
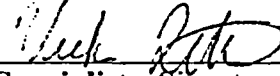
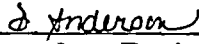
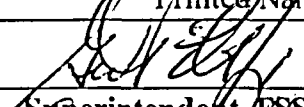



**MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FB-2400 STAFF BUILDING TUNNEL
SURVEY UNIT 1**

| | | |
|--------------|---|-------------------------|
| Prepared By: |  FSS Engineer – Signature <u>Andy Olsen</u> Printed Name | Date: <u>13.dec. 04</u> |
| Reviewed By: | <u>VLL</u>  FSS Specialist – Signature <u>Vicki Litton</u> Printed Name | Date: <u>12-21-04</u> |
| Reviewed By: |  Independent Review – Signature <u>D. ANDERSON</u> Printed Name | Date: <u>12/21/04</u> |
| Approved By: |  Superintendent, FSS – Signature <u>George Pillsbury</u> Printed Name | Date: <u>12/21/04</u> |
| Approved By: |  FSS, MOP – Signature <u>JAMES R. TUCKER</u> Printed Name | Date: <u>12/22/04</u> |

**MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FB-2400 STAFF BUILDING TUNNEL
SURVEY UNIT 1**

A. SURVEY UNIT DESCRIPTION

Survey Unit 1 is located in Survey Area FB2400 in the Staff Building tunnel. The tunnel is located on the north side of the Turbine Building at site coordinates 407,712 N and 624,066 E using Maine State Coordinate System (West Zone) NAD 1927. The Staff Building tunnel is shown in relation to other major site structures in map FB 2400 SITE. All maps referenced in this release record are provided in Attachment 1 unless otherwise noted.

During plant operations, the tunnel provided entry to the Turbine Building from the Technical Support Center in the Staff Building basement during emergency drills. It was not used for general personnel access until the plant was being decommissioned.

The survey unit is approximately 153 m² and consists of the concrete floor which is approximately 27.4 m in length and includes the lower 1 m of the west and east concrete walls.

On the north and south ends of the tunnel are concrete stairs. Following final survey, the concrete stairs on both tunnel ends, the ceiling and a temporary block wall installed for decommissioning will be removed. Only the floor and approximately 1 m of lower wall will remain.

In addition there is a 0.6 m by 0.6 m concrete sump in the tunnel. The sump is approximately 1.2 m deep.

B. SURVEY UNIT DESIGN INFORMATION

The Historical Site Assessment initially classified the survey unit as Class 3 per the LTP. During plant operation, the tunnel was located outside the Restricted Area (RA) boundaries. With the onset of decommissioning activities, the RA fence was moved and the southern end of the tunnel fell inside the RA boundaries. The small portion of the tunnel currently located inside the Restricted Area will be surveyed under survey area FR 0200 after the concrete is removed. Radioactive material was not used or stored in the tunnel; therefore, it was expected to meet the LTP requirements for a Class 3 area. The tunnel configuration and dimensions are provided on map FB2400 SA Ref 1 (Attachment 1).

Tunnel flooding during plant operations was believed to be groundwater influx. However, at one point slightly contaminated Condensate Storage Tank (CST) water flooded the tunnel, perhaps as recently as 1996. A radioactive liquids discharge line passed through the south end of the tunnel during decommissioning, and was removed in September 2004. Its function was to discharge water meeting release limits to the river. In May 2004, it ruptured on overpressure of domestic water supply, flooding the tunnel. Water sample analysis at that time did not identify activity above environmental levels.

Concrete samples taken in the tunnel for characterization, notably from the trenches along each wall/floor juncture, indicated activity up to 1.97 pCi/g Co-60 and up to 0.40 pCi/g Cs-137, which calculated to a maximum of 444 dpm/100 cm². As a result, the area was reclassified from Class 3 to Class 2.

The survey unit design parameters are shown in Table 1. Given a relative shift of 3.0, it was determined that 14 direct measurements were required for the Sign Test, but 15 were taken due to the grid map geometry. Sample measurement locations were determined using a random start point and a systematic square grid. These locations are presented on map FB2400-1f (Attachment 1).

A 10% to 100% scan coverage is required for Class 2 areas. To meet this requirement, 52 floor grids (approximately 1 m²), 52 juncture surveys and the floor/wall surfaces were incorporated into the scan design. The total scan area was approximately 57 m² or 38% of the survey unit. Scan grids and their locations are shown on maps FB2400-1b through 1e (Attachment 1).

The instruments used in this survey are listed by model and serial number in Attachment 2 in Table 2-1. Scan MDCs are also listed in Table 2-2 of Attachment 2, and are compared to the DCGL and the investigation level. As shown in this table, the scan MDC is less than the scan investigation level in all cases, thus providing high confidence (95% or higher) that an elevated area would be detected in the scanning process. Actual background measurements were consistent with design backgrounds used to determine the instrument scan MDC values listed in LTP Table 5-6.

