Maine Yankee

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January 20, 2005
MN-05-001 RA-05-002
Proposed Change No. 218, Supplement 12

UNITED STATES NUCLEAR REGULATORY COMMISSION
Attention: Document Control Desk
Washington, DC 20555

References:
(1) License No. DPR-36 (Docket No. 50-309)
(2) Maine Yankee Letter to the USNRC, MN-02-048, dated October 15, 2002, Revision 3, Maine Yankee's License Termination Plan
(3) USNRC Letter to Maine Yankee, dated February 28, 2003, Issuance of Amendment No. 168 to Facility Operating License No. DPR-36
(4) Maine Yankee Letter to the USNRC, MN-04-020, dated March 15, 2004, License Amendment Request: Release of Non-ISFSI Site Land, Proposed Change No. 218

Subject: **Release of Non-ISFSI Site Land - FSS Final Report No. 7**

On March 15, 2004, Maine Yankee submitted a request for amendment (Reference No. 4) to the facility operating license (Reference No. 1) pursuant to 10 CFR 50.90 and in accordance with the NRC Approved License Termination Plan (LTP) for Maine Yankee (Reference No. 2), to indicate NRC's approval of the release of the Non-ISFSI site land from the jurisdiction of the license. In support of that request, Maine Yankee supplied the information required in LTP section 1.4.2 and 5.9.3. The land area associated with the license amendment request included the entire non-ISFSI portion of the site land. Maine Yankee is submitting the required dismantlement and survey information for the survey units that make up the non-ISFSI portion of the site land in a phased fashion. Accordingly, Maine Yankee is herewith supplying the dismantlement and survey information for one survey area comprising six survey units. Other descriptive information and technical evaluations contained in Reference No. 4 are unaffected by these revisions and are, therefore, not included in this submittal, as indicated.

Attachment I - Final Status Survey Final Report No. 7, provides dismantlement and summary survey information for the survey units covered in this submittal and the revised schedule for the submittal of the remaining dismantlement and survey information. Attachment II provides a copy of the revised, supporting final status survey release records for the survey units that make up the seventh phase of survey information.

Maine Yankee requests timely review and acceptance of this dismantlement and survey information in accordance with the NRC review schedule agreements developed in the September 9, 2004 and January 5, 2005 NRC - Maine Yankee management meetings.

NMSSD1

If you have any questions, please contact me.

Sincerely,

Michael A. Whitty for M.J.M.

Michael J. Meisner
Vice President and Chief Nuclear Officer

Attachments

I. Final Status Survey Final Report No. 7
II. Release Records

cc: Dr. R. R. Bellamy, NRC Region I
Mr. D. R. Lewis, Esq., Shaw Pittman
Mr. C. Pray, State of Maine, Nuclear Safety Advisor
Mr. P. J. Dostie, State of Maine, Division of Health Engineering
Mr. D. Gillen, NRC Acting Director, Division of Waste Management
Mr. M. Rosenstein, USEPA Region I
Mr. S. J. Collins, NRC Regional Administrator, Region I
Mr. J. Buckley, NRC NMSS Project Manager, Decommissioning
Mr. M. Roberts, NRC Region I
Mr. R. Shadis, Friends of the Coast

[1] These survey units are soil remediation (excavation) areas within the overall survey package FR0100 for RCA Yard West. The survey unit titles have being revised to be consistent with the release record designations,i.e., FR-0111 or Yard West Excavations.

1.0 Description

This letter is submitted as a supplement to Proposed Change No. 218 (Reference 7.3), which requests an amendment to the Operating License No. DPR-36 for Maine Yankee, specifically License Condition 2.B(9), addressing release of lands from the jurisdiction of the Facility Operating License. Maine Yankee requested that the NRC review and approve the release of remaining land under License No. DPR-36 with the exception of the land where the Independent Spend Fuel Storage Installation (ISFSI) is located. In support of that request, Maine Yankee supplied the information required in LTP section 1.4.2 and 5.9.3. The land area associated with the license amendment request included the entire non-ISFSI portion of the site land. Maine Yankee is submitting the required dismantlement and survey information for the survey units that make up the non-ISFSI portion of the site land in a phased fashion. Other descriptive information and technical evaluations contained in Reference No. 7.3 are unaffected by these submittals and are, therefore, not included in this submittal, as indicated.

In this submittal, Maine Yankee is providing the dismantlement and survey information for one area (six survey units), as described in Table 1 in Section 4.1.1. Maine Yankee is providing this information to facilitate NRC review and acceptance. This written NRC acceptance must conclude, for the land associated with the release, that the remaining dismantlement has been performed in accordance with the approved license termination plan, and the terminal radiation survey and associated documentation demonstrates that the facility and site are suitable for release in accordance with the criteria for decommissioning in 10 CFR part 20, subpart E by meeting a site release criteria of 10 millirem TEDE per year over background (all pathways) with no more than 4 millirem (as distinguishable from background) TEDE per year from groundwater sources of drinking water in accordance with the approved License Termination Plan.

Reference 7.3 provided the information required by section 1.4 of Maine Yankee's License Termination Plan (LTP). LTP section 1.4 discusses the information to be provided in support of releasing land from the jurisdiction of License No. DPR-36 and also describes Maine Yankee's overall phased approach to releasing land. This submittal provides the dismantlement, FSS results, and recontamination prevention and control information required by LTP section 1.4 specific to the survey units covered in this submittal.

