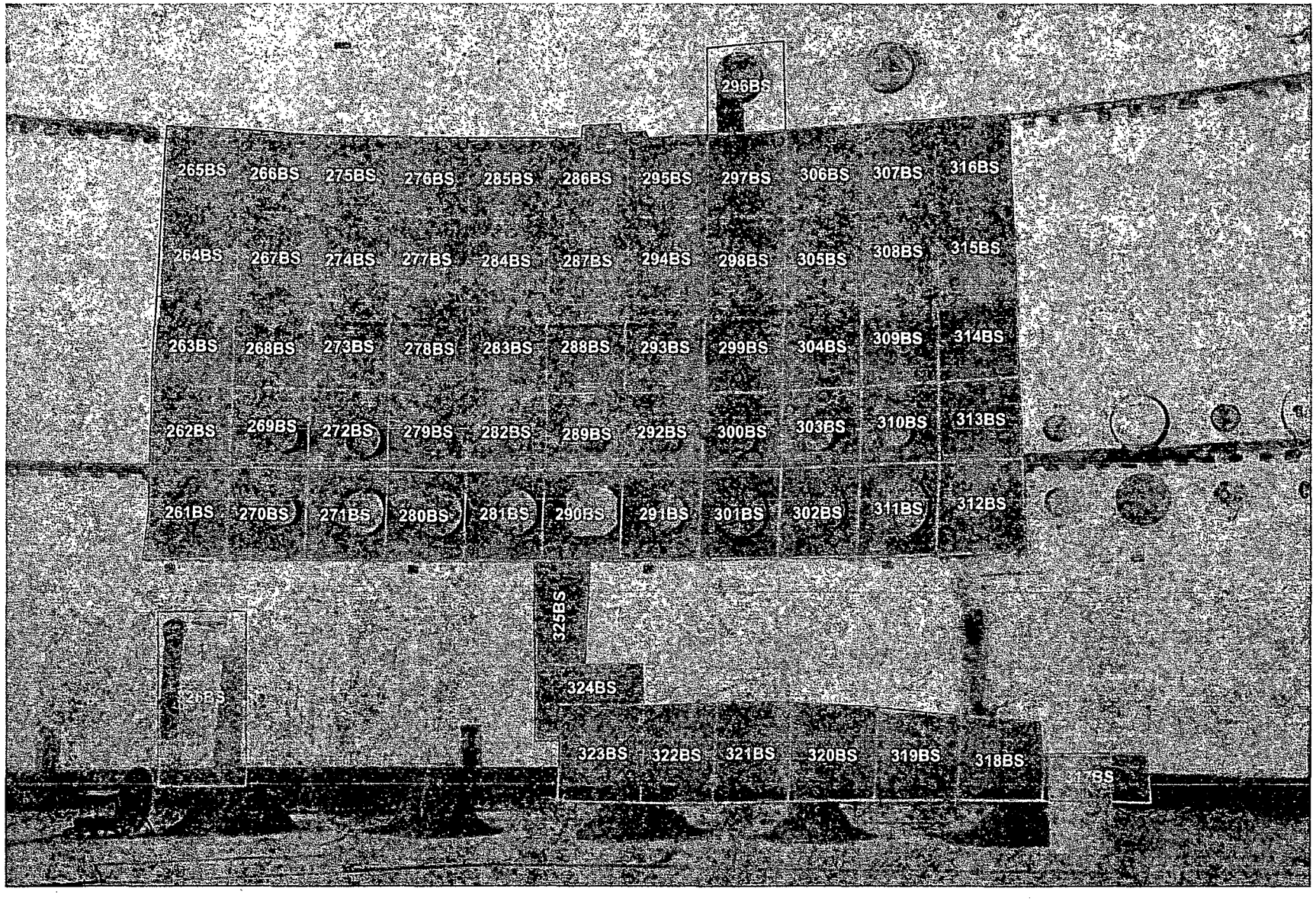
Map F8110113-11, Reactor Containment Interior Walls
Beta Scan Measurements
F8110113M0152BS to F8110113M0220BS