Background values were established for the scan measurements based on local values in the survey unit and previously established material background. These background values listed in Table 1 were used to establish alarm setpoints, to confirm that the scan MDCs used were appropriate, and to establish net activity for direct measurements. Instrument scan setpoints were set at the DCGL plus background. Ninety-degree surface junctures (i.e., wall-floor) were scanned using the 43-68 probe with a reduced efficiency.

TABLE 1
SURVEY UNIT DESIGN PARAMETERS

| Survey Unit | Design Criteria | Basis |
|---------------------------------------|--------------------------------|--|
| Area | 152.55 m ² | Class 2, < 2,000 m ² |
| Number of Direct Measurements | 14 | Based on an adjusted LBGR of 16,857 dpm/100 cm ² , sigma ¹ of 381 dpm/100 cm ² , and a relative shift of 3.0. Type I = Type II = 0.05 |
| Sample Area | 10.9 m ² | 152.55 m ² / 14 = 10.9 m ² |
| Sample Grid Spacing | 3.3 m | (10.9) ^{1/2} |
| Scan Grid Area | 1 m ² or less | Class 2 |
| Area Factor | N/A | Class 2 |
| Scan Survey Area | 57 m ² (38%) | Class 2, 10% - 100% |
| Background | | |
| 43-68 Direct and Scan (flat surfaces) | 3,169 dpm/100 cm ² | Ambient and Material |
| 43-68 Scan (junctures) | 5,952 dpm/100 cm ² | Ambient and Material |
| 43-68 Scan (damp concrete) | 7,127 dpm/100 cm ² | Ambient and Material |
| Scan Investigation Level | DCGL plus Background | See Table 2-2 (Attachment 2) |
| DCGL | 18,000 dpm/100 cm ² | References 2 and 3 |
| Design DCGL _{EMC} | N/A | Class 2 |

C. SURVEY RESULTS

Fifteen direct measurements were made in Survey Unit 1. All direct measurements were less than the DCGL. The direct measurement data are presented in Table 2.

No verified alarms occurred during the surface scans (i.e., flats and junctures). No investigations were required.

Two of the scanned grids (C052, C078) had small areas of 100 cm² each that were noted as being damp by the survey technician. The logged results were 886 and 962 cpm respectively. While the "43-68 Damp Concrete" setpoint of 1550 cpm was not used for these grids, the results were considerably below this. Thus, no resurvey was necessary.

¹ Design sigma is based on LTP Table 5-1B, Staff Building Tunnel, B2400, (LTP, Rev. 3).

TABLE 2
DIRECT MEASUREMENTS

| Sample Location | Gross Activity dpm/100 cm ² | Net Activity (Table 1 Background Subtracted) dpm/100 cm ² |
|--------------------|---|--|
| FB2400-1-C001 | 3669 | 500 |
| FB2400-1-C002 | 3071 | -98 |
| FB2400-1-C003 | 3205 | 36 |
| FB2400-1-C004 | 3065 | -104 |
| FB2400-1-C005 | 2882 | -287 |
| FB2400-1-C006 | 2949 | -220 |
| FB2400-1-C007 | 3297 | 128 |
| FB2400-1-C008 | 2106 | -1062 |
| FB2400-1-C009 | 2705 | -464 |
| FB2400-1-C010 | 2906 | -263 |
| FB2400-1-C011 | 2821 | -348 |
| FB2400-1-C012 | 3101 | -67 |
| FB2400-1-C013 | 3278 | 110 |
| FB2400-1-C014 | 2998 | -171 |
| FB2400-1-C015 | 3150 | -18 |
| Mean | 3013 | -155 |
| Median | 3065 | -104 |
| Standard Deviation | 342 | 342 |
| Range | 2106 to 3669 | -1062 to 500 |

D. SURVEY UNIT INVESTIGATIONS PERFORMED AND RESULTS

No verified alarms occurred, no locations of potentially elevated activity were identified, and thus no investigations were performed.

E. SURVEY UNIT DATA ASSESSMENT

An analysis of the direct sample measurement results including the mean, median, standard deviation and sample result range are provided in Table 2. Without subtracting background, all direct measurement results were below the DCGL. The maximum direct sample result with background subtracted was equivalent to 500 dpm/100 cm².

When adjusted for background, the mean residual contamination level is -155 dpm/100 cm², equivalent to an annual dose of 0.0 mrem².

There were no verified alarms and, therefore, no investigations were required.

² This annual dose equivalent is based on LTP Table 6-11 which shows the contaminated concrete dose contribution for surfaces contaminated at the DCGL to be 0.301 mrem/y.

F. ADDITIONAL DATA EVALUATION

Attachment 4 provides additional data evaluation associated with Survey Unit 1, including relevant statistical information. Based on survey unit direct measurement data, this attachment provides the Sign Test Summary, Quantile Plot, Histogram and Retrospective Power Curve.

1. The Sign Test Summary provides an overall summary of design input (Table 1) and resulting calculated values used to determine the required number (N) of direct measurements (per LTP Section 5.4.2). The Sign Test Summary is a separate statistical analysis that also calculates the mean, median, and standard deviation of the direct measurements.

