

**Rancho Seco**  
**Final Status Survey Summary Report**  
**March 27, 2008**  
**North Turbine Deck (+) 40' El.**  
**Survey Unit F8260303**

Prepared By: D. Anderson Date: 3/27/2008

**FSS Engineer**

Reviewed By: [Signature] Date: 4/15/08

**Lead FSS Engineer**

Approved By: [Signature] Date: 7-29-08

**Dismantlement Superintendent, Radiological**

## FINAL STATUS SURVEY SUMMARY REPORT

### Survey Unit:

F8260303, North Turbine Deck (+) 40' El.

### 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 cm<sup>2</sup> and a maximum value of 24,900 dpm/100 cm<sup>2</sup>. Direct measurements on the grade elevation showed a mean gross activity level of 2,035 dpm/100 cm<sup>2</sup> and a maximum value of 6,980 dpm/100 cm<sup>2</sup>. Direct measurements on the mezzanine elevation showed a mean gross activity level of 1,566 dpm/100 cm<sup>2</sup> and a maximum value of 2,626 dpm/100 cm<sup>2</sup>. Direct measurements on the +40' elevation showed a mean gross activity level of 2,843 dpm/100 cm<sup>2</sup> and a maximum value of 3,615 dpm/100 cm<sup>2</sup>. Direct measurements on the building exterior showed a mean gross activity level of 1,984 dpm/100 cm<sup>2</sup> and a maximum value of 10,312 dpm/100 cm<sup>2</sup>. 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.

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 486 m<sup>2</sup> were scanned for approximately 60% 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**

<b>Survey Design Parameter</b>	<b>Value</b>	<b>Comment</b>
<b>Survey Area:</b>	F826	North Turbine Deck (+) 40' El.
<b>Survey Unit:</b>	0303	Structure Surface
<b>Class:</b>	2	LTP Table 5-4
<b>SU Area (m<sup>2</sup>):</b>	815	
<b>Evaluator:</b>	D. Anderson	
<b>DCGL (dpm/100 cm<sup>2</sup>):</b>	43,000	Gross Activity DCGL
<b>Area Factor:</b>	N/A	Class 2
<b>Design DCGL<sub>emc</sub> (dpm/100 cm<sup>2</sup>):</b>	N/A	Class 2
<b>LBGR (dpm/100 cm<sup>2</sup>):</b>	37,831	Adjusted
<b>Design Sigma (dpm/100 cm<sup>2</sup>):</b>	1,723	
<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>	58.2	Class 2
<b>Scan Area (m<sup>2</sup>):</b>	486	
<b>Scan Coverage (%):</b>	60%	Class 2
<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>	3	
<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 2
<b>Grid Spacing L:</b>	7.5	Class 2

**Survey Results:**

A total of 24 direct measurements were made in F8260303. 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. All ISOCS gamma measurements were less than the Cs-137 and Co-60 MDAs. 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**

<b>Measurement ID</b>	<b>Gross Activity (dpm/100 cm<sup>2</sup>)</b>
F8260303-M0001BD	2,270
F8260303-M0002BD	2,016
F8260303-M0003BD	1,849
F8260303-M0004BD	2,024
F8260303-M0005BD	2,389
F8260303-M0006BD	2,198
F8260303-M0007BD	2,151
F8260303-C0008BD	1,603
F8260303-C0009BD	1,831
F8260303-C0010BD	1,914
F8260303-C0011BD	1,841
F8260303-C0012BD	1,717
F8260303-C0013BD	2,148
F8260303-C0014BD	2,070
F8260303-C0015BD	1,935
F8260303-C0016BD	2,075
F8260303-C0017BD	2,080
F8260303-C0018BD	1,935
F8260303-C0019BD	1,982
F8260303-C0020BD	1,919
F8260303-M0021BD	2,008
F8260303-M0022BD	1,841
F8260303-M0023BD	2,484
F8260303-M0024BD	2,333
Mean:	2,026
Median:	2,012
Standard Deviation:	210
Range:	1,603 – 2,484

**Table 3. Removable Surface Activity Results**

Measurement ID	Surface Beta Activity (dpm/100 cm <sup>2</sup> )
F8260303M0001SM	-7.4
F8260303M0002SM	-4.82
F8260303M0003SM	6.8
F8260303M0004SM	0.34
F8260303M0005SM	2.93
F8260303M0006SM	-7.4
F8260303M0007SM	-2.24
F8260303C0008SM	2.93
F8260303C0009SM	1.64
F8260303C0010SM	-2.24
F8260303C0011SM	2.93
F8260303C0012SM	-2.24
F8260303C0013SM	-3.53
F8260303C0014SM	-0.95
F8260303C0015SM	1.64
F8260303C0016SM	-2.24
F8260303C0017SM	-3.53
F8260303C0018SM	-6.11
F8260303C0019SM	-3.53
F8260303C0020SM	-3.53
F8260303M0021SM	-4.82
F8260303M0022SM	1.64
F8260303M0023SM	1.64
F8260303M0024SM	-4.82
Mean:	-1.54
Median:	-2.24
Standard Deviation:	3.69
Range:	-7.4 to 6.8

**Survey Unit Data Assessment:**

The survey design required 24 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**

<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>	24		
<b>Median</b> (dpm/100 cm <sup>2</sup> ):	2,012		
<b>Mean</b> (dpm/100 cm <sup>2</sup> ):	2,026		
<b>Direct Measurement Standard Deviation</b> (dpm/100 cm <sup>2</sup> ):	210		
<b>Total Standard Deviation</b> (dpm/100 cm <sup>2</sup> ):	210		Based on samples and backgrounds.
<b>Maximum</b> (dpm/100 cm <sup>2</sup> ):	2,484		Background Subtract Not Applied
<b>Material Type:</b>	N/A		
<b>Sign Test Final N Value:</b>	24		Class 2
<b>S+ Value:</b>	24		
<b>Critical Value:</b>	16		
<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		
<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 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 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 43,000 dpm/100 cm<sup>2</sup> 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 F8260303 meets the release criteria of 10CFR20.1402.