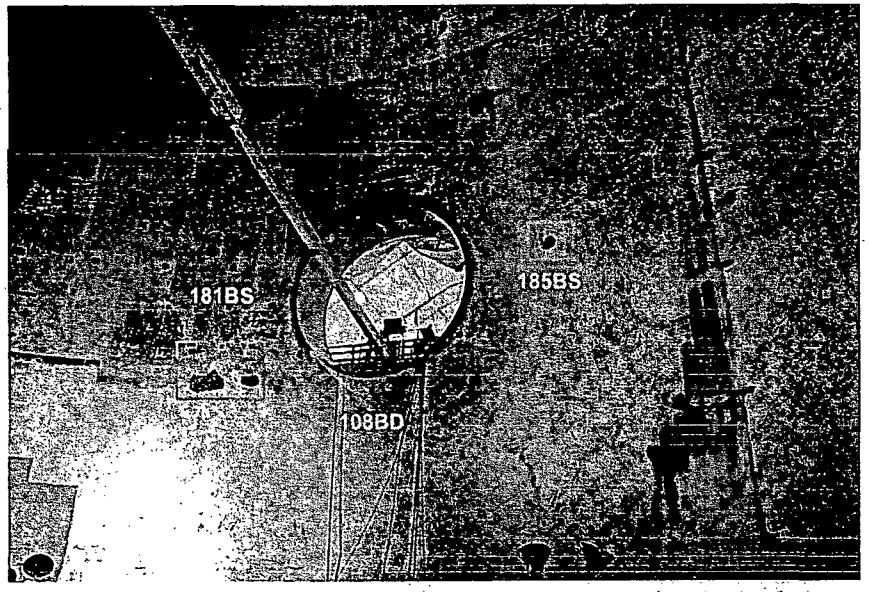
Map F8110113-12, Containment Interior Walls (-) 27' El. to (+) 25' El.
Beta Scan Measurements of Liner Perforations
F8110113C0116BS to F8110113C0126BS and
X8110113M0330BS to X8110113M0331BS