The critical value and the result of the Sign Test are provided in the Sign Test Summary table, as well as a listing of the key release criteria. As is shown in the table, all of the key release criteria were satisfied for the FSS of the survey unit, except the final sigma (total standard deviation). While the total standard deviation of 413 dpm/100 cm² exceeded the design sigma of 381 dpm/100 cm², the increase in sigma would not have affected the relative shift. Therefore, the survey design had sufficient power to reject the null hypothesis so no additional measurements were required.

2. The Quantile Plot was generated from direct measurement data listed in Table 2 and indicates general symmetry about the median. The data set and plot are consistent with expectations for a Class 2 survey unit. It also should be noted that the maximum net activity (location C001) of 500 dpm/100 cm² was well below the DCGL of 18,000 dpm/100 cm².
3. A Histogram Plot was also developed based on the direct measurement values. This plot shows that the direct data were essentially a normal distribution.
4. A Retrospective Power Curve was constructed based on FSS results. The curve shows that the survey unit having a mean residual activity at a small fraction of the DCGL has a high probability (power) of meeting the release criteria. Thus, it can be concluded that 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.

G. CHANGES IN INITIAL SURVEY UNIT ASSUMPTIONS ON EXTENT OF RESIDUAL ACTIVITY

The survey unit was initially classified as a Class 3, but was reclassified to Class 2 as discussed in Section B. The direct measurement total standard deviation exceeded the design sigma. However, the increase in sigma would not have affected the relative shift. Therefore, the survey design had sufficient power to reject the null hypothesis so no additional measurements were required.

H. LTP CHANGES SUBSEQUENT TO SURVEY UNIT FSS

The FSS of Survey Unit 1 was designed and performed in September and October 2004 using the criteria of the approved LTP Revision 3 (References 3 and 5). There have been no subsequent LTP changes with potential to impact this FSS.

I. CONCLUSION

The FSS of this survey unit was designed based on the LTP designation as a Class 2 area. The survey design parameters are presented in Table 1. The required number of direct measurements was determined for the Sign Test in accordance with the LTP. As presented in Table 2, all beta direct measurements were less than the DCGL of 18,000 dpm/100 cm².

A Sign Test Summary analysis demonstrated that the Sign Test criteria were satisfied. The direct measurement total sigma was determined to be greater than that used for design, however a sufficient number of samples were taken.

The Retrospective Power Curve shown in Attachment 4 confirmed that sufficient samples were taken to support rejection of the null hypothesis providing high confidence that the survey unit satisfied the release criteria and the data quality objectives were met. Attachment 4 also revealed that direct measurement data represented essentially a normal distribution, with variance consistent with expectations for a Class 2 survey unit.

The scan survey design for this survey unit was developed in accordance with the LTP with significant aspects of the design discussed in Section B and Table 1. Scanning resulted in no verified alarms for evaluation.

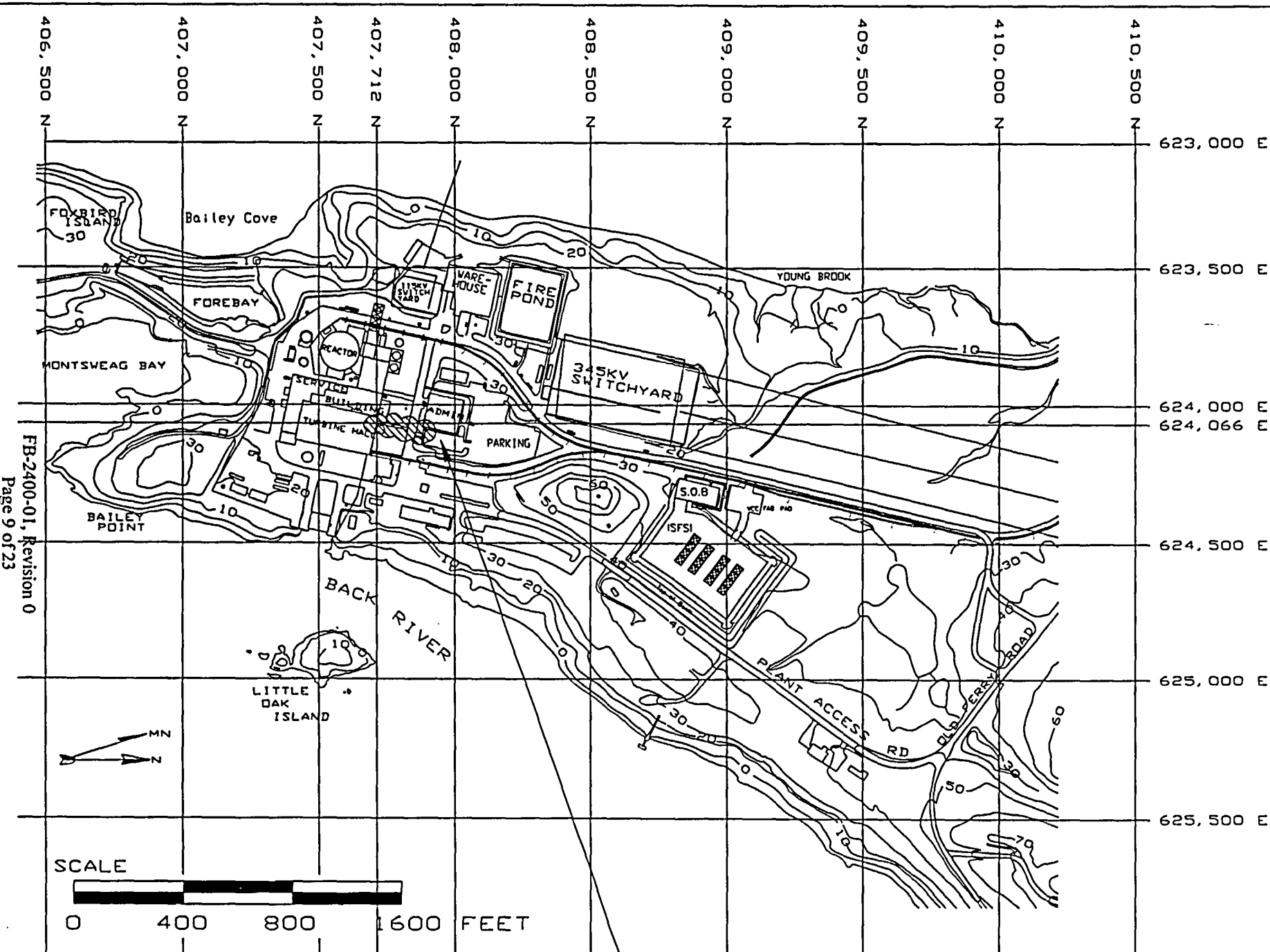
It is concluded that FB2400 Survey Unit 1 meets the release criteria of 10CFR20.1402 and the State of Maine enhanced criteria.

