MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FB-0200 CONTROL AND COMPUTER ROOM FOOTPRINT
SURVEY UNIT 1

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A. SURVEY UNIT DESCRIPTION

FB-0200 is the survey area located in the footprint of the former Service Building where the Control Room and Computer Room were located. The northwest corner of the Service Building is positioned at coordinates 407735 N and 623965 E using the Maine State Coordinate System (West Zone) NAD 1927, and is shown on map FB 0200-SITE-A in Attachment 1. The entire footprint survey area of approximately 485 m^2 was designated as Survey Unit 1.

B. SURVEY UNIT DESIGN INFORMATION

Per LTP Table 5-1B, FB-0200 was designated as Class 3 because it had no history of surface or airborne contamination, and there were no cross-contaminated systems residing in, or traversing through this area. The survey area was used as the plant operations Control Room including a kitchen area, and the Computer Room contained the plant computer systems and office space.

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. Measurement locations were randomly determined and are illustrated on the map FB 0200-02 (Attachment 1). All direct measurements consisted of soil samples obtained at the required locations. The samples are analyzed with laboratory gamma spectroscopy.

A 1% to 10% scan coverage of the area was required. A minimum 10% surface scan (> 48.5 m^2) was accomplished by scanning eight grids with a total area equaling 50.75 m^2. The location of the scan areas are shown on map FB 0200-01 in Attachment 1. The survey instruments used, their MDCs, and alarm setpoints are provided in Attachment 2.

Background values were established for the scan measurements based on local scaler values in the survey unit. These background values were used to establish scan alarm set-points.

TABLE 1

SURVEY UNIT DESIGN PARAMETERS

Survey Unit	Design Criteria	Basis
Area	485 m^2	No limit for Class 3 Area
Number of Direct Measurements Required	14	Based on an adjusted LBGR of 2.69 pCi/g, sigma[1] of 0.17 pCi/g, and relative shift of 3.0. Type I = Type II = 0.05
Sample Area	N/A	Class 3 Area
Sample Grid Spacing	N/A	Class 3 Area
Scan Grid Area	7 grids sized 2.5 m x 2.5 m 1 grid sized 2 m x 3.5 m	Class 3 Area
Area Factor	N/A	Class 3 Area
Scan Survey Area	50.75 m^2	Class 3 Area $\geq$ 10%
Background		
SSPA-3 (scan)	Average background $\pm$ 1000 c/m	DI 6-150, EC-009-01, LTP Section 5
Scan Alarm	3 sigma of background	EC-009-01 (Reference 5)
DCGL[2]	3.2 pCi/g	LTP Revision 3 (Reference 1 and 2)
$DCGL_{EMC}$	N/A	Class 3 Area

C. SURVEY UNIT RESULTS

As required, 14 direct soil measurements were made. The results of the soil sample analyses are shown in Table 2. All direct measurements were below the DCGL.

There were eight scan grids as shown on survey map FB 0200-01 (Attachment 1). Scan alarms occurred in two of the eight grids. The investigation results for the two alarm grids are discussed in Section D.

1 LTP Table 5-1C, Footnote a, Sigma for R0200 yard east.

2 Refer to Section H for an additional discussion relating to the design DCGL.

TABLE 2

DIRECT MEASUREMENTS

Sample Number	Cs-137 (pCi/g)[1]
FB0200-1-3S009SS	< 0.028
FB0200-1-3S010SS	< 0.029
FB0200-1-3S011SS	< 0.031
FB0200-1-3S012SS	< 0.030
FB0200-1-3S013SS	< 0.030
FB0200-1-3S014SS	< 0.026
FB0200-1-3S015SS	< 0.023
FB0200-1-3S016SS	< 0.027
FB0200-1-3S017SS	< 0.027
FB0200-1-3S018SS	< 0.026
FB0200-1-3S019SS	< 0.029
FB0200-1-3S020SS	< 0.029
FB0200-1-3S021SS	< 0.028
FB0200-1-3S022SS	< 0.027
Mean	**0.028**
Median	**0.028**
Standard Deviation	**0.002**
Range	**0.023 – 0.031**

(1) < Indicates results were below the listed MDA value.
The samples were also analyzed for Co-60 at a similar MDA; all were less than MDA.