The information contained in this submittal, together with the information provided in the prior and subsequent supplemental phases will be sufficient for the NRC to make a determination equivalent to 10 CFR 50.82(a)(11) regarding the lands to be released from the license. Once these lands are so released, it is understood that the NRC will not require any additional surveys or decontamination of these areas unless the NRC determines that the criteria of 10CFR Part 20, Subpart E were not met and that residual activity remaining on the land could result in a significant threat to public health and safety.

2.0 Proposed License Condition

The proposed wording for the license condition is provided in Reference 7.3 and is not affected by this supplement.

3.0 Background

Reference 7.3 transmitted an application to amend Maine Yankee's License No. DPR-36 to release the remaining non-ISFSI land from the jurisdiction of the license. The process for releasing land from Maine Yankee's license is established in section 1.4 of the License Termination Plan. This LTP section defines the information that will be provided to support release of land from Maine Yankee's license. This information, includes (1) a description of the boundaries associated with the area to be released, (2) discussion of dismantlement activities performed; (3) final status survey results; (4) evaluation of the potential for re-contamination and controls applied to prevent this; (5) an evaluation of the impact on the exclusion area for site lands remaining under the Part 50 license; (6) an evaluation of possible combined dose effects as a result of partial release; (7) an evaluation of potential impact on various licensee programs and; (8) a no significant hazards determination evaluation. Items (1), (5), (6), (7), and (8) are applicable to the License Amendment Request and the release of the entire remaining non-ISFSI land. Items (2), (3), and (4) are specific to each survey unit/area. This information is contained in this submittal for the survey units covered by this submittal.

4.0 Site Information and Physical Description

4.1 Physical Description of Land to be Released

The land to be released is described in Reference 7.3 and is unchanged by this submittal.

4.1.1 Survey Unit Information Included in this Submittal

As discussed in section 1.0 above, this submittal provides a discussion of demolition activities completed and final status survey results for the survey units located on the proposed land to be released. Details are provided for each survey unit on survey methods, results, data analysis, and conclusions. Additional information on all remaining survey units for the Non-ISFSI land areas will be provided in subsequent submittals. In all cases, Maine Yankee is providing sufficient information, as required, relating to each survey unit so that the NRC staff can verify that the License Termination Plan has been fully implemented for each survey area and that the final status survey results support unrestricted release of the land from License DPR-36 in accordance with the proposed license amendment.

Table 1 provides a description of the survey units addressed in this submittal.

Table 1 - Survey Unit Description			
Survey Area	**Survey Unit**	**Class**	**General Description of Survey Unit**
FR-0111	6	1	**Yard West Excavations** - An excavation in the southwest corner of the Restricted Area. The survey unit extended from the west side of FR 0111 Survey Unit 5 to the west Restricted Area fence line. The survey unit is approximately 813 m^2.
FR-0111	7	1	**Yard West Excavations** - An excavation in the southeast corner of the original Restricted Area "backyard". The area extended along the south boundary of FR 0111 Survey Units 3 and 4 to the west edge of the Service Building slab and south to the Restricted Area boundary. The survey unit is approximately 1,336 m^2.
FR-0111	8	1	**Yard West Excavations** – An excavation in the northwest corner of the original Restricted Area "backyard". The area was bordered on the north by the Restricted Area fence, on the west by the 115 kV switchyard, on the east by FR 0111 Survey Units 11 and 12, and on the south by FR 0111 Survey Unit 9. The survey unit is approximately 1,528 m^2.
FR-0111	9	1	**Yard West Excavations** – An excavation centered along the west boundary of the Restricted Area between outfall 6 and the Restricted Area roadway. The area was bordered on the north by FR 0111 Survey Unit 8, on the south by FR 0111 Survey Unit 6, on the east by FR 0111 Survey Units 10 and 11,and on the west by the Restricted Area fence. The survey unit is approximately 1,622 m^2.
FR-0111	10	1	**Yard West Excavations** – An excavation located southwest of the former Containment Building encompassing portions of areas that were originally surveyed under packages FR 0111 Survey Units 4 and 5 as well as FA 1900 Survey Unit 1 (HV-7&9). The area was bordered on the north by FR 0111 Survey Unit 11, on the south by FR 0111 Survey Units 4 and 5, on the east by FR 0111 Survey Units 13 and 14, and on the west by FR 0111 Survey Unit 9. The survey unit is approximately 1,332 m^2.
FR-0111	13	1	**Yard West Excavations** – An excavation located southeast of the former Containment Building encompassing portions of areas that were originally surveyed under packages FR 0111 Survey Units 3, 4 and 7. The rectangular area was bordered on the north by FR 0111 Survey Unit 14, on the south by FR 0111 Survey Units 3, 4 and 7, on the west by FR 0111 Survey Unit 10 and on the east by FR 0111 Survey Units 17 and 18. The survey unit is approximately 1,290.5 m^2.

These areas and locations of these survey units are shown in Figure 1. The cross-hatched portions of the site represent the areas for which detailed dismantlement and survey information is being provided in this submittal. Shaded areas in Figure 1 represent those included in previous submittals. See Figure 2 for an expanded scale illustration, showing the site's industrial area.

