

Rancho Seco
Final Status Survey Summary Report
July 4, 2008
Turbine Building (-) 7' El., Lube Oil Pit
Survey Unit F8260011

Prepared By: *D. Anderson* Date: 7/4/2008
FSS Engineer

Reviewed By: *Robert J. Dehn* 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:

F8260011, Turbine Building (-) 7' El., Lube Oil Pit

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.

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 160.35 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 (-) 7' El., Lube Oil Pit
Survey Unit:	0011	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m ²):	160.35	
Evaluator:	D. Anderson	
DCGL (dpm/100 cm ²):	43,000	Gross Activity DCGL
Area Factor:	3.6	Class 1
Design DCGL _{mc} (dpm/100 cm ²):	154,800	Class 1
LBGR (dpm/100 cm ²):	33,610	Adjusted
Design Sigma (dpm/100 cm ²):	3,130	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m ²):	6.97	Class 1
Scan Area (m ²):	160.35	
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:	23	Class 1
Grid Spacing L:	2.6	Class 1

Survey Results:

A total of 24 direct measurements were made in F8260011. 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 1,331 to 13,858 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)
F8260011-C0001BD	2,101
F8260011-C0002BD	2,163
F8260011-C0003BD	1,852
F8260011-C0004BD	1,675
F8260011-C0005BD	1,966
F8260011-C0006BD	2,210
F8260011-C0007BD	1,717
F8260011-C0008BD	1,468
F8260011-C0009BD	1,841
F8260011-C0010BD	1,821
F8260011-C0011BD	1,380
F8260011-C0012BD	1,473
F8260011-C0013BD	1,406
F8260011-C0014BD	1,375
F8260011-C0015BD	1,520
F8260011-C0016BD	1,463
F8260011-C0017BD	1,349
F8260011-C0018BD	1,727
F8260011-C0019BD	1,468
F8260011-C0020BD	2,713
F8260011-C0021BD	1,541
F8260011-C0022BD	1,473
F8260011-C0023BD	1,312
F8260011-C0024BD	1,141
Mean:	1,673
Median:	1,530
Standard Deviation:	360
Range:	1,141 – 2,713

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm²)
F8260011C0001SM	1.64
F8260011C0002SM	-3.53
F8260011C0003SM	1.64
F8260011C0004SM	-3.53
F8260011C0005SM	-0.95
F8260011C0006SM	-4.82
F8260011C0007SM	-0.95
F8260011C0008SM	-3.53
F8260011C0009SM	-4.82
F8260011C0010SM	0.34
F8260011C0011SM	-4.82
F8260011C0012SM	-2.24
F8260011C0013SM	-2.24
F8260011C0014SM	-3.53
F8260011C0015SM	-0.95
F8260011C0016SM	-3.53
F8260011C0017SM	-3.53
F8260011C0018SM	-3.53
F8260011C0019SM	-4.82
F8260011C0020SM	-4.82
F8260011C0021SM	-3.53
F8260011C0022SM	2.93
F8260011C0023SM	-0.95
F8260011C0024SM	-2.24
Mean:	-2.35
Median:	-3.53
Standard Deviation:	2.25
Range:	-4.82 to 2.93

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

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):	24	
Median (dpm/100 cm ²):	1,530	
Mean (dpm/100 cm ²):	1,673	
Direct Measurement Standard Deviation	360	
(dpm/100 cm ²):		
Total Standard Deviation (dpm/100 cm ²):	360	Based on samples and backgrounds.
Maximum (dpm/100 cm ²):	2,713	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	24	
S+ Value:	24	
Critical Value:	16	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGL_{mc}:	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.

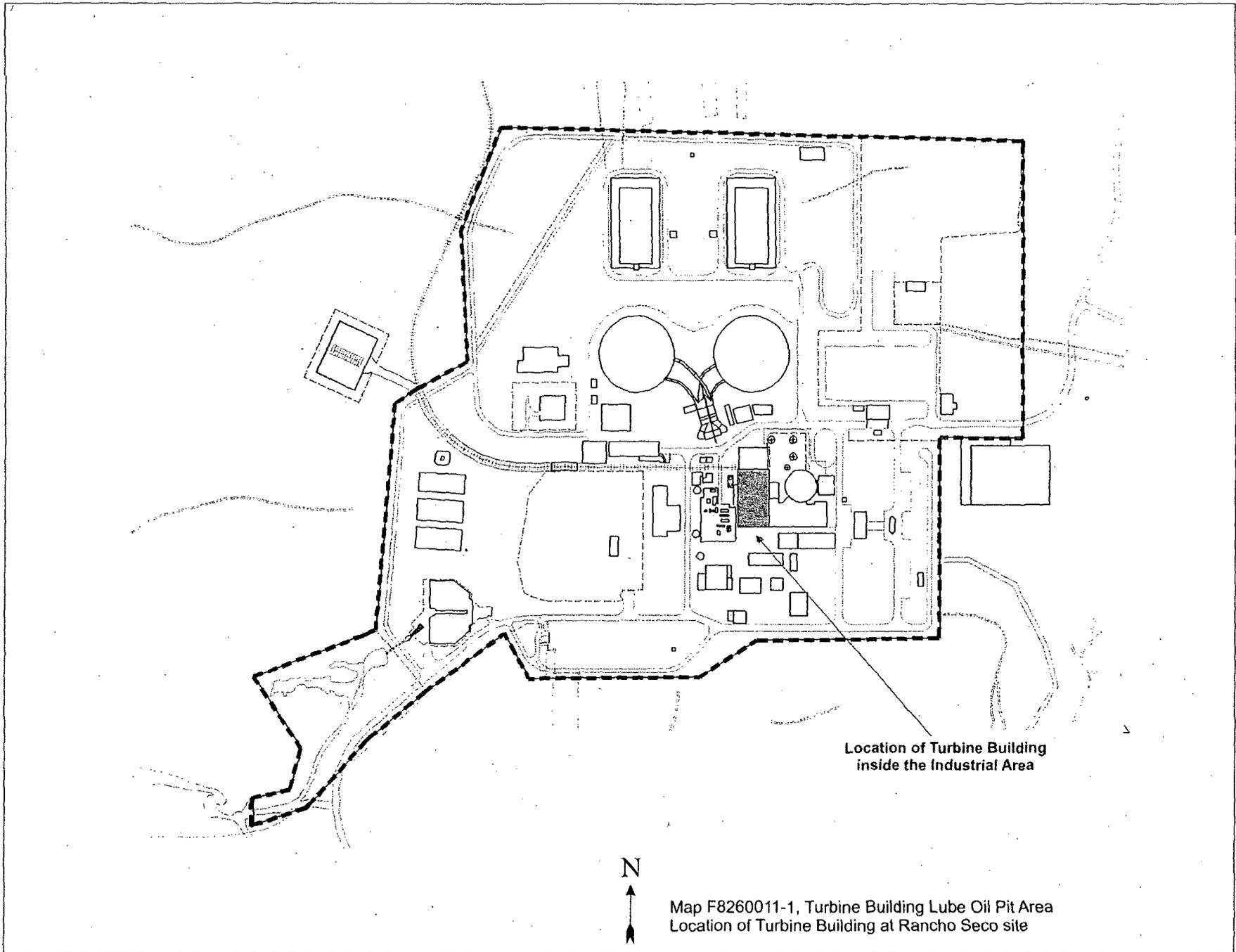
It is concluded that survey unit F8260011 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