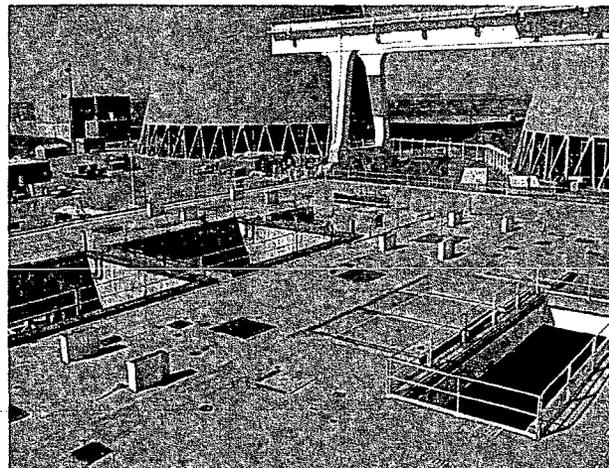
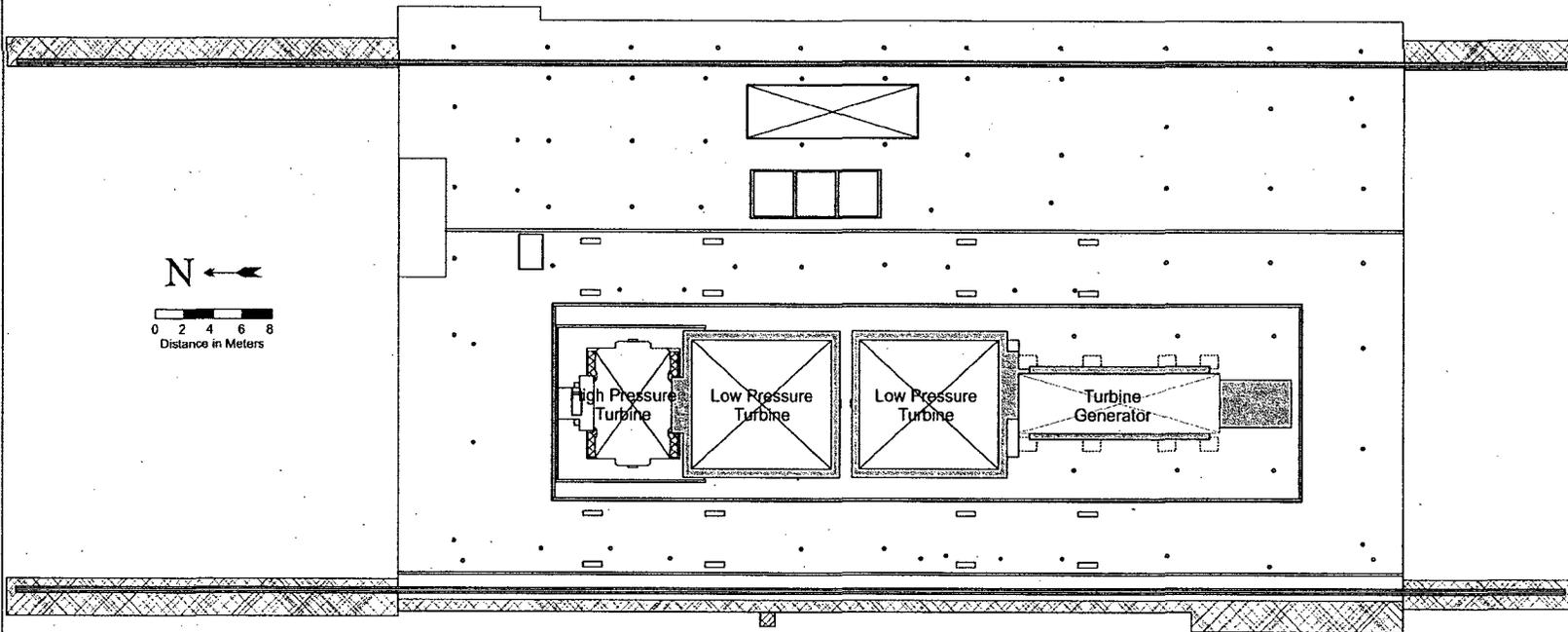
**Attachment 1**