4.1.2 Survey Unit Information Being Provided in Subsequent Submittals

As discussed above, Maine Yankee will provide additional submittals of detailed information on dismantlement activities and final status survey results as these activities are completed. Below is a list of the Survey Areas that remain to be submitted along with an expected schedule for submittal. The schedule indicates the changes to the schedule from that provided in Reference No. 7.23. These survey areas encompass the remaining survey areas specified in the Maine Yankee License Termination Plan that have not yet been submitted. The actual submittal schedule, the grouping and scope of survey areas, and sequence of these survey areas, is subject to adjustment based upon the progress of dismantlement, remediation and survey activities.

Eighth Submittal Scheduled for 2/17/05
~~FA-0400 Fuel Storage Building (FSB)~~ **Moved to Ninth Submittal**
FB-1500 Warehouse 2/3 Footprints (Moved from Seventh Submittal)
~~FB-1600 Training Annex Footprint~~ **(Incorporated into FR-0800 Administration and Parking Areas)**
FD-0700 Fire Protection System Buried Piping (Returned to Eighth Submittal)
FD-3500 Storm Drains - 4 ~~5~~ Survey Units **(Current Survey Area consists of 4 Survey Units)**
FR-0100 RCA Yard West - 3 Survey Units (Current Survey Area consists of 3 Survey Units; moved up from Ninth Submittal)
FR-0111 **Yard West Excavations**[2] **- 1** Survey Unit **[14]**
FR-0200 Yard East - 1 Survey Unit
~~FR-0220 Spare Transformer Pad Footprint~~ **(moved to Ninth Submittal)**
FR-0900 Balance of Plant Land - 3 Survey Units (2 survey units moved from Seventh Submittal, 1 survey unit added to FR-0900 Survey Area)

Ninth Submittal Scheduled for 3/9/05
FA-0400 Fuel Storage Building (FSB)
FD-0600 Service Water Piping
~~FR-0100 RCA Yard West - 4 Survey Units~~
FR-0200 Yard East - 2 ~~8~~ Survey Units [2 and 3]
FR-0220 Spare Transformer Pad Footprint (moved from Eight Submittal)
FR-0800 Administration and Parking Areas
FR-2600 Duct Banks (buried)
~~FR-2900 Railroad Tracks & Roadways - 3 Survey Units~~
FR-0111 **Yard West Excavations - 5 Survey Units [11, 12, 15, 16, 17]**

Tenth Submittal Scheduled for 4/19/05

FR-0111 Yard West Excavations - 3 Survey Units (Moved from Ninth Submittal) [18, 19, 20]
FR-0200 Yard East - 6 Survey Units (Moved from Ninth Submittal) [4 through 9]
FR-2900 Railroad Tracks & Roadways - 3 Survey Units (Moved from Ninth Submittal)

[2] **These survey units are soil remediation (excavation) areas within the overall survey package FR-0100 for RCA Yard West. The above survey unit titles are being revised to be consistent with the release record designations, i.e., FR-0111 or Yard West Excavations.**

4.2 Dismantlement Activities

The Maine Yankee License Termination Plan (LTP) describes the dismantlement activities to be performed for each structure and area of the Maine Yankee plant. In general, the LTP indicates that structures will be demolished to an elevation corresponding to three feet below grade. A few structures will remain in-place including the 345 kV switchyard and associated relay house. The LTP stated the possibility of other structures, such as the Warehouses and Staff Building, to be left standing following successful completion of final status surveys. The Warehouses and Staff Building have now been demolished. The former Low Level Waste Storage Building, now the ISFSI Security Operations Building (SOB), will remain in-place until fuel is transferred to the United States Department of Energy and will be dismantled and/or released concurrent with FSS of the ISFSI and license termination. Portions of the west plant access road will remain in-place to service the ISFSI and/or other future uses of the site. Since Old Ferry Road is a public road, it will also remain in-place. Certain below grade structural remnants and buried/embedded piping will remain in-place as described in LTP section 3.2.4.

Various options for sequencing building demolition and final status survey activities are established for buildings within the Restricted Area. For all options, a final status survey is conducted on building basement surfaces before fill material is placed in the basement. Routine communications are held with State of Maine and NRC representatives to facilitate scheduling of State and NRC surveys, as necessary.

This section reviews the activities that have been performed for the survey area(s) included in this submittal.

4.2.1 FR-0111 Yard West Excavations

Survey Area FR-0111 addresses FSS in a number of soil remediation areas within the site's radiologically Restricted Area (RA) and is comprised of twenty survey units. This report includes the FSS for Survey Units 6 through 10 and 13. Survey Units 1 through 5 were reported in Report 6. The FSS of remaining survey units will be reported in subsequent submittals. Dismantlement activities for these survey units involved demolition of certain above grade structures, including portions of the Containment Building, Spray Building, Equipment Hatch, Personnel Hatch, and the High Radiation Bunker. Some survey units included soil excavations to remediate contaminated soil and removed buried system piping. Soil excavations were expanded, as required to support soil remediation to meet the soil DCGL. Some small sections of buried piping remained. The areas represented by the subject survey units included certain foundation remnants and/or footings associated with the High Radiation Bunker and Yard Crane. See associated survey unit release records for additional discussion. This land area excavation included the removal of contaminated soil that was previously licensed for alternate disposal under 10 CFR 20.302 (currently 20.2002).

5.0 Technical Evaluation

5.1 Potential for Cross-contamination from Subsequent Activities

Since decommissioning activities are being conducted onsite in parallel with final status survey and release decisions, measures must be taken to protect survey areas from contamination during and subsequent to the final status survey (FSS). Maine Yankee LTP sections 3.5.6, 5.1.2 and 5.11 describe contamination and access controls measures and periodic routine monitoring practices to prevent and/or detect the re-contamination of survey areas during or following FSS. These requirements are implemented, as appropriate, through established procedures and were summarized in Reference 7.3.

