MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0900 BALANCE OF PLANT AREAS
SURVEY UNIT 1

Prepared By:	Dale Randall FSS Engineer - Signature Dale Randall Printed Name	Date: 2-16-05
Reviewed By:	FSS Specialist - Signature R. Tozzie Printed Name	Date: 2/16/05
Reviewed By:	Independent Review – Signature C. A. Olsen Printed Name	Date: 16. FEB. 05
Approved By:	Superintendent, FSS – Signature George Pillsbury Printed Name	Date: 2/17/05
Approved By:	FSS, MOP – Signature James R. Paxon Printed Name	Date: 2/17/05

MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0900 BALANCE OF PLANT AREAS
SURVEY UNIT 1

A. SURVEY UNIT DESCRIPTION

FR-0900 Survey Unit 1, Balance of Plant Areas, is an open land area. The majority of the area is made up of open land, but some wooded locations are also included. Accessible open land areas were selected for survey. These five major areas are shown on map FR0900-02.

FR-0900 Survey Unit 1 is shown in relationship to the Maine State Coordinate System (West Zone), NAD 1927 and other major site structures in map FR0900-01. All maps referenced in this release record are provided in Attachment 1, unless otherwise noted. The survey unit's total area is approximately 71,050 m^2. This total area conservatively includes areas that were or will be surveyed in other survey units.[1]

B. SURVEY UNIT DESIGN INFORMATION

FR-0900 Survey Unit 1 was designated a Class 3 survey unit. The survey unit design parameters are summarized in Table 1. Given a relative shift of 3.0, it was determined that 14 direct measurements were required for the Sign Test. Five additional sample locations were added due to the size of the survey unit. Measurement locations were determined using the random point method, are designated as shown in Table 2, and are illustrated on the map FR0900-03 (Attachment 1). All direct measurements consisted of soil samples obtained at the required locations. The samples were analyzed with laboratory gamma spectroscopy.

Three hundred seventy-five scan grids of nominal 1 m x 10 m size were established as indicated on survey maps. One percent to 10% scan coverage of the area was required.[2] Scan areas are indicated on Maps FR0900-04 through FR0900-08 (Attachment 1). The 10 m^2 scan grids were made to provide a total of 3,750 m^2 (5.2% of the survey unit area coverage).

The instruments used in this survey are listed by model and serial number in Attachment 2 (Table 2-1). Scan MDCs are also listed in Attachment 2 (Table 2-2) and are compared to the DCGL and the investigation level.

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 variability in background within the survey unit, the grids were divided into twelve different background groups based on the location. These are specified in Table 1.

---

1 Examples of other survey areas/units include FB-1400, FB-2600, FR-0800, FR-0900-03, and FR-0910.

2 LTP Table 5-3

TABLE 1

SURVEY UNIT DESIGN PARAMETERS

Survey Unit	Design Criteria	Basis
Area	71,050 m^2	Class 3, no limit
Number of Direct Measurements Required	14	Based on an adjusted LBGR of 2.76 pCi/g, sigma[3] of 0.48 pCi/g, and a 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	1m x 10m	<= 10 m^2
Area Factor	N/A	Class 3 Area
Scan Survey Area	Approximately 3,750m^2	Class 3 area 1 -10%
Background		
SPA-3	Background (cpm)	Scan Grid Group
	8,810	Group A
	9,720	Group B
	10,330	Group C
	10,300	Group D
	10,616	Group E
	10,900	Group F
	11,718	Group G
	11,727	Group H
	11,866	Group I
	12,350	Group J
	13,350	Group K
	13,950	Group L
Scan Investigation Level	3 sigma of background plus background.	See Table 2-2, Attachment 2 EC-009-01 (MY) (Reference 1)
DCGL	4.2 pCi/g	LTP Revision 3 (Reference 2)
Design $DCGL_{EMC}$	N/A	Class 3 Area

C. SURVEY RESULTS

Fourteen direct soil measurements were required, 19 were taken and the results are presented in Table 2. All direct measurements were below the DCGL. In addition, 11 biased samples were selected based on surface water flow and ground topology, these results were below the DCGL and are presented in Table 3. Seventy-five verified alarms were received during the soil scans and required investigation. In addition, 22 grids required investigation due to other reasons (i.e., low background or temperature). The investigation results are discussed in Section D.

---

[3] Design sigma based on LTP Revision 3, Table 5-1C, Balance of Plant Areas, FR-0900.

TABLE 2

DIRECT MEASUREMENTS

Sample Number	Cs-137 (pCi/g)*
FR-0900-01-3S007	**1.70E+00 ± 1.32E-01**
FR-0900-01-3S008	**5.62E-01 ± 5.01E-02**
FR-0900-01-3S010	**4.04E-02 ± 1.62E-02**
FR-0900-01-3S015	**8.90E-02 ± 2.29E-02**
FR-0900-01-3S016	< 4.31E-02
FR-0900-01-3S017	**2.09E-01 ± 3.22E-02**
FR-0900-01-3S018	< 3.11E-02
FR-0900-01-3S019	< 3.17E-02
FR-0900-01-3S020	< 3.49E-02
FR-0900-01-3S021	**4.82E-02 ± 1.74E-02**
FR-0900-01-3S022	**2.76E-02 ± 1.72E-02**
FR-0900-01-3S023	< 3.20E-02
FR-0900-01-3S024	< 3.60E-02
FR-0900-01-3S025	**5.87E-02 ± 2.13E-02**
FR-0900-01-3S026	**5.74E-02 ± 3.24E-02**
FR-0900-01-3S027	**8.38E-02 ± 3.53E-02**
FR-0900-01-3S028	**8.09E-02 ± 3.85E-02**
FR-0900-01-3S029	**5.22E-01 ± 6.80E-02**
FR-0900-01-3S030	**1.76E-01 ± 4.92E-02**
Mean	**2.03E-01**
Median	**5.74E-02**
Standard Deviation	**3.96E-01**
Range	**2.76E-02 – 1.70E+00**

* Samples were also analyzed for Co-60; all were less than an MDA of 0.072 pCi/g

TABLE 3

BIAS DIRECT MEASUREMENTS

Sample Number	Cs-137 (pCi/g)*
FR-0900-01-3-S001	3.51E-01 ± 4.20E-02
FR-0900-01-3-S002	9.37E-01 ± 6.76E-02
FR-0900-01-3-S003	3.76E-01 ± 4.64E-02
FR-0900-01-3-S004	3.70E-01 ± 3.60E-02
FR-0900-01-3-S005	5.66E-01 ± 5.83E-02
FR-0900-01-3-S006	3.99E-02 ± 1.81E-02
FR-0900-01-3-S009	1.04E-01 ± 2.59E-02
FR-0900-01-3-S011	1.45E+00 ± 1.16E-01
FR-0900-01-3-S012	8.13E-01 ± 6.92E-02
FR-0900-01-3-S013	1.76E-01 ± 3.01E-02
FR-0900-01-3-S014	1.51E-01 ± 2.65E-02
Mean	4.85E-01
Median	3.70E-01
Standard Deviation	4.29E-01
Range	3.99E-02 – 1.45E+00

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

D. SURVEY UNIT INVESTIGATIONS PERFORMED AND RESULTS

The 97 scan grids which required additional investigation were examined by taking a soil sample at the highest SPA-3 count rate location for each grid. Except as noted below, all investigation results are presented in Table 3-1. In addition, except for the reclassified portion of the Survey Unit, as noted below, all samples collected were in the range of background for Cs-137 and were less than the MDA for Co-60.

For eight of the grids, an isotopic *in-situ* gamma scan (ISOCS) was performed over 100% of the scan grid area. The ISOCS measurements were required due to the depth/thickness of ice and water in the survey grid exceeding the SPA-3 limits. The ISOCS action levels were set at 1.0 pCi/g Cs-137 and 0.36 pCi/g Co-60. All results were less than the action limits as shown in Table 3-1 (Attachment 3).

The scan of grid S103 resulted in a verified alarm. The follow-up investigation determined that the cause of the scan alarm was a small volume of contaminated soil media. This contaminated media was completely collected into a 1-liter sample. The contaminated portion was subsequently segregated to a 100 g aliquot of soil media that was found to contain Co-60 with a specific activity of 1,030 pCi/g. In accordance with the License Termination Plan (LTP), (Reference 3) the subject area was reclassified into a Class 1 survey unit. Three reclassified grids with alarms are not included in Table 3-1.

The biased selection of grid S103 in survey unit one was based primarily on the topology and drainage of the surrounding area and the fact that it lay in close proximity to an exterior staircase walkway and a paved roadway. Since the adjacent roadway was crowned and will be surveyed as a separate survey unit, 100% of the down gradient ditch, and a portion of the lower hillside adjacent to the ditch, was selected for reclassification.

Since the contaminated area was isolated to a 1 m^2 area, the 104 m^2 area of FR-0900 Survey Unit 2 was deemed adequate to achieve the design objectives of both the Class 1 survey unit and a Class 2 buffer unit, which would typically surround a Class 1 survey unit.

The reclassification resulted in grids S100 thru grids S109 being removed from FR-0900-01 and placed into the scan area for FR-0900-02. The resulting scan area for Survey Unit 1 is 3,650 m^2 or 5.1% of the original design area and is, therefore, acceptable.