July 4, 2008

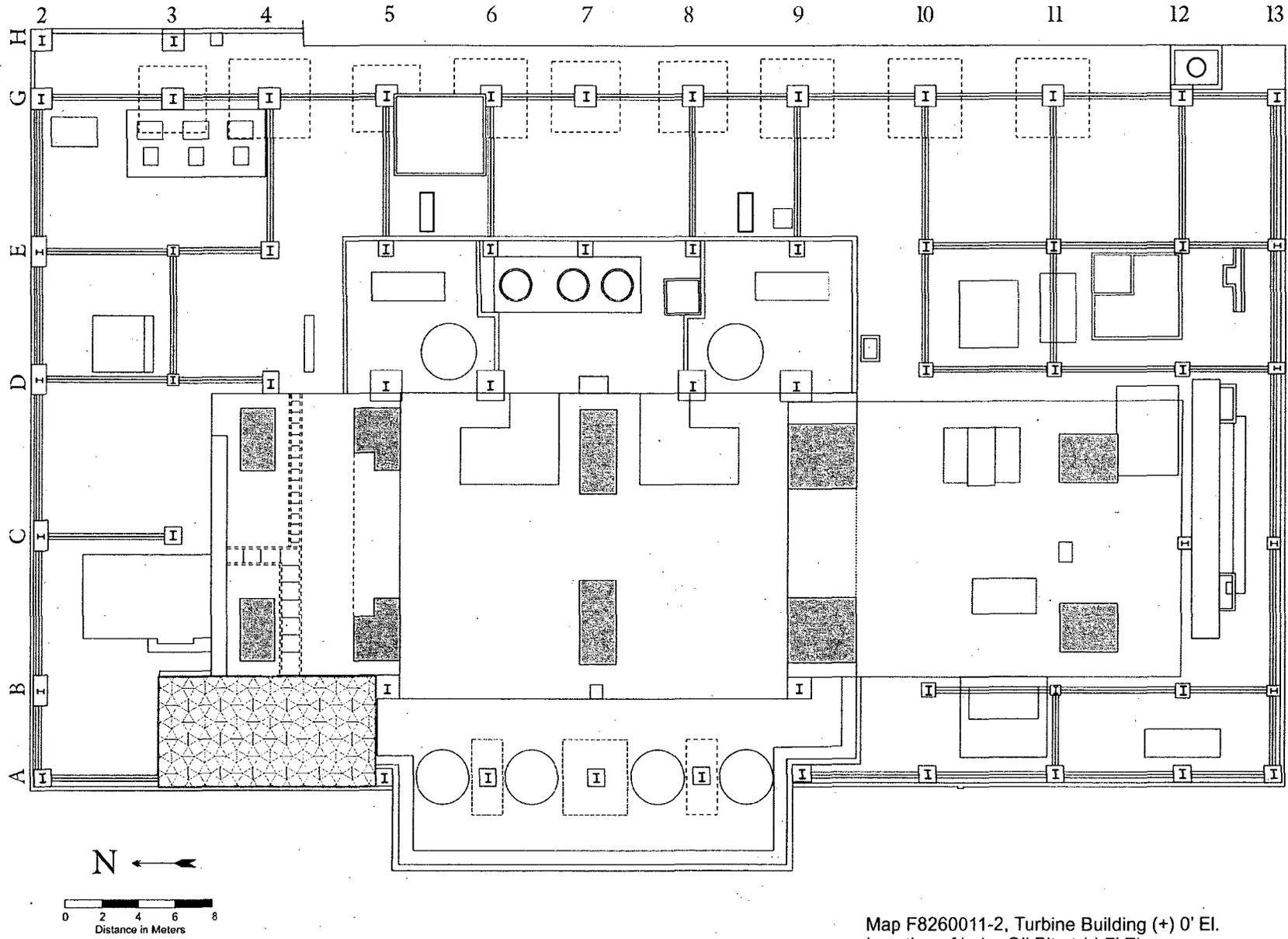
Survey Unit F8260011



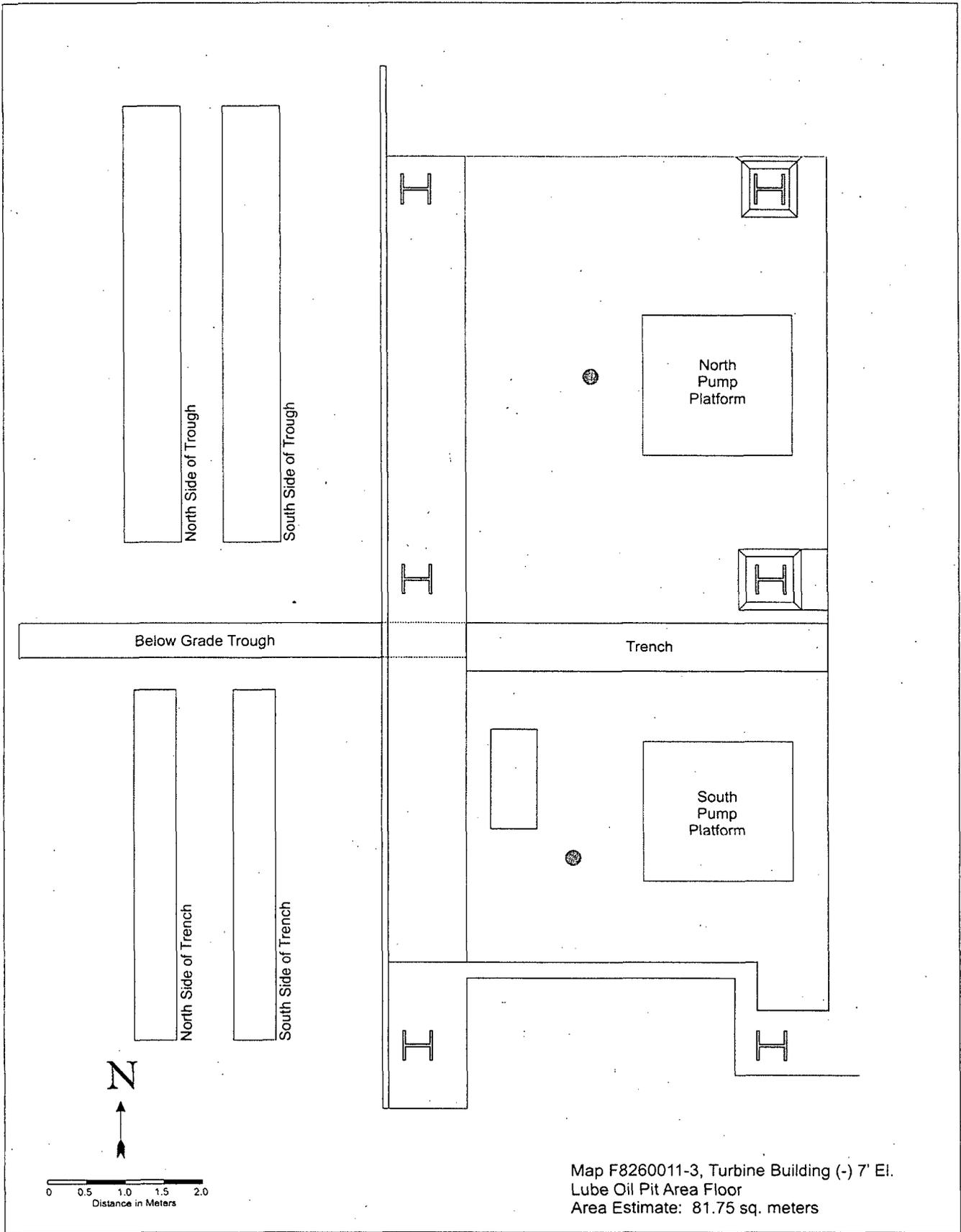
Location of Turbine Building
inside the Industrial Area

