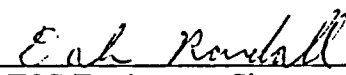
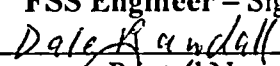
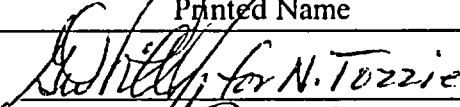






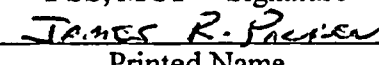


**MAINE YANKEE  
FINAL STATUS SURVEY RELEASE RECORD  
FR-0400 FOREBAY  
SURVEY UNIT 1**

Prepared By:	<div style="text-align: center;"> FSS Engineer – Signature</div> <div style="text-align: center;"> Printed Name</div>	Date: <u>11-10-04</u>
Reviewed By:	<div style="text-align: center;"> FSS Specialist – Signature</div> <div style="text-align: center;"> Printed Name</div>	Date: <u>11/12/04</u>
Reviewed By:	<div style="text-align: center;"> Independent Review – Signature</div> <div style="text-align: center;"> Printed Name</div>	Date: <u>11/15/04</u>
Approved By:	<div style="text-align: center;"> Superintendent, FSS – Signature</div> <div style="text-align: center;"> Printed Name</div>	Date: <u>11/15/04</u>
Approved By:	<div style="text-align: center;"> FSS, MOP – Signature</div> <div style="text-align: center;"> Printed Name</div>	Date: <u>12/22/04</u>

**MAINE YANKEE  
FINAL STATUS SURVEY RELEASE RECORD  
FR-0400 FOREBAY  
SURVEY UNIT 1**

**A. SURVEY UNIT DESCRIPTION**

Survey Unit 1 is located within Survey Area FR-0400, the Forebay. The Forebay is located south of the radiologically Restricted Area of the site at coordinates 407,250 N and 623,600 E (see map FR 0400-SITE, Attachment 1). The Forebay is a large, rock-lined basin in which condenser cooling water collected prior to its release through the diffuser system out to the ocean. During plant operation, the Forebay/Diffuser System was the licensed discharge path for liquid, radiological effluent. After plant shutdown, stop logs were set in place at the Forebay end of the diffuser to isolate the Forebay in order to prevent the release of Forebay sediment into the river during remediation activities.

Two earthen dikes make up the north-south running walls of the Forebay with concrete walls at the extreme north and south ends to support the circulating water and diffuser pipes. The dike walls form a V at the southern end of the Forebay (adjacent to Foxbird Island). The diffuser discharge pipes originate at the notch of the V. A concrete dam, or weir, runs in the east west direction at the northern end of the Forebay and creates a small, water-filled area called the sealpit. The sealpit maintained a water seal over the circulating water pipes to prevent loss of flow with tidal fluctuations.

Survey Unit 1 consists of the floor of the sealpit and its sloping walls up to an elevation of 4.5 feet. The sealpit consists of a rock and gravel floor, previously covered with sediment<sup>1</sup>, and exposed ledge walls on the east and west sides. The weir forms the south end and the concrete support structure of the circ water pipes forms the north end. The Survey Unit has a surface area of approximately 640 m<sup>2</sup>.

**B. SURVEY UNIT DESIGN INFORMATION**

The Forebay received the liquid radioactive discharges from the plant. It was known to have been contaminated to levels in excess of the release limits and extensive remediation activities including underwater dredging, underwater vacuuming, and dry surface vacuuming were performed. Given the high probability of residual contamination, the Forebay was classified as Class 1.

Revision 3 of the Maine Yankee License Termination Plan (LTP)<sup>2</sup> states that the Forebay dose from residual radioactivity "is so insignificant and the probability so low that an individual would be able to successfully place a viable well within the Forebay, survey measurements of the Forebay surfaces including rip-rap will be limited". As a result, the survey design for the Forebay is a reasonable approach to demonstrate compliance with the release criteria while not necessarily meeting all of the requirements for a "MARSSIM" survey.

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<sup>1</sup> A large amount of the sediment was removed during remediation; some sediment remained which was used for volumetric sampling.

<sup>2</sup> LTP, Revision 3 refers to the LTP submitted in October 2002 (Reference 1) as amended by the MY's addenda of November 2002 (Reference 2). LTP, Revision 3 was approved by the NRC in February 2003 (Reference 3).

A technical basis document outlining the proposed Forebay survey plan was submitted to the NRC prior to commencing the surveys. One aspect of the Technical Basis document was to describe the use of underwater *in situ* gamma spectroscopy for performing some of the Forebay survey measurements. The sealpit was chosen as one of the test areas to demonstrate the use of *in situ* surveys. As a result, many measurements were made, both *in situ* and volumetric, of the residual activity in the sealpit. The *in situ* measurements were used as characterization data for the survey unit; the volumetric measurements were used for the survey unit direct measurements.

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. Each sample measurement location was determined using a random start point and a square grid. These locations are presented on survey map FR0400-03 (Attachment 1). All direct measurements consisted of soil samples obtained at the required locations. The samples are analyzed with laboratory gamma spectroscopy.

The survey unit design also included 179 individual scan grids of approximately 2 m by 2 m (see map FR0400-04, Attachment 1). Each grid was scanned by NaI detector. The survey instruments used, their MDC values, and alarm setpoints are provided in Attachment 2. The design  $DCGL_{EMC}$  is greater than the scan MDC. The investigation level was established at approximately  $DCGL_{EMC}$  plus background.

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 setpoints, and to confirm the scan MDCs used were appropriate. Due to the different media that exists in the survey unit, a wide range of backgrounds was encountered. The scan grids were arranged into five background groups based on similar readings. A different alarm setpoint was developed for each group.