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. The maximum direct measurement result was less than 40.4% of the Cs-137 DCGL. The level of activity is not unexpected for undisturbed soil. Further, since the activity is less than the action levels in LTP Table 5-7, no additional investigations or any additional reclassification is 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. When the established background value is subtracted from the mean sample results of 0.203 pCi/g for the survey unit, the result is 0.013 pCi/g. This would be equivalent to an annual dose rate of 0.031 mrem/y[4]. However, for 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.

The biased samples contained Cs-137 in concentrations that are consistent with those expected for background, based on the values given in Maine Yankee Procedure PMP 6.7.8 (Reference 4). No Co-60 was detected in the biased samples.

---

4 See Attachment E to Maine Yankee Procedure PMP 6.7.8 (Reference 4).
Annual dose rate = 0.013/4.2 x 10 = 0.031 mrem/y.

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 (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 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 below 50% of the DCGL which is 2.1 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 one outlier. The outlier is approximately 40.4% of the DCGL.

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 THE 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 FSS of Survey Unit 1 was designed, performed and evaluated in late 2003 to early 2005. The design was performed to the criteria of the LTP, Revision 3 (Reference 3). No subsequent LTP changes with potential impact to this survey unit needed to be evaluated.

I. CONCLUSION

The FSS of this survey unit was designed based on the LTP based classification 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 50% of the DCGL of 4.2 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 one outlier.

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. All verified alarms were investigated and determined to be less than the DCGL.

It is concluded that FR-0900 Survey Unit 1 meets the release criteria of 10CFR20.1402 and the State of Maine enhanced criteria.

J. REFERENCES

1. Maine Yankee Engineering Calculation, EC 009-01

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

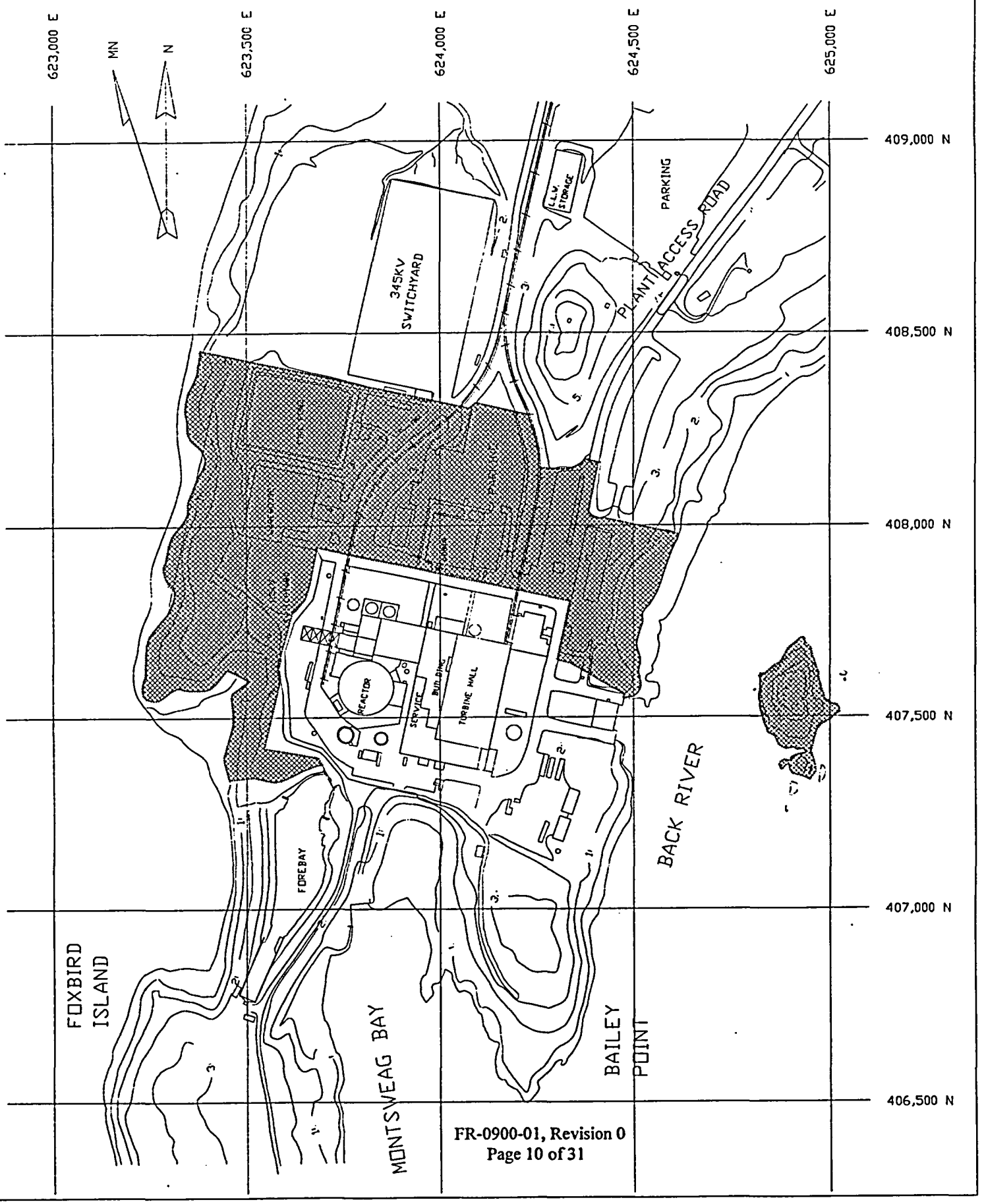
3. NRC letter to Maine Yankee, dated February 28, 2003, Approval of LTP Rev. 3 and Addenda

4. Approach for Dealing with Background Radioactivity for Maine Yankee Final Status Surveys, Attachment E to Maine Yankee Procedure PMP 6.7.8, FSS Data Processing and Reporting