D. SURVEY UNIT INVESTIGATIONS PERFORMED AND RESULTS

Of the eight grids scanned within the Control and Computer Room Footprint, Grids #1 and #2 alarmed. The two grids were re-scanned and a soil sample was taken at the highest count rate location. The soil samples were analyzed by gamma spectroscopy and no plant-derived fission products were detected. The results of the investigation measurements are tabulated in Attachment 3.

E. SURVEY UNIT DATA ASSESSMENT

An analysis of the direct sample measurement results, including mean, median, standard deviation, and sample result range are provided in Table 2. There was no detectable plant-derived fission product from the 14 soil samples collected, and the final sigma was less than the design sigma (and no additional samples were required).

For illustrative purposes, as indicated in LTP Section 5.9.3, a simplified general retrospective dose estimate can be calculated from the average residual contamination level by subtracting the established mean fallout Cs-137 background value (0.19 pCi/g) for disturbed soil from the survey unit sample mean activity (0.028 pCi/g). The result is a net value of –0.162 pCi/g. This would equate to an annual dose rate of 0.0 mrem/y. However, for the purposes of demonstrating compliance with the radiological criteria for license termination and the enhanced State Criteria, background activity is not subtracted from the soil sample analysis activity values.

F. ADDITIONAL DATA EVALUATION

Attachment 4 provides additional data evaluation associated with this Survey Unit, 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 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 clearly satisfied for the FSS of this survey unit.

2. The Quantile Plot was generated from direct measurement data listed in Table 2. The data set and plot are consistent with expectations for a Class 3 survey unit. All of the measurements are well below the DCGL of 2.39 pCi/g.

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 with no outliers.

4. A Retrospective Power Curve was constructed, based on FSS results. The curve shows that this 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 was designed as a Class 3 area; the FSS results were consistent with that classification. The direct measurement sample standard deviation was less than the design sigma. Thus, no additional measurements were required.

H. LTP CHANGES SUBSEQUENT TO SURVEY UNIT FSS

The survey design used 3.2 pCi/g as the DCGL. The lower DCGL (applicable to the restricted area) was chosen due to the survey unit's proximity to the Primary Auxiliary Building. Subsequently, the DCGL applicable to this survey unit was changed to 2.39 pCi/g (Reference 4). The revised DCGL would not result in additional sample requirements (design relative shift >> 3) and soil measurement MDAs were well below the revised DCGL. The LTP revision has no effect on this survey.

I. CONCLUSION

The FSS of this survey unit was designed based on the LTP designation as a Class 3 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 direct measurements were less than the DCGL of 2.39 pCi/g.

A Sign Test Summary analysis demonstrated that the Sign Test criteria were satisfied. The direct measurement sigma was determined to be less than that used for design, thus indicating that a sufficient number of samples was 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 no outliers.

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 two verified alarms. Investigations of the alarm grids yielded no indication of plant-derived fission products.

It is concluded that FB0200 Survey Unit 1 meets the release criteria of 10CFR20.1402 and that State of Maine enhanced criteria.

J. REFERENCES

1. Maine Yankee License Termination Plan, Revision 3, Maine Yankee letter to the NRC, MN-02-048, dated October 15, 2002

2. Maine Yankee License Termination Plan, Revision 3 Addenda, Maine Yankee letter to the NRC, MN-02-061, dated November 26, 2002

3. NRC letter to Maine Yankee, dated February 28, 2003, Approval of LTP Rev. 3 and Addenda

4. MY letter to the NRC, MN-03-049, dated September 11, 2003, "Proposed Change: Revised Activated Concrete DCGL and More Realistic Activated Concrete Dose Modeling"