**TABLE 1**  
**SURVEY UNIT DESIGN PARAMETERS**

Survey Unit	Design Criteria	Basis
Area	640 m <sup>2</sup>	
Number of Direct Measurements Required	14	Based on an LBGR of 3.5 pCi/g, sigma <sup>3</sup> of 0.31 pCi/g, and a relative shift (adjusted) of 3.0 Type I = Type II = 0.05
Sample Area	45.7 m <sup>2</sup>	640 m <sup>2</sup> / 14 samples
Sample Grid Spacing	6.76 m	(45.7) <sup>1/2</sup>
Area Factor	1.5	LTP, Table 6-12
Scan Survey Area	640 m <sup>2</sup>	Class 1 – 100%
Background		
SPA-3 (scan)	Varied 14,570 to 22,650	DI 6-150, EC-009-01, LTP Section 5
Scan Investigation Level	20 pCi/g + background	~ DCGL <sub>EMC</sub> See Table 2-2 (Attachment 2)
DCGL <sup>4</sup>	7.0 pCi/g Co-60	Forebay Technical Basis Document
Design DCGL <sub>EMC</sub>	10.5 pCi/g Co-60	Area Factor x DCGL (from Table 6-12 of the LTP)

### C. SURVEY RESULTS

Fourteen direct measurements were required, sixteen were actually taken. The direct measurement data are presented in Table 2. All direct measurements were below the DCGL.

Sample S001 also had detectable Sb-125 (not shown on Table 2) at less than 0.5% of the DCGL.

All accessible areas were scan surveyed. Portions of the survey unit could not be surveyed due to interferences, safety hazards, and/or water. Fifty-four grids within the survey unit were identified as needing investigation due to high background and/or verified alarm. The investigations are discussed in Section D.

<sup>3</sup> Sigma was determined using post remediation survey data.

<sup>4</sup> This DCGL was used for the survey design. The actual DCGLs listed in Table 2-2 were used for data evaluation. Refer to Section H for additional discussion.

**TABLE 2**  
**DIRECT MEASUREMENTS**

Sample Number	Cs-137 (pCi/g)	Co-60 (pCi/g)	Unitized Values of Unity Rule
FR0400-1-SS001	1.02E+00 + 6.98E-02	4.95E+00 + 1.96E-01	4.41E-01
FR0400-1-RS002	3.22E-02 + 1.33E-02	1.50E-01 + 1.59E-02	1.34E-02
FR0400-1-RS003	< 2.96E-02	6.03E-02 + 1.36E-02	5.88E-03
FR0400-1-RS004	< 3.59E-02	< 3.82E-02	4.21E-03
FR0400-1-SS005	1.88E+00 + 1.33E-01	7.76E-01 + 4.52E-02	1.19E-01
FR0400-1-RS006	< 3.63E-02	< 3.79E-02	4.20E-03
FR0400-1-RS007	< 3.83E-02	5.74E-02 + 1.71E-02	5.88E-03
FR0400-1-RS008	< 3.73E-02	< 4.29E-02	4.65E-03
FR0400-1-SS009	3.06E-01 + 3.21E-02	1.45E-01 + 1.79E-02	2.09E-02
FR0400-1-SS010	3.30E-01 + 3.80E-02	6.21E-01 + 3.96E-02	6.12E-02
FR0400-1-SS011	5.30E-01 + 4.45E-02	1.06E+00 + 5.26E-02	1.04E-01
FR0400-1-SS012	6.31E-01 + 5.61E-02	5.85E-01 + 3.92E-02	6.69E-02
FR0400-1-RS013	< 3.57E-02	< 4.23E-02	4.55E-03
FR0400-1-RS014	1.82E-02 + 7.37E-03	7.96E-02 + 1.64E-02	7.15E-03
FR0400-1-RS015	< 2.95E-02	5.33E-02 + 1.63E-02	5.28E-03
FR0400-1-RS016	< 2.77E-02	< 2.62E-02	2.98E-03
Mean	3.14E-01	5.45E-01	5.44E-02
Median	3.68E-02	7.00E-02	6.51E-03
Standard Deviation	5.09E-01	1.22E+00	1.10E-01
Range	1.82E-02 – 1.88E+00	2.62E-2 – 4.95E+00	2.98E-03 – 4.41E-01

“<” indicates MDA value.

#### D. SURVEY UNIT INVESTIGATIONS PERFORMED AND RESULTS

The scan process identified 54 grid locations of potentially elevated activity. These were investigated by survey investigation package XR0400-01. Investigated grids were divided into four 1 m<sup>2</sup> x 1 m<sup>2</sup> grids, rescanned, and a sample collected from each 1 m<sup>2</sup> grid at the highest scan location. Eight of the 54 investigated grids had fewer than the typical 4 investigation samples due to grid geometry, interferences, safety hazards, etc. These investigation results were evaluated against the DCGL<sub>EMC</sub> criteria and determined to be in compliance. This assessment is included as Attachment 3, Table 3-1. Investigation data is presented in Table 3-1 as the average of the multiple samples from the investigated grids.

## 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. All sample measurement results were less than the DCGL. Positively detected values are bolded in Table 2. The mean value of the DCGL unity column in Table 2 indicates that the direct samples were at 5.44% of the DCGL limit. This is equivalent to an annual dose rate of 0.49 mrem/y<sup>5</sup>. The maximum direct sample result was equivalent to 44% of the DCGL. The sample standard deviation is larger than the design sigma, however, no additional measurements were required (the survey had sufficient power – refer to Section F).

Fifty-four areas were identified for investigation while surveying and were investigated as shown in Table 3-1 of Attachment 3. The potential elevated area size was limited to a 2m x 2m grid with an Area Factor of more than 4.1. One of the 54 verified alarms was determined to be greater than the DCGL. When this is added to the SU mean, the result equals 36.7% of the Elevated Measurement Comparison unity limit, thereby satisfying the EMC criterion.

## 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 unitized 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, except for the final sigma, were clearly satisfied for the FSS of this survey unit. Based on the results of the Sign Test and the magnitude of the final sigma, it is evident that the increase did not adversely affect the survey design and a sufficient number of samples were obtained.