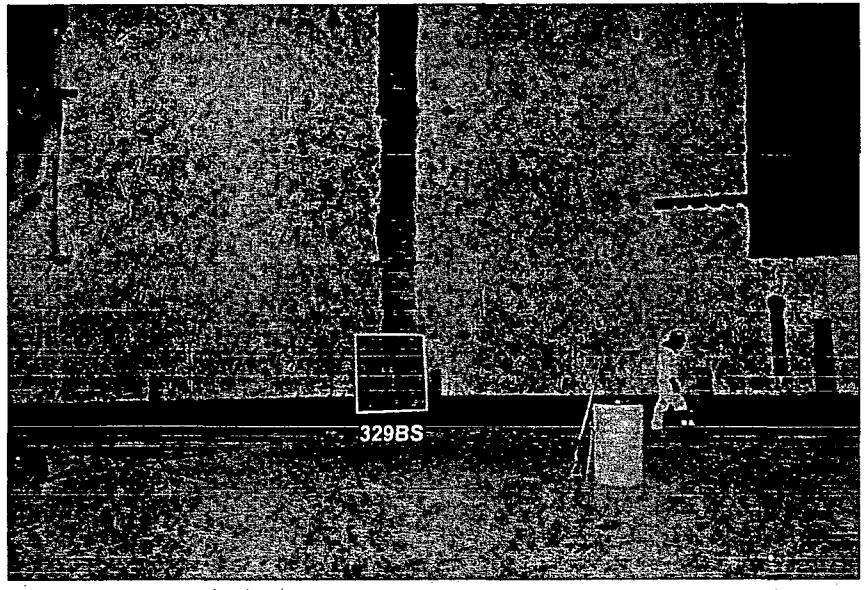


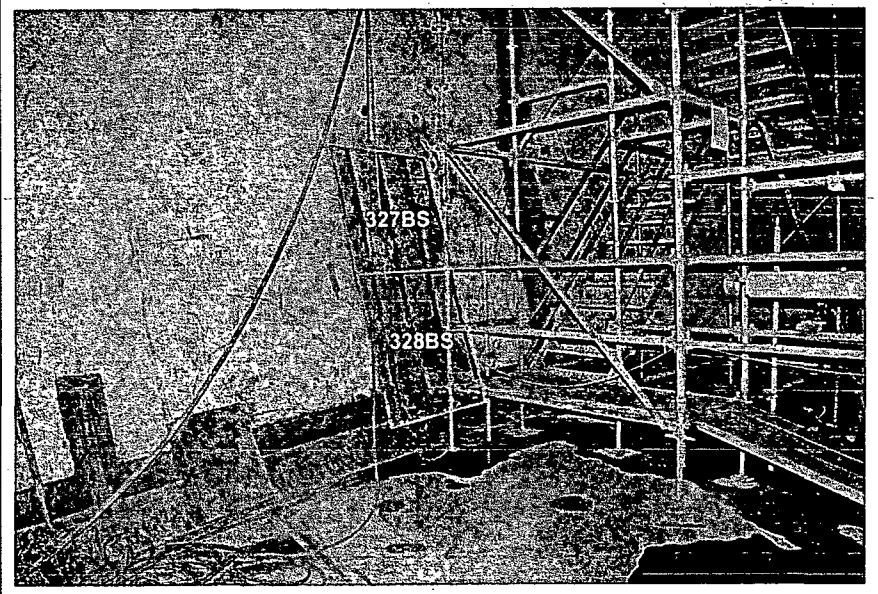
Map F8110113-13, Containment Interior Walls (-) 27' El. to (+) 25' El.
Beta Scan Measurements
X8110113M0221BS to X8110113M0260BS



Map F8110113-14, Containment Interior Walls (-) 27' El. to (+) 25' El.
Beta Scan Measurements
X8110113M0261BS to X8110113M0326BS







Map F8110113-15, Containment Interior Walls (-) 27' El. to (+) 25' El.
Beta Scan Measurements
X8110113M0181BS, X8110113M0185BS and
X8110113C0327BS to X8110113C0329BS
Beta Direct Measurements X8110113M0802BD, X8110113M0108BD,
X8110113P0642BD and X8110113M0200BD

Attachment 2

Instrumentation

February 16, 2009

Survey Unit F8110113

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; 142509	44-116; 193992[1]	343	884
M2350; 189089	44-116; 192946[1]	343	884
M2350; 149789	43-68B; 161415[1]	257	612
M2350; 149789	43-68B; 161415[2]	433	1,033
M2350; 142509	43-68B; 160696[1]	257	612
M2350; 149789	43-68B; 148633[1]	257	612
M2350; 149789	43-51B; 190167[3]	586	1,370
M2350; 149789	43-51B; 190167[2]	1,324	4,494
M2350; 149789	43-51B; 190167[1]	788	2,675
M2350; 142509	43-51B; 190667[1]	788	2,675
M2350; 149789	43-116-1B; 256006[3]	290	436
M2350; 149789	43-116-1B; 256006[1]	472	1,930
Tennelec; 0401171	N/A	4.93 dpm α, 8.21 dpm β	N/A

[1]Metal Surfaces
[2]Concrete Surfaces
[3]Metal Junctures

Instrument	Detector Model No.	Detector Serial No.	MDC
ISOCS	N/A	1983920	Metal – 969 dpm/100 cm^2 Cs-137, Metal – 772 dpm/100 cm^2 Co-60

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm^2)
Investigation Criteria - Direct	640,700
Investigation Criteria – Beta Scan	43,000
Investigation Criteria – Gamma Scan (ISOCS average activity – 19.6 sq. meter field of view)	34,000 Cs-137 11,000 Co-60
Investigation Criteria – Gamma Scan (ISOCS average activity – 12.6 sq. meter field of view)	59,000 Cs-137 19,000 Co-60
$DCGL_W$	43,000
$DCGL_{EMC}$	640,700