5. Maine Yankee Engineering Calculation, EC-009-01

Attachment 1

Survey Unit Maps

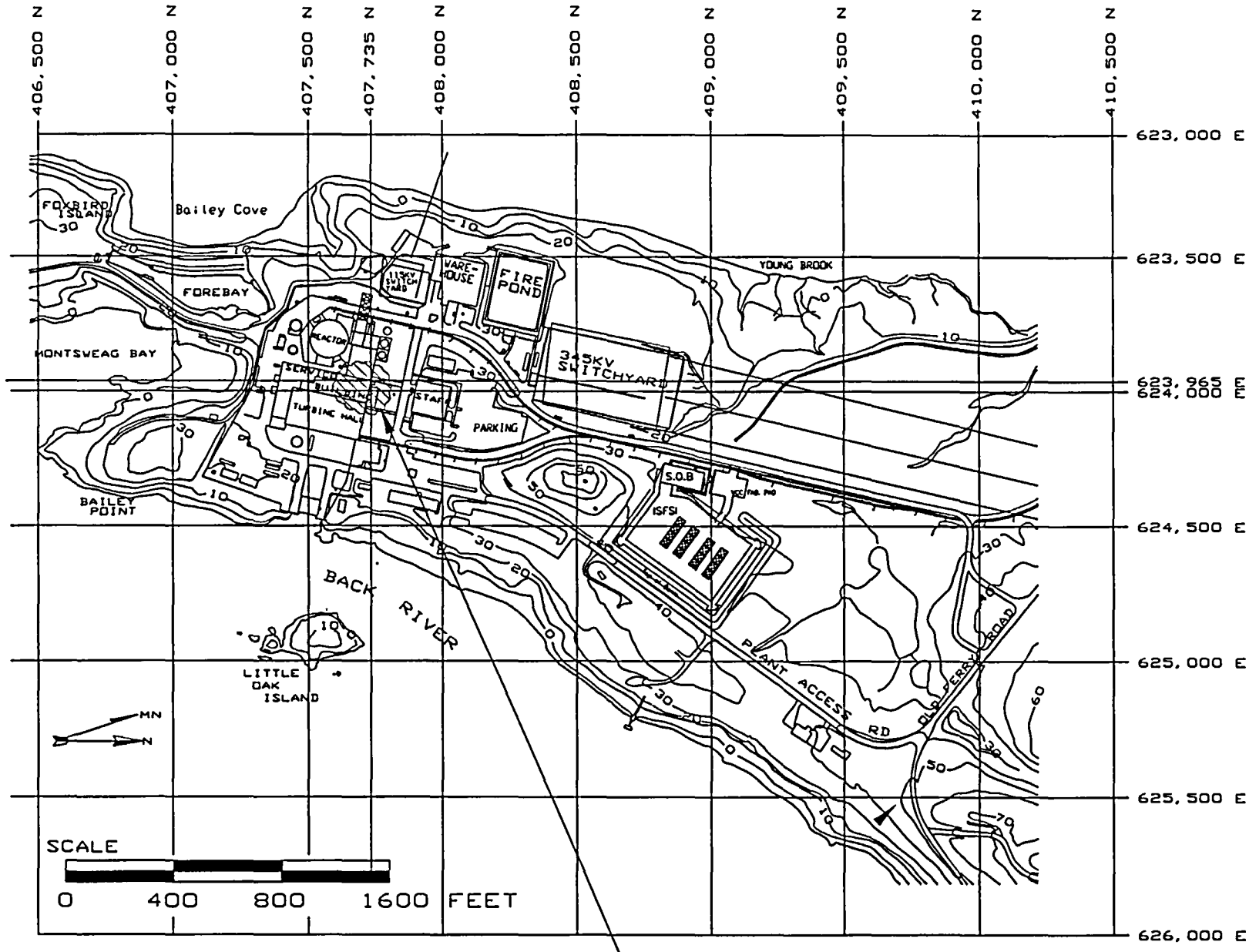
Maine Yankee Decommissioning Team

Maine Yankee Decommissioning Project Survey Form

Map ID #:FB0200-SITE-A
Revised: 10-29-03

Survey Type: ☐ Characterization ☐ Turnover ■ Final Status Survey

Survey Area Name: Service Building Phase II

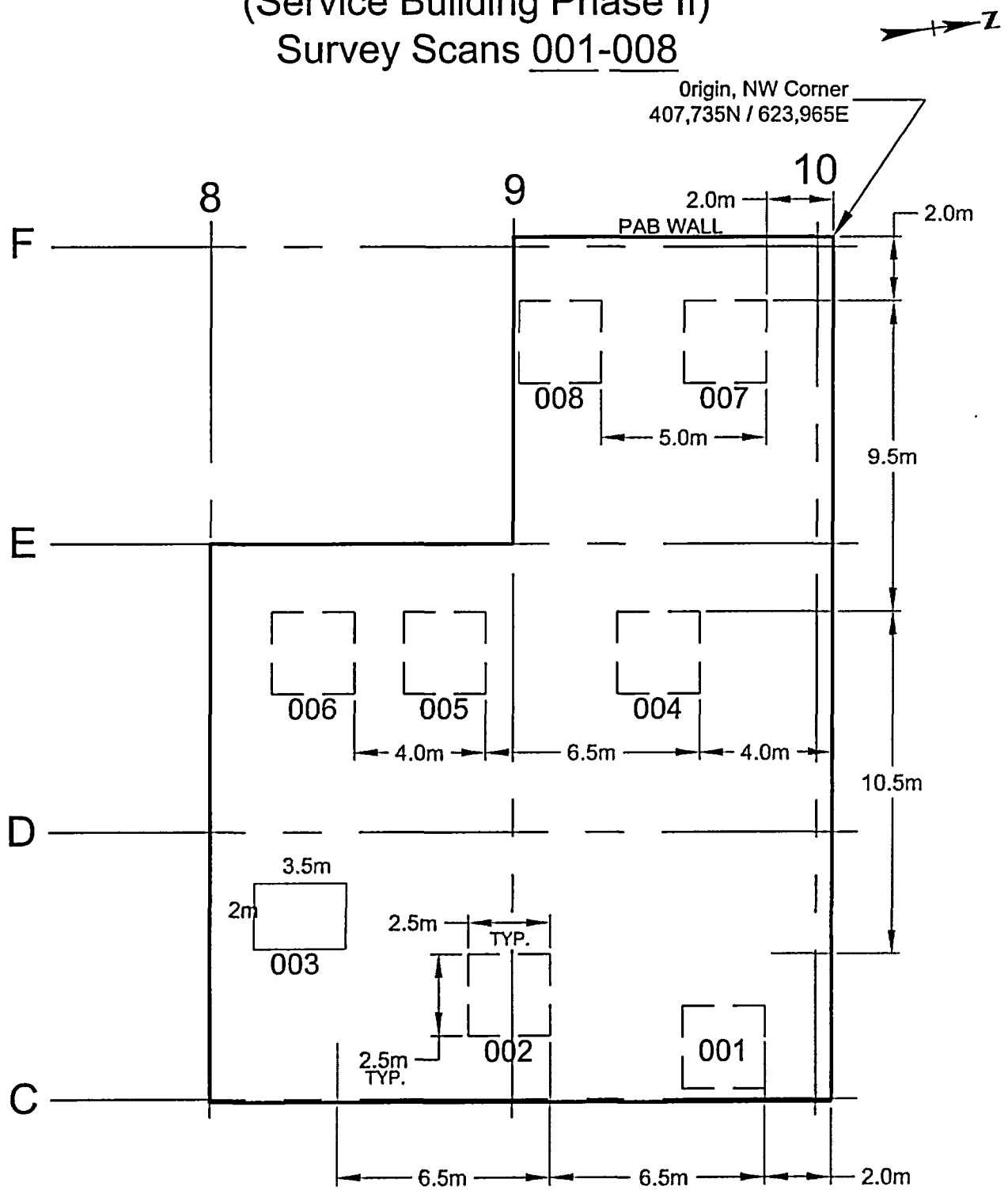


SURVEY AREA, FB 0200
North West Coordinate of Service Bldg at -407,735N
-623,965E

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

Maine Yankee Decommissioning Team	*Maine Yankee Decommissioning Project Survey Form*	Map ID #: FB 0200-01 Revised: 11-11-03
Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey	Survey Area Name: Control & Computer Room Footprint	