2. The Quantile Plot was generated from unitized direct measurement data listed in Table 2. The data set and plot are consistent with expectations for a Class 1 survey unit. All of the measurements are below the DCGL of 12.01 pCi/g Co-60 and 34.76 pCi/g Cs-137.
3. A Histogram Plot was also developed based on the unitized direct measurement values. This plot shows that the direct data were essentially a log-normal distribution with one outlier.
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.

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<sup>5</sup> This annual dose equivalent is based on the Forebay technical basis document (Reference 4), which shows that the excavation scenario DCGL is equivalent to 9 mrem/y.

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

Due to remediation activities, the source term appears to have increased Cs-137 to Co-60 ratios. This was addressed by separately evaluating Cs-137 and performing data analysis on unitized values.

The distribution of contaminant activity was not uniform across the survey unit. Contamination tended to be in the highest concentrations in small pockets of a few square inches between boulders or in recesses along the ledge. Since these small pockets were the only locations with soil media available for sampling, the results likely overstate the extent of remaining activity, as the media volume is very small.

## **H. LTP CHANGES SUBSEQUENT TO SURVEY UNIT FSS**

The FSS of Survey Unit 1 was designed and performed using the criteria of the approved Forebay Technical Basis Document (Reference 5) and LTP Revision 3 Addenda (Reference 1 and 2). Subsequent LTP changes have been evaluated and have no impact on the design, conduct, or assessment of the final status survey of Survey Unit 1.

However, a change was made to the soil excavation scenario (due to the challenge to the EMC criteria in SU 7 and SU 8) which increased the Forebay soil DCGL from a value equal to the RA soil dose limit to one which incorporated the entire 10 (9 actually used) mrem/y limit allowed for soil outside the RA. This change raised the DCGLs for Co-60, Cs-137, and Sb-125 to 12.01 pCi/g, 34.76 pCi/g, and 69.52 pCi/g respectively. The surface soil area factors were applied to these values to derive the appropriate DCGL<sub>EMC</sub> values which were also applied to SU-1.

## **I. CONCLUSION**

The FSS of this survey unit was designed based on the LTP designation as a Class 1 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 12.01 pCi/g Co-60 and 34.76 pCi/g Cs-137.

A Sign Test Summary analysis demonstrated that the Sign Test criteria were satisfied. The sample standard deviation is larger than the design sigma, however, no additional measurements were required due to power of sign test.

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 log-normal distribution, with variance consistent with expectations for a Class 1 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 a number of verified alarms (Section C) and grids with high background for evaluation. Attachment 3 shows the areas identified for investigation and provides the results of the investigation actions. The areas under investigation were evaluated using the appropriate area factor. The survey unit was determined to satisfy the elevated measurement comparison unity rule per LTP methodology at 37% of the DCGL<sub>EMC</sub> criteria limit.

It is concluded that FR-0400 Survey Unit 1 meets the release criteria of 10CFR20.1402 and the State of Maine enhanced criteria.

## **J. REFERENCES**

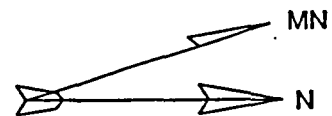
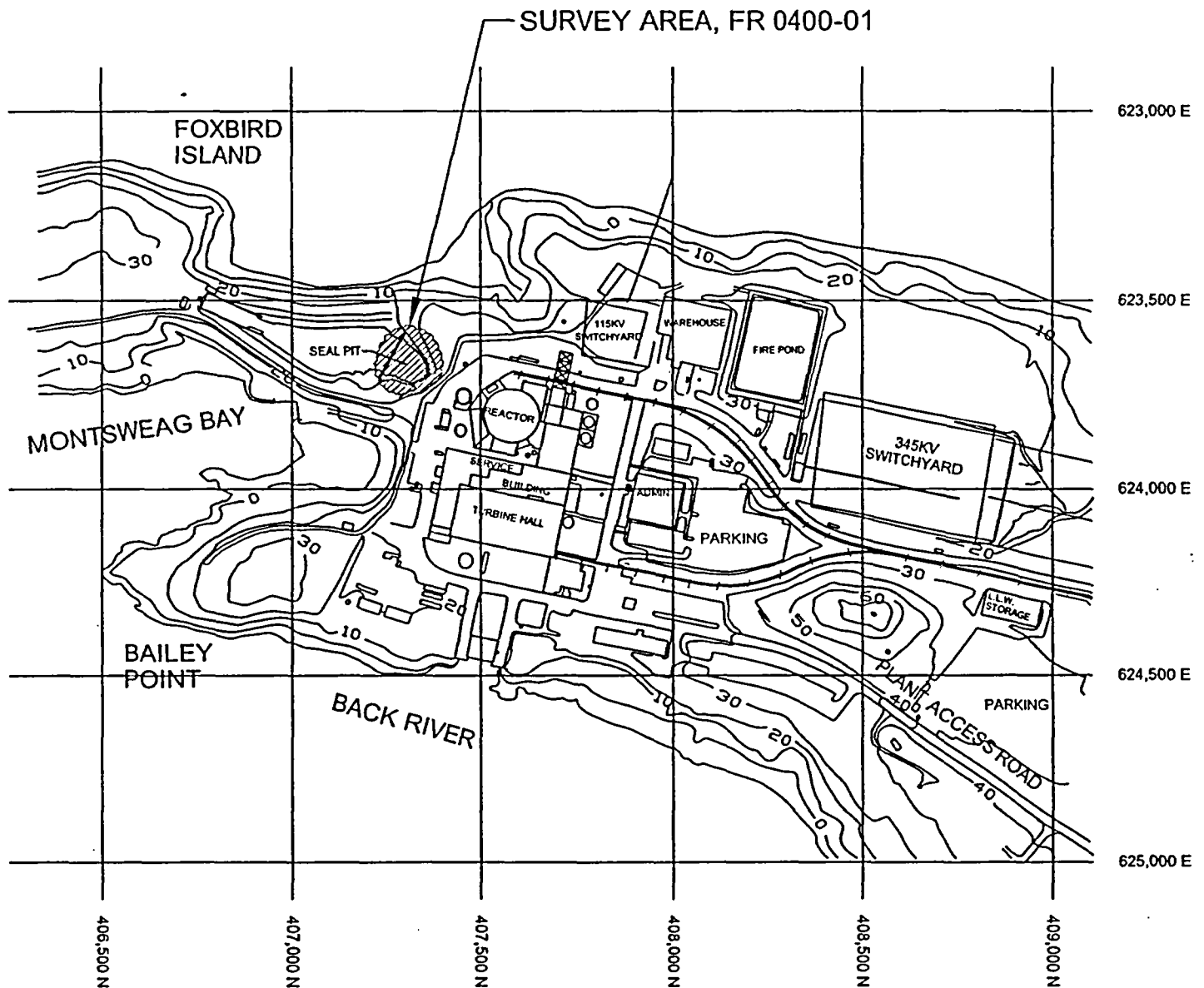
1. Maine Yankee License Termination Plan, Revision 3, October 15, 2002
2. Maine Yankee letter to the NRC, MN-02-061, dated November 26, 2002
3. NRC letter to Maine Yankee, dated February 28, 2003
4. Maine Yankee Calculation EC-041-01, Revision 1
5. Maine Yankee letter to the NRC, MN-03-051, Forebay Technical Basis Document, dated September 3, 2003