The potential for re-contamination and the contamination controls/monitoring for the specific survey areas included in this release phase are discussed and evaluated below:

5.1.1 FR-0111 Yard West Excavations

Contamination controls for the soil remediation areas (Yard West Excavations) required special measures due to the proximity of other demolition and excavation work on-going in adjacent survey units and to manage water from both rain and groundwater sources.

1. In general, standard access controls and posting requirements were implemented following the completion of excavation.
2. Buffer zones were established around excavation areas to minimize the potential for foreign material to be inadvertently moved into the excavation.
3. As a general practice, backfilling was accomplished as expeditiously as possible, to minimize the duration that the excavation was open.
4. Due to rainwater and groundwater intrusion, a number of water management measures were instituted. Dikes were used around the open excavation to minimize rainwater accumulation within the excavation. Pooled water in the excavation was sampled, processed, and discharged, meeting applicable discharge permit requirements.

As an additional control measure, following FSS of these survey units, the site RA boundaries were revised to reduce the overall size of the RA. As a result, the subject FR-0111 survey unit areas were no longer within the RA. This action not only provides for improved management and control of activities (within a smaller RA) but also further reduces the possibility of vehicles traversing and contaminating the subject FR-0111 survey unit areas.

6.0 Final Status Survey Report

Maine Yankee LTP section 5.9.3 identifies the contents of the written reports of final status survey results that are to be submitted to the NRC. These contents include the items described in NUREG 1757, Vol. 2, Section 4.5 (Reference 7.6). The survey unit design information and survey results are provided below in summary fashion. Specific survey unit design details and results are provided in a copy of each survey unit release record in Attachment II of this submittal.

6.1 Overview of Results

The following survey units are included in this report:

1. FR-0111-SU-6 Yard West Excavations - An excavation in the southwest corner of the Restricted Area. The survey unit extended from the west side of FR 0111 Survey Unit 5 to the west Restricted Area fence line.
2. FR-0111-SU-7 Yard West Excavations - An excavation in the southeast corner of the original Restricted Area "backyard". The area extended along the south boundary of FR 0111 Survey Units 3 and 4 to the west edge of the Service Building slab and south to the Restricted Area boundary.
3. FR-0111-SU-8 Yard West Excavations - An excavation in the northwest corner of the original Restricted Area "backyard". The area was bordered on the north by the Restricted Area fence, on the west by the 115 kV switchyard, on the east by FR 0111 Survey Units 11 and 12, and on the south by FR 0111 Survey Unit 9.
4. FR-0111-SU-9 Yard West Excavations - An excavation centered along the west boundary of the Restricted Area between outfall 6 and the Restricted Area roadway. The area was bordered on the north by FR 0111 Survey Unit 8, on the south by FR 0111 Survey Unit 6, on the east by FR 0111 Survey Units 10 and 11, and on the west by the Restricted Area fence.
5. FR-0111-SU-10 Yard West Excavations - An excavation located southwest of the former Containment Building encompassing portions of areas that were originally surveyed under packages FR 0111 Survey Units 4 and 5 as well as FA 1900 Survey Unit 1 (HV-7&9). The area was bordered on the north by FR 0111 Survey Unit 11, on the south by FR 0111 Survey Units 4 and 5, on the east by FR 0111 Survey Units 13 and 14, and on the west by FR 0111 Survey Unit 9.
6. FR-0111-SU-13 Yard West Excavations - An excavation located southeast of the former Containment Building encompassing portions of areas that were originally surveyed under packages FR 0111 Survey Units 3, 4 and 7. The rectangular area was bordered on the north by FR 0111 Survey Unit 14, on the south by FR 0111 Survey Units 3, 4 and 7, on the west by FR 0111 Survey Unit 10 and on the east by FR 0111 Survey Units 17 and 18.

The release record for each survey unit contains a description of the survey unit; design information including classification, size, number of measurements, map, scan coverage, and DCGL; survey results; survey unit investigations (anomalous data); data assessment results, including statistical evaluations, if applicable and a simplified general retrospective dose estimate; changes in initial survey unit assumptions on extent of residual activity, an evaluation of LTP changes subsequent to the FSS of the survey unit and survey unit conclusions.

Overall, the release records for these survey units demonstrate that they meet the criteria for release for unrestricted use in accordance with the NRC approved Maine Yankee License Termination Plan.

6.2 Discussion of Changes to FSS Program

The purpose of this section is to discuss changes to the FSS program. Relevant NRC guidance documents (Reference Nos. 7.5 and 7.6) recommend a discussion of any changes that were made in the final status survey from what was proposed in the decommission plan or other prior submittals. Since Maine Yankee began performing final status survey activities prior to NRC approval of the LTP, some of the elements of the FSS program described in the approved LTP are different than those used in the design and conduct of early FSS activities. Some changes to the LTP were made following NRC approval using the change process outlined in the license condition and described in LTP section 1.4.1. In addition, some changes to the FSS program may be associated with a License Amendment Request to the LTP made in accordance with 10 CFR 50.90. The key FSS program changes that might impact completed FSS surveys covered in this Final FSS Report were included in Reference Nos. 7.3 and 7.4. The impacts of applicable changes on each survey unit are discussed in the survey units' release record provided in Attachment II.