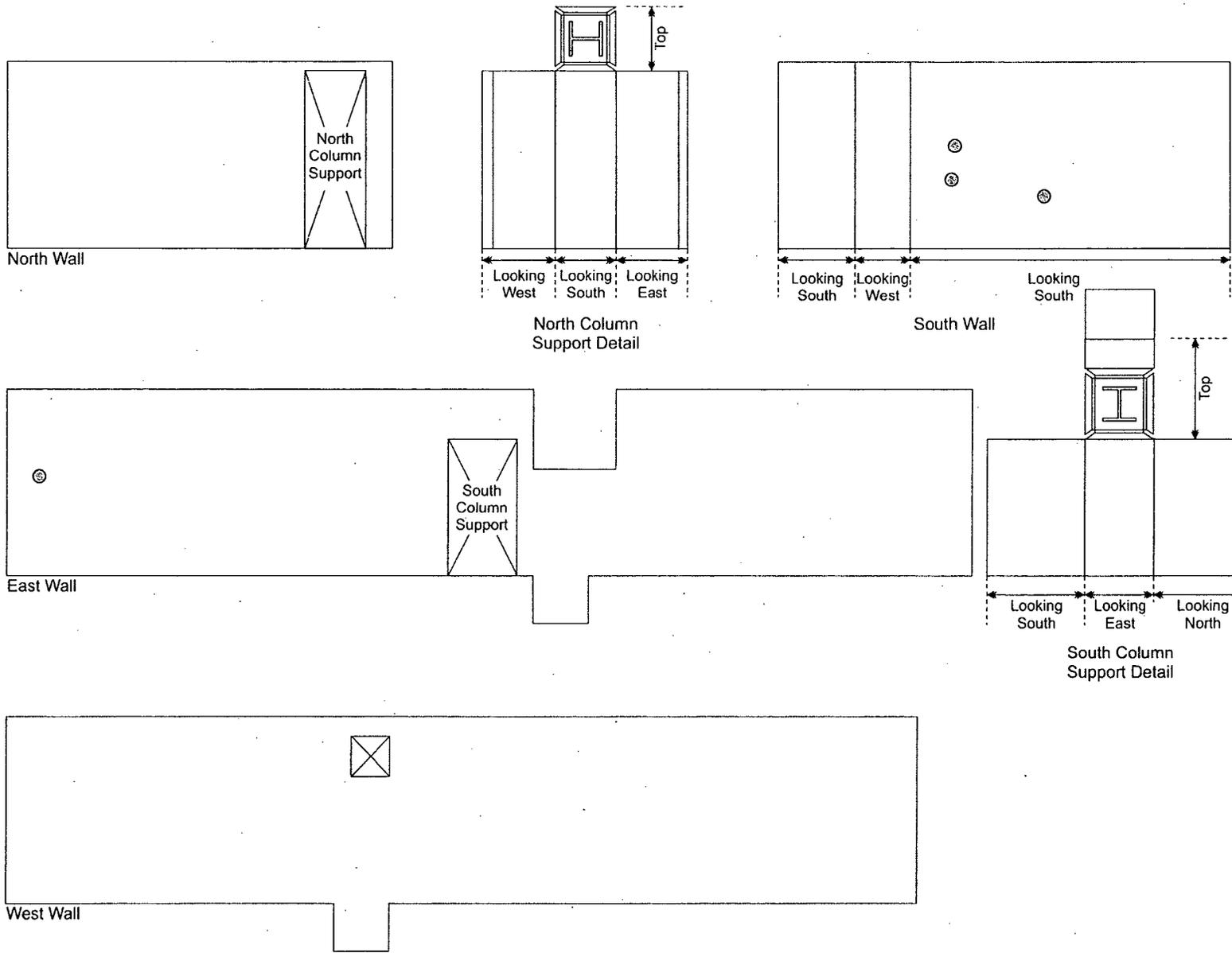


Map F8260011-1, Turbine Building Lube Oil Pit Area
Location of Turbine Building at Rancho Seco site

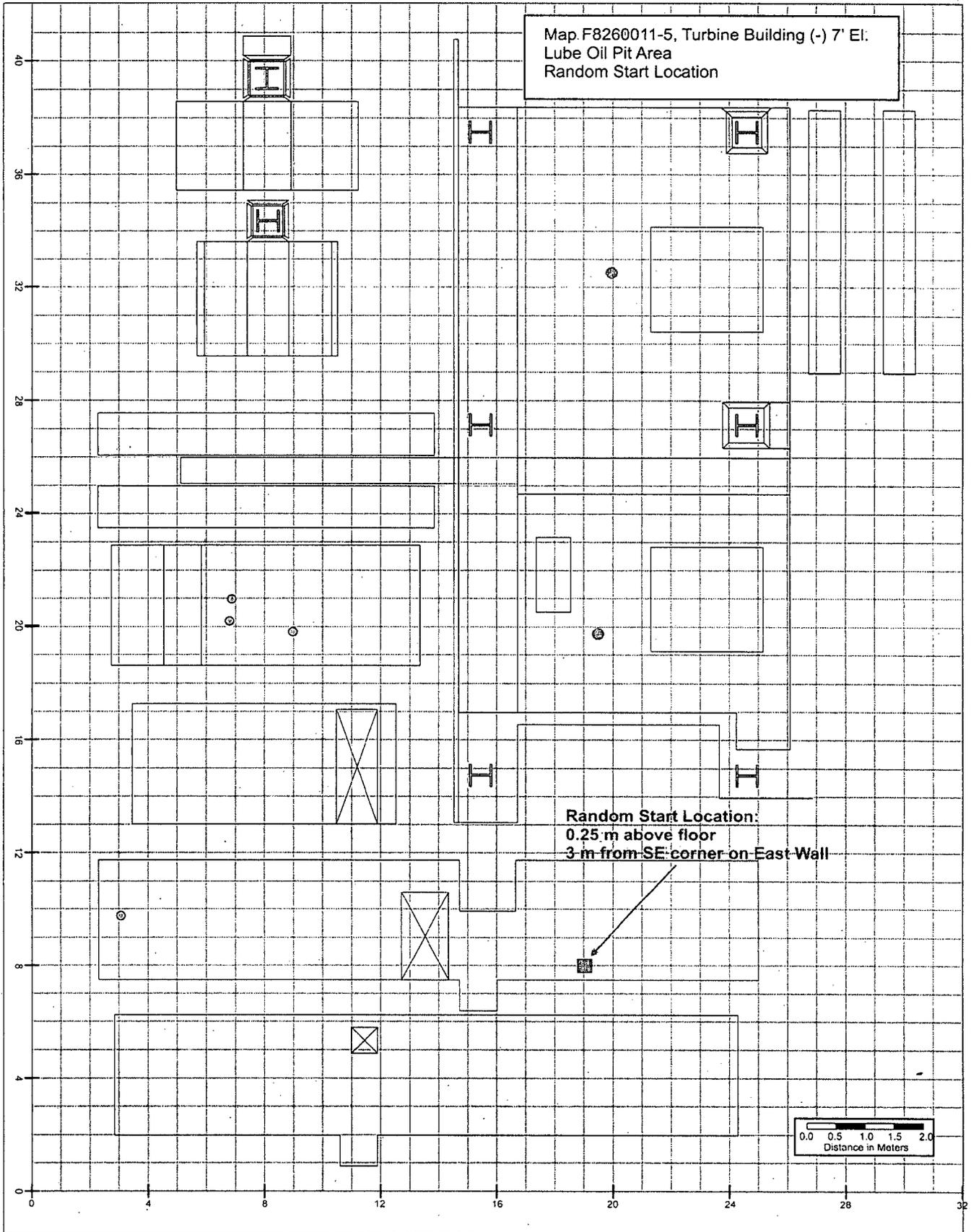


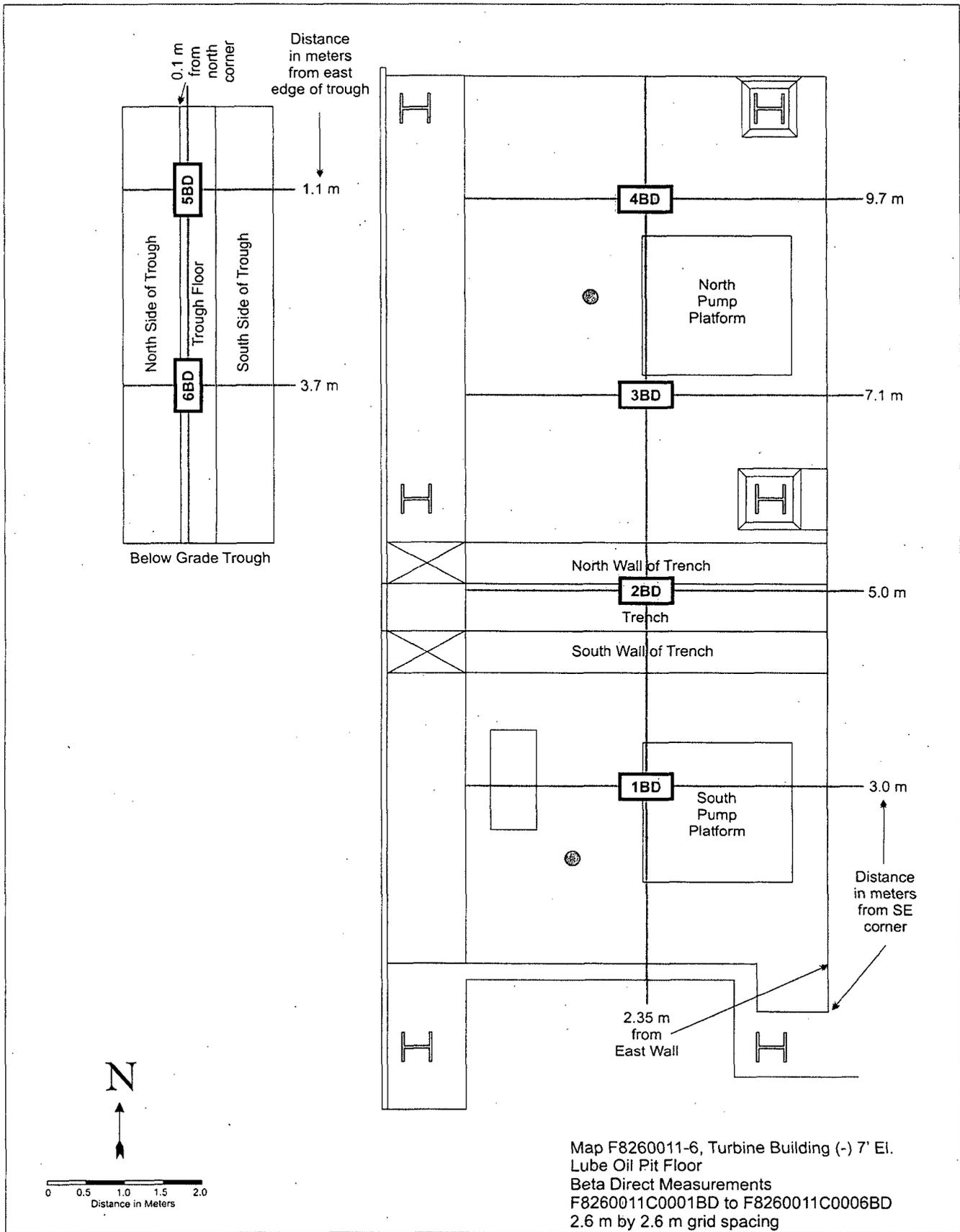
Map F8260011-2, Turbine Building (+) 0' El.
Location of Lube Oil Pit at (-) 7' El.