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**Attachment 1**

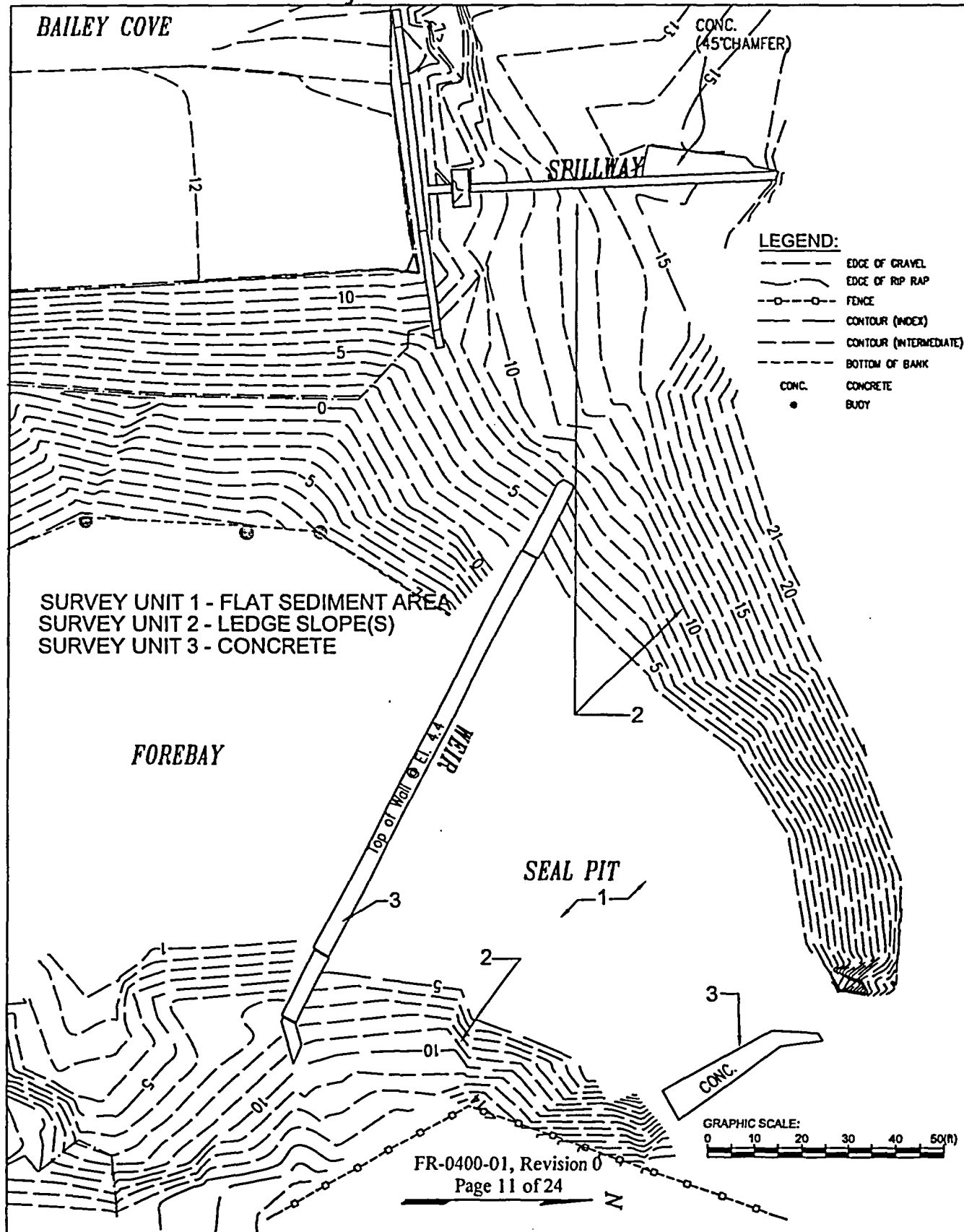
**Survey Unit Maps**



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

## Seal Pit FSS

### Survey Unit Reference #1 - 3



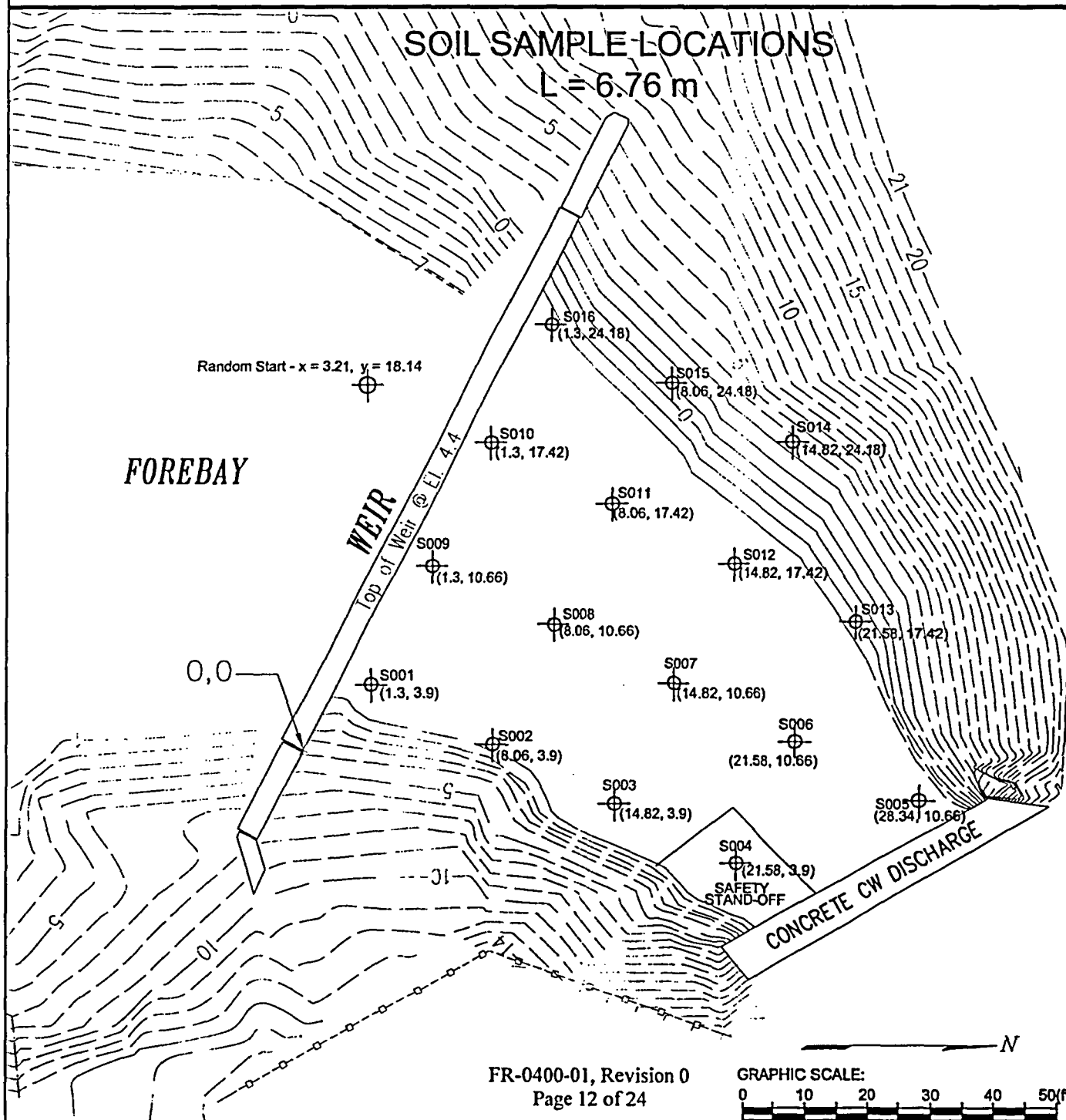
Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey

Survey Area Name: FOREBAY SEAL PIT

# FR 0400: FOREBAY, SEAL PIT

## Survey Unit 1 - SOIL/SEDIMENT SAMPLE LOCATIONS #S001 - S016

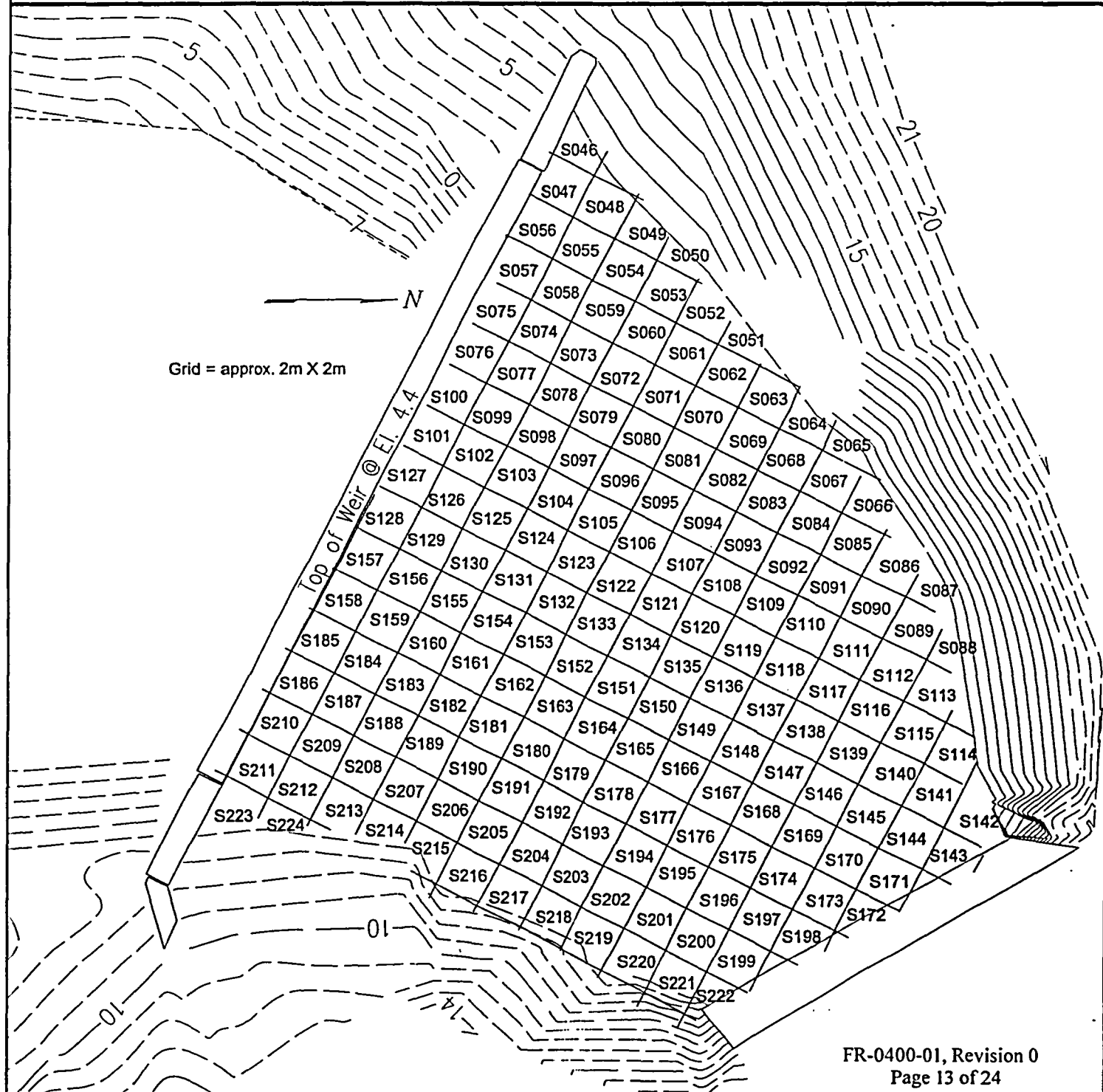
Surface Area is approximately 640 sq-m



Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey

Survey Area Name: ForeBay Seal Pit

**FR 0400: FOREBAY, SEAL PIT**  
**Survey Unit 1, Sediment Area**  
**Gamma Scans Grids # S046 - S224**  
**Surface Area is approximately 640 sq-m**



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**Attachment 2**

**Survey Unit Instrumentation**

**TABLE 2-1****INSTRUMENT INFORMATION**

<b>E-600 S/N</b>	<b>Probe S/N (type)</b>
2489	2055 (SSPA-3)
2491	725328 (SSPA-3)
2490	726560 (SSPA-3)
2488	725332 (SSPA-3)
2490	725332 (SSPA-3)
2617	726560 (SSPA-3)
2491	725328 (SSPA-3)
2490	2055 (SSPA-3)
2488	725328 (SSPA-3)
1622	725332 (SSPA-3)
1929	726560 (SSPA-3)

**HPGe Detectors for Lab Analysis of Volumetric Sample**

<b>Detector Number</b>	<b>MDC (pCi/g) (nominal)</b>
FSS-1	0.15 Co-60 0.15 Cs-137 0.1 Sb-125
FSS-2	0.15 Co-60 0.15 Cs-137 0.1 Sb-125
DET-2	0.15 Co-60 0.15 Cs-137 0.1 Sb-125
DET-3	0.15 Co-60 0.15 Cs-137 0.1 Sb-125

**TABLE 2-2**  
**INSTRUMENT SCAN MDC, DCGL,**  
**INVESTIGATION LEVEL, AND DESIGN DCGL<sub>EMC</sub>**

<b>Detector</b>	<b>SSPA-3</b>
<b>Scan MDC</b>	5.9 pCi/g (Note 1)
<b>DCGL</b>	12.01 pCi/g Co-60 69.52 pCi/g Sb-125 34.76 pCi/g Cs-137
<b>Investigation Level Alarm Setpoint</b>	9500 c/m + background (20 pCi/g + background)
<b>Design DCGL<sub>EMC</sub></b>	18 pCi/g Co-60 104.28 pCi/g Sb-125 52.14 pCi/g Cs-137

Note 1: Design Scan MDC, LTP Table 5-6

## **Attachment 3**

### **Investigation Table**



TABLE 3-1

