

Rancho Seco
Final Status Survey Summary Report
June 18, 2008
Turbine Building (+) 0' El., South Floor
Survey Unit F8260151

Prepared By: *D. Anderson* Date: 6/18/2008
FSS Engineer

Reviewed By: *Robert F. DeLun* Date: 11/20/08
Lead FSS Engineer

Approved By: *E. J. [Signature]* Date: 2-27-09
Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8260151, Turbine Building (+) 0' El., South Floor

Survey Unit Description:

Operating History: The reinforced concrete and steel structure contained the turbine-generator and supporting systems. The building contained five 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.

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 in the condenser pit elevation showed a mean gross activity level of 3,077 dpm/100 cm² and a maximum value of 24,900 dpm/100 cm². Direct measurements on the grade elevation showed a mean gross activity level of 2,035 dpm/100 cm² and a maximum value of 6,980 dpm/100 cm². Direct measurements on the mezzanine elevation showed a mean gross activity level of 1,566 dpm/100 cm² and a maximum value of 2,626 dpm/100 cm². Direct measurements on the +40' elevation showed a mean gross activity level of 2,843 dpm/100 cm² and a maximum value of 3,615 dpm/100 cm². Direct measurements on the building exterior showed a mean gross activity level of 1,984 dpm/100 cm² and a maximum value of 10,312 dpm/100 cm². Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the interior of the turbine building was determined to be Class 1, 2, & 3 areas and the exterior was a Class 3.

During characterization surveys of F8260141 (Turbine Building (+) 0' El., South Floor, Class 2), beta measurements identified activity within a 4-meter by 4-meter area that exceeded the DCGL of 43,000 dpm/100 cm². The area was subsequently remediated and reclassified as a Class 1 structure, based on the classification procedure (DSIP-0020). As a result of the reclassification, a new survey package was initiated as F8260151.

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 random-start, fixed grid pattern and 16 m² were scanned for 100% coverage. Samples of removable contamination were collected at each direct measurement location. 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:	F826	Turbine Building (+) 0' El., South Floor
Survey Unit:	0151	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m²):	16	
Evaluator:	D. Anderson	
DCGL (dpm/100 cm²):	43,000	Gross Activity DCGL
Area Factor:	14.9	Class 1
Design DCGL_{emc} (dpm/100 cm²):	640,700	Class 1
LBGR (dpm/100 cm²):	25,030	Adjusted
Design Sigma (dpm/100 cm²):	5,990	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m²):	1.0	Class 1
Scan Area (m²):	16	
Scan Coverage (%):	100%	Class 1
Z_{1-α}:	1.645	
Z_{1-β}:	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	3	
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 1
Grid Spacing L:	1.0	Class 1

Survey Results:

A total of 16 direct measurements were made in F8260151. 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 scan measurements indicated areas of elevated activity. Scan activity ranged from 3,492 to 13,953 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 cm ²)
F8260151-C0001BD	1,323
F8260151-C0002BD	1,421
F8260151-C0003BD	1,323
F8260151-C0004BD	1,520
F8260151-C0005BD	1,110
F8260151-C0006BD	1,312
F8260151-C0007BD	1,473
F8260151-C0008BD	1,899
F8260151-C0009BD	1,567
F8260151-C0010BD	2,806
F8260151-C0011BD	1,509
F8260151-C0012BD	1,717
F8260151-C0013BD	1,349
F8260151-C0014BD	1,535
F8260151-C0015BD	1,421
F8260151-C0016BD	1,551
Mean:	1,552
Median:	1,491
Standard Deviation:	380
Range:	1,110 – 2,806

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm²)
F8260151C0001SM	-0.95
F8260151C0002SM	-4.82
F8260151C0003SM	-3.53
F8260151C0004SM	-2.24
F8260151C0005SM	0.34
F8260151C0006SM	-2.24
F8260151C0007SM	-0.95
F8260151C0008SM	-2.24
F8260151C0009SM	-2.24
F8260151C0010SM	-0.95
F8260151C0011SM	4.22
F8260151C0012SM	-4.82
F8260151C0013SM	-2.24
F8260151C0014SM	-2.24
F8260151C0015SM	0.34
F8260151C0016SM	-4.82
Mean:	-1.83
Median:	-2.24
Standard Deviation:	2.3
Range:	-4.82 to 4.22

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 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):	16	
Median (dpm/100 cm ²):	1,491	
Mean (dpm/100 cm ²):	1,552	
Direct Measurement Standard Deviation	380	
(dpm/100 cm ²):		
Total Standard Deviation (dpm/100 cm ²):	380	Based on samples and backgrounds.
Maximum (dpm/100 cm ²):	2,806	
Material Type:	N/A	Background Subtract Not Applied
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 < DCGL_{emc}:	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:

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 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. No potential areas of elevated activity were detected. 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 cm² and none of the removable surface activity measurements exceeded 10% of 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.