Attachment 3

Investigation

February 16, 2009

Survey Unit F8110113

Table 3-1 Survey Unit Investigation

Grid	*Investigation Level (cpm)*	*Initial Value (cpm)*	*Investigation Result (cpm)*	*Elevated Area (m^2)*	*Area Factor*	*$DCGL_{emc}$*	*Investigation Result ($dpm/100cm^2$)*	*$DCGL_{emc}$ Unity Fraction*
70	1,861	3,954	4,803	0.077	169.6	7,291,255	78,480	0.011
71	1,861	4,654	7,058	0.074	178.4	7,671,205	115,327	0.015
102	1,861	(not logged)	1,006 (scan)				23,250	N/A
103	1,861	2,147	1,589	0.009	1,432.6	61,600,459	25,964	N/A
108	9,880	24,985	54	0.019	670.8	28,843,635	1,361	N/A
152[1]	9,880	32,391	2,499 (scan)	N/A	N/A	N/A	10,873	N/A
176[2]	9,880	249,608	1,109 (scan)	N/A	N/A	N/A	6,435	N/A
181	9,880	21,252	3,557 (scan)	N/A	N/A	N/A	15,477	N/A
185	9,880	9,751	2,677 (scan)	N/A	N/A	N/A	11,648	N/A
200	9,880	10,699	13,076	0.046	281.2	12,092,295	40,224	N/A
202[3]	9,880	27,140	(Refer to Note 3 for additional explanation)					N/A
P031 Exterior	1,100	1,835	891	0.008	1,671.0	71,852,951	22,449	N/A
P033 Exterior	1,100	4,829	1,004	0.014	958.0	41,195,710	25,296	N/A
P034 Exterior	1,100	12,761	109	N/A	N/A	N/A	2,746	N/A
P035 Exterior	1,100	4,618	2,537	0.035	373.9	16,078,331	63,920	0.004
P036 Exterior	1,100	1,394	962	0.019	670.8	28,843,635	24,238	N/A
P041 Interior	1,100	1,442	1,784	0.009	1,432.6	61,600,459	44,948	0.001
P041 Exterior	1,100	3,350	(surveyed as 290)	N/A	N/A	N/A	N/A	N/A
P042 Exterior	1,100	1,500	1,233	0.009	1,432.6	61,600,459	31,066	N/A
P044 Exterior	1,100	1,649	(surveyed as 271)	N/A	N/A	N/A	N/A	N/A
P047 Interior	1,100	1,531	58	N/A	N/A	N/A	1,461	N/A

Grid	Investigation Level (cpm)	Initial Value (cpm)	Investigation Result (cpm)	Elevated Area (m^2)	Area Factor	$DCGL_{emc}$	Investigation Result ($dpm/100cm^2$)	$DCGL_{emc}$ Unity Fraction
P047 Exterior	1,100	2,575	2,289	0.005	2,309.2	99,294,293	57,672	0.001
P052 Exterior	1,100	14,047	14,105	0.008	1,671.0	71,852,951	355,379	0.005
P053 Exterior	1,100	9,197	9,748	0.032	403.5	17,351,697	245,603	0.014
P054 Exterior	1,100	3,542	2,348	0.012	1,116.5	48,009,355	59,158	0.001
P063 Exterior	1,100	5,102	(surveyed as 296)	N/A	N/A	N/A	N/A	N/A
P064 Exterior	1,100	3,065	3,019	0.054	241.4	10,380,264	76,064	0.007
P080 Exterior	1,100	1,665	1,110	0.039	336.9	14,485,228	27,967	N/A
271	1,100	1,317	1,171	0.018	718.7	30,902,519	29,504	N/A
274	9,880	11,446	9,993	0.098	134.2	5,769,409	30,740	N/A
277	9,880	13,148	10,904	0.065	203.1	8,734,115	33,543	N/A
279	1,100	6,783	(surveyed as P052 Ext)	N/A	N/A	N/A	N/A	N/A
279	9,880	13,275	11,218	0.126	104.7	4,500,134	34,508	N/A
285	9,880	11,361	11,404	0.018	718.7	30,902,519	35,081	N/A
286	9,880	16,314	12,406	0.028	458.0	19,693,511	38,163	N/A
287	9,880	20,114	20,918	0.054	241.4	10,380,264	64,347	0.006
289	9,880	13,060	12,607	0.054	241.4	10,380,264	38,781	N/A
290	9,880	11,965	10,118	0.023	559.1	24,039,191	31,125	N/A
291	1,100	1,410	2,052	0.010	1,337.2	57,498,866	51,701	0.001
294	9,880	16,961	15,499	0.085	154.3	6,634,517	47,677	0.007
296	9,880	10,099	2,983	0.017	745.3	32,046,305	75,157	0.002
299	9,880	11,118	8,877	0.032	403.5	17,351,697	27,307	N/A
300	1,100	1,533	1,209	0.005	2,309.2	99,294,293	30,461	N/A
326	9,880	13,998	11,742	0.026	503.3	21,642,934	36,120	N/A