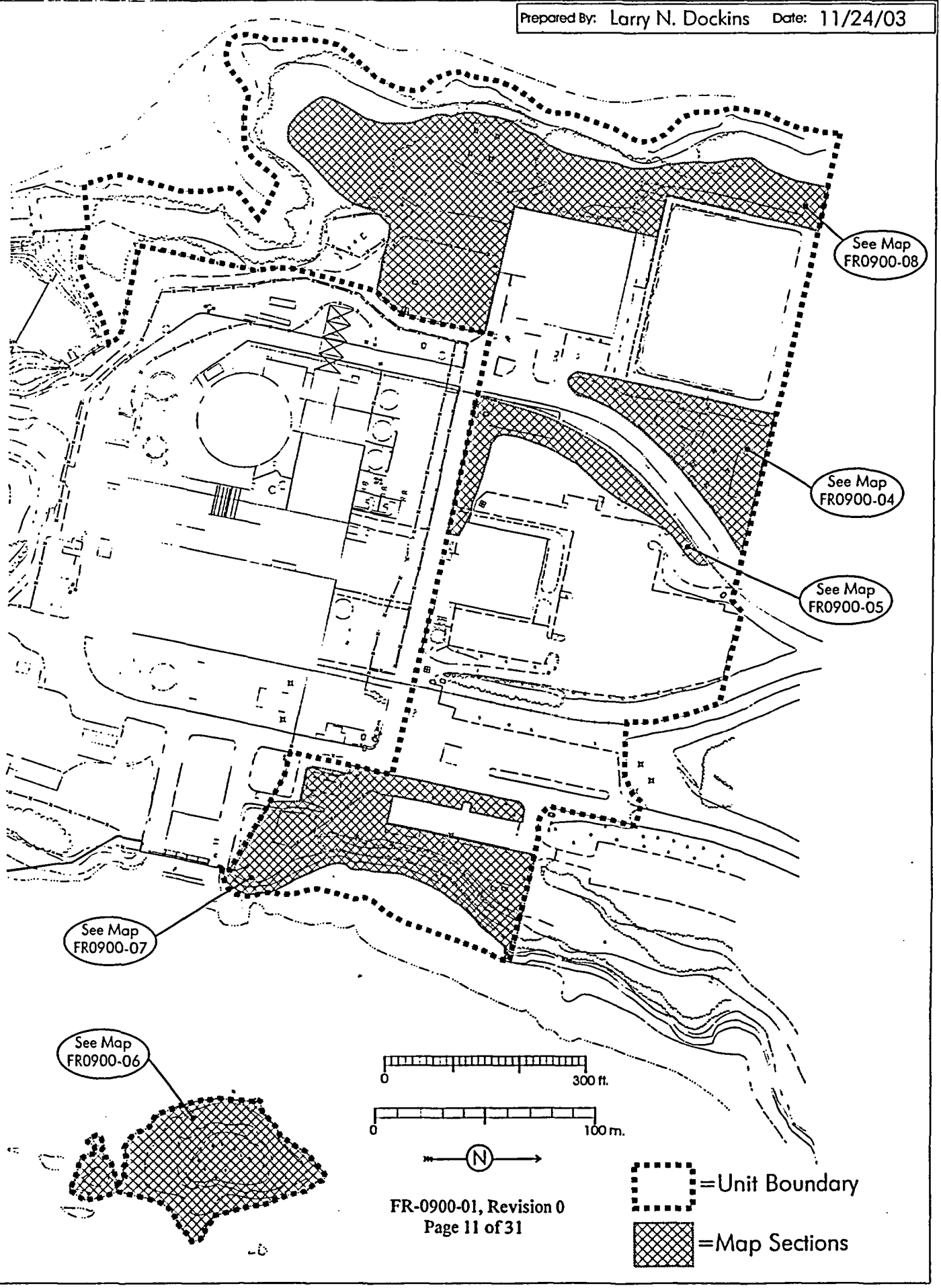
Attachment 1

Survey Unit Maps

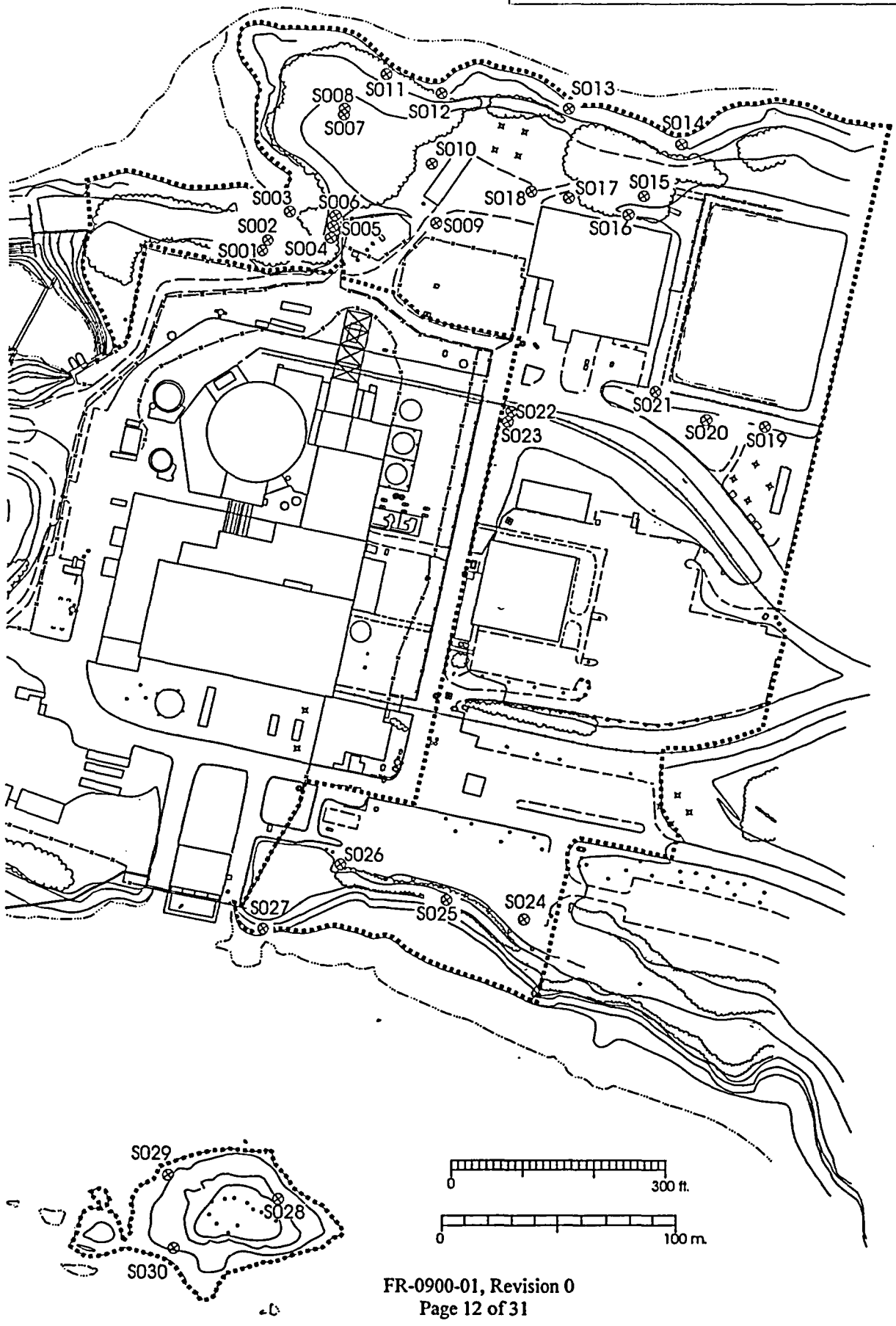
Maine Yankee Decommissioning Team	**Maine Yankee Decommissioning Project Survey Map**	Map ID# FR0900-01
Survey Type: ☐ Characterization ☐ Turnover ■ Final Status Survey	Survey Area Name: BALANCE OF PLANT LAND	
	Prepared By: Larry N. Dockins	Date: 11/24/03



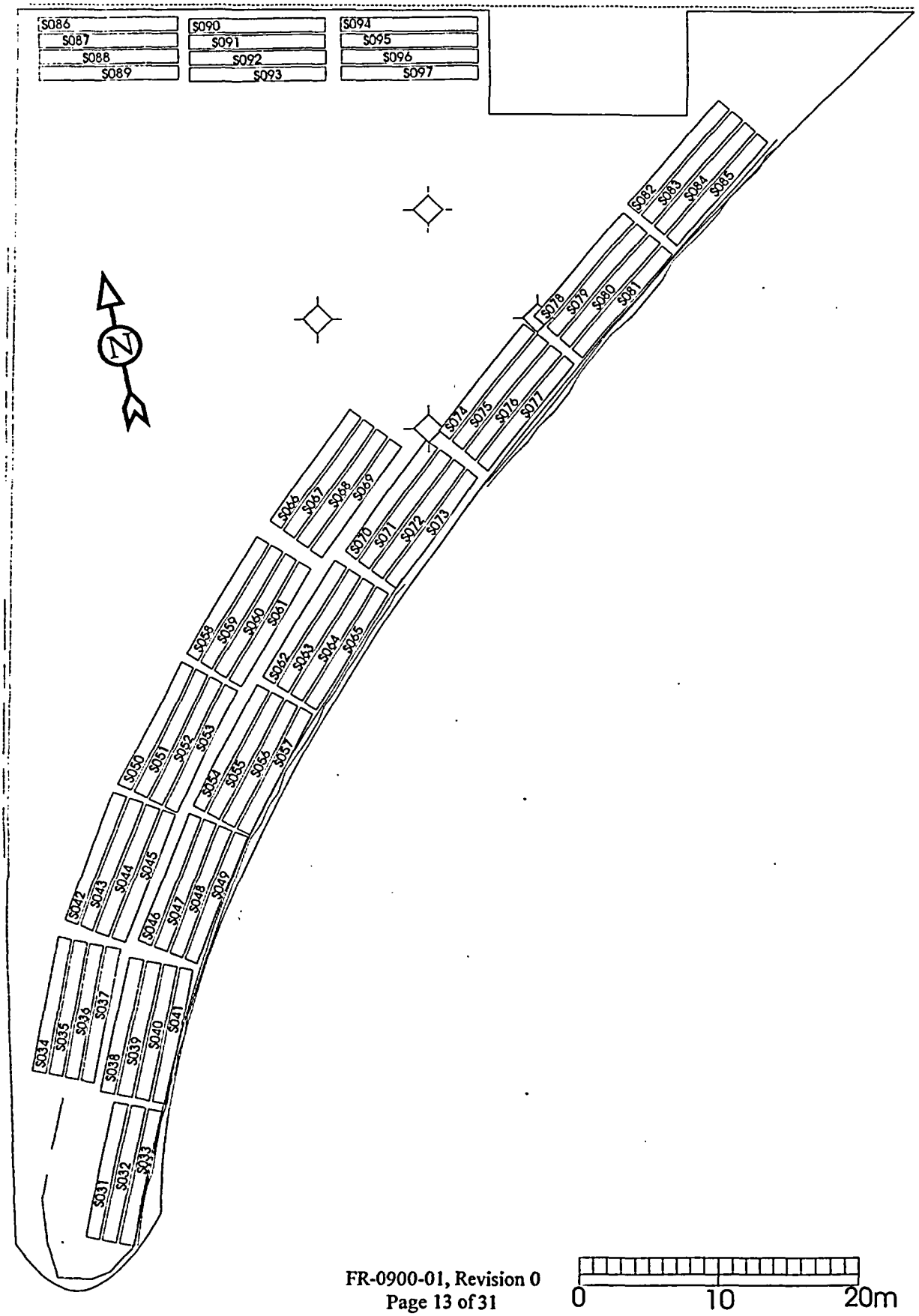
Maine Yankee Decommissioning Team	**Maine Yankee Decommissioning Project Survey Map**	Map ID# FR0900-02
Survey Type: ☐ Characterization ☐ Turnover ■ Final Status Survey	Survey Area Name: BALANCE OF PLANT LAND	
	Prepared By: Larry N. Dockins Date: 11/24/03	



Maine Yankee Decommissioning Team	***Maine Yankee Decommissioning Project Survey Map***	Map ID# FR0900-03
Survey Type: ☐ Characterization ☐ Turnover ■ Final Status Survey	Survey Area Name: Soil Sample Locations	
	Prepared By: Larry N. Dockins	Date: 12/4/03