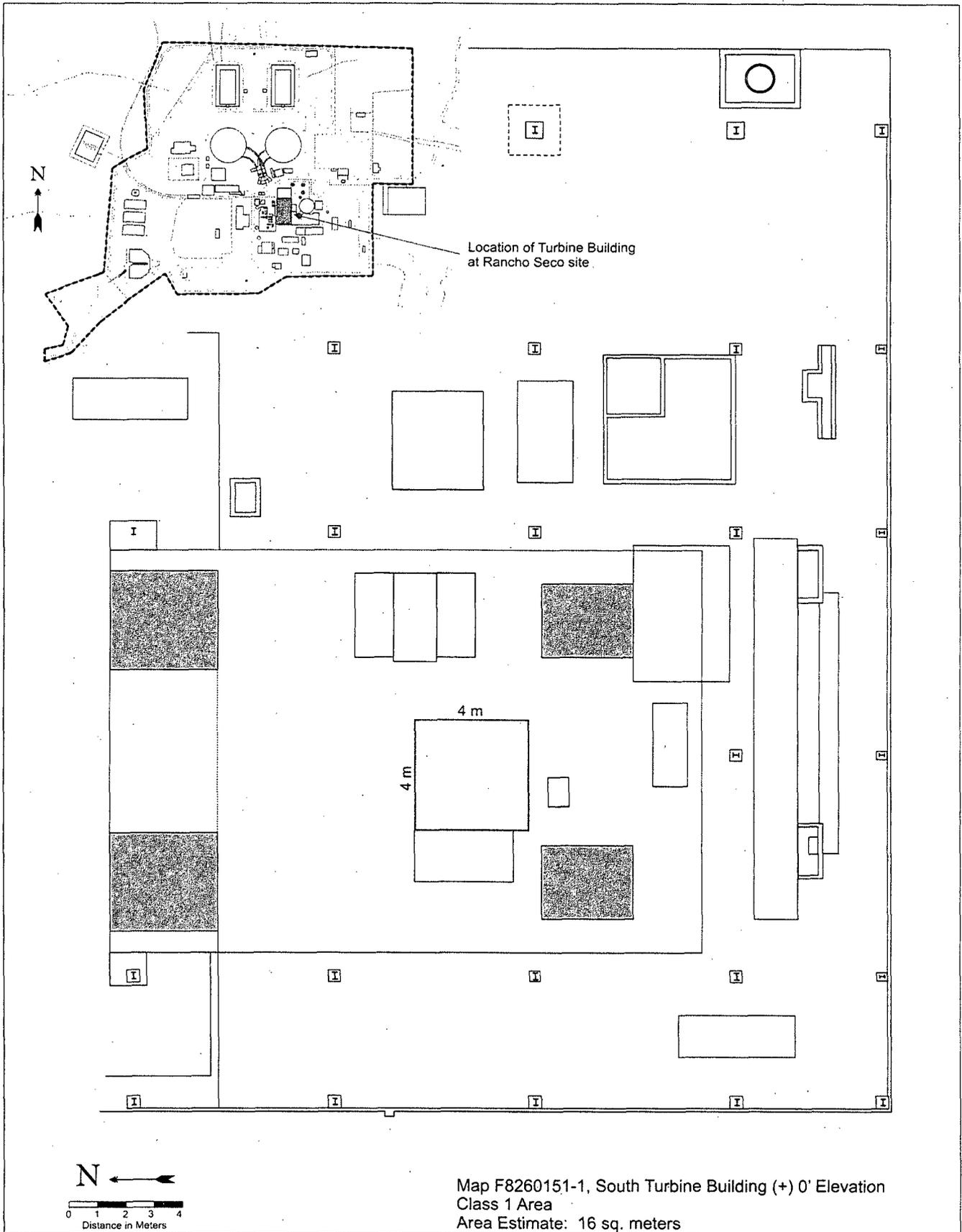
It is concluded that survey unit F8260151 meets the release criteria of 10CFR20.1402.