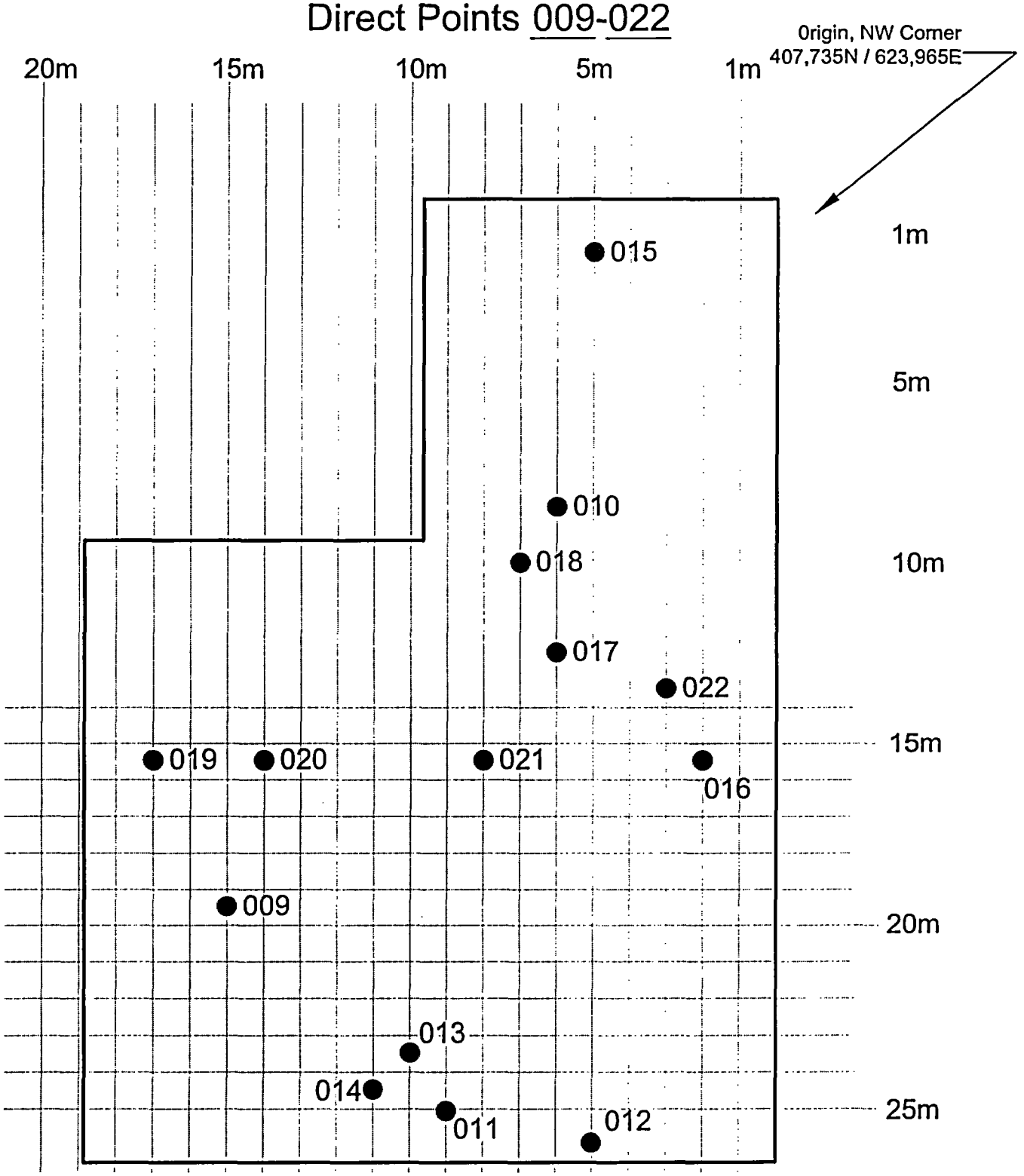
Control & Computer Room Footprint
(Service Building Phase II)
Survey Scans 001-008