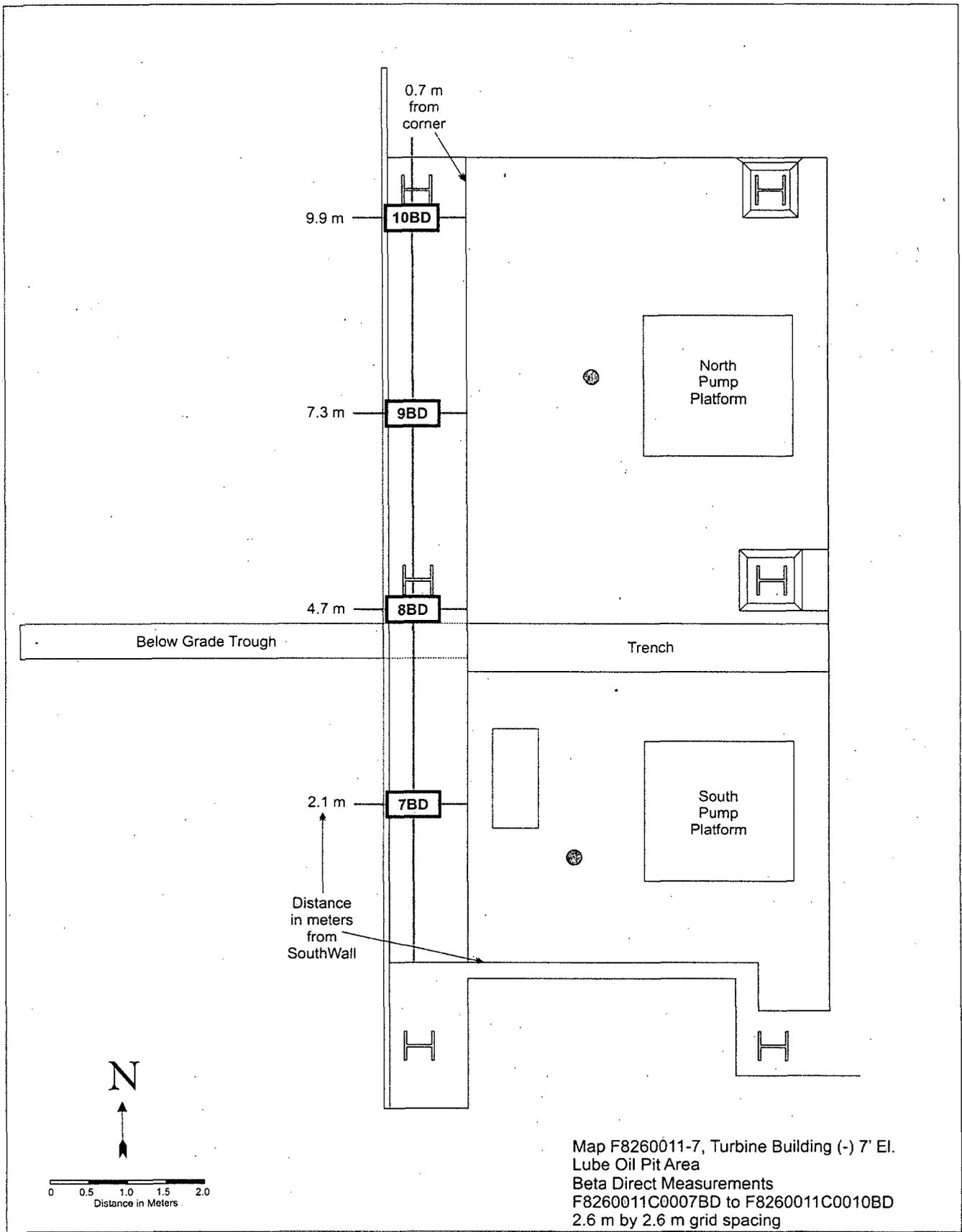


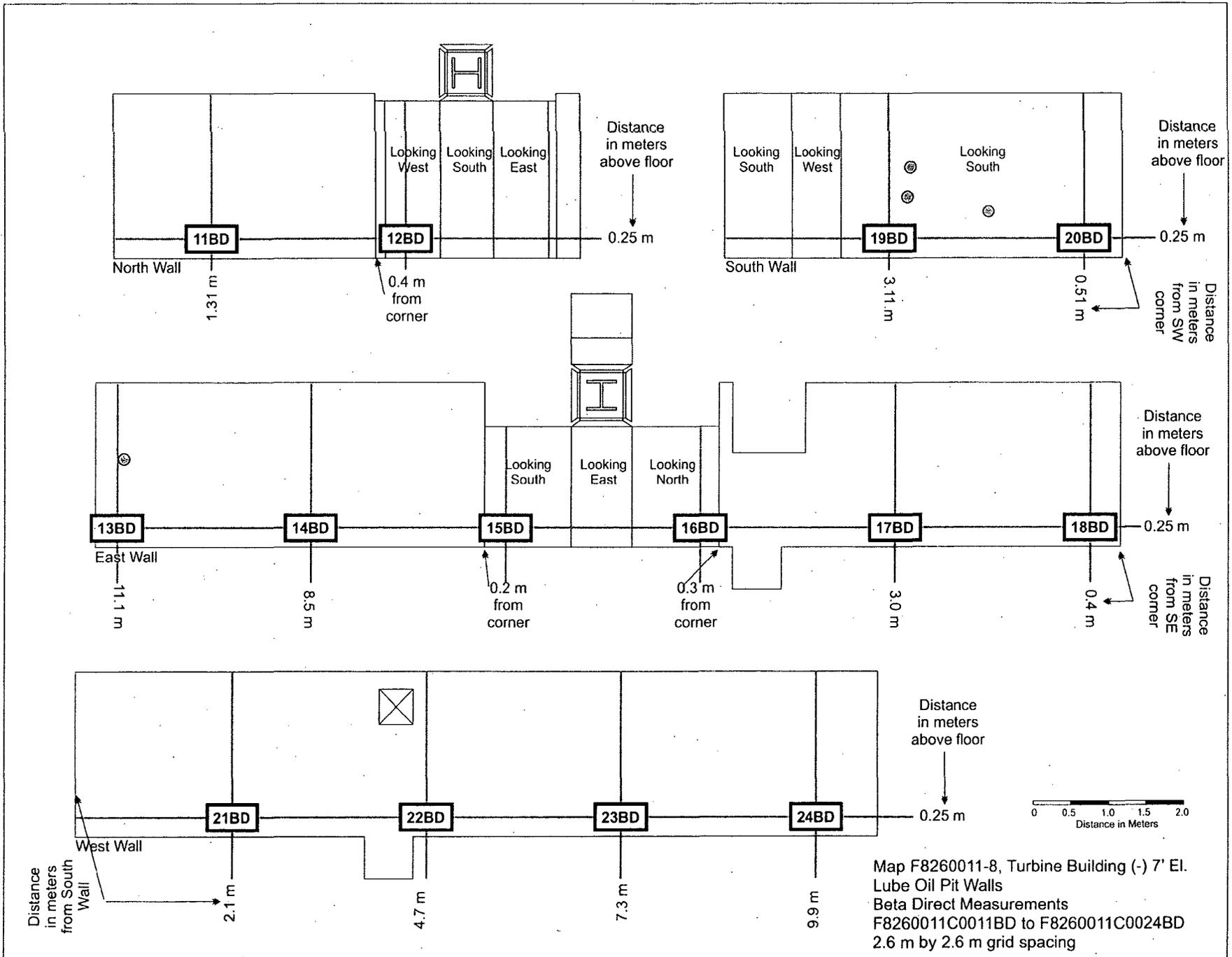


Map F8260011-4, Turbine Building (-) 7' El.
Lube Oil Pit Area Walls
Area Estimate: 78.6 sq. meters