Grid	*Investigation Level (cpm)*	*Initial Value (cpm)*	*Investigation Result (cpm)*	*Elevated Area (m^2)*	*Area Factor*	*$DCGL_{emc}$*	*Investigation Result ($dpm/100cm^2$)*	*$DCGL_{emc}$ Unity Fraction*
Survey Unit Remainder						DCGL = 43,000	SU Mean = 2,004	0.047
							EMC Unity Sum	0.122

[1]Grid 152 (2 m by 2 m area) was initially greater than the $DCGL_{EMC}$. Investigation of the area resulted in the decision to perform additional remediation. The area was resurveyed as grids 330 and 331. Beta scan activity for these grids ranged from 5,961 to 15,785 dpm/100 cm^2, based on a surveyor efficiency of 0.5 and no background subtracted. The reported investigation result is based on the average count rate of the two grids and represents the residual radioactivity levels following additional remediation.

[2]Grid 176 (2 m by 2 m area) was initially greater than the $DCGL_{EMC}$. Investigation of the area resulted in the decision to perform additional remediation. The area was resurveyed as grids 221 to 260. Beta scan activity for these grids ranged from 2,460 to 14,913 dpm/100 cm^2, based on a surveyor efficiency of 0.5 and no background subtracted. The reported investigation result is based on the average count rate of the 40 grids and represents the residual radioactivity levels following additional remediation.