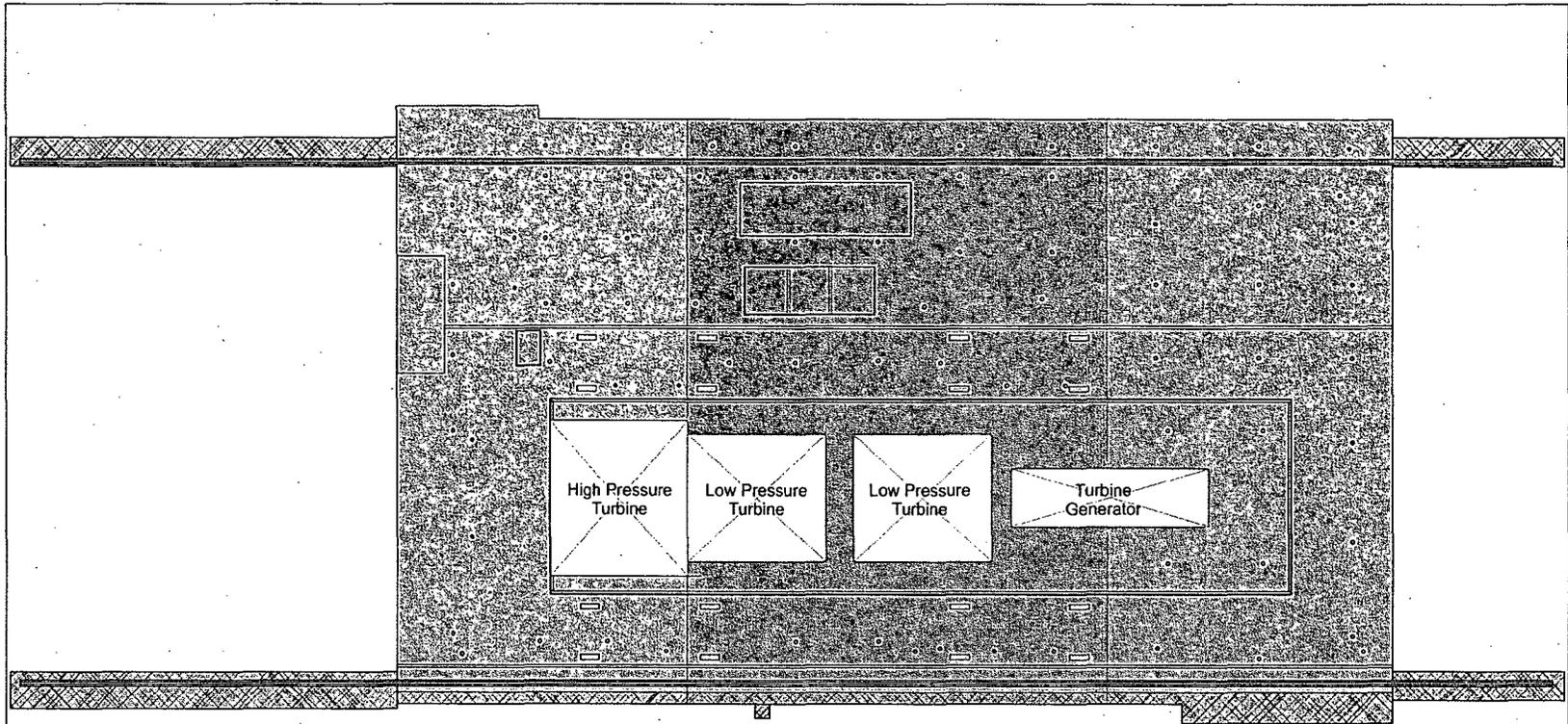
**Maps**

**March 27, 2008**

**Survey Unit F8260303**

Map F8260303-1, Turbine Building Deck (+) 40' El.  
Area Estimate: 2,615 sq. meters



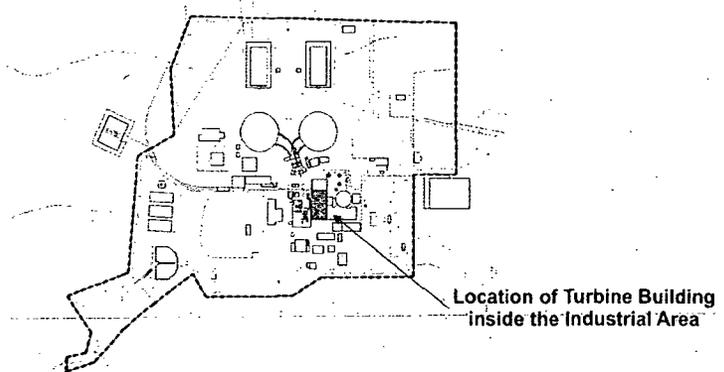
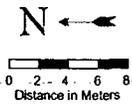