Maine Yankee Decommissioning Team	**Maine Yankee Decommissioning Project Survey Map**	Map ID# FR0900-04
Survey Type: ☐ Characterization ☐ Turnover ■ Final Status Survey	Survey Area Name: Scan Grid Locations	
	Prepared By: Larry N. Dockins Date: 12/5/03	



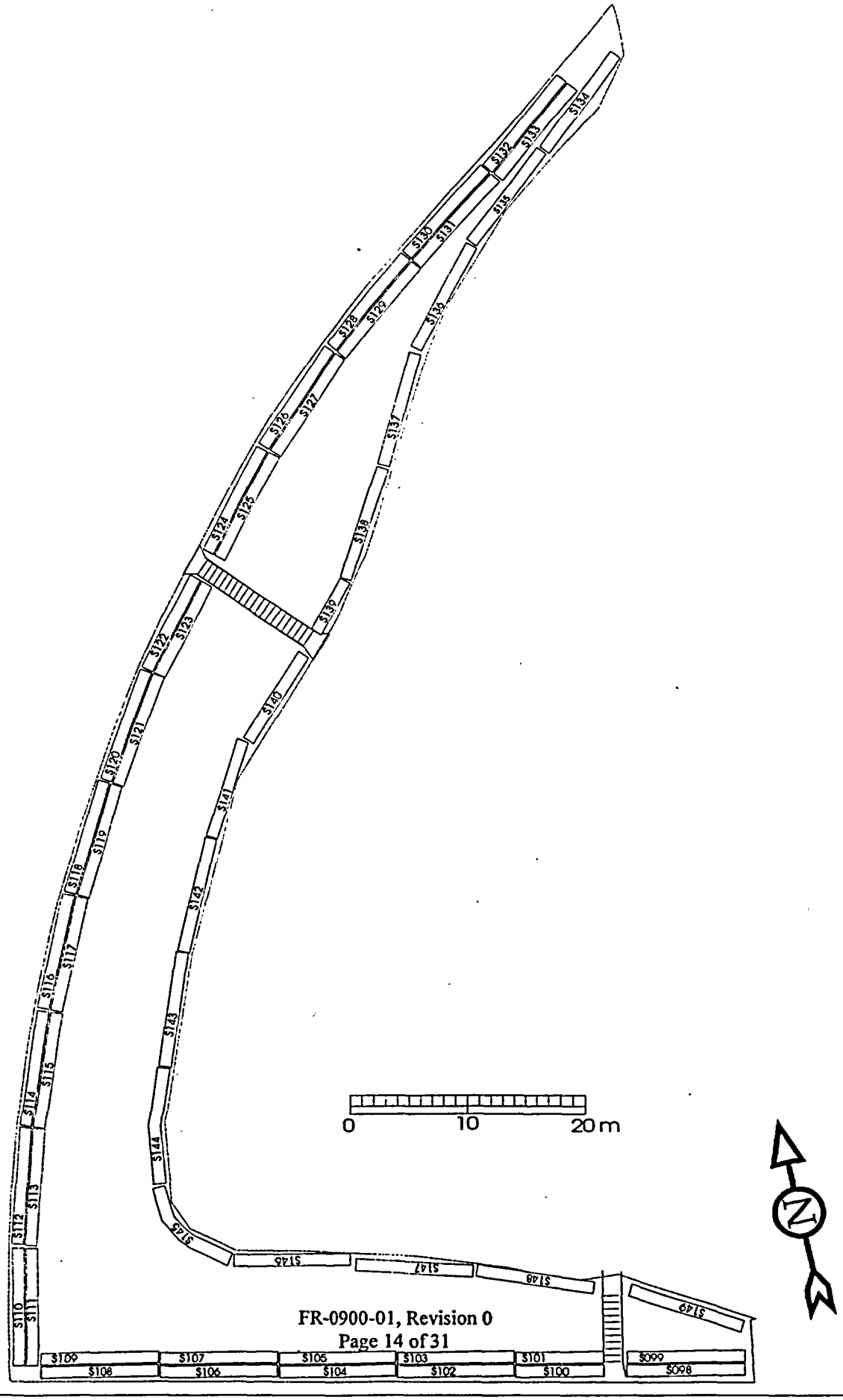
0 10 20m

Maine Yankee Decommissioning Team	**Maine Yankee Decommissioning Project Survey Map**	Map ID# FR0900-05

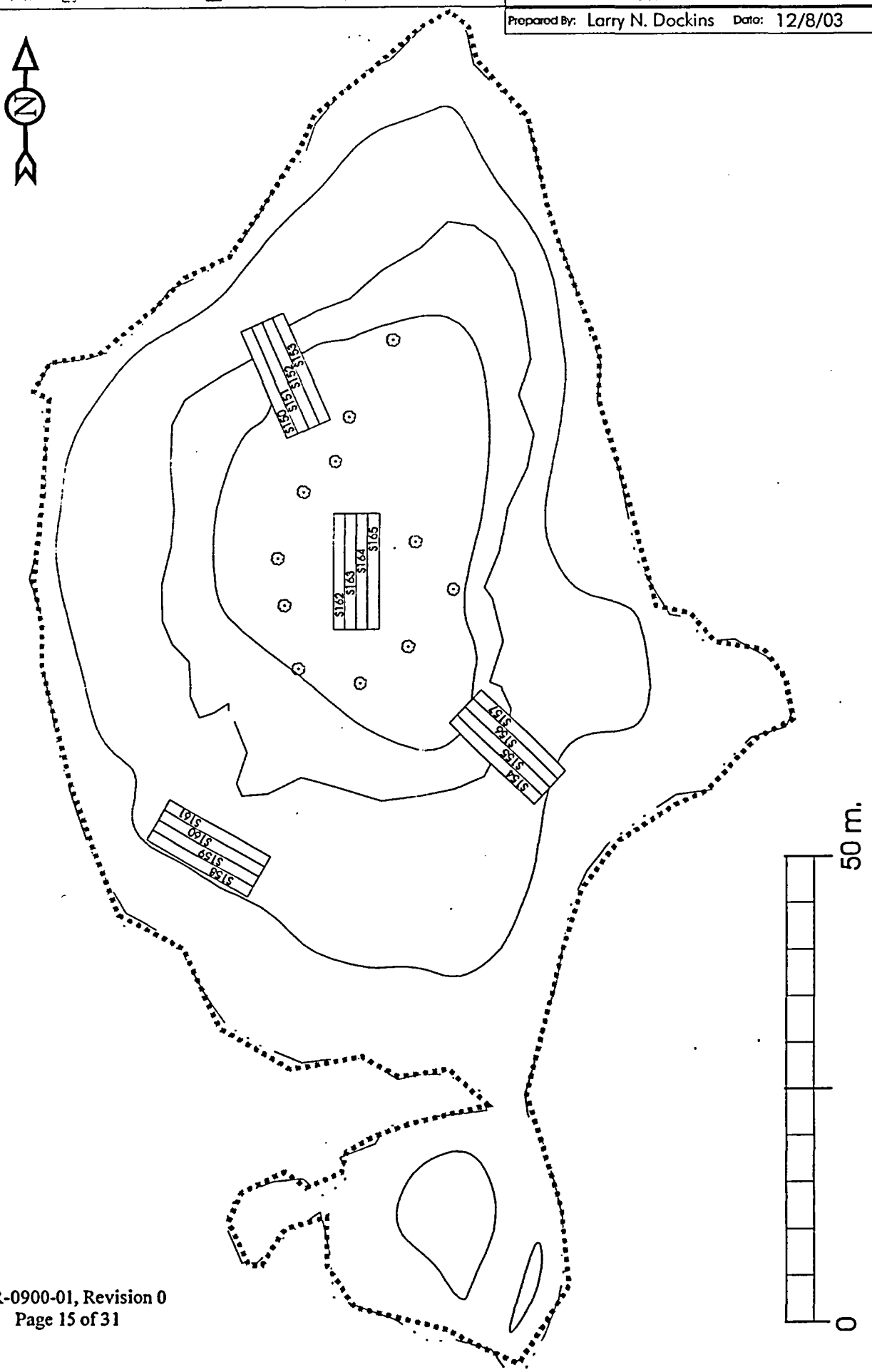
Survey Type: ☐ Characterization ☐ Turnover ■ Final Status Survey