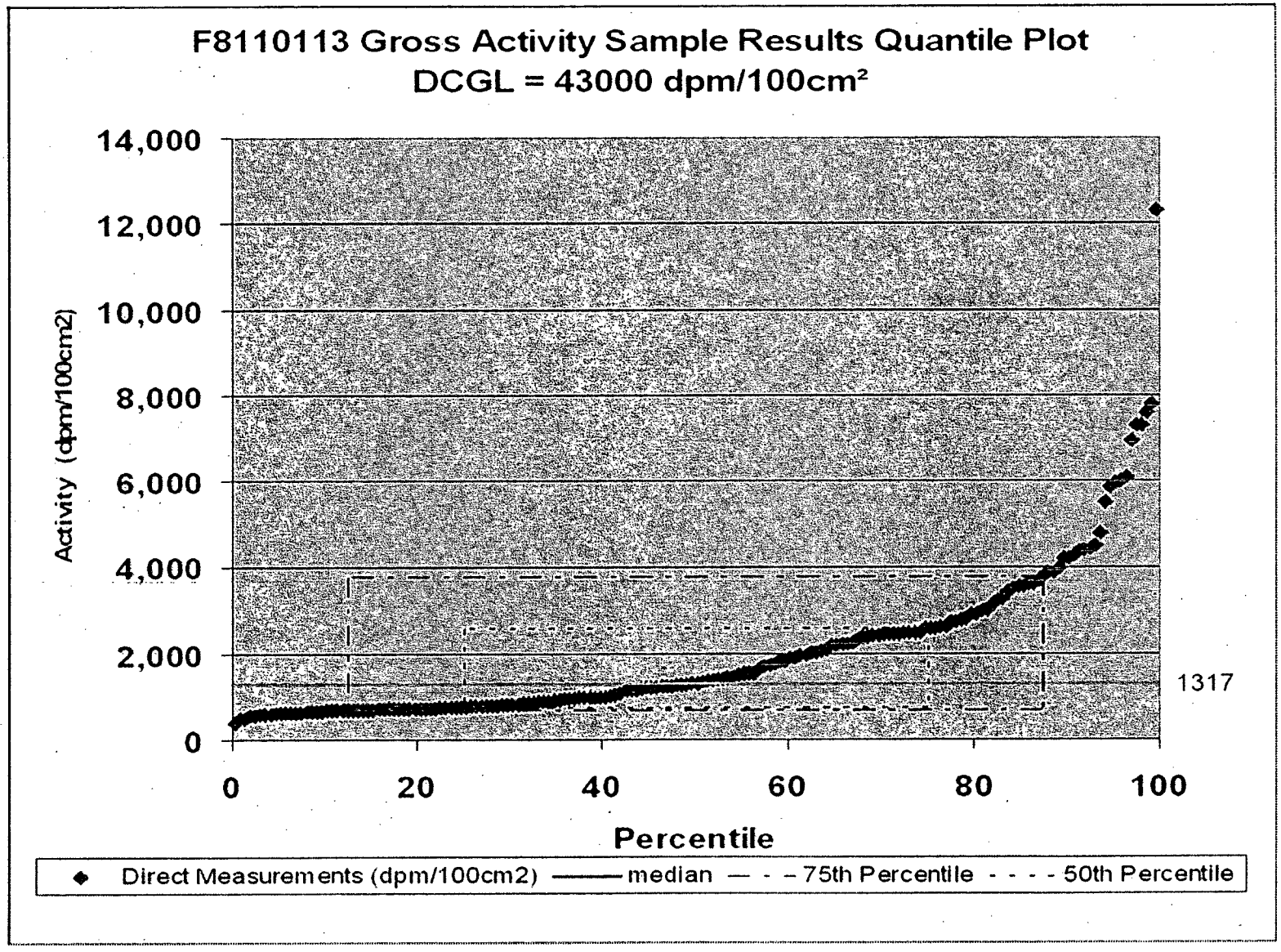
[3]Grids 198, 199 and 202 (adjacent 2 m by 2 m areas) were initially greater than the $DCGL_{EMC}$. Measurements for 198 and 199 were not logged. Investigation of the area resulted in the decision to perform additional remediation. These grids were resurveyed as 261 to 326. Beta scan activity for these grids ranged from 3,159 to 241,725 dpm/100 cm^2, based on a surveyor efficiency of 0.5 and no background subtracted. Grids exceeding 43,000 dpm/100 cm^2 are further annotated in the above table. The investigation results for these grids represent the residual radioactivity levels following the remediation.