6.2.1 Deep Soil Co-60 DCGL Change

The purpose of this LTP Change was to restore the original intent of the License Termination Plan to simplify dose modeling by restricting the Deep Soil DCGL to be the same as the Surface Soil DCGL. This change applied to areas within the original RA boundary in accordance with the LTP or other areas to which the summed contributions of LTP Table 6-11 have been conservatively applied. The change increased the Deep Soil DCGL for Co-60 from 0.48 pCi/g to 0.86 pCi/g to be consistent with the Surface Soil DCGL for Co-60. As a result, the dose contribution from Deep Soil increased by 0.9 mrem/yr from 1.14 mrem/yr to 2.04 mrem/yr. While this would theoretically allow the Deep Soil Cs-137 Surrogate DCGL to increase, it remained constrained to be the same as the Surface Soil Cs-137 Surrogate DCGL.

Deep soil is defined as soil at depths greater than 15cm. A separate calculation is required for deep soil because the NRC soil screening values apply to the top 15cm of soil only. The resident farmer is exposed to deep soil through the direct exposure pathway and groundwater. The deep soil could be brought to the surface at some time in

the future through the activities of the resident farmer. Therefore, to simplify dose modeling for deep soil brought to the surface , the original intent of the License Termination Plan was to have the same DCGL's for Deep Soil as for Surface Soil.

The deep soil dose model applies to areas inside the restricted area (RA). The area of the RA is approximately 10,000 m^2, which represents the size of the resident farmer survey unit and contains the other contaminated materials considered. Soil areas outside of the RA boundary do not require consideration of dose from any other materials unless contamination from materials other than surface soil is found to require remediation in order to meet the release criteria. If so, as a conservative measure, the contaminated material DCGL's found in LTP Table 6-11 as modified by Reference Nos. 7.17 and 7.18 may be applied, as applicable. In areas outside the RA boundary, soil uncovered as a result of the removal of concrete foundations/slabs, which would otherwise be at an elevation below the six-inch surface soil protocol, may be treated as surface soil, as long as remediation was not required in order to meet the release criteria.

The conceptual model for deep soil assumes a 15cm layer of uncontaminated soil for the purpose of calculating the additional direct radiation exposure. The 15cm cover represents the layer of surface soil. The direct radiation from residual contamination in the top 15cm soil layer was accounted for in the surface soil screening values. A very large volumetric source term was assumed, i.e., 28,500m^3, for the purpose of conservatively determining the potential for groundwater contamination from deep soil - that is, the portion of the 3 meter soil depth not including the 15cm surface soil (2.85 meters) times the area of the resident farmer's farm, which is the approximate area of the original restricted area (10,000 m^2). This is considered a bounding source term volume and essentially represents the entire volume of soil within the restricted area down to bedrock. After remediation and backfill, the actual remaining volume of deep soil with any significant contamination will be a very small fraction of 28,500m^3.

LTP Section 6.7.2 states: "Before applying the unity rule, the DCGLs, for areas inside the RA, will be adjusted to represent the Table 6-11 total surface soil dose, as opposed to 10 mrem/yr." As seen in Table 6-11, the dose from surface soil is limited because of the additional dose from the other contaminated materials on the site. The unity rule calculation will limit the surface soil dose by multiplying the $Cs\text{-}137_S$ and Co-60 DCGL's corresponding to 10 mrem/yr by a factor equal to the Table 6-11 total surface soil dose value divided by 10 mrem/yr. If the dose contribution from surface soil changes in the future, the multiplication factor will change accordingly."

In order to calculate the inside-RA surface soil DCGL for Co-60, the total surface soil contribution from Table 6-11 as modified by Reference Nos. 2, 3 and 4 (5.63 mrem/yr) is divided by the surface soil unitized dose factor for Co-60 from Table 6-7 (6.58 mrem/yr per pCi/g). This calculation is shown below:

$$\text{Surface Soil DCGL Co-60} = \frac{\text{Surface Soil Total Dose Commitment (mrem/yr) Table 6-11}}{\text{Unitized Co-60 Surface Soil Dose per pCi/g Table 6-7}}$$

$$\frac{5.63 \text{ mrem/yr}}{6.58 \text{ mrem/yr per pCi/g}} = 0.86 \text{ pCi/g}$$

Similarly, the inside-RA deep soil DCGL for Co-60 is calculated by dividing the total deep soil contribution from Table 6-11 as modified by Reference Nos. 7.17 and 7.18 (1.14 mrem/yr) by the deep soil unitized dose factor for Co-60 from Table 6-9 (2.40 mrem/yr per pCi/g). This calculation is shown below:

$$\text{Deep Soil DCGL Co-60} = \frac{\text{Deep Soil Total Dose Commitment (mrem/yr) Table 6-11}}{\text{Unitized Co-60 Deep Soil Dose per pCi/g Table 6-9}}$$

$$\frac{1.14 \text{ mrem/yr}}{2.40 \text{ mrem/yr per pCi/g}} = 0.48 \text{ pCi/g}$$

Therefore, in order to restore the objective of having the same DCGL for deep soil as for surface soil, the inside RA deep soil DCGL for Co-60 was increased from 0.48 pCi/g to 0.86 pCi/g, a factor of 1.79 (less than a factor of two.)