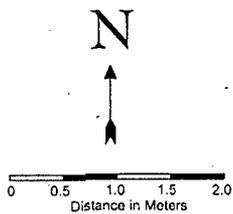
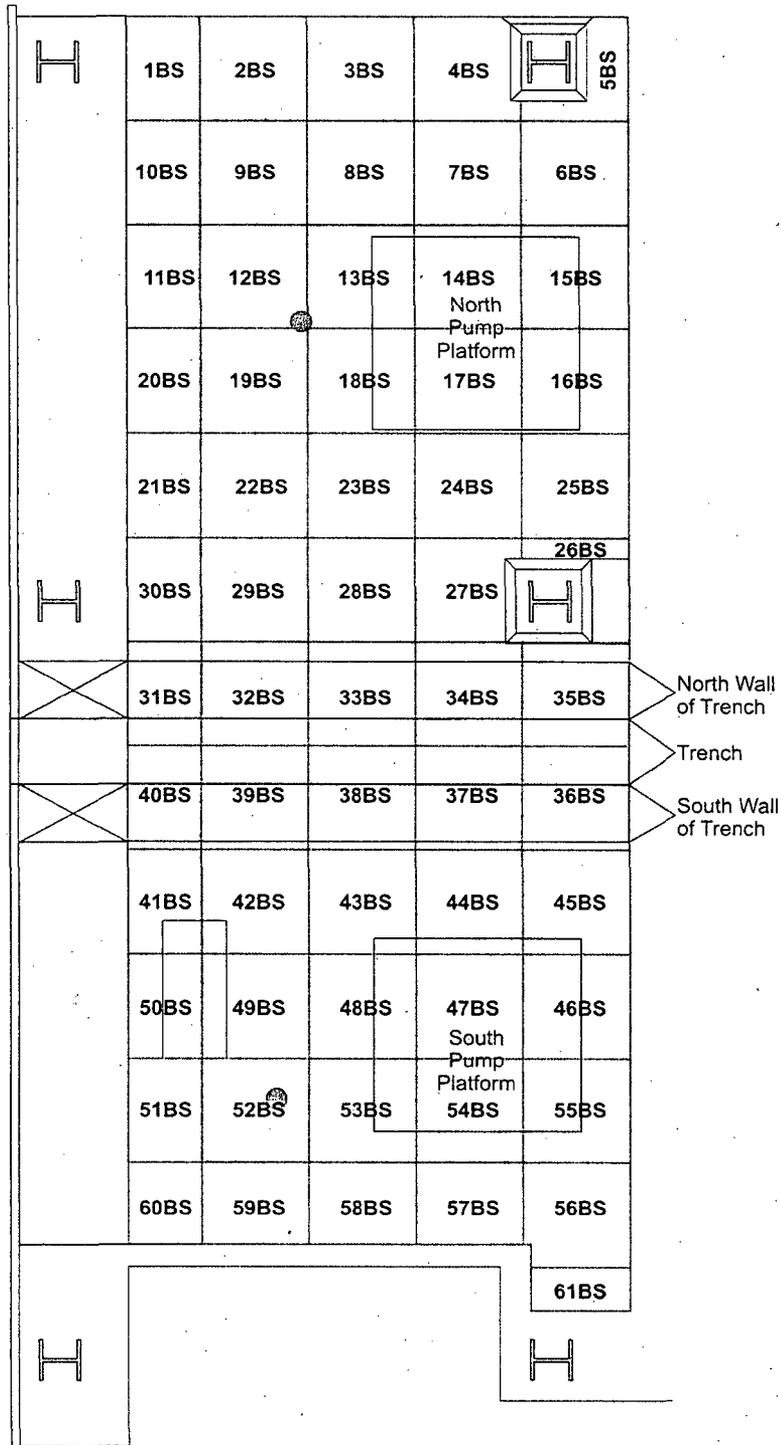




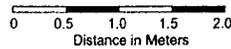
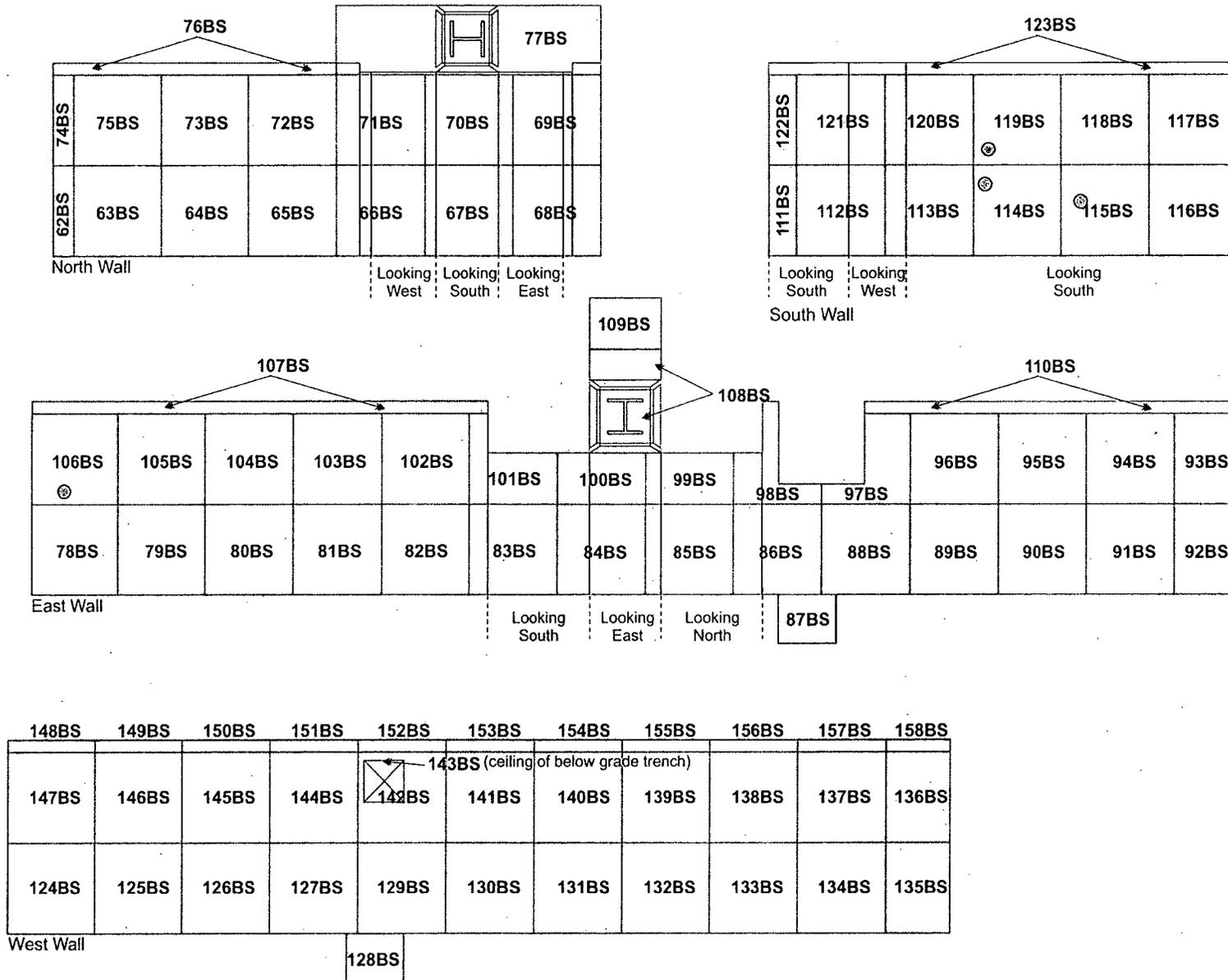