J. REFERENCES

1. Maine Yankee License Termination Plan, Revision 3, Maine Yankee letter to the NRC, MN-02-048, October 15, 2002
2. Maine Yankee License Termination Plan, Revision 3 Addenda, Maine Yankee letter to the NRC, MN-02-061, November 26, 2002
3. NRC letter to Maine Yankee, February 28, 2003
4. Maine Yankee letter to the NRC, MN-03-049, September 11, 2003 (LTP Supplement to LTP Revision 3)
5. Issuance of License Amendment No. 170, NRC letter to Maine Yankee, dated February 18, 2004

Attachment 1
Survey Unit Maps

Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey
Survey Area Name: Staff Building Tunnel



SURVEY AREA, FB 2400

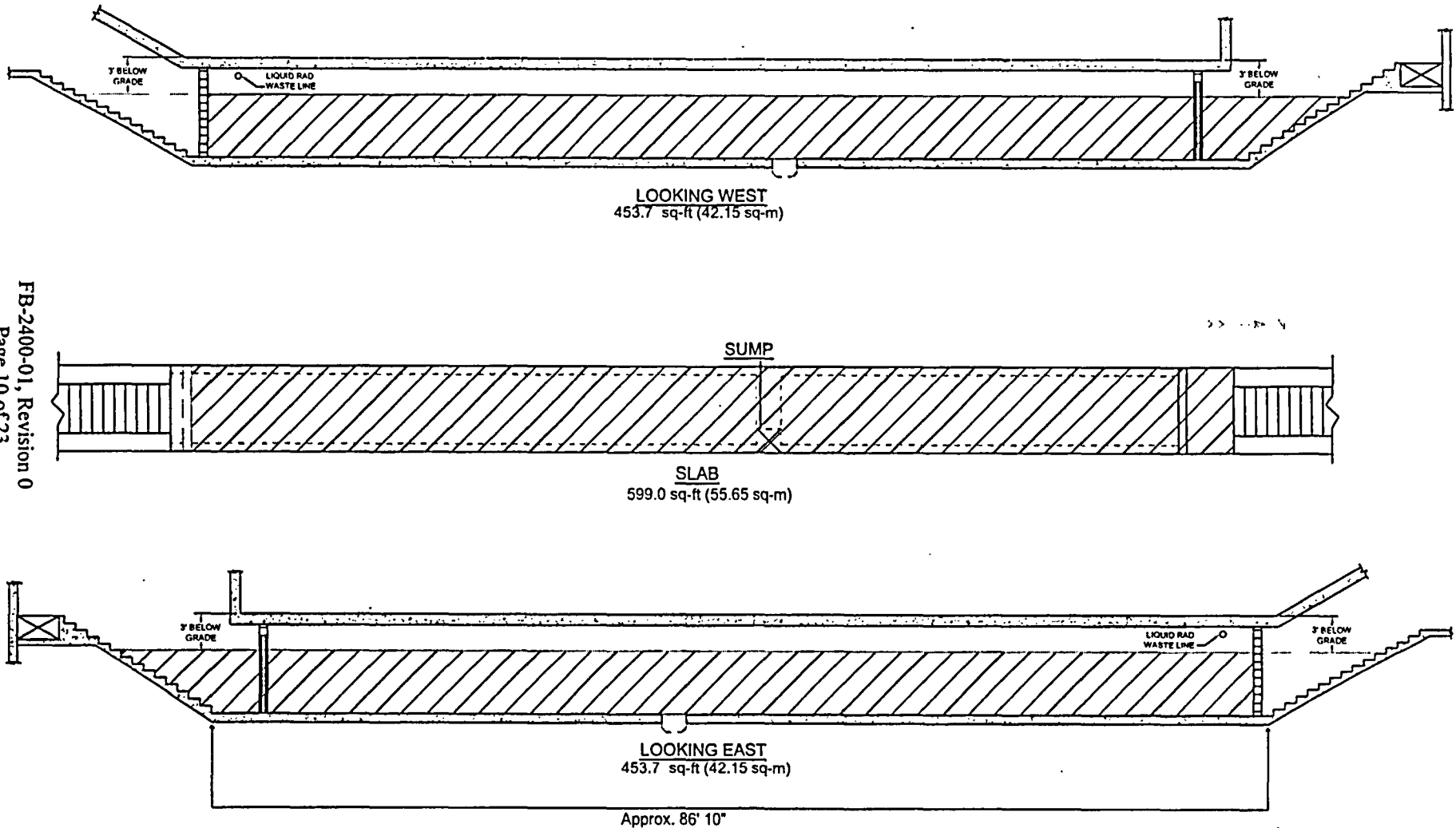
South East Corner of Staff Building Tunnel at Coordinate -407,712N
-624,066E