This resulted in an increase in the total deep soil dose commitment from 1.14 mrem/yr to 2.04 mrem/yr (an increase in 0.9 mrem/yr) and resulted in an increase in the total dose from all materials as described in Table 6-11 (as modified by Reference Nos. 2, 3 and 4). This increase is given below:

Non-containment dose from 7.44 mrem/yr to 8.34 mrem/yr
Containment dose from 7.27 mrem/yr to 8.17 mrem/yr

Thus the new inside-RA deep soil DCGL for Co-60 is calculated by dividing the total deep soil contribution from Table 6-11 as modified by this LTP Change (2.04 mrem/yr) by the deep soil unitized dose factor for Co-60 from Table 6-9 (2.40 mrem/yr per pCi/g). This calculation is shown below:

$$\text{Deep Soil DCGL Co-60} = \frac{\text{Deep Soil Total Dose Commitment (mrem/yr)}}{\text{Unitized Co-60 Deep Soil Dose per pCi/g}} =$$

$$\frac{2.04 \text{ mrem/yr}}{2.40 \text{ mrem/yr per pCi/g}} = 0.86 \text{ pCi/g}$$

This LTP change was evaluated against the criteria found in Maine Yankee License Condition 2.B.(10) and LTP Sections 1.4.1, 2.5.3.f, 3.2, 4.2.1, 5.5.2.a, and 5.6.4. The change to increase the inside-RA deep soil DCGL from 0.48 pCi/g to 0.86 pCi/g does not require prior NRC approval pursuant to the change processes described in the Maine Yankee Operating License or the License Termination Plan. The License Termination Plan does require that State of Maine be notified of the increase in the DCGL.

6.3 Final Status Survey Methodology

This section summarizes the implementation of the LTP Final Status Survey methodology for the survey units that are included in this report supporting the release of remaining non-ISFSI site land. Table 2 lists the key FSS design features for each survey unit. These design features include the survey unit classification and size, the standard deviation and Lower Boundary of the Gray Region (LBGR) used for determining the number of static measurement taken, the percent scan coverage, the Derived Concentration Guideline Limit (DCGL), the design $DCGL_{EMC}$[3], and the number of measurements required.

Table 2 - Survey Unit Final Parameters

Survey Unit	Class	Survey Unit Size (m^2)	Standard Deviation	LBGR	DCGL	Design $DCGL_{EMC}$	Units	No. Meas.	% Scan
FR-0111 Yard West Excavations									
6	1	812.7	1.33	1.2	2.39 0.86	4.54 1.63	pCi/g Cs-137 pCi/g Cs-60	40	100
7	1	1,336	1.33	1.2	2.39 0.86	4.06 1.46	pCi/g Cs-137 pCi/g Cs-60	40	100
8	1	1,528	1.33	1.2	2.39 0.86	3.94 1.42	pCi/g Cs-137 pCi/g Co-60	40	100
9	1	1,622	1.33	1.2	2.39 0.86	3.59 1.29	pCi/g Cs-137 pCi/g Co-60	40	100
10	1	1,332	1.33	1.2	2.39 0.86	3.59 1.29	pCi/g Cs-137 pCi/g Co-60	40	100
13	1	1,290.5	1.33	1.2	2.39 0.86	4.06 1.46	pCi/g Cs-137 pCi/g Co-60	40	100

[3] $DCGL_{EMC}$: Derived Concentration Guideline Limit for the Elevated Measurement Comparison

6.4 Final Status Survey Results

The methods used to determine the number of static measurements to be taken are described in the LTP and the specific survey unit release records provided in Attachment II.

Table 3 - Survey Unit FSS Results

Survey Unit	Class	No of Static Meas. Taken	Mean Sample (see units)	Maximum Sample (see units)	Standard Deviation (see units)	Units	No. Scan Elevated Areas (Note 1)
FR-0111 Yard West Excavations							
6 (Note 2)	1	41	1.58E-01	7.07E-01	1.60E-01	Unitized	0
7 (Note 2)	1	41	1.03E-01	6.24E-01	9.21E-02	Unitized	1
8	1	40	9.47E-02	7.41E-02	1.34E-01	pCi/g Cs-137	0
9 (Note 2)	1	43	9.94E-02	2.79E-01	3.51E-02	Unitized	0
10 (Note 2)	1	42	1.40E-01	1.70E+00	2.57E-01	Unitized	0
13	1	40	6.69E-02	1.01E+00	1.53E-01	pCi/g Cs-137	0

Note 1: This column (No. Scan Elevated Areas) indicates the number of verified scan alarms whose post investigation, as-left, contamination level exceeded the DCGL (or unity for multiple nuclides).

Note 2: Unity Rule values.

6.5 Survey Unit Conclusions

Maine Yankee concludes that this information is sufficient for the NRC to make a determination equivalent to 10 CFR 50.82(a)(11) regarding the survey units contained in this submittal. The surveys for these survey units and associated documentation demonstrate that these areas of the facility and site are suitable for release in accordance with the criteria for decommissioning in 10 CFR part 20, subpart E by meeting a site release criteria of 10 millirem TEDE per year over background (all pathways) with no more than 4 millirem (as distinguishable from background) TEDE per year from groundwater sources of drinking water in accordance with the approved License Termination Plan.