Survey Area Name: Scan Grid Locations

Prepared By: Larry N. Dockins Date: 12/5/03

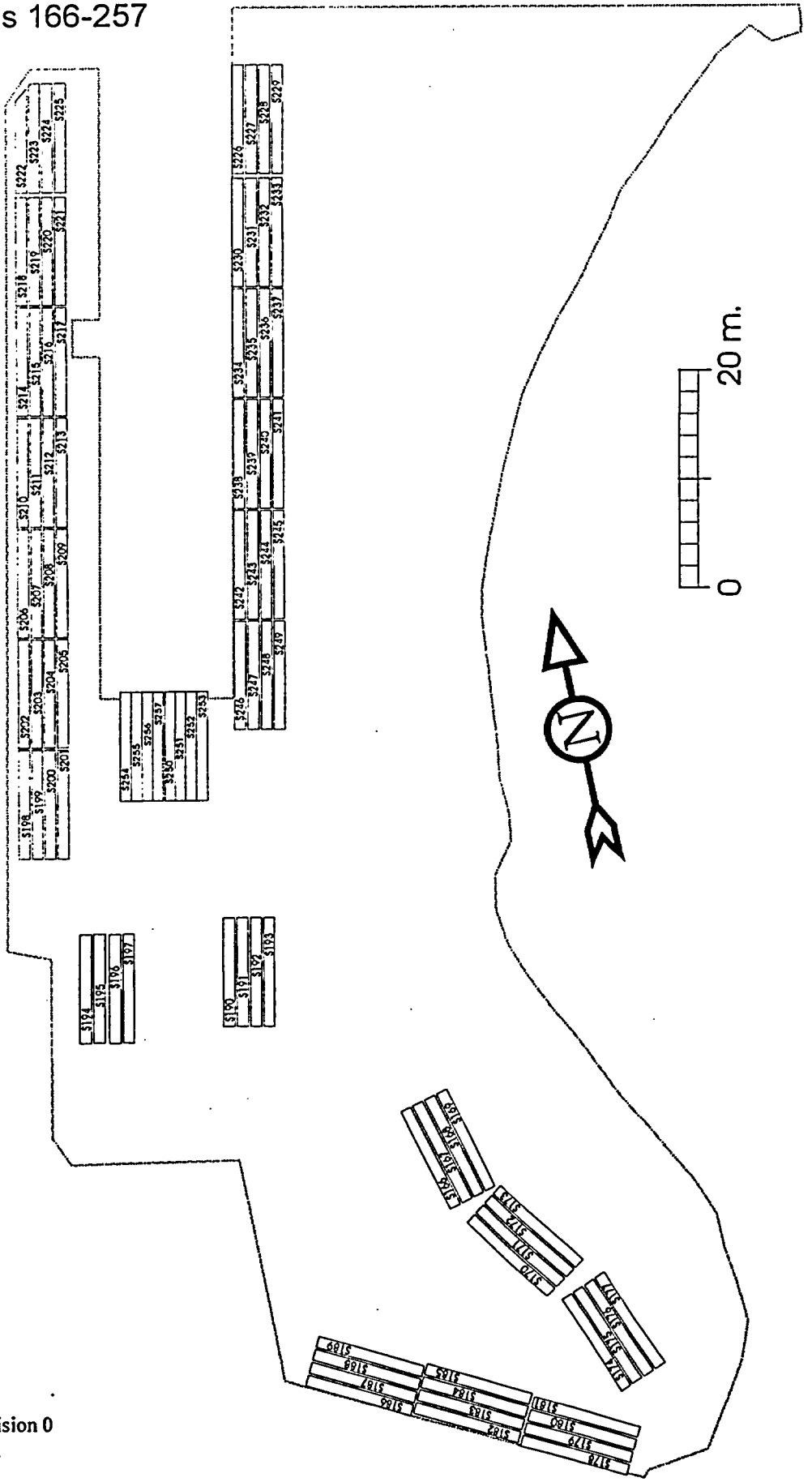


Maine Yankee Decommissioning Team	**Maine Yankee Decommissioning Project Survey Map**	Map ID# FR0900-06
Survey Type: ☐ Characterization ☐ Turnover ■ Final Status Survey	Survey Area Name: Scan Grid Locations	
	Prepared By: Larry N. Dockins Date: 12/8/03	



Maine Yankee Decommissioning Team	**Maine Yankee Decommissioning Project Survey Map**	Map ID# FR0900-07
Survey Type: ☐ Characterization ☐ Turnover ■ Final Status Survey	Survey Area Name: Scan Grid Locations	
	Prepared By: Robert Tozzie	Date: 11/29/04

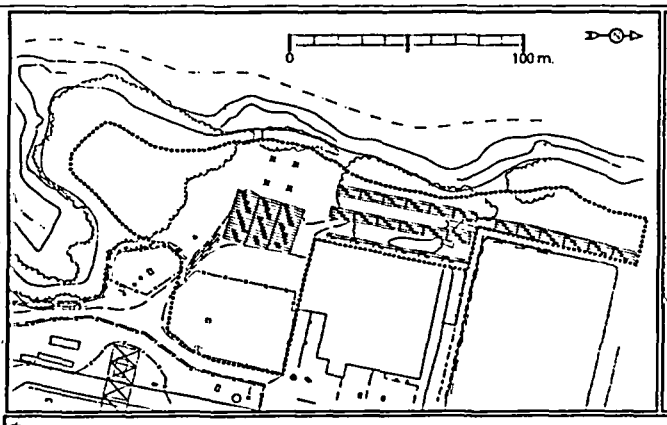
FR0900 SU1 East
Scan Grids 166-257

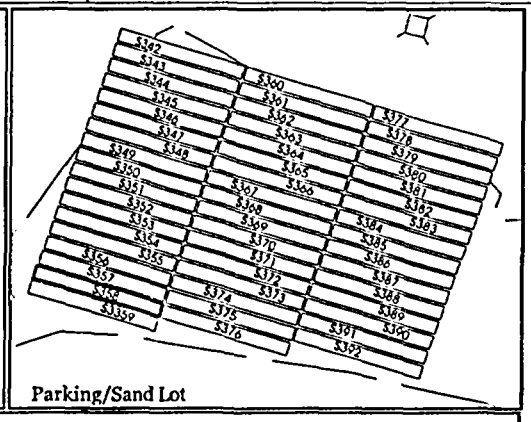


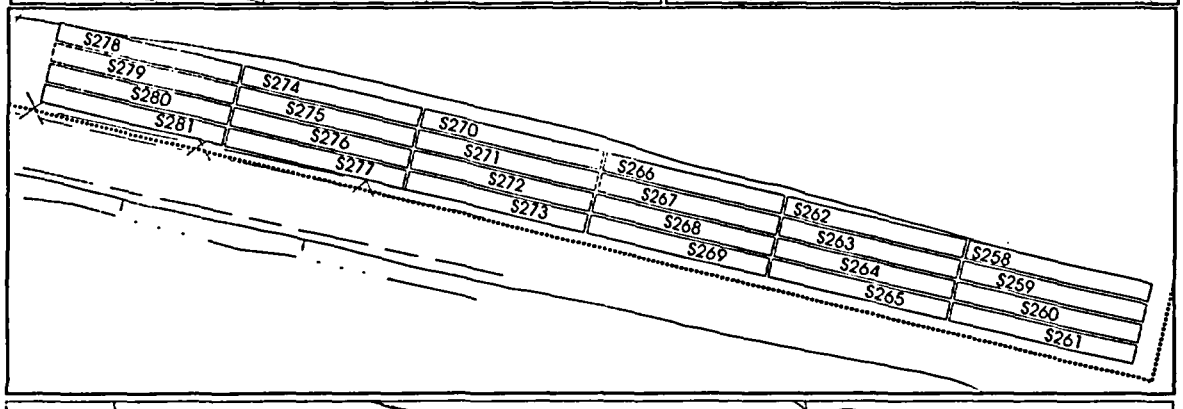
Maine Yankee Decommissioning Team	Maine Yankee Decommissioning Project Survey Map	Prepared By: Robert Tozzie	Date: 2/1/05	Map ID# FR0900-08

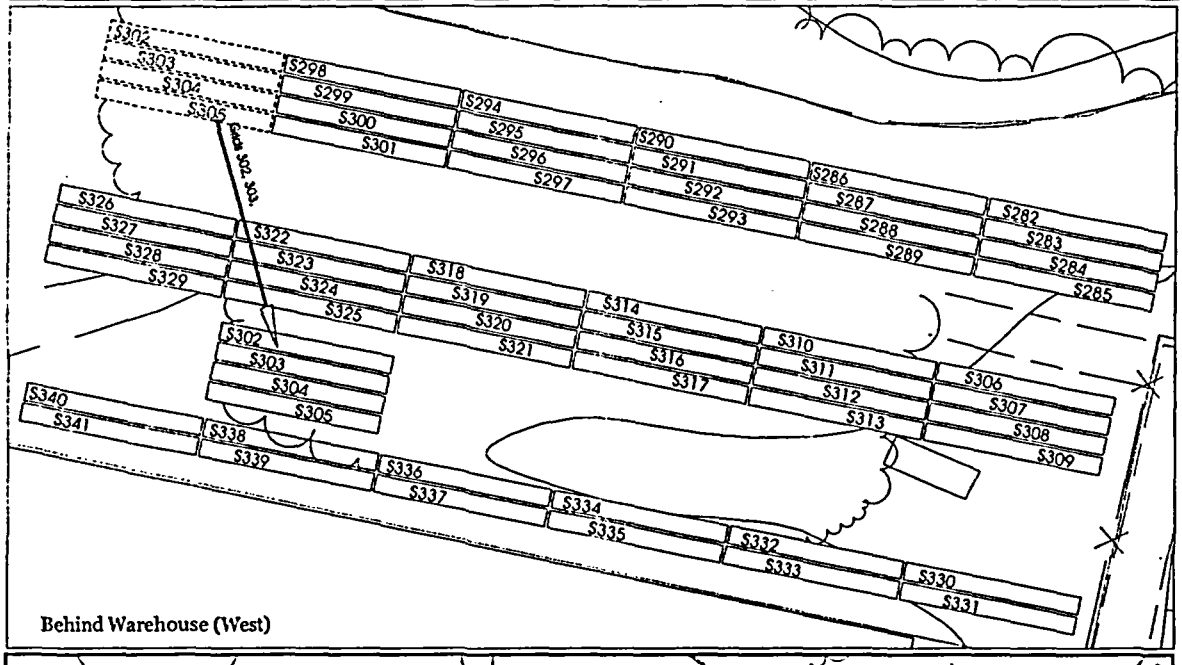
Survey Type: ☐ Characterization ☐ Turnover ■ Final Status Survey