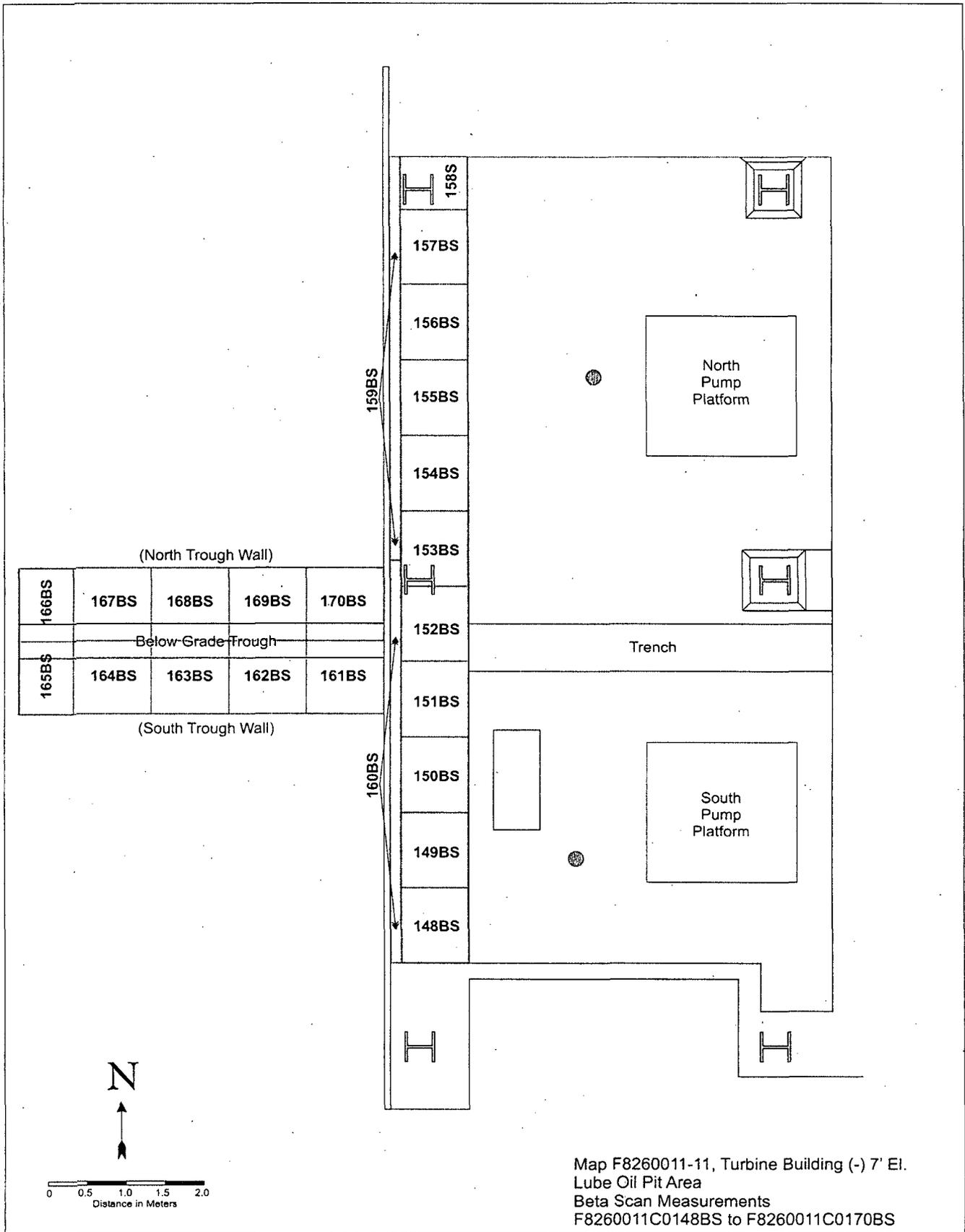
Map F8260011-8, Turbine Building (-) 7' El.
Lube Oil Pit Walls
Beta Direct Measurements
F8260011C0011BD to F8260011C0024BD
2.6 m by 2.6 m grid spacing

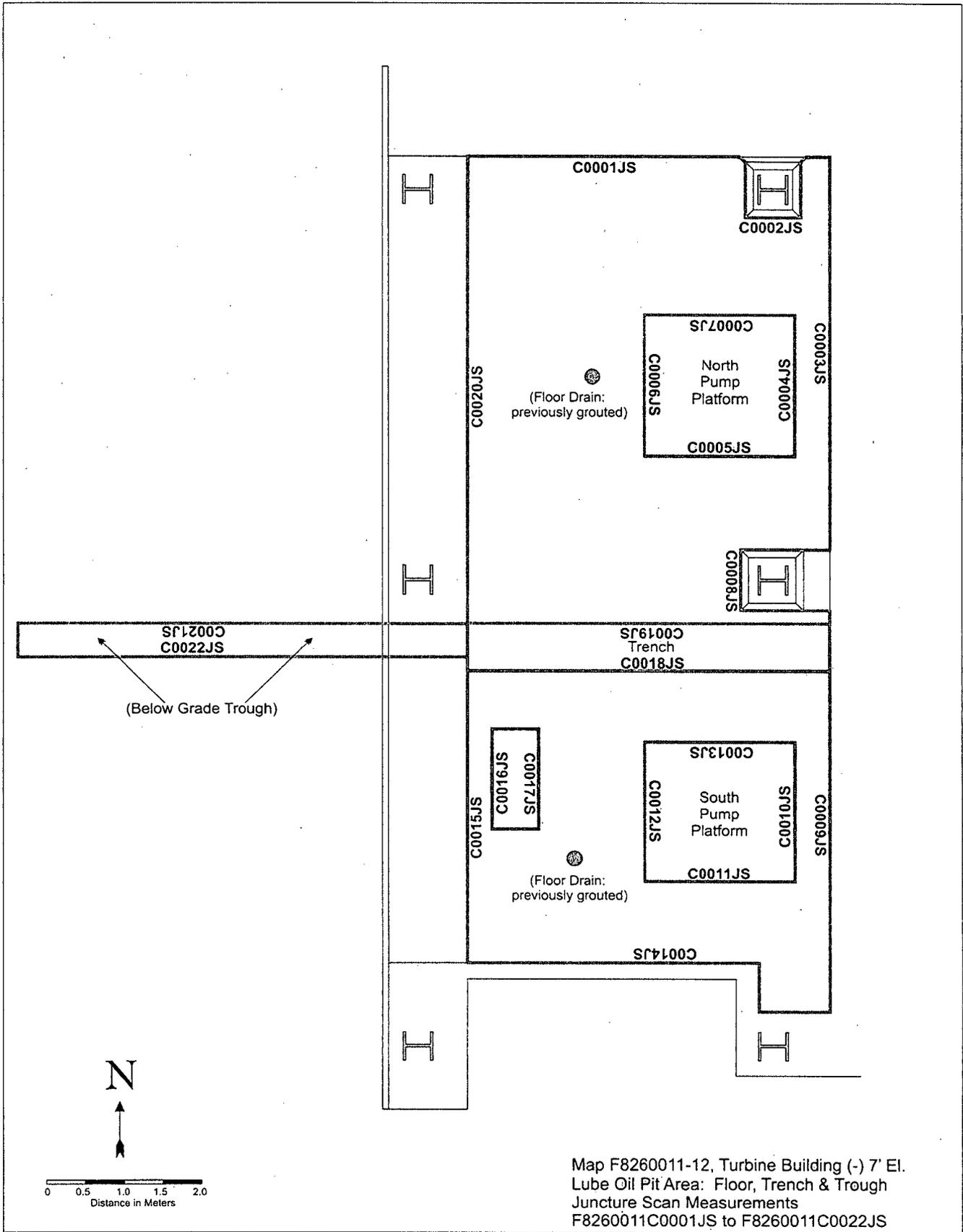


Map F8260011-9, Turbine Building (-) 7' El.
Lube Oil Pit Floor
Beta Scan Measurements
F8260011C0001BS to F8260011C0061BS