Note: Grid based on Maine State Coordinate System
(West Zone) NAD 1927

Final Status Survey

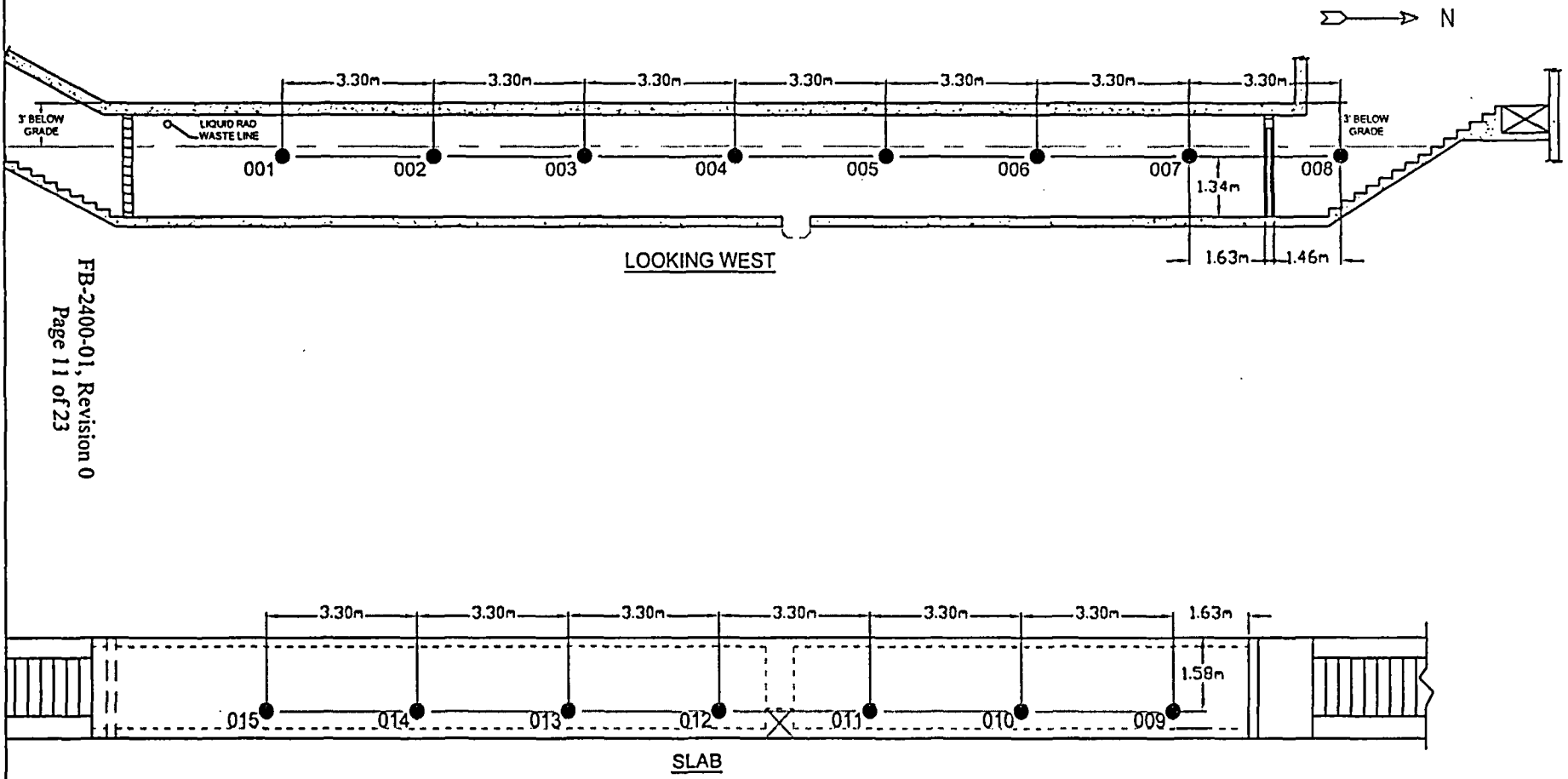
FB2400: Staff Building Tunnel (El. 13')