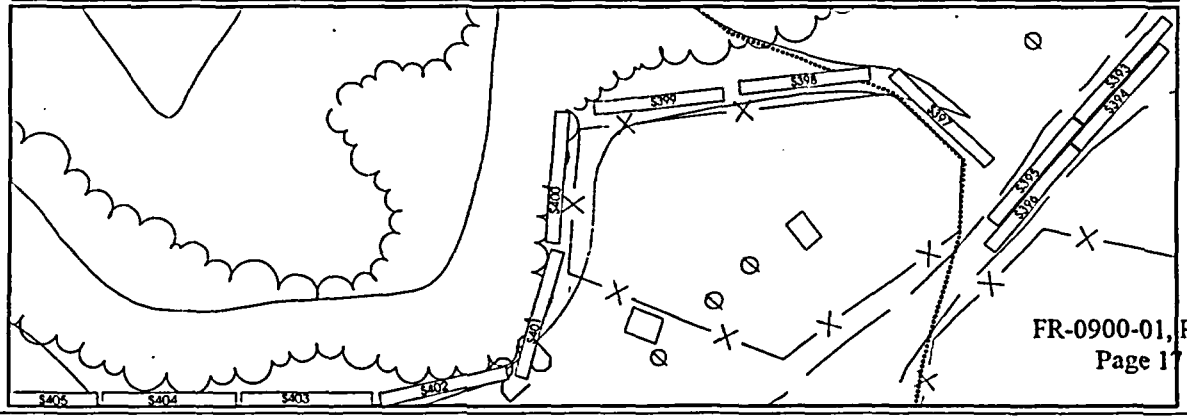
Survey Area Name: Balance of Plant Land











Attachment 2

Survey Unit Instrumentation

TABLE 2-1

INSTRUMENT INFORMATION

E-600 S/N	SSPA-3 Probe S/N
1625	725332
1933	726561
2488	725328
2488	725890
1645	725890
2489	726560
2490	2255
2490	726554
2490	726560
2491	2055
1641	726561
2618	726561
2619	2255
2619	725328
2621	726561
2620	725890
2620	726560
2621	725328
2621	726560

HPGe Detectors for Lab Analysis of Volumetric Samples

Detector Number	MDC (pCi/g)
FSS-1	0.01 – 0.10
FSS-2	0.02 – 0.08
DET-2	0.10 – 0.20
DET-3	0.12 – 0.13

ISOCS Detector for Field Measuremenets

Detector Number	MDC (pCi/g)
ISOCS – 7607	0.2 – 0.6

TABLE 2-2

INSTRUMENT SCAN MDC, DCGL, INVESTIGATION LEVEL, AND $DCGL_{EMC}$

Parameter		Comments
DCGL (pCi/g)	4.2 Cs-137	Approved DCGL for land areas outside the Restricted Area, LTP Section 6.7 (Reference 2)
SPA-3 Scan MDC (pCi/g)	5.9	Design Scan MDC, LTP Table 5-6 Rev 3 Addenda (Reference 2)
ISOCS Scan MDC (pCi/g)	Co-60 0.23 – 0.31 Cs-137 0.25 – 0.53	~ 36% DCGL
SPA-3 Investigation Level (Alarm setpoint) cpm	10,990	Group A
	12,000	Group B
	12,690	Group C
	12,700	Group D
	13,000	Group E
	13,300	Group F
	14,200	Group G and H
	14,390	Group I
	14,900	Group J
	16,000	Group K
	16,690	Group L
ISOCS Action Level (pCi/g)	1.0 pCi/g Cs-137 0.36 pCi/g Co-60	Class 3 Area

Attachment 3

Investigation Table

TABLE 3-1
INVESTIGATION TABLE

FSS SURVEY RESULTS				INVESTIGATION RESULTS			
Grid	Reason	Alarm Setpoint (cpm)	Scan Measurement (cpm)	Scaler Measurement (cpm)	Sample ID	CS-137 (pCi/g)	DCGL Comparison
S034	ALARM	14,200	14,750	15,850	XR0900-01-3-S034-SS	<6.48E-02	<DCGL
S035	ALARM	14,200	14,420	14,030	XR0900-01-3-S035-SS	**3.31E-02 ± 8.87E-03**	<DCGL
S036	ALARM	14,200	14,550	13,710	XR0900-01-3-S036-SS	**5.61E-02 ± 2.31E-02**	<DCGL
S038	ALARM	14,200	14,210	13,320	XR0900-01-3-S038-SS	**1.61E-01 ± 2.47E-02**	<DCGL
S042	ALARM	14,200	14,420	17,170	XR0900-01-3-S042-SS	<6.04E-02	<DCGL
S074	LOW BK	14,200	13,180	10,600	XR0900-01-3-S074-SS	**1.78E-01 ± 4.43E-02**	<DCGL
S075	LOW BK	14,200	12,650	10,440	XR0900-01-3-S075-SS	**1.43E-01 ± 3.59E-02**	<DCGL
S076	LOW BK	14,200	13,070	9,970	XR0900-01-3-S076-SS	<6.77E-02	<DCGL
S077	LOW BK	14,200	12,590	10,750	XR0900-01-3-S077-SS	<6.12E-02	<DCGL
S080	LOW BK	14,200	12,370	11,520	XR0900-01-3-S080-SS	<5.21E-02	<DCGL
S082	< 0 °F	16,000	15,720	11,450	XR0900-01-3-S082-SS	<4.87E-02	<DCGL
S083	< 0 °F	16,000	15,750	12,320	XR0900-01-3-S083-SS	<6.42E-02	<DCGL
S084	< 0 °F	16,000	15,680	11,360	XR0900-01-3-S084-SS	**9.53E-02 ± 3.42E-02**	<DCGL
S085	< 0 °F	16,000	15,660	10,710	XR0900-01-3-S085-SS	<5.31E-02	<DCGL
S087	ALARM	14,390	14,390	13,680	XR0900-01-3-S087-MS	< 1.05E-01	<DCGL
					XR0900-01-3-A087-SS	**6.56E-02 ± 1.74E-02**	<DCGL
S088	INSUFFICIENT SCAN SURVEY TIME	14,390	14,150	11,230	XR0900-01-3-S088-SS	<4.92E-02	<DCGL
				(ISOCS investigation)	XR0900-01-3-S088-GS-X001	<5.08E-01	<DCGL
					XR0900-01-3-S088-GS-X002	<5.31E-01	<DCGL
					XR0900-01-3-S088-GS-X003	<4.83E-01	<DCGL
S094	ALARM	14,390	14,900	12,710	XR0900-01-3-S094-SS	<2.44E-02	<DCGL
S095	ALARM	14,390	14,660	12,390	XR0900-01-3-S095-SS	**8.36E-02 ± 1.77E-02**	<DCGL
S098	ALARM	16,690	17,420	15,000	XR0900-01-3-S098-SS	**6.22E-02 ± 2.11E-02**	<DCGL
S110	ALARM	16,690	17,930	16,170	XR0900-01-3-S110-SS	2.73E-02 ± 1.43E-02	<DCGL
S111	ALARM	16,690	21,700	20,800	XR0900-01-3-S111-SS	**2.07E-02 ± 6.36E-03**	<DCGL
S112	ALARM	16,690	18,660	16,370	XR0900-01-3-S112-SS	<2.46E-02	<DCGL
S113	ALARM	16,690	18,720	16,650	XR0900-01-3-S113-SS	**4.15E-02 ± 1.49E-02**	<DCGL