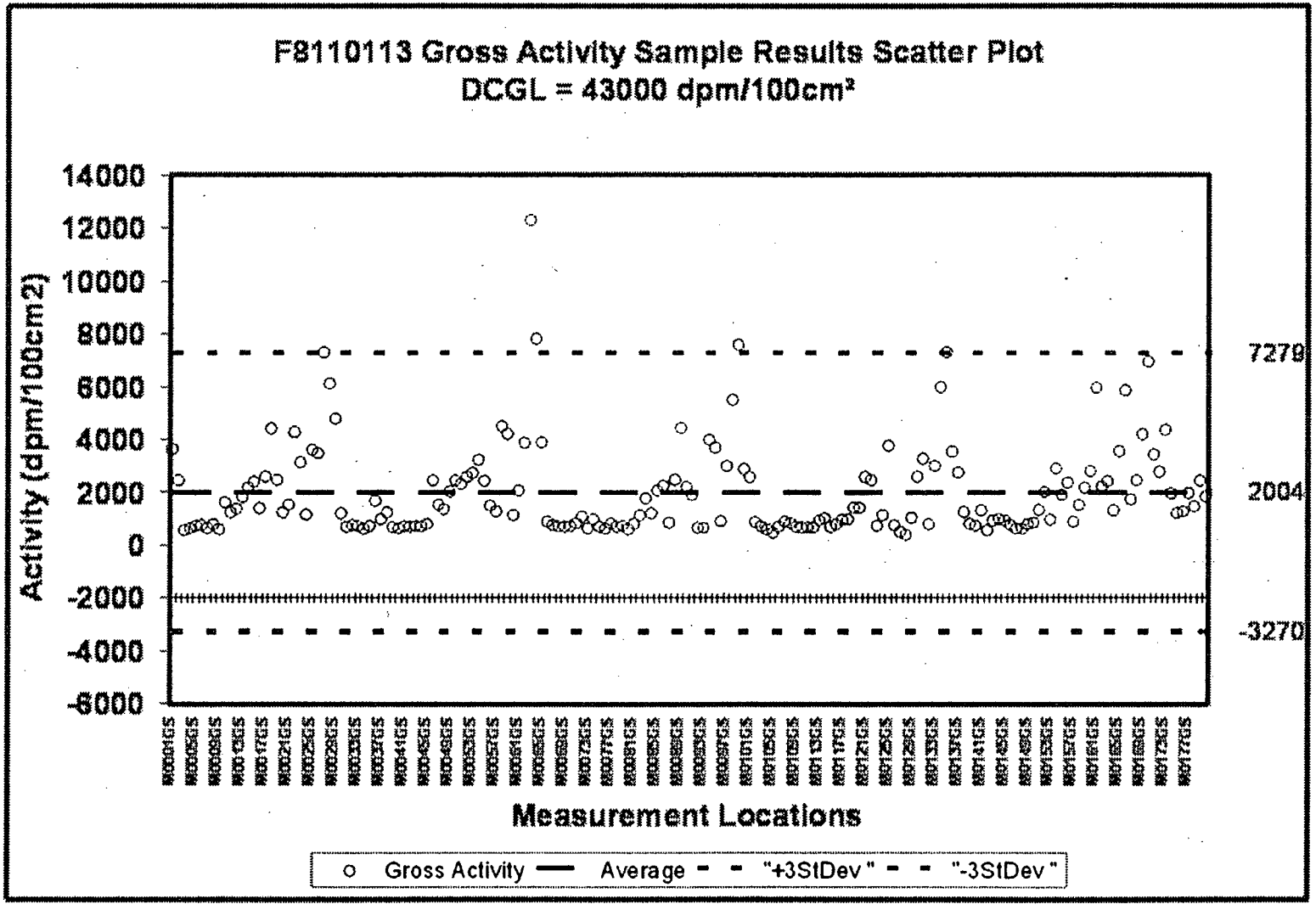
Attachment 4

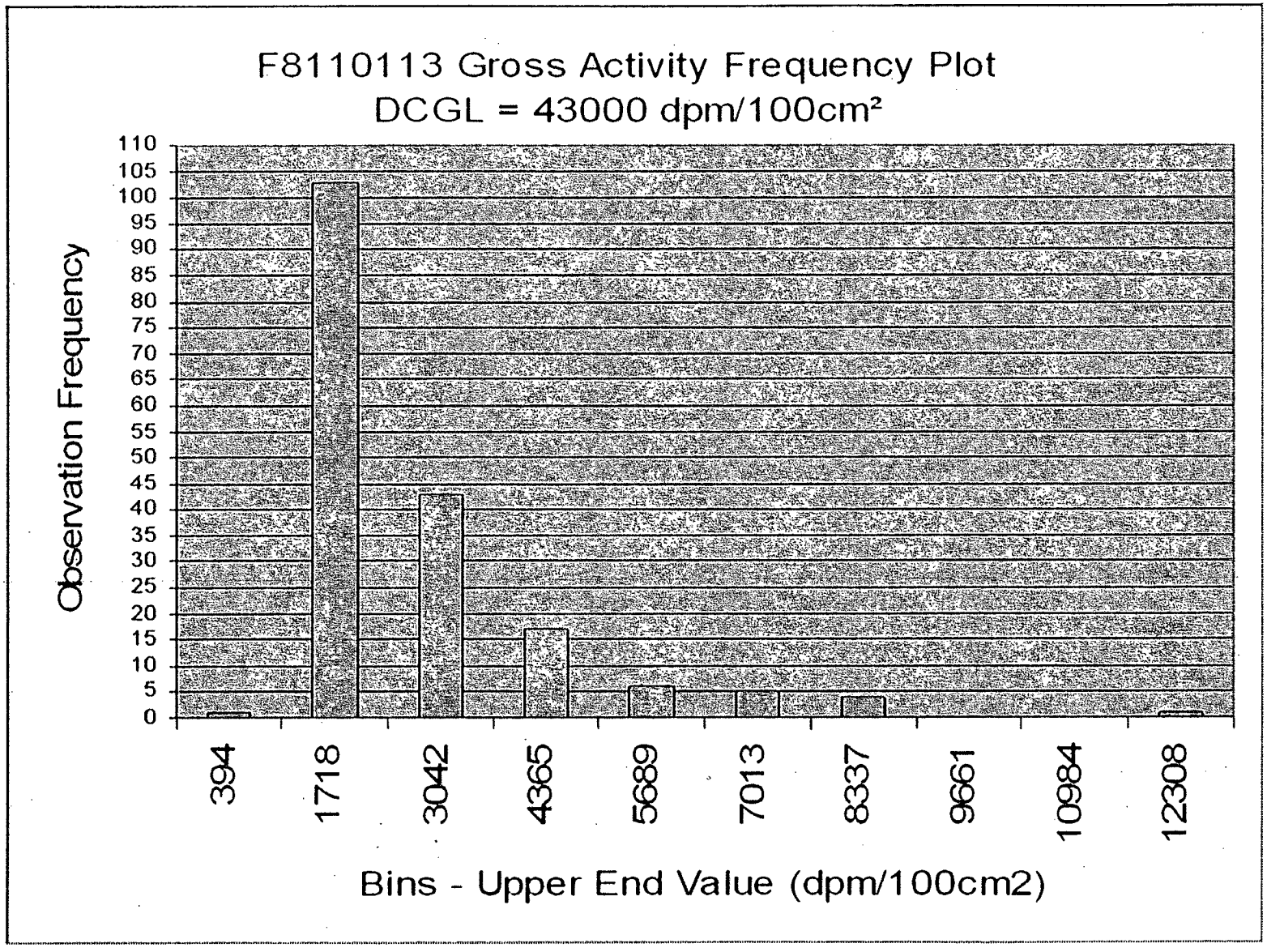
Data Assessment

February 16, 2009

Survey Unit F8110113


F8110113 Gross Activity Sample Results Quantile Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
0
20
40
60
80
100
Percentile
1317
Direct Measurements (dpm/100cm2)
median
75th Percentile
50th Percentile


F8110113 Gross Activity Sample Results Scatter Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
14000
12000
10000
8000
6000
4000
2000
0
-2000
-4000
-6000
7279
2004
-3270
Measurement Locations
Gross Activity
Average
"+3StDev"
"-3StDev"


F8110113 Gross Activity Frequency Plot
DCGL = 43000 dpm/100cm²
Observation Frequency
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
394
1718
3042
4365
5689
7013
8337
9661
10984
12308
Bins - Upper End Value (dpm/100cm2)