Surface Area Reference Map



$$(2 (42.15) + 55.65 + 3.3 \text{ [S Wall]} + 2.7 \text{ [Sump]} + 6.6 \text{ [N Wall]}) \text{ sq-m} = 152.55 \text{ sq-m Total Area } < 3' \text{ Grade}$$

Final Status Survey FB2400: Staff Building Tunnel (El. 13') Direct Points 001 - 015



Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey Survey Area Name: Staff Building Tunnel

Final Status Survey
FB2400: Staff Building Tunnel (El. 13')
Survey Scans 001-052

Σ → N

| | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 024 | 021 | 020 | 017 | 016 | 013 | 012 | 009 | 008 | 005 | 004 | 001 |
| 023 | 022 | 019 | 018 | 015 | 014 | 011 | 010 | 007 | 006 | 003 | 002 |

SLAB, N End

Q TRENCH

| | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 052 | 049 | 048 | 045 | 044 | 041 | 040 | 037 | 036 | 033 | 032 | 029 | 028 | 025 |
| 051 | 050 | 047 | 046 | 043 | 042 | 039 | 038 | 035 | 034 | 031 | 030 | 027 | 026 |

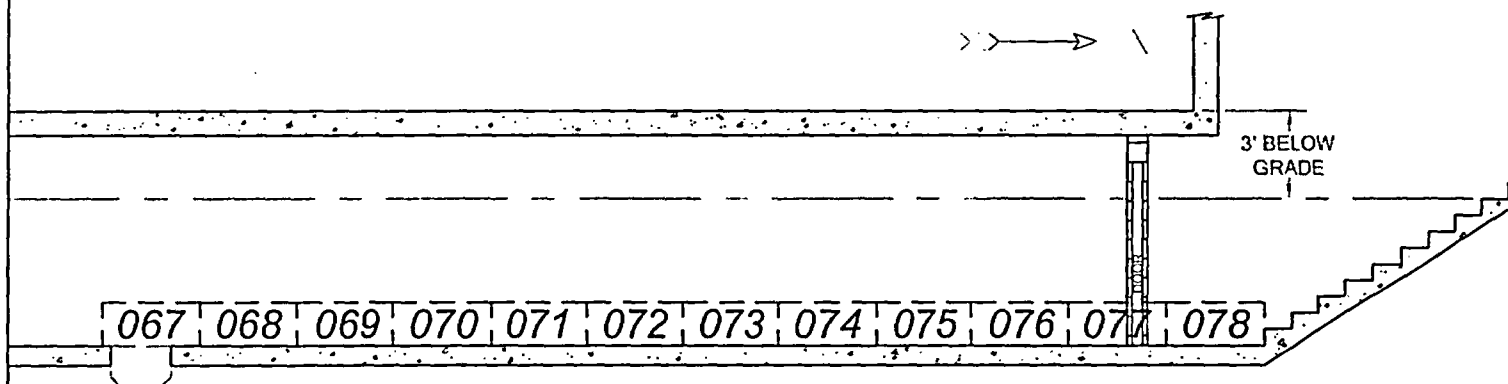
SLAB, S End

Q TRENCH

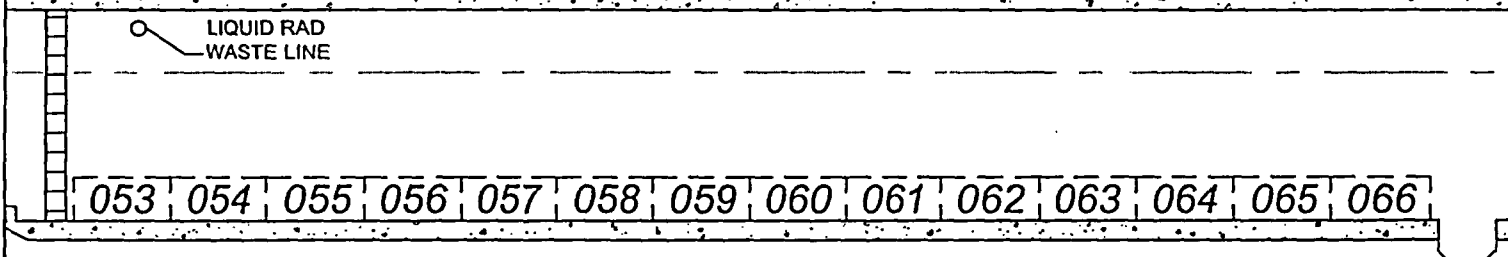
Survey Type: ☐ Characterization ☒ Turnover ☐ Final Status Survey