10% Scan Total Area = 485 sq-m

Maine Yankee Decommissioning Team	*Maine Yankee Decommissioning Project Survey Form*	Map ID #: FB 0200-02 Revised: 10-29-03
Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey	Survey Area Name: Service Building Phase II	

Service Building Phase II
Footprint Final Status Survey
Direct Points 009-022



Total Area = 485 sq-m

Attachment 2

Survey Unit Instrumentation

TABLE 2-1

INSTRUMENT INFORMATION

E-600 S/N	Probe S/N (type)
2617	725328 (SSPA-3)
1625	2258 (SSPA-3)
2488	2258 (SSPA-3)

HPGe Detectors for Lab Analysis of Volumetric Samples

Detector Number	MDC (pCi/g)
FSS-1	0.02 to 0.13
FSS-2	0.02 to 0.13

TABLE 2-2

INSTRUMENT SCAN MDC, DCGL, AND INVESTIGATION LEVEL

Detector	SPA-3	Comments
Scan MDC (pCi/g)	5.9	Design Scan MDC (Reference 2)
DCGL (pCi/g)	2.39	DCGL for land areas within the RA
Investigation Level (Alarm Setpoint) (cpm)	15,590	3 sigma of background

Attachment 3

Investigation Table

TABLE 3-1

INVESTIGATION RESULTS

Investigation Location	Alarm Setpoint (cpm)	Initial Scan Alarm (cpm)	Investigation Number	Maximum Scan value (cpm)	Investigation Result Cs-137* (pCi/g)
Grid 1	15,590	16,060	XB0200-01-3-S001	20,000	< 2.81E-2
Grid 2	15,590	15,900	XB0200-01-3-S002	22,800	< 3.06E-2

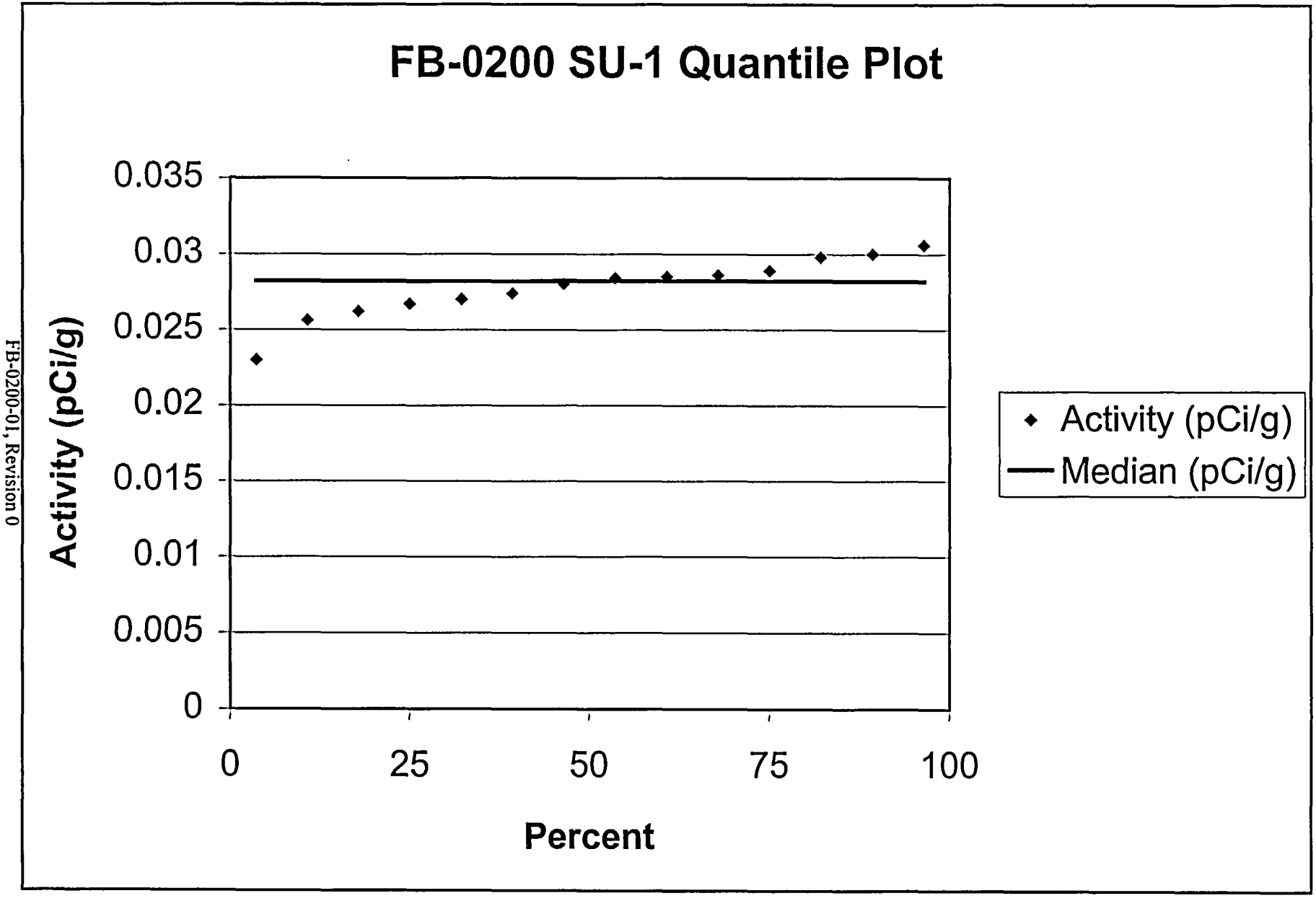
* Samples were also analyzed for Co-60; all were less than an MDA of 0.05 pCi/g.