FSS SURVEY RESULTS				INVESTIGATION RESULTS			
Grid	Reason	Alarm Setpoint (cpm)	Scan Measurement (cpm)	Scaler Measurement (cpm)	Sample ID	CS-137 (pCi/g)	DCGL Comparison
S114	ALARM	16,690	19,410	19,100	XR0900-01-3-S114-SS	<6.43E-02	<DCGL
S115	ALARM	16,690	21,500	19,500	XR0900-01-3-S115-SS	**1.25E-01 ± 1.51E-02**	<DCGL
S116	ALARM	14,200	15,550	14,610	XR0900-01-3-S116-SS	**8.49E-02 ± 1.90E-02**	<DCGL
S117	ALARM	14,200	16,770	15,360	XR0900-01-3-S117-SS	**5.04E-02 ± 1.37E-02**	<DCGL
S119	ALARM	16,690	20,900	17,530	XR0900-01-3-S119-SS	**2.68E-02 ± 1.36E-02**	<DCGL
S121	ALARM	16,690	20,500	20,600	XR0900-01-3-S121-SS	<6.23E-02	<DCGL
S122	ALARM	16,690	19,480	17,580	XR0900-01-3-S122-SS	**4.84E-02 ± 1.56E-02**	<DCGL
S123	ALARM	16,690	19,320	21,600	XR0900-01-3-S123-SS	<7.81E-02	<DCGL
S126	LOW BK	16,690	15,170	12,130	XR0900-01-3-S126-SS	<5.93E-02	<DCGL
S127	ALARM	16,690	17,710	16,460	XR0900-01-3-S127-SS	**4.63E-02 ± 1.55E-02**	<DCGL
S128	LOW BK	16,690	15,270	13,260	XR0900-01-3-S128-SS	<4.32E-02	<DCGL
S129	LOW BK	16,690	16,410	12,720	XR0900-01-3-S129-SS	<5.22E-02	<DCGL
S132	LOW BK	16,690	15,650	13,220	XR0900-01-3-S132-SS	**9.96E-02 ± 3.37E-02**	<DCGL
				(ISOCS investigation	XR0900-01-3-S132-GS-X001	<5.23E-01	<DCGL
					XR0900-01-3-S132-GS-X002	<5.10E-01	<DCGL
					XR0900-01-3-S132-GS-X003	<5.05E-01	<DCGL
S133	LOW BK	16,690	15,260	12,790	XR0900-01-3-S133-SS	**1.30E-01 ± 5.09E-02**	<DCGL
				(ISOCS investigation	XR0900-01-3-S133-GS-X001	<5.23E-01	<DCGL
					XR0900-01-3-S133-GS-X002	<4.66E-01	<DCGL
					XR0900-01-3-S133-GS-X003	<4.86E-01	<DCGL
S134	ALARM	14,200	14,330	13,820	XR0900-01-3-S134-SS	<5.65E-02	<DCGL
S141	ALARM	12,690	13,920	11,710	XR0900-01-3-S141-SS	**3.09E-02 ± 1.30E-02**	<DCGL
S144	ALARM	14,200	15,880	14,820	XR0900-01-3-S144-SS	**1.44E-01 ± 2.09E-02**	<DCGL
S147	ALARM	16,690	17,540	14,460	XR0900-01-3-S147-SS	**1.24E-01 ± 2.07E-02**	<DCGL
S148	ALARM	16,690	17,420	14,690	XR0900-01-3-S148-SS	**3.57E-02 ± 1.28E-02**	<DCGL
S149	ALARM	16,690	17,390	15,780	XR0900-01-3-S149-SS	<2.77E-02	<DCGL
S150	LOW BK	10,990	10,960	9,070	XR0900-01-3-S150-SS	**7.39E-01 ± 5.79E-02**	<DCGL
S151	ALARM	10,990	13,730	12,100	XR0900-01-3-S151-SS	**1.10E+00 ± 8.33E-02**	<DCGL
S152	ALARM	10,990	14,880	10,960	XR0900-01-3-S152-SS	**5.53E-01 ± 4.73E-02**	<DCGL
S153	ALARM	10,990	12,210	11,140	XR0900-01-3-S153-SS	**1.16E+00 ± 7.84E-02**	<DCGL

FSS SURVEY RESULTS				INVESTIGATION RESULTS			
Grid	Reason	Alarm Setpoint (cpm)	Scan Measurement (cpm)	Scaler Measurement (cpm)	Sample ID	CS-137 (pCi/g)	DCGL Comparison
S157	LOW BK	10,990	7,830	6,570	XR0900-01-3-S157-SS	**2.37E-01 ± 3.24E-02**	<DCGL
S158	LOW BK	10,990	7,830	7,000	XR0900-01-3-S158-SS	**2.75E-01 ± 3.01E-02**	<DCGL
S159	LOW BK	10,990	7,750	6,050	XR0900-01-3-S159-SS	**2.13E-01 ± 3.24E-02**	<DCGL
S162	LOW BK	10,990	8,460	7,640	XR0900-01-3-S162-SS	**4.95E-01 ± 4.09E-02**	<DCGL
S164	ALARM	10,990	14,460	10,760	XR0900-01-3-S164-SS	**4.66E-01 ± 3.87E-02**	<DCGL
S165	ALARM	10,990	14,570	11,080	XR0900-01-3-S165-SS	**1.10E-01 ± 2.26E-02**	<DCGL
S177	ALARM	12,700	13,320	11,550	XR0900-01-3-S177-SS	**1.53E-01 ± 4.95E-02**	<DCGL
S180	ALARM	12,700	13,200	13,000	XR0900-01-3-S180-SS	<6.30E-02	<DCGL
S182	ALARM	12,700	13,690	12,440	XR0900-01-3-S182-SS	<7.84E-02	<DCGL
S186	ALARM	12,700	13,040	11,950	XR0900-01-3-S186-SS	<4.36E-02	<DCGL
S187	ALARM	12,700	13,540	11,050	XR0900-01-3-S187-SS	<4.57E-02	<DCGL
S188	ALARM	12,700	17,910	16,160	XR0900-01-3-S188-SS	<5.83E-02	<DCGL
S189	ALARM	12,700	14,500	14,990	XR0900-01-3-S189-SS	<5.81E-02	<DCGL
S195	ALARM	13,300	13,350	12,170	XR0900-01-3-S195-SS	<6.44E-02	<DCGL
S256	ALARM	13,300	13,890	11,590	XR0900-01-3-S256-VS	<1.25E-01	<DCGL
S274	Low BK	14,200	13,180	11,420	XR0900-01-3-S274-SS	<5.66E-02	<DCGL
S278	ALARM	13,000	14,850	13,890	XR0900-01-3-S278-SS	<5.09E-02	<DCGL
S294	ALARM	12,000	12,160	9,540	XR0900-01-3-S294-SS	<6.22E-02	<DCGL
S296	ALARM	12,000	12,340	12,600	XR0900-01-3-S296-SS	<6.29E-02	<DCGL
S297	ALARM	12,000	15,210	12,820	XR0900-01-3-S297-SS	<6.91E-02	<DCGL
S300	ALARM	12,000	12,270	10,480	XR0900-01-3-S300-SS	<5.68E-02	<DCGL
S301	ALARM	12,000	12,610	10,600	XR0900-01-3-S301-SS	<5.09E-02	<DCGL
S302	ALARM	12,000	12,520	11,060	XR0900-01-3-S302-SS	<5.82E-02	<DCGL
S303	ALARM	12,000	12,670	10,380	XR0900-01-3-S303-SS	<4.93E-02	<DCGL
S304	ALARM	12,000	12,850	10,730	XR0900-01-3-S304-SS	<5.63E-02	<DCGL
S305	ALARM	12,000	13,680	10,630	XR0900-01-3-S305-SS	<5.33E-02	<DCGL
S309	ALARM	12,000	12,150	9,220	XR0900-01-3-S309-SS	<6.75E-02	<DCGL
				(ISOCS investigation	XR0900-01-3-S309-GS-X001	<5.10E-01	<DCGL
					XR0900-01-3-S309-GS-X002	<5.10E-01	<DCGL
					XR0900-01-3-S309-GS-X003	**2.95E-01 ± 1.74E-01**	<DCGL

FSS SURVEY RESULTS				INVESTIGATION RESULTS			
Grid	Reason	Alarm Setpoint (cpm)	Scan Measurement (cpm)	Scaler Measurement (cpm)	Sample ID	CS-137 (pCi/g)	DCGL Comparison
S316	Low BK	12,000	11,230	10,910	XR0900-01-3-S316-SS	<6.62E-02	<DCGL
S318	ALARM	12,000	12,140	8,680	XR0900-01-3-S318-SS	<7.30E-02	<DCGL
S319	ALARM	12,000	12,910	11,050	XR0900-01-3-S319-SS	<6.38E-02	<DCGL
S320	ALARM	12,000	12,920	11,070	XR0900-01-3-S320-SS	<5.47E-02	<DCGL
S321	ALARM	12,000	13,150	11,260	XR0900-01-3-S321-SS	<6.23E-02	<DCGL
S322	ALARM	13,000	13,040	10,900	XR0900-01-3-S322-SS	<5.88E-02	<DCGL
S327	ALARM	13,000	13,060	10,230	XR0900-01-3-S327-SS	**1.37E-01 ± 3.43E-02**	<DCGL
S328	ALARM	13,000	13,330	11,000	XR0900-01-3-S328-SS	<6.31E-02	<DCGL
S332	ALARM	13,000	13,500	11,310	XR0900-01-3-S332-SS	<5.95E-02	<DCGL
S333	ALARM	13,000	13,100	11,150	XR0900-01-3-S333-SS	<6.31E-02	<DCGL
S337	ALARM	14,200	14,690	11,330	XR0900-01-3-S337-SS	<5.96E-02	<DCGL
S357	ALARM	12,000	12.050	9,200	XR0900-01-3-S357-SS	<4.83E-02	<DCGL
				(ISOCS investigation	XR0900-01-3-S357-GS-X001	<4.72E-01	<DCGL
					XR0900-01-3-S357-GS-X002	<5.08E-01	<DCGL
					XR0900-01-3-S357-GS-X003	<4.55E-01	<DCGL
S358	ALARM	12,000	12,400	11,480	XR0900-01-3-S358-SS	<5.42E-02	<DCGL
S359	ALARM	12,000	12,000	9,200	XR0900-01-3-S359-SS	<5.06E-02	<DCGL
				(ISOCS investigation	XR0900-01-3-S359-GS-X001	<4.37E-01	<DCGL
					XR0900-01-3-S359-GS-X002	<4.63E-01	<DCGL
					XR0900-01-3-S359-GS-X003	<4.40E-01	<DCGL
S374	ALARM	12,000	12,080	9,270	XR0900-01-3-S374-SS	<5.32E-02	<DCGL
				(ISOCS investigation	XR0900-01-3-S374-GS-X001	<5.00E-01	<DCGL
					XR0900-01-3-S374-GS-X002	<4.78E-01	<DCGL
					XR0900-01-3-S374-GS-X003	<4.66E-01	<DCGL
S383	ALARM	12,000	12,030	8,830	XR0900-01-3-S383-SS	<4.73E-02	<DCGL
				(ISOCS investigation	XR0900-01-3-S383-GS-X001	<4.58E-01	<DCGL
					XR0900-01-3-S383-GS-X002	<4.37E-01	<DCGL
					XR0900-01-3-S383-GS-X003	<5.00E-01	<DCGL
S394	ALARM	14,200	14,350	12,570	XR0900-01-3-S394-SS	<2.65E-02	<DCGL
S396	ALARM	14,200	14,160	12,470	XR0900-01-3-S396-SS	<2.83E-02	<DCGL