Survey Area Name: Staff Building Tunnel

Final Status Survey
FB2400: Staff Building Tunnel (El. 13')
Juncture Survey Scans 053-078



LOOKING WEST, NORTH
END



LOOKING WEST, SOUTH
END

Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey

Survey Area Name: Staff Building Tunnel

Final Status Survey
FB2400: Staff Building Tunnel (El. 13')
Juncture Survey Scans 079-104

LIQUID RAD
WASTE LINE

091 092 093 094 095 096 097 098 099 100 101 102 103 104

LOOKING EAST, SOUTH END

3' BELOW
GRADE

079 080 081 082 083 084 085 086 087 088 089 090

LOOKING EAST, NORTH END

Survey Type ☐ Characterization ☐ Turnover ☒ Final Status Survey Survey Area Name: Staff Building Tunnel

Final Status Survey
FB2400: Staff Building Tunnel (El. 13')
Survey Scans 105 - 109

West Sump Wall

109

South Sump Wall

108

105

Sump Bottom

106

North Sump Wall

107

East Sump Wall

Attachment 2

Survey Unit Instrumentation

TABLE 2-1

INSTRUMENT INFORMATION

| E-600 S/N | Probe S/N (type) |
|------------------|-------------------------|
| 1625 | 148931 (43-68) |
| 1625 | 148937 (43-68) |
| 1641 | 148939 (43-68) |
| 1648 | 149069 (43-68) |

TABLE 2-2

**INSTRUMENT SCAN MDC, DCGL,
AND INVESTIGATION LEVEL**

| Detector | 43-68 (Flats) | 43-68 (Junctures) | 43-68 (Damp Concrete) |
|--|---------------------------------------|---------------------------------------|---------------------------------------|
| Scan MDC (dpm/100 cm ²) | 1,832 (Note 1) | 3,969 (Note 2) | 4,860 (Note 2) |
| DCGL (dpm/100 cm ²) | 18,000 | 18,000 | 18,000 |
| Investigation Level (Alarm Setpoint) (dpm/100 cm ²) | 21,184 (~ DCGL plus background) | 23,942 (~ DCGL plus background) | 25,105 (~ DCGL plus background) |

NOTES

1. LTP Table 5-6
2. The 43-68 Scan MDC from LTP Table 5-6 was adjusted to account for a change in efficiency due to geometry or surface condition.

Attachment 3

Investigation Table

(No Investigations Required)