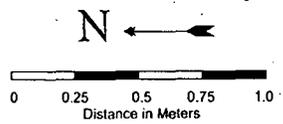
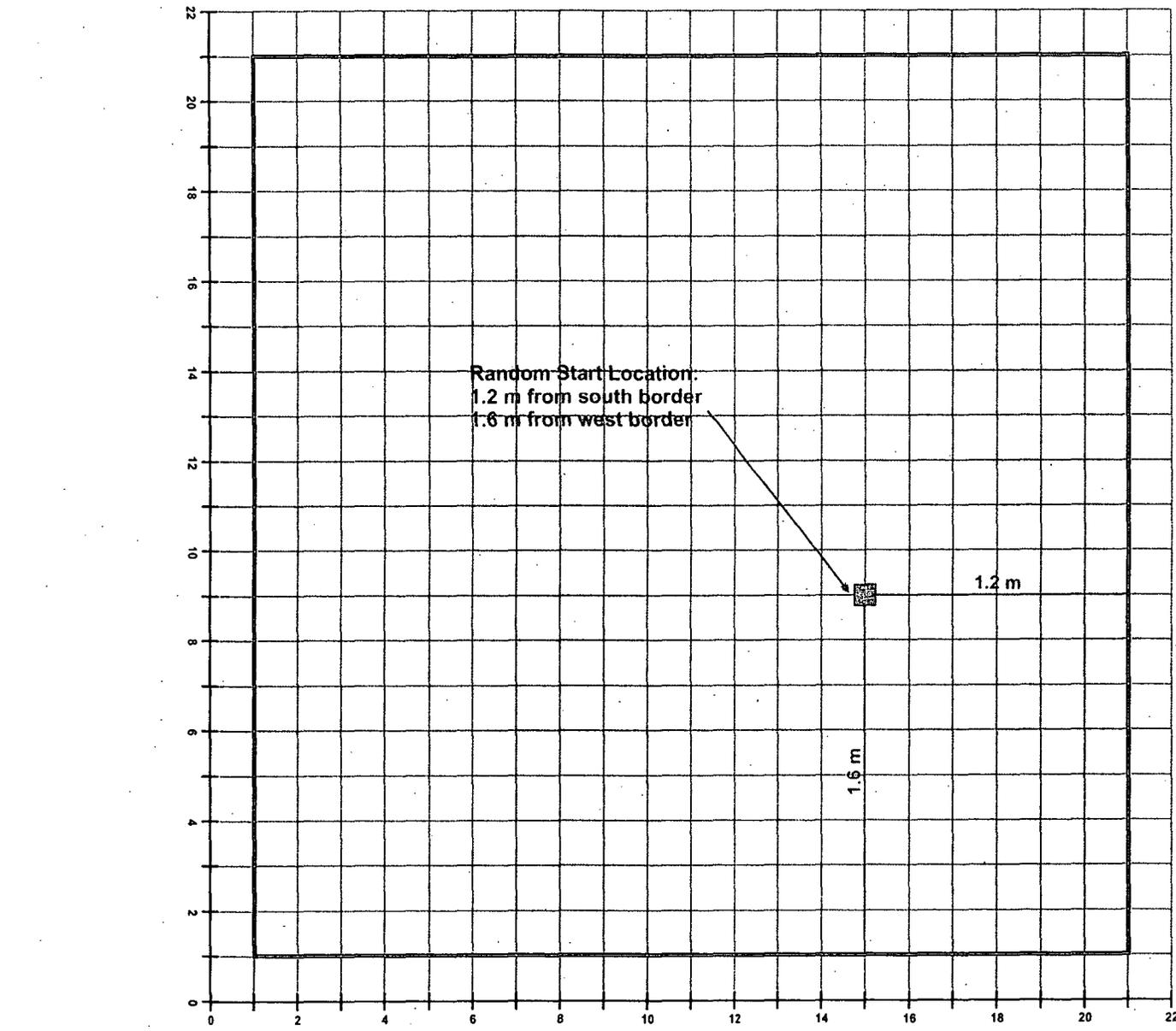
Attachment 1