## INVESTIGATION TABLE

FSS SURVEY RESULTS				INVESTIGATION RESULTS				
Grid	Reason	Alarm Setpoint (cpm)	Scan Measurement (cpm)	Area Factor	Co-60 (pCi/g)	Sb-125 (pCi/g)	Cs-137 (pCi/g)	DCGL <sub>EMC</sub> Fraction
46	High BK	N/A	N/A	4.1	5.80E-02	1.04E-01	5.55E-02	< DCGL
47	Alarm	28,220	47,900	4.1	4.29E-02	1.05E-01	3.84E-02	< DCGL
49	Alarm	28,220	32,000	4.1	3.80E-02	8.86E-02	4.08E-02	< DCGL
50	Alarm	32,150	34,900	4.1	6.39E-02	1.21E-01	5.30E-02	< DCGL
53	Alarm	30,080	33,600	4.1	4.50E-02	9.26E-02	4.18E-02	< DCGL
55	Alarm	28,220	29,800	4.1	1.12E-01	1.07E-01	4.68E-02	< DCGL
56	Alarm	28,220	29,100	4.1	4.94E-02	8.50E-02	3.02E-02	< DCGL
57	Alarm	28,220	28,900	4.1	3.92E-02	9.32E-02	3.07E-02	< DCGL
58	High BK	26,180	N/A	4.1	5.04E-02	8.28E-02	3.54E-02	< DCGL
59	Alarm	30,080	34,100	4.1	4.83E-02	9.18E-02	3.62E-02	< DCGL
62	Alarm	28,220	31,700	4.1	1.18E-01	1.12E-01	4.30E-02	< DCGL
63	Alarm	28,220	43,200	4.1	1.23E-01	1.03E-01	3.70E-02	< DCGL
65	High BK	N/A	N/A	4.1	1.51E+01	2.46E-01	2.70E+00	3.13E-01
66	High BK	N/A	N/A	4.1	1.75E-01	1.12E-01	4.76E-02	< DCGL
67	Alarm	32,150	43,400	4.1	6.06E-01	8.82E-02	2.03E-01	< DCGL
70	Alarm	30,080	35,300	4.1	4.80E-02	9.91E-02	2.99E-02	< DCGL
71	Alarm	28,200	30,500	4.1	3.92E-02	8.25E-02	3.14E-02	< DCGL
75	Alarm	26,180	29,200	4.1	3.15E-02	7.60E-02	6.46E-02	< DCGL
80	High Bk	N/A	N/A	4.1	1.48E+00	1.02E-01	7.04E-01	< DCGL
82	High Bk	26,180	N/A	4.1	8.08E-01	8.80E-02	8.66E-01	< DCGL
86	Alarm	30,080	36,700	4.1	6.90E+00	2.64E-01	1.67E+00	< DCGL
89	Alarm	30,080	32,500	4.1	5.94E+00	1.70E-01	1.11E+00	< DCGL
112	High BK	N/A	N/A	4.1	1.32E-01	8.48E-02	1.18E-01	< DCGL
117	High BK	26,180	23,200	4.1	6.01E-02	1.02E-01	5.04E-02	< DCGL