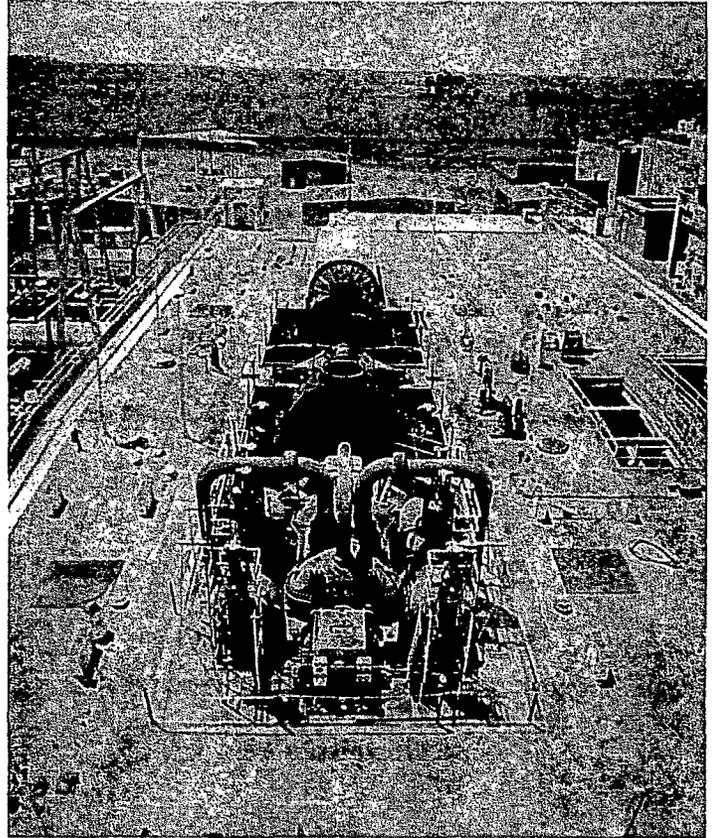
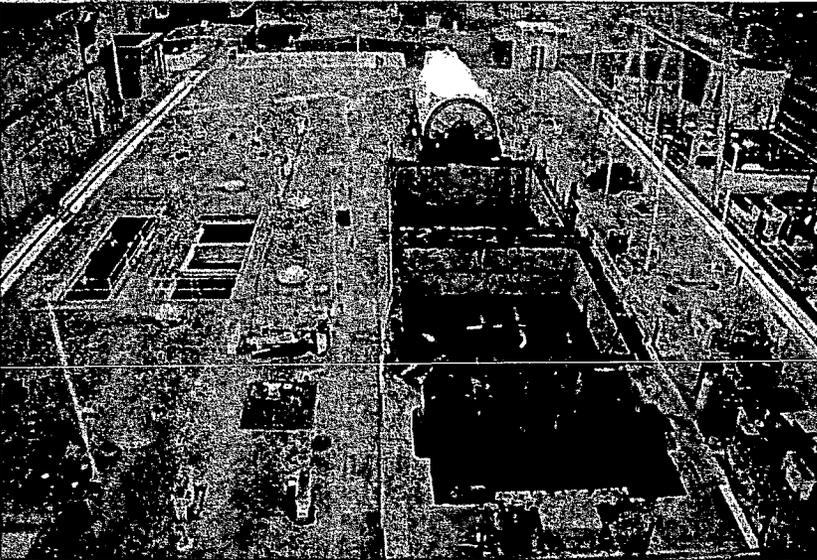
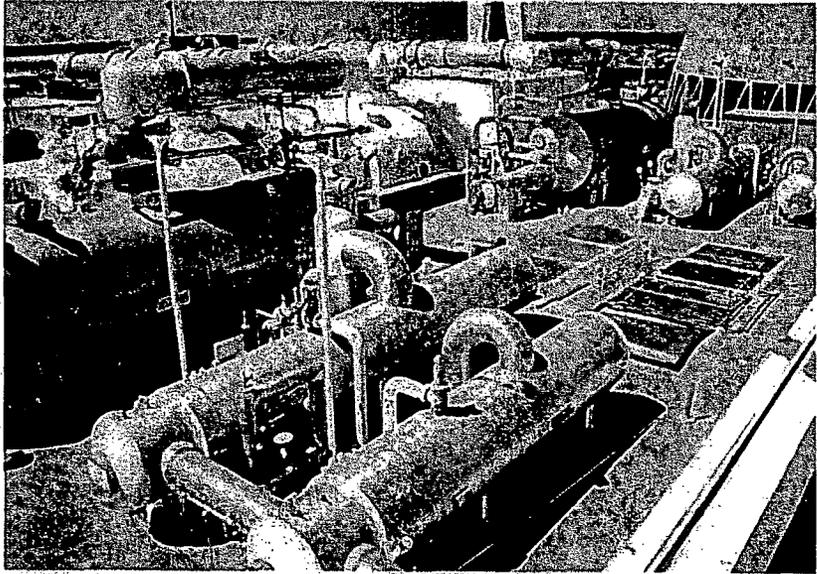
F8260303: North Turbine Deck  
Area Estimate: 815 sq. meters

F8260304: Center Turbine Deck  
Area Estimate: 953 sq. meters

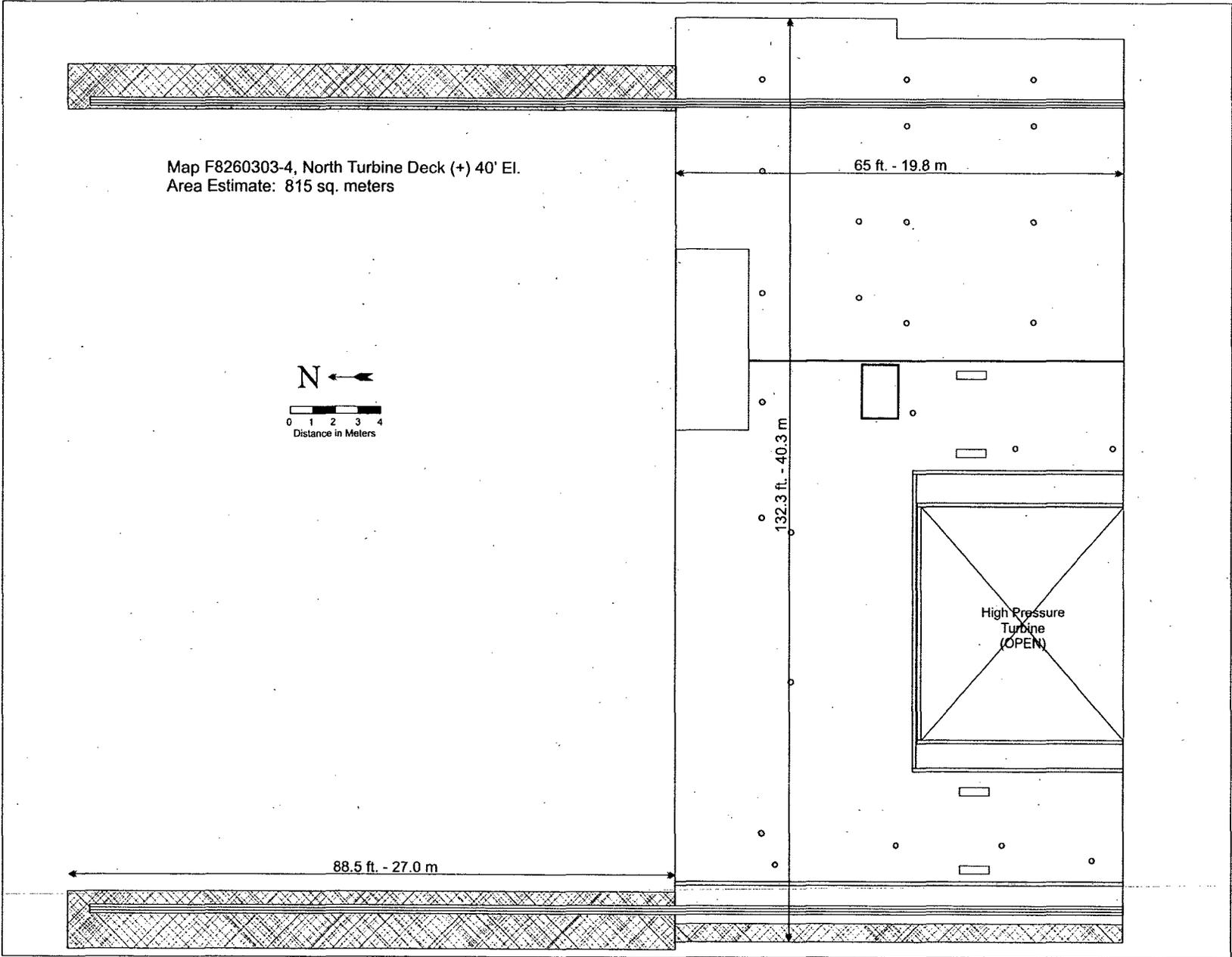
F8260305: South Turbine Deck  
Area Estimate: 847 sq. meters