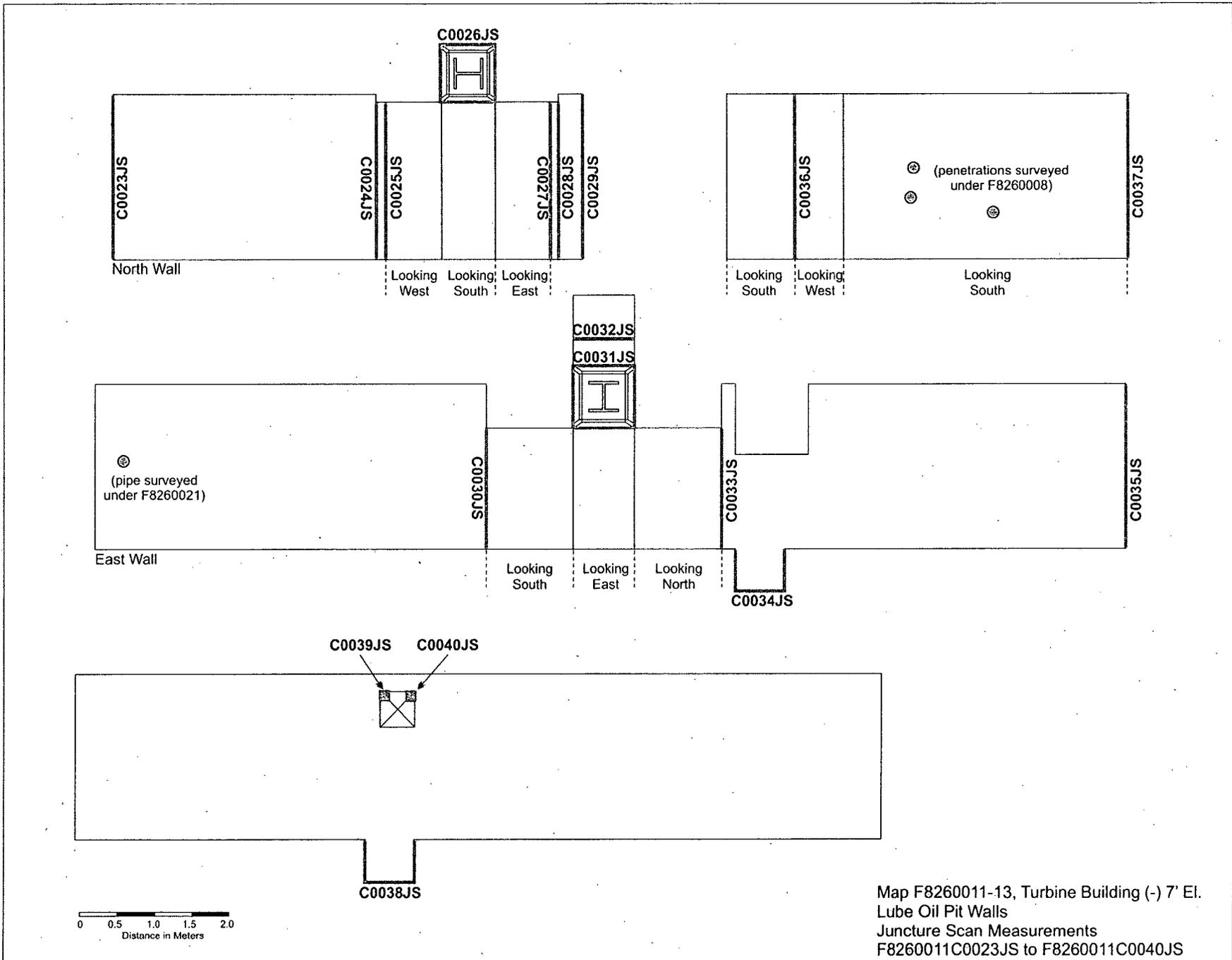


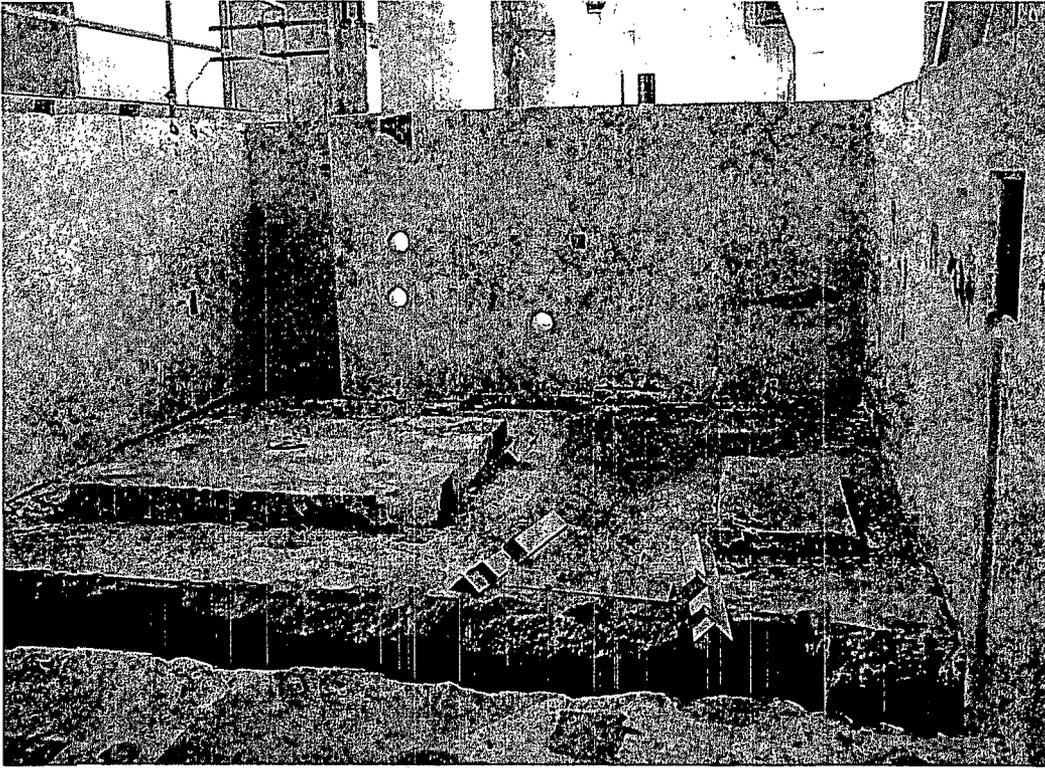
Map F8260011-10, Turbine Building (-) 7' El.
Lube Oil Pit Walls
Beta Scan Measurements
F8260011C0062BS to F8260011C0158BS



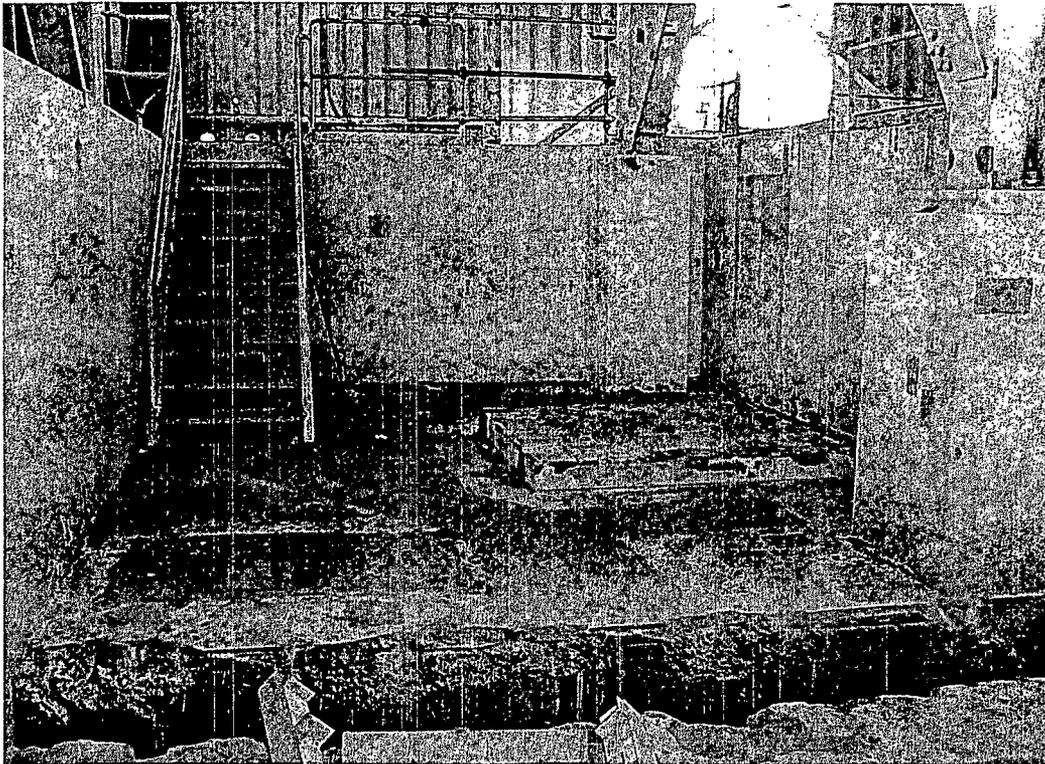


Map F8260011-12, Turbine Building (-) 7' El.
 Lube Oil Pit Area: Floor, Trench & Trough
 Juncture Scan Measurements
 F8260011C0001JS to F8260011C0022JS