FSS SURVEY RESULTS				INVESTIGATION RESULTS				
Grid	Reason	Alarm Setpoint (cpm)	Scan Measurement (cpm)	Area Factor	Co-60 (pCi/g)	Sb-125 (pCi/g)	Cs-137 (pCi/g)	DCGL <sub>EMC</sub> Fraction
140	High BK	26,180	22,100	4.1	7.73E-01	9.10E-02	9.50E-01	< DCGL
142	High BK	N/A	N/A	4.1	4.59E-02	8.01E-02	3.17E-02	< DCGL
143	High BK	N/A	N/A	4.1	3.57E-02	6.94E-02	2.73E-02	< DCGL
144	High BK	N/A	N/A	4.1	3.31E-02	7.21E-02	3.25E-02	< DCGL
145	Water	26,180	N/A	4.1	3.14E-02	7.67E-02	3.28E-02	< DCGL
150	Alarm	28,220	29,800	4.1	3.99E-02	8.97E-02	3.55E-02	< DCGL
163	Alarm	26,180	33,600	4.1	6.22E-02	1.10E-01	4.87E-02	< DCGL
166	High BK	32,150	25,000	4.1	4.43E-02	9.23E-02	3.74E-02	< DCGL
167	Water	26,180	N/A	4.1	4.06E-02	9.42E-02	3.45E-02	< DCGL
168	High BK	28,220	23,400	4.1	6.10E-02	1.14E-01	4.68E-02	< DCGL
169	High BK	28,200	22,500	4.1	2.44E-01	9.40E-02	2.44E-01	< DCGL
170	High BK	N/A	N/A	4.1	3.01E-02	6.53E-02	2.91E-02	< DCGL
171	High BK	N/A	N/A	4.1	5.08E-02	1.12E-01	4.61E-02	< DCGL
172	Low BK	30,080	N/A	4.1	1.01E-01	1.10E-01	5.48E-02	< DCGL
173	Alarm	28,220	30,400	4.1	6.31E-02	1.19E-01	5.47E-02	< DCGL
174	High BK	26,180	21,700	4.1	6.11E-02	1.03E-01	4.17E-02	< DCGL
175	High BK	N/A	N/A	4.1	5.82E-02	1.19E-01	5.46E-02	< DCGL
176	Unknown	32,150	30,400	4.1	5.11E-02	9.22E-02	3.69E-02	< DCGL
194	Alarm	30,080	32,500	4.1	2.93E-02	7.99E-02	3.11E-02	< DCGL
195	High BK	30,080	29,900	4.1	3.52E-02	8.94E-02	3.63E-02	< DCGL
202	Alarm	32,150	36,200	4.1	4.67E-01	1.05E-01	6.97E-02	< DCGL
203	High BK	N/A	N/A	4.1	3.17E+00	1.83E-01	5.59E-01	< DCGL
204	Alarm	30,080	37,800	4.1	6.72E-02	1.09E-01	4.57E-02	< DCGL
207	Alarm	24,070	26,500	4.1	2.64E-01	8.97E-02	7.04E-02	< DCGL
215	Alarm	26,180	30,300	4.1	1.72E+00	9.98E-02	3.93E-01	< DCGL
216	Alarm	26,180	30,500	4.1	1.68E+00	2.26E-01	1.96E-01	< DCGL
217	Alarm	30,080	46,600	4.1	1.53E-01	9.93E-02	5.32E-02	< DCGL

FSS SURVEY RESULTS				INVESTIGATION RESULTS				
Grid	Reason	Alarm Setpoint (cpm)	Scan Measurement (cpm)	Area Factor	Co-60 (pCi/g)	Sb-125 (pCi/g)	Cs-137 (pCi/g)	DCGL <sub>EMC</sub> Fraction
218	High BK	N/A	N/A	4.1	<b>1.80E-01</b>	1.03E-01	<b>7.34E-02</b>	< DCGL
219	Alarm	32,150	38,900	4.1	<b>7.27E-02</b>	1.06E-01	<b>4.79E-02</b>	< DCGL
224	High BK	N/A	N/A	4.1	<b>3.10E+00</b>	8.74E-02	<b>1.42E+00</b>	< DCGL
				SU Mean	<b>5.45E-01</b>	0.00E+00	<b>3.14E-01</b>	5.45E-02
						Total		<b>3.67E-01</b>

#### NOTES

1. Bolded values are positive detects. All other values are reported at the MDA.
2. Activity values are composited results from the 4 m<sup>2</sup> scan grid.
3. Area Factors are based on the 4 m<sup>2</sup> area of scan grids.
4. Survey unit mean activity values have not been subtracted from investigation results, which is conservative.