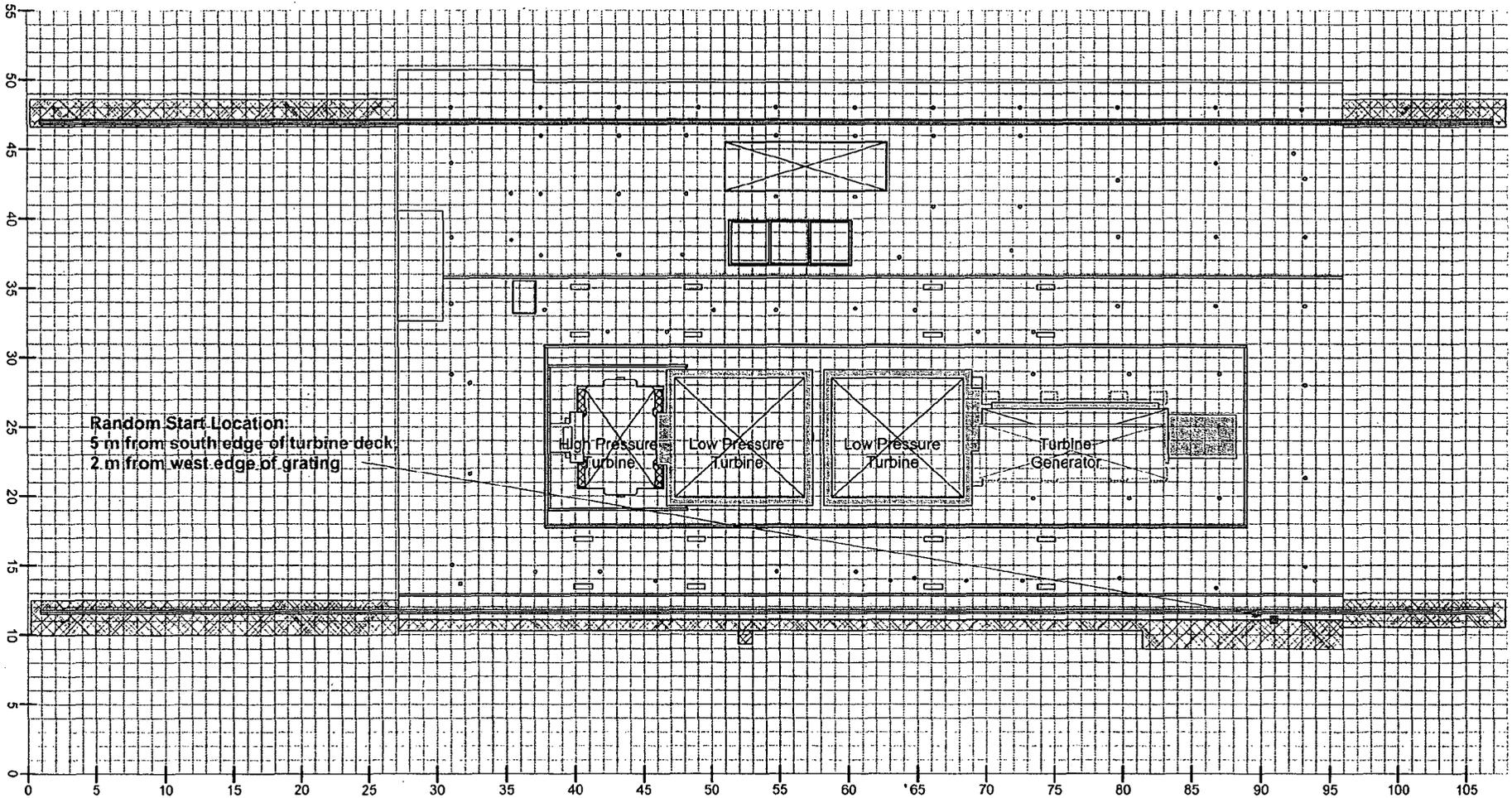
Map F8260303-2, Turbine Building Deck (+) 40' El.  
Area Estimate: 2,615 sq. meters  
(3 survey units – Class 2)





Map F8260303-3, Turbine Building Deck (+) 40' EI.