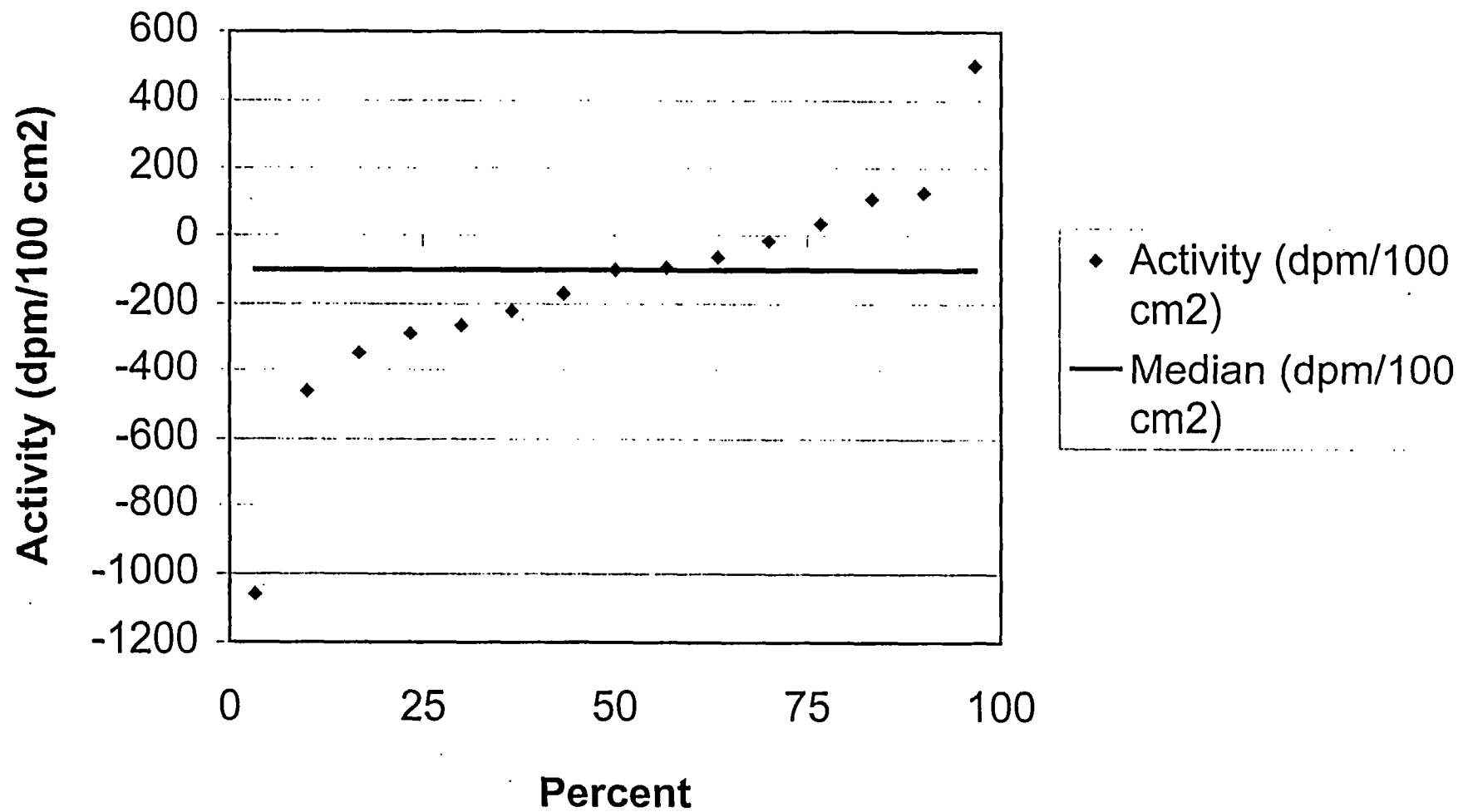
Attachment 4

Statistical Data

Survey Package FB2400 Unit 1 Surface Sign Test Summary

| Evaluation Input Values | | Comments |
|--|--------------------|--|
| Survey Package: | FB2400 | |
| Survey Unit: | 01 | |
| Evaluator: | CAO | |
| DCGL _w : | 18,000 | dpm/100cm2 |
| DCGL _{emc} : | n/a | Class 2 |
| LBGR: | 16,857 | dpm/100cm2 |
| Sigma: | 381 | dpm/100cm2 |
| Type I error: | 0.05 | |
| Type II error: | 0.05 | |
| Total Instrument Efficiency: | 13.0% | |
| Detector Area (cm ²): | 126 | |
| Material Type: | Concrete Unpainted | Choosing 'N/A' sets material background to "0" |
| Calculated Values | | Comments |
| Z _{1-α} : | 1.645 | |
| Z _{1-p} : | 1.645 | |
| Sign p: | 0.99865 | |
| Calculated Relative Shift: | 3.0 | |
| Relative Shift Used: | 3.0 | Uses 3.0 if Relative Shift >3 |
| N-Value: | 11 | |
| N-Value+20%: | 14 | |
| Static Data Values | | Comments |
| Number of Samples: | 15 | |
| Median: | -104 | dpm/100cm2 |
| Mean: | -155 | dpm/100cm2 |
| Net Static Data Standard Deviation: | 342 | dpm/100cm2 |
| Total Standard Deviation: | 413 | SRSS |
| Maximum: | 500 | dpm/100cm2 |
| Sign Test Results | | Comments |
| Adjusted N Value: | 15 | |
| S+ Value: | 15 | |
| Critical Value: | 11 | |
| Criteria Satisfaction | | Comments |
| Sufficient samples collected: | Pass | |
| Maximum value <DCGL _w : | Pass | |
| Median value <DCGL _w : | Pass | |
| Mean value <DCGL _w : | Pass | |
| Maximum value <DCGL _{emc} : | Pass | |
| Total Standard Deviation <=Sigma: | Investigate | Sufficient power to reject the null hypothesis |
| Sign test results: | Pass | |
| Final Status | | Comments |
| The survey unit passes all conditions: | Investigate | |

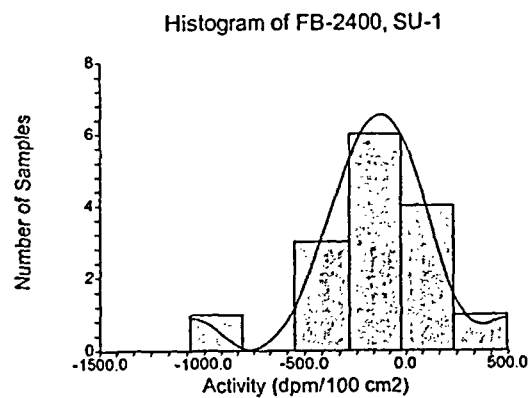
FB-2400 SU-1 Quantile Plot



One-Sample T-Test Report

Page/Date/Time 2 12/13/04 9:02:58 AM
Database C:\Program Files\NCSS97\FB2400 SU-1.S0
Variable C2

Plots Section



One-Sample T-Test Power Analysis

Page/Date/Time 2 12/13/04 9:04:08 AM

Chart Section