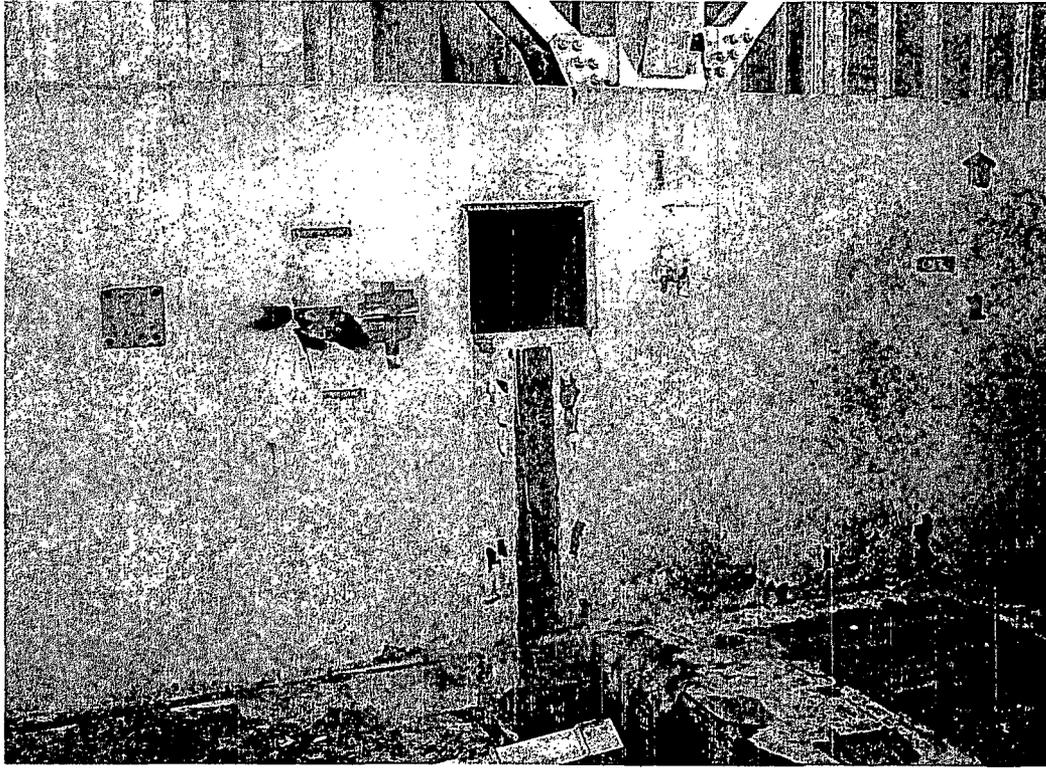


South End of Lube Oil Pit

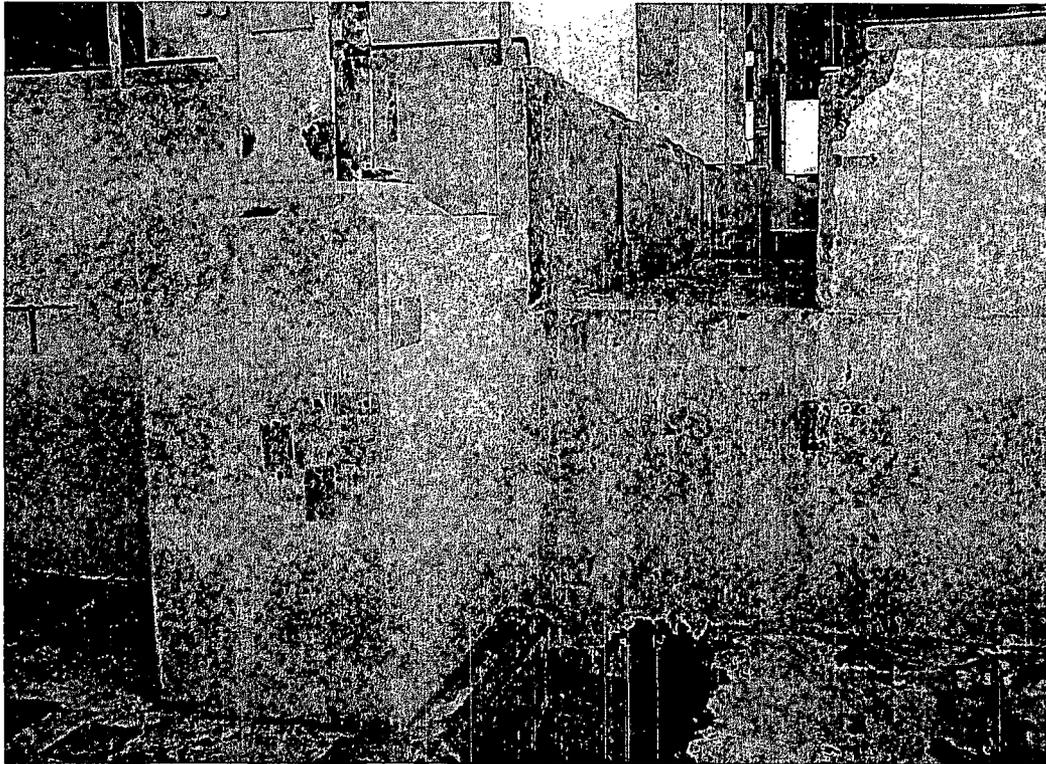


North End of Lube Oil Pit

Photos-1

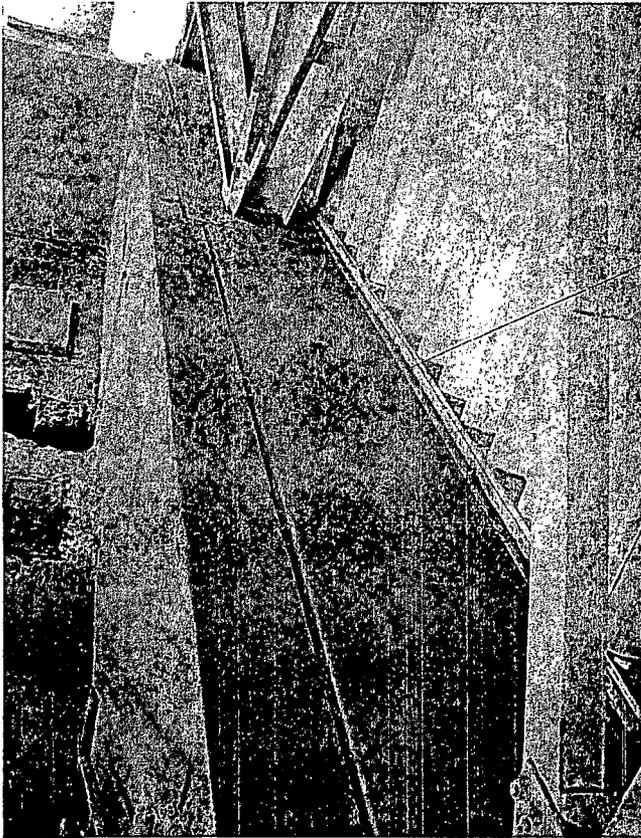


West Wall of Lube Oil Pit

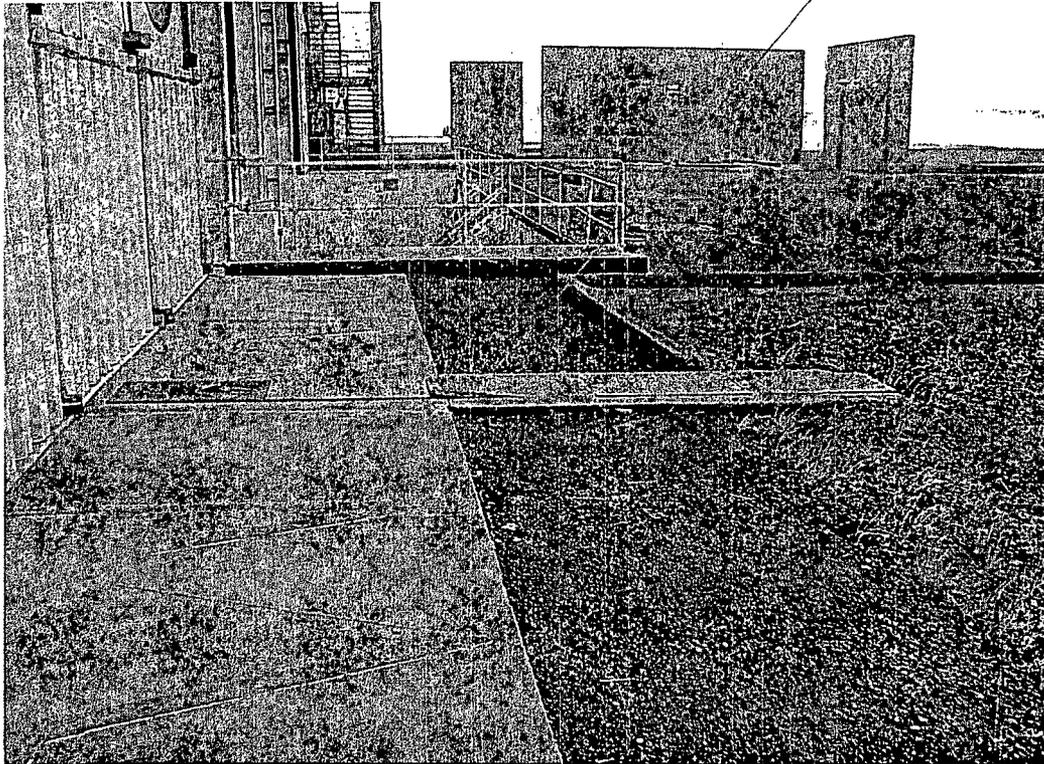


East Wall of Lube Oil Pit

Photos-2



Horizontal Surface above
West Wall of Lube Oil Pit



Below Grade Trench that
extends outside Turbine Bldg.

Photos-3

Attachment 2

Instrumentation

July 4, 2008

Survey Unit F8260011

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; 203486	43-68B; 190476	433	1,033
M2350; 193700	43-68B; 190294	433	1,033
M2350; 203481	43-68B; 161405	433	1,033
M2350; 175834	43-68B; 148634	433	1,033
M2350; 193700	43-116-1B; 216072	491	739
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	154,800
Investigation Criteria – Scan	154,800
DCGL _w	43,000
DCGL _{EMC}	154,800

Attachment 3

Investigation

July 4, 2008

Survey Unit F8260011

(none required)

Attachment 4

Data Assessment

July 4, 2008

Survey Unit F8260011