Maps

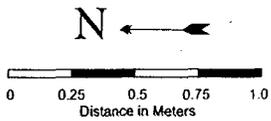
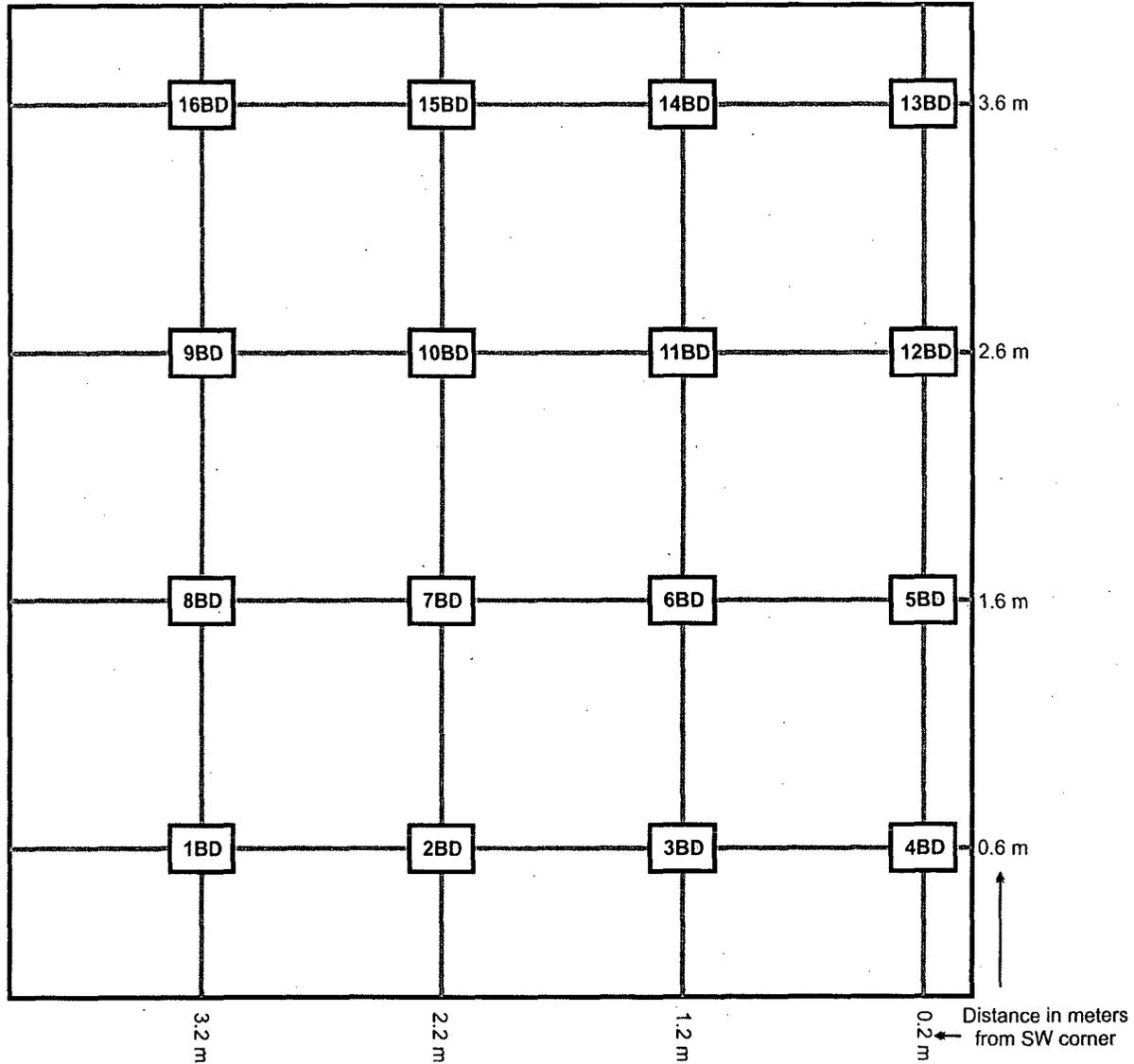
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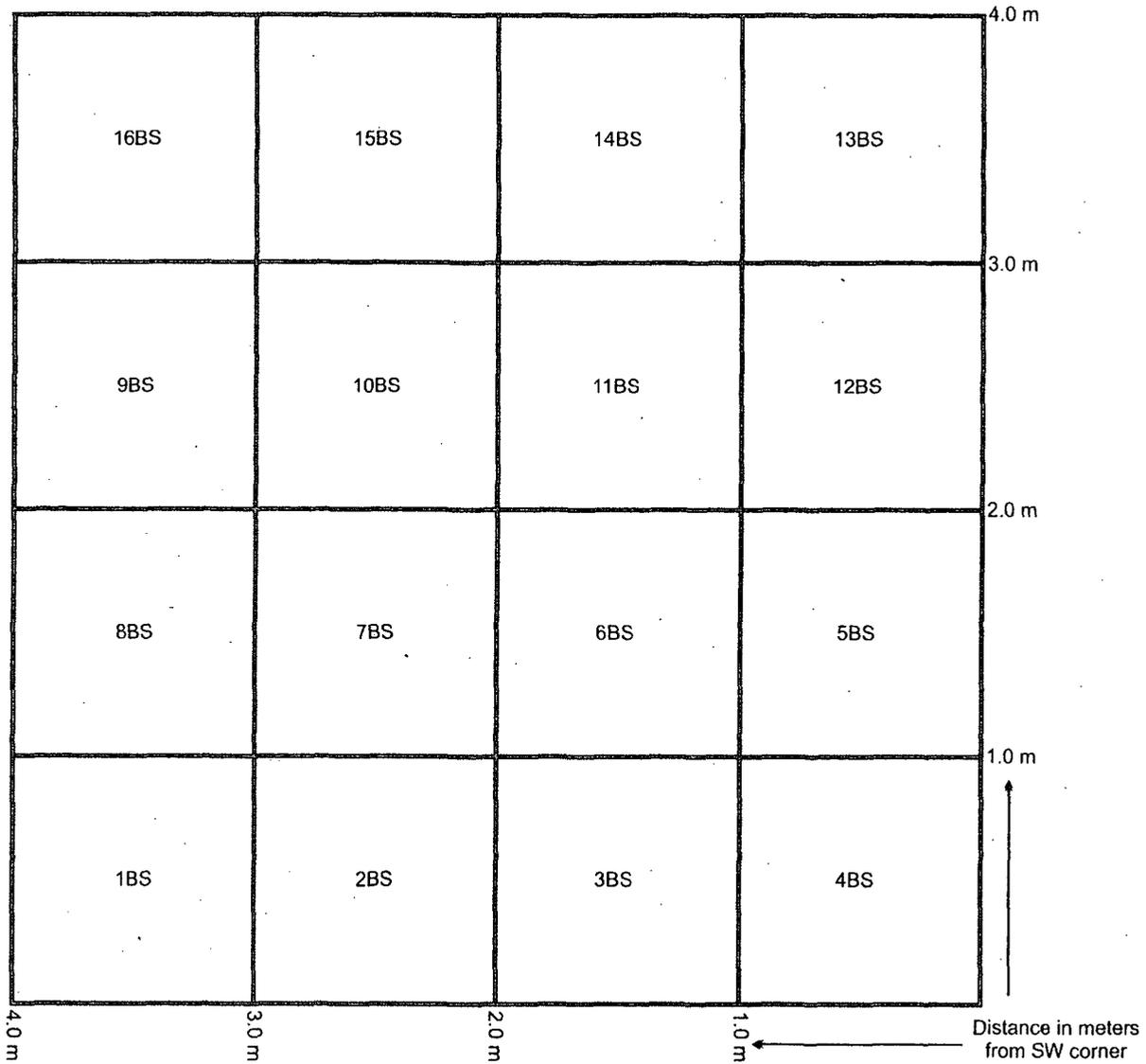




Map F8260151-2, South Turbine Building (+) 0' Elevation
Class 1 Area
Random Start Location



Map F8260151-3, South Turbine Building (+) 0' Elevation
Class 1 Area
Beta Direct Measurements
F8260151C0001BD to F8260151C0016BD
1 m by 1 m grid spacing



Map F8260151-4, South Turbine Building (+) 0' Elevation
Class 1 Area
Beta Scan Measurements
F8260151C0001BS to F8260151C0016BS

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; 149794	43-68/5B; 149103	433	1,033
Tennelec; 0401171	N/A	5.88 dpm α , 11.71 dpm β	N/A

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	640,700
Investigation Criteria – Scan	640,700
DCGL _W	43,000
DCGL _{EMC}	640,700

Attachment 3

Investigation

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(none required)

Attachment 4

Data Assessment

June 18, 2008

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