FSS SURVEY RESULTS				INVESTIGATION RESULTS			
Grid	Reason	Alarm Setpoint (cpm)	Scan Measurement (cpm)	Scaler Measurement (cpm)	Sample ID	CS-137 (pCi/g)	DCGL Comparison
S404	ALARM	14,200	15,040	13,860	XR0900-01-3-S404-SS	4.70E-01 ± 4.23E-02	<DCGL
S405	ALARM	14,200	14,960	11,990	XR0900-01-3-S405-SS	2.90E-01 ± 3.15E-02	<DCGL
					SU Mean / DCGL		0.048
					Total		0.048

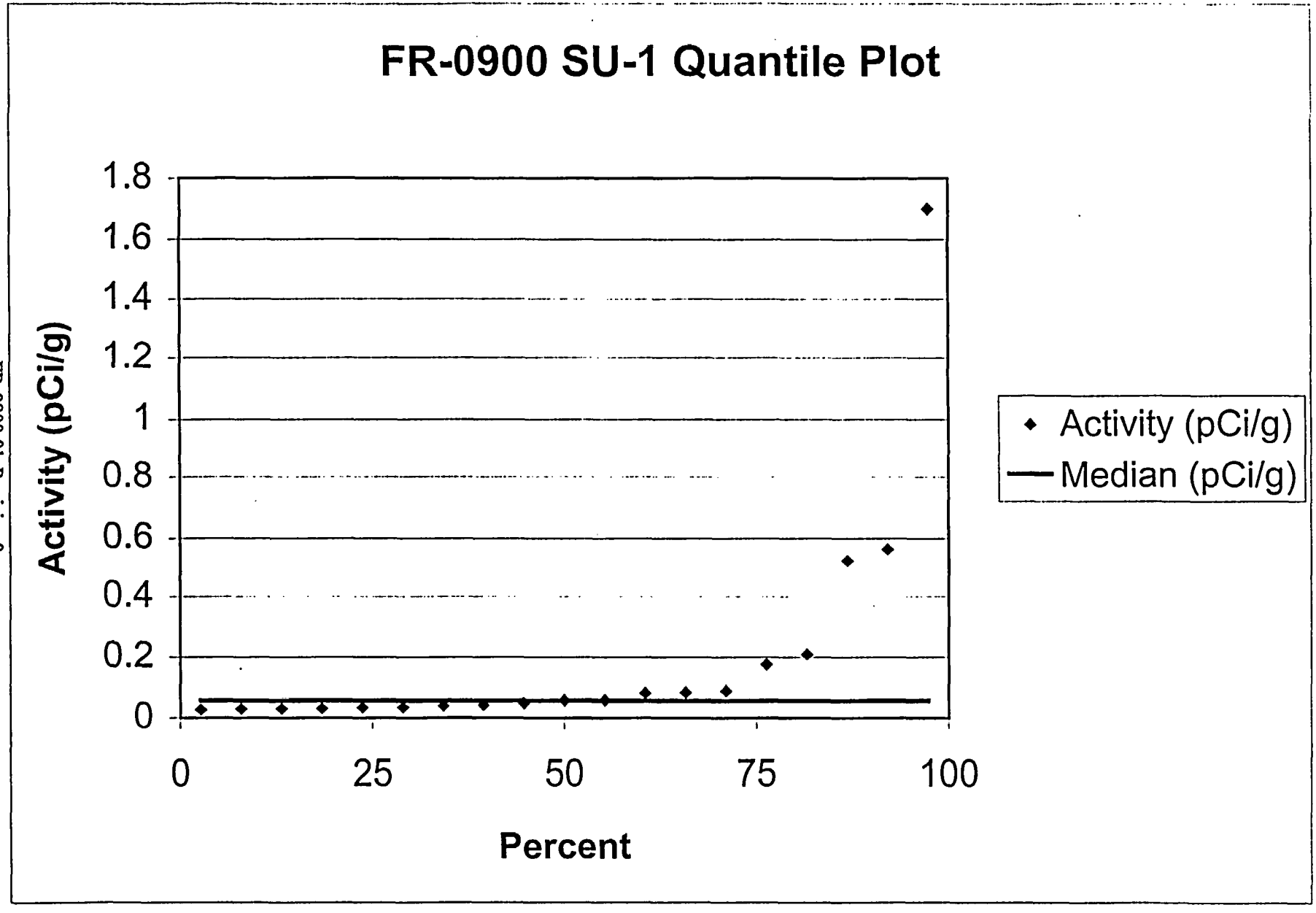
NOTES:
1. "<" indicates value less than MDA, MDA value is reported.
2. The samples were also analyzed for Co-60; all were less than an MDA of 0.1 pCi/g.

Attachment 4

Statistical Data

Survey Package FR0900 Unit 1 Soil Sign Test Summary

Evaluation Input Values		Comments
Survey Package:	FR0900	BOP Land Area
Survey Unit:	01	
Evaluator:	DR	
$DCGL_w$:	4.20E+00	
$DCGL_{emc}$:	4.20E+00	
LBGR:	2.76E+00	
Sigma:	4.80E-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:	3.0	
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:	19	
Median:	5.74E-02	
Mean:	2.03E-01	
Net Sample Standard Deviation:	3.96E-01	
Total Standard Deviation:	3.96E-01	SRSS
Maximum:	1.70E+00	
Sign Test Results		**Comments**
Adjusted N Value:	19	
S+ Value:	19	
Critical Value:	13	
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	


FR-0900 SU-1 Quantile Plot
Activity (pCi/g)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
25
50
75
100
Percent
Activity (pCi/g)
Median (pCi/g)

One-Sample T-Test Report

Page/Date/Time	2 2/15/05 3:55:27 PM
Database	C:\Program Files\NCSS97\FR0900 SU-1.S0
Variable	C2

Plots Section

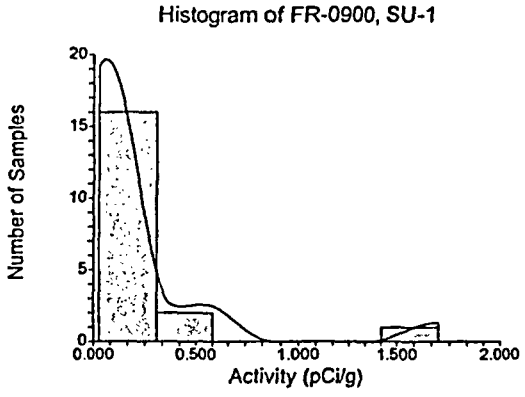
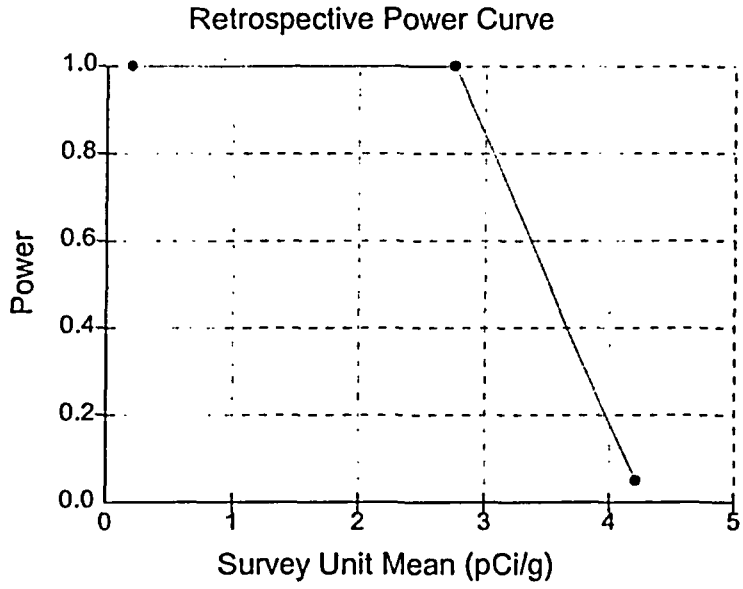



Chart Section