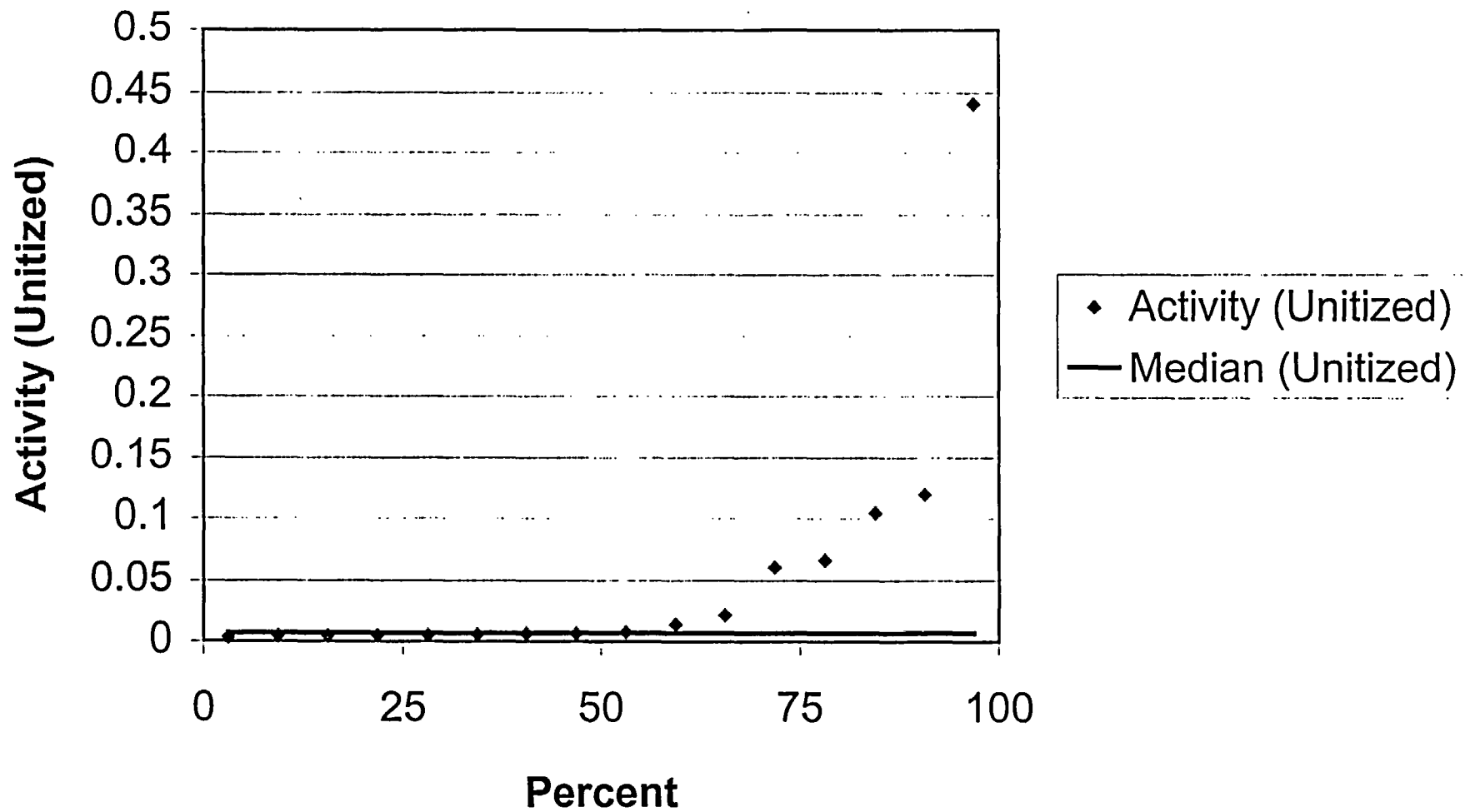
**Attachment 4**

**Statistical Data**

## Survey Package FR0400 Unit 1 Soil Sign Test Summary

Evaluation Input Values		Comments
Survey Package:	FR0400	Forebay / Seal Pit
Survey Unit:	01	
Evaluator:	DR	
DCGL <sub>w</sub> :	1.00E+00	
DCGL <sub>emc</sub> :	1.50E+00	
LBGR:	5.00E-01	
Sigma:	2.58E-02	(0.31 pCi/g / 12.01 pCi/g) Unitized
Type I error:	0.05	
Type II error:	0.05	
Nuclide:	UNITY	
Soil Type:	N/A	
Calculated Values		Comments
Z <sub>1-<math>\alpha</math></sub> :	1.645	
Z <sub>1-<math>\beta</math></sub> :	1.645	
Sign p:	0.99865	
Calculated Relative Shift:	19.3	
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:	16	
Median:	6.51E-03	
Mean:	5.44E-02	
Net Sample Standard Deviation:	1.10E-01	
Total Standard Deviation:	1.10E-01	SRSS
Maximum:	4.41E-01	
Sign Test Results		Comments
Adjusted N Value:	16	
S+ Value:	16	
Critical Value:	11	
Sign test results:	Pass	
Criteria Satisfaction		Comments
Sufficient samples collected:	Pass	
Maximum value <DCGL <sub>w</sub> :	Pass	See Sections D&E of Release Record
Median value <DCGL <sub>w</sub> :	Pass	
Mean value <DCGL <sub>w</sub> :	Pass	
Maximum value <DCGL <sub>emc</sub> :	Pass	
Total Standard Deviation <=Sigma:	Investigate	See Section F of Release Record
Criteria comparison results:	Investigate	See Section I of Release Record
Final Status		Comments
The survey unit passes all conditions:	Investigate	The SU passes

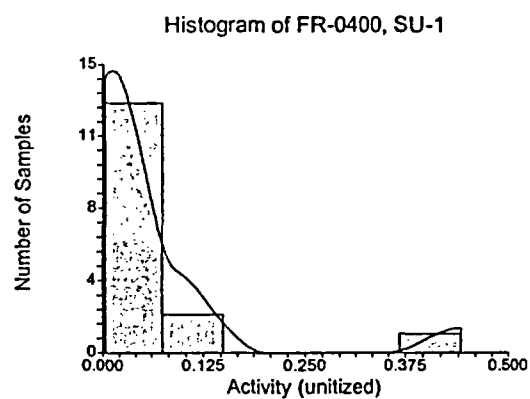
## FR-0400 SU-1 Quantile Plot



## One-Sample T-Test Report

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Database C:\Program Files\NCSS97\FR0400SU-1.S0  
Variable C2

### Plots Section



# One-Sample T-Test Power Analysis

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## Chart Section