Attachment 4

Statistical Data

Survey Package FB0200 Unit 1 Soil Sign Test Summary

Evaluation Input Values		Comments
Survey Package:	FB0200	Control/Computer Rooms
Survey Unit:	01	
Evaluator:	GP	
$DCGL_w$:	2.39E+00	
$DCGL_{emc}$:	2.39E+00	
LBGR:	1.20E+00	
Sigma:	1.70E-01	
Type I error:	0.05	
Type II error:	0.05	
Nuclide:	CS-137	
Soil Type:	N/A	
Calculated Values		**Comments**
$Z_{1-\alpha}$:	1.645	
$Z_{1-\beta}$:	1.645	
Sign p:	0.99865	
Calculated Relative Shift:	7.0	
Relative Shift Used:	3.0	Uses 3.0 if Relative Shift is >3
N-Value:	11	
N-Value+20%:	14	
Sample Data Values		**Comments**
Number of Samples:	14	
Median:	2.82E-02	
Mean:	2.78E-02	
Net Sample Standard Deviation:	2.00E-03	
Total Standard Deviation:	2.00E-03	SRSS
Maximum:	3.06E-02	
Sign Test Results		**Comments**
Adjusted N Value:	14	
S+ Value:	14	
Critical Value:	10	
Sign test results:	Pass	
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:	Pass	
Criteria comparison results:	Pass	
Final Status		**Comments**
The survey unit passes all conditions:	Pass	


FB-0200 SU-1 Quantile Plot
Activity (pCi/g)
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0
25
50
75
100
Percent
Activity (pCi/g)
Median (pCi/g)

One-Sample T-Test Report

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Variable	C2

Plots Section

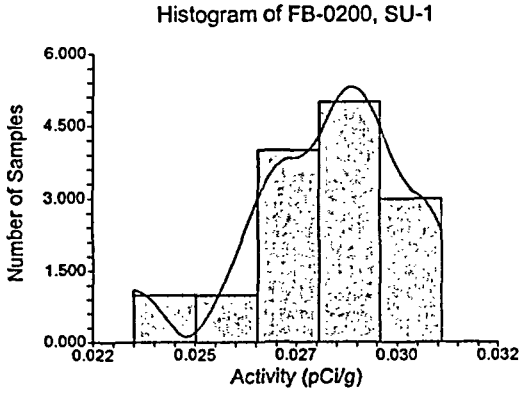

Chart Section