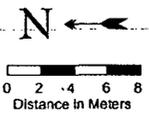
Random Start Location:  
5 m from south edge of turbine deck,  
2 m from west edge of grating

High Pressure  
Turbine

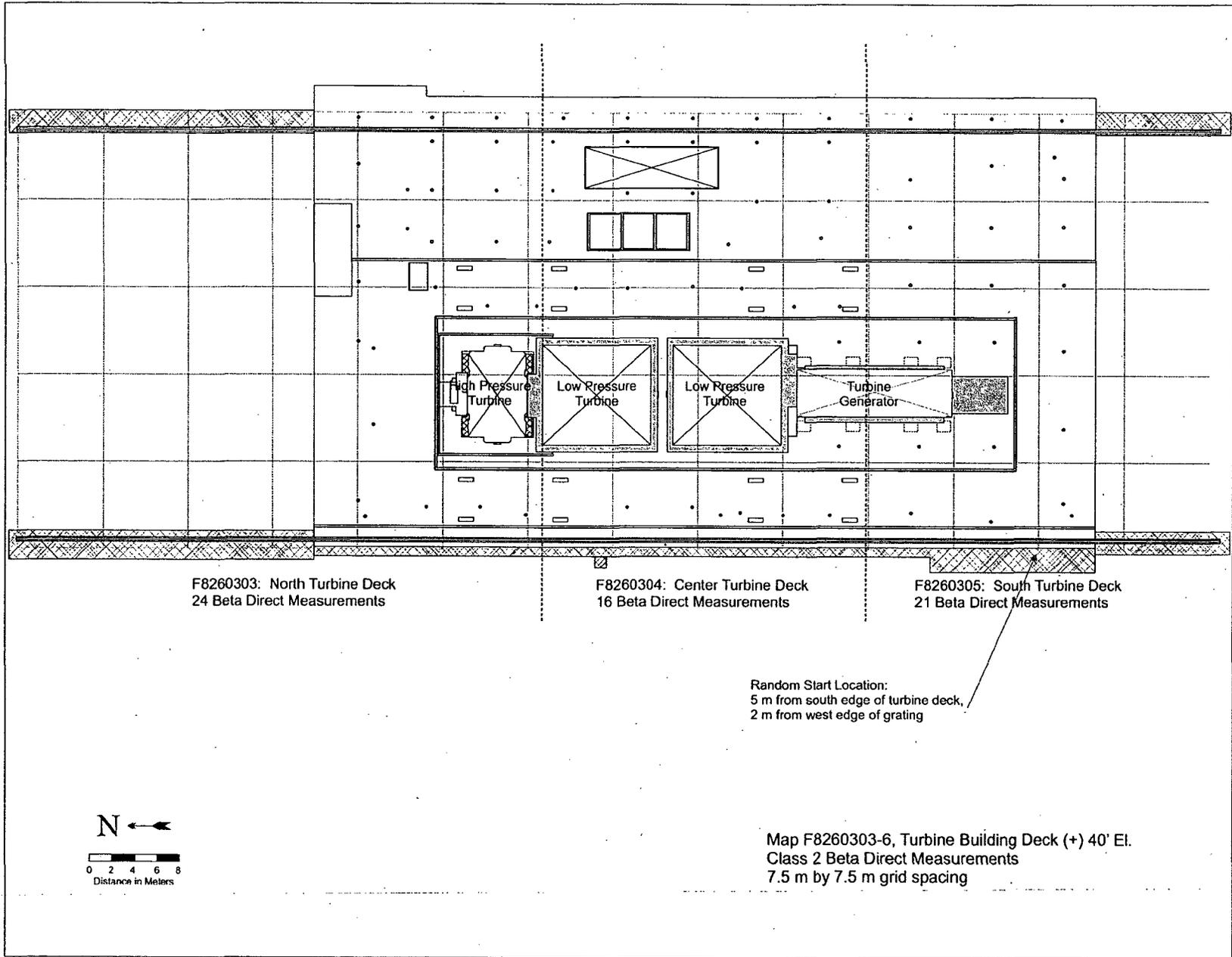
Low Pressure  
Turbine

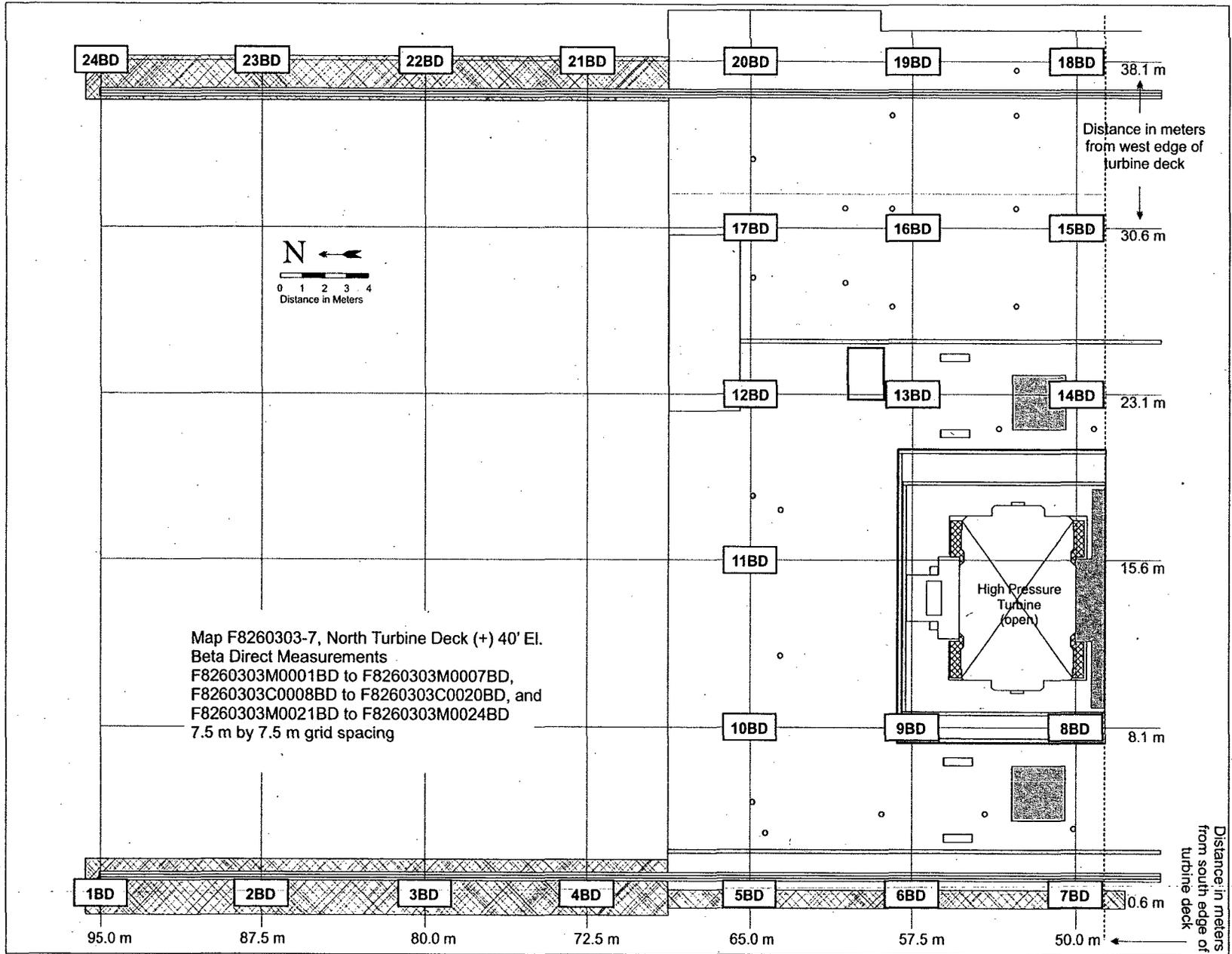
Low Pressure  
Turbine

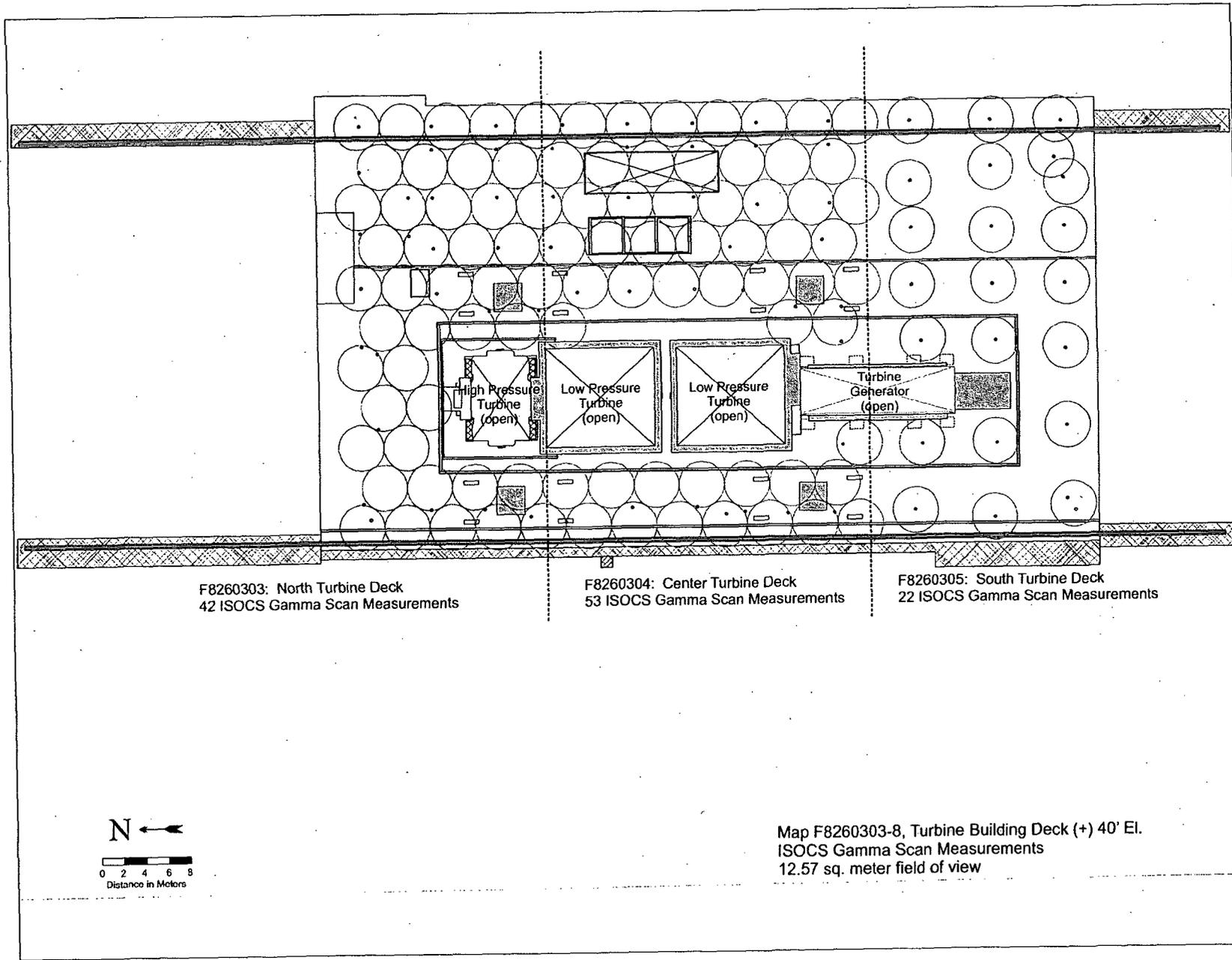
Turbine  
Generator

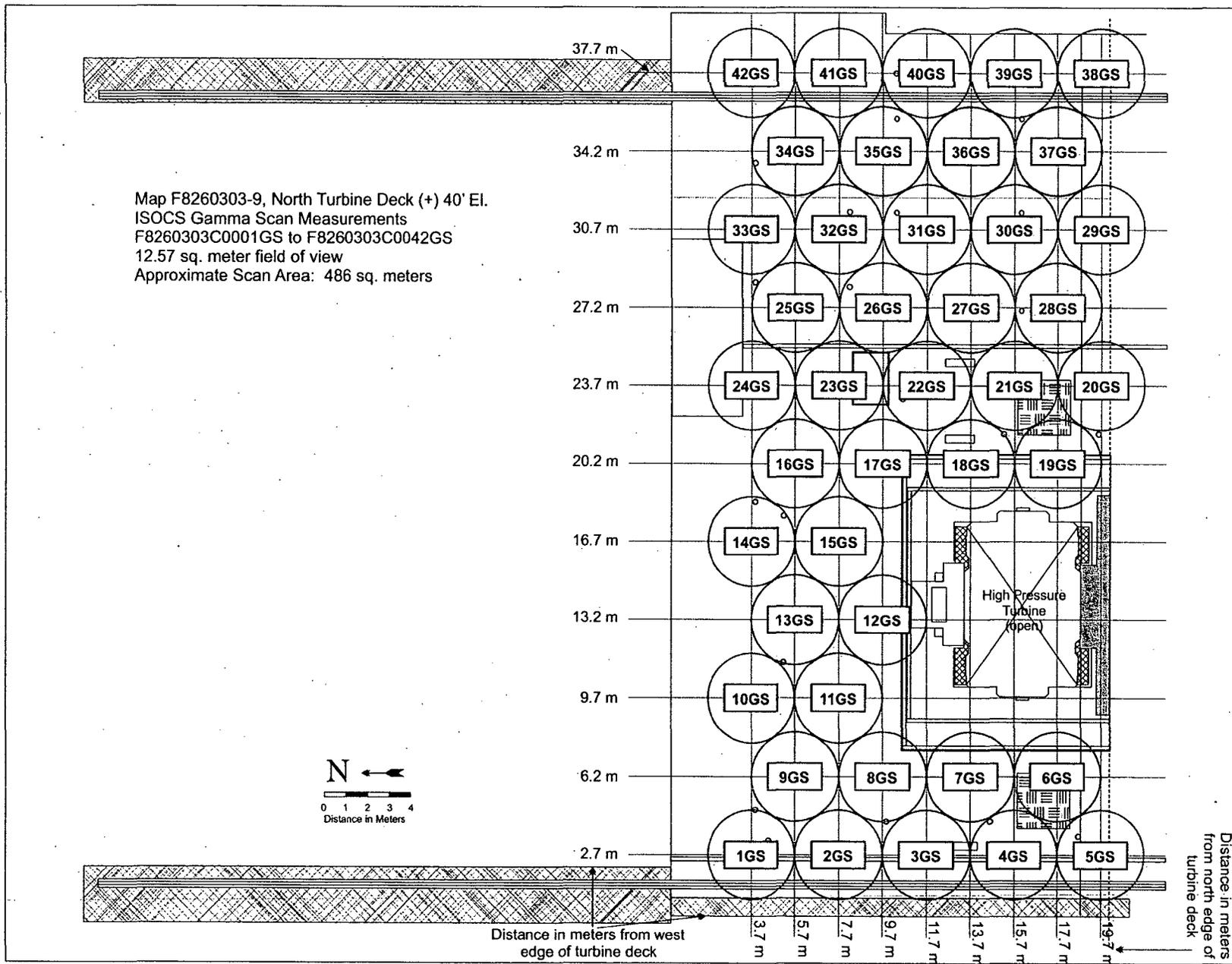


Map F8260303-5, Turbine Building Deck (+) 40' El.  
Random Start Location









**Attachment 2**

**Instrumentation**

**March 27, 2008**

**Survey Unit F8260303**

**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; 175834	43-68B; 190482	433	1,033
Tennelec; 0401171	N/A	5.88 dpm $\alpha$ , 11.71 dpm $\beta$	N/A

<b>Instrument</b>	<b>Detector Model No.</b>	<b>Detector Serial No.</b>	<b>MDC</b>
ISOCS	N/A	2983947	Concrete – 1,040 dpm/100 cm <sup>2</sup> Cs-137, Concrete – 907 dpm/100 cm <sup>2</sup> Co-60

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

<b>Parameter</b>	<b>Value (dpm/100 cm<sup>2</sup>)</b>
Investigation Criteria - Direct	43,000
Investigation Criteria – Scan (ISOCS average activity)	4,300
DCGL <sub>w</sub>	43,000
DCGL <sub>EMC</sub>	N/A

**Attachment 3**

**Investigation**

**March 27, 2008**

**Survey Unit F8260303**

**(none required)**

**Attachment 4**

**Data Assessment**

**March 27, 2008**

**Survey Unit F8260303**