7.0 References

7.1 Maine Yankee Letter to USNRC dated October 15, 2002, "Revision 3, Maine Yankee's License Termination Plan", MN-02-048
7.2 USNRC Letter to Maine Yankee dated February 28, 2003, "Issuance of Amendment No. 168 to Facility Operating License No. DPR-36 - Maine Yankee Atomic Power Station (TAC No. M8000) - Approval of the MY License Termination Plan
7.3 Maine Yankee Letter to the USNRC, MN-04-020, dated March 15, 2004, License Amendment Request: Release of Non-ISFSI Site Land, Proposed Change No. 218
7.4 Maine Yankee Letter to the USNRC, MN-04-031, dated May 6, 2004, Release of Non-ISFSI Site Land - FSS Final Report No. 1A, Proposed Change No. 218, Supplement 1
7.5 USNRC, NUREG 1727 "NMSS Decommissioning Standard Review Plan"
7.6 USNRC, NUREG 1757 "Consolidated NMSS Decommissioning Guidance"
7.7 USNRC, NUREG 1575 "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)" Revision 1 dated October 18, 2000, supplemented June 2001
7.8 Maine Yankee Letter to the USNRC, MN-04-044, dated August 12, 2004, Release of Non-ISFSI Site Land - Resubmittal of FSS Final Report No. 1, Proposed Change No. 218, Supplement 2
7.9 Maine Yankee Letter to the USNRC, MN-04-047, dated September 2, 2004, License Amendment Request - Release of Non-ISFSI Site Lands, Proposed Change No. 218, Supplement 3
7.10 Maine Yankee Letter to the USNRC, MN-04-49, dated September 15, 2004, Release of Non-ISFSI Site Land - - FSS Final Report No. 2, Proposed Change No. 218, Supplement 4
7.11 Maine Yankee Letter to the USNRC, MN-04-052, dated October 12, 2004, Release of Non-ISFSI Site Land - FSS Final Report No. 3, Proposed Change No. 218, Supplement 5
7.12 Maine Yankee Letter to the USNRC, MN-04-053, dated October 14, 2004, Release of Non-ISFSI Site Land – Addendum to FSS Final Report No. 1, Proposed Change No. 218, Supplement 6
7.13 Maine Yankee Letter to the USNRC, MN-04-056, dated November 17, 2004, Release of Non-ISFSI Site Land – FSS Final Report No. 4, Proposed Change No. 218, Supplement 7
7.14 Maine Yankee Letter to the USNRC, MN-04-035, dated May 13, 2004, Area Classification Change: Containment Foundation Drain
7.15 Maine Yankee Letter to the USNRC, MN-02-063, dated December 12, 2002, Update on Forebay Dike Coring Results and Associated Changes to LTP Attachment 2H (LTP Revision 3 Addenda)
7.16 Maine Yankee Letter to the USNRC, MN-03-004, dated January 21, 2003, Forebay Remediation Plan Phase 2
7.17 Maine Yankee Letter to the USNRC, MN-03-049, dated September 11, 2003, Proposed Change: Revised Activated Concrete DCGL and More Realistic Activated Concrete Dose Modeling – License Condition 2.B.(10), License Termination
7.18 USNRC Letter to Maine Yankee dated February 18, 2004, Issuance of Amendment No. 170 to Facility Operating License No. DPR-36 – Maine Yankee Atomic Power Station (TAC NO. M8000)
7.19 Maine Yankee Letter to the USNRC, MN-04-059, dated December 7, 2004, Release of Non-ISFSI Site Land – FSS Final Report No. 5, Proposed Change No. 218, Supplement 9
7.20 Maine Yankee Letter to the USNRC, MN-03-051, dated September 3, 2003, Technical

Basis Document: Forebay FSS Survey Measurement Methods (In Situ Gamma Spectroscopy) - 30 Day Notice LTP Requirement

7.21 Maine Yankee Letter to the USNRC, MN-03-067, dated October 21, 2003, Maine Yankee Response to NRC and State of Maine Comments on the Technical Basis Document: Forebay FSS Survey Measurement Methods (In Situ Gamma Spectroscopy)

7.22 Maine Yankee Letter to the USNRC, MN-02-063, dated December 12, 2002, Update on Forebay Dike Coring Results and Associated Changes to LTP Attachment 2H (LTP Revision 3 Addenda)

7.23 Maine Yankee Letter to the USNRC, MN-04-060, dated December 22, 2004, Release of Non-ISFSI Site Land – FSS Final Report No. 6, Proposed Change No. 218, Supplement 10

7.24 Maine Yankee Letter to the USNRC, MN-04-061, dated December 23, 2004, Response to NRC RAIs on FSS Report No. 2, Proposed Change No. 218, Supplement 11

License Amendment Request: Release of Non-ISFSI Site Lands
ATTACHMENT II
Final Status Survey Release Records

1. FR-0111-SU-6 — Yard West Excavations - An excavation in the southwest corner of the Restricted Area. The survey unit extended from the west side of FR 0111 Survey Unit 5 to the west Restricted Area fence line.
2. FR-0111-SU-7 — Yard West Excavations - An excavation in the southeast corner of the original Restricted Area "backyard". The area extended along the south boundary of FR 0111 Survey Units 3 and 4 to the west edge of the Service Building slab and south to the Restricted Area boundary.
3. FR-0111-SU-8 — Yard West Excavations - An excavation in the northwest corner of the original Restricted Area "backyard". The area was bordered on the north by the Restricted Area fence, on the west by the 115 kV switchyard, on the east by FR 0111 Survey Units 11 and 12, and on the south by FR 0111 Survey Unit 9.
4. FR-0111-SU-9 — Yard West Excavations - An excavation centered along the west boundary of the Restricted Area between outfall 6 and the Restricted Area roadway. The area was bordered on the north by FR 0111 Survey Unit 8, on the south by FR 0111 Survey Unit 6, on the east by FR 0111 Survey Units 10 and 11, and on the west by the Restricted Area fence.
5. FR-0111-SU-10 — Yard West Excavations - An excavation located southwest of the former Containment Building encompassing portions of areas that were originally surveyed under packages FR 0111 Survey Units 4 and 5 as well as FA 1900 Survey Unit 1 (HV-7&9). The area was bordered on the north by FR 0111 Survey Unit 11, on the south by FR 0111 Survey Units 4 and 5, on the east by FR 0111 Survey Units 13 and 14, and on the west by FR 0111 Survey Unit 9.
6. FR-0111-SU-13 — Yard West Excavations - An excavation located southeast of the former Containment Building encompassing portions of areas that were originally surveyed under packages FR 0111 Survey Units 3, 4 and 7. The rectangular area was bordered on the north by FR 0111 Survey Unit 14, on the south by FR 0111 Survey Units 3, 4 and 7, on the west by FR 0111 Survey Unit 10 and on the east by FR 0111 Survey Units 17 and 18

MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0111 YARD WEST EXCAVATIONS
SURVEY UNIT 6

Prepared By:	D Anderson **FSS Engineer** - Signature D. ANDERSON Printed Name	Date: 1/5/05
Reviewed By:	Larry Dockins **FSS Specialist** - Signature Larry Dockins Printed Name	Date: 1/5/05
Reviewed By:	 **Independent Review** - Signature W J Cooper Printed Name	Date: 1/4/05
Approved By:	 **Superintendent, FSS** - Signature George P Tilbury Printed Name	Date: 1/18/05
Approved By:	 **FSS, MOP** - Signature JAMES R. ROGER Printed Name	Date: 1/19/05

MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0111 YARD WEST EXCAVATIONS
SURVEY UNIT 6

A. SURVEY UNIT DESCRIPTION

FR 0111 Yard West Excavations Survey Unit 6 was a 812.7 m^2 excavation in the southwest corner of the Restricted Area. The survey unit extended from the west side of FR 0111 Survey Unit 5 to the west Restricted Area fence line and was located at coordinates 407,450 N and 623,600 E using Maine State Coordinate System (West Zone) NAD 1927. The location of the survey unit in relation to the Containment Building and the surrounding FR 0111 survey units is shown on map FR0111U6-SITE (Attachment 1).

Survey Unit 6 excavation was created as a result of the removal of contaminated sub-surface soil from locations S020 and S103 as identified in Characterization Package CR 5000. The remaining excavation was 2.5 meters (8 ft.) to 3 meters (10 ft.) below grade with one hole in the northeast corner of the survey unit that extended to 3.7 (12 ft.) meters below grade. An abstract of the terrain levels and excavated depths is shown on map FR0111U6-INFO (Attachment 1).

B. SURVEY UNIT DESIGN INFORMATION

Survey Unit 6 met the LTP Revision 3 definition for a Class 1 survey unit. The survey unit design parameters are shown in Table 1. Given a relative shift of 0.8, it was determined that 40 direct measurements were required for the Sign Test. Because the measurement locations were based on a systematic square grid with a random start point, the N=40 design led to a survey unit map with 41 locations. The direct point locations are illustrated on map FR0111U6-DIRT (Attachment 1). Direct measurements (soil samples) were collected from required locations and analyzed with laboratory gamma spectroscopy instrumentation.

In accordance with the LTP, scans covering 100% of the 812.7 m^2 area were required for the Class 1 survey unit. This was accomplished by use of an *in situ* gamma spectroscopy detector (ISOCS) configured at a 3-meter distance from the surface to obtain overlapping 28-m^2 fields of view. Locations of the 44 survey scans are shown on map FR0111U6-SCANS.

Additional ISOCS scans were performed on the steep sloped surfaces in the southwest corner of the survey unit. A total of 8 horizontal (or perpendicular to the surface) gamma scans were performed using the 90-degree collimator at a distance of 2 meters from the surfaces to obtain overlapping 12 m^2 fields of view. Locations of horizontal scans are provided on map FR0111U6-VERTICAL (Attachment 1).

The combination of all ISOCS scans ensured 100% scan coverage of all exposed surfaces within Survey Unit 6. The survey instruments used 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, the investigation level, and the $DCGL_{EMC}$. As shown in this table, the scan MDC is less than the scan investigation level, thus providing high confidence (95% or higher) that an elevated area would be detected in the scanning process. Further, since the investigation level was always less than the design $DCGL_{EMC}$, no EMC sample size adjustment was necessary.

TABLE 1

SURVEY UNIT DESIGN PARAMETERS

Survey Unit	Design Criteria	Basis
Area	812.7 m^2	Class 1, < 2,000 m^2
Number of Direct Measurements Required	40	Based on an LBGR of 1.2 pCi/g, sigma[1] of 1.33 pCi/g, and a relative shift of 0.8. Type I = Type II = 0.05
Sample Area	20.32 m^2	812.7 m^2 / 40 = 20.32 m^2
Sample Grid Spacing	4.5 m	$(20.32)^{1/2}$
Scan Grid Area	ISOCS scan at various distances	See Section B
Area Factor	1.9	Class 1 Area, LTP Table 6-12
Scan Area	812.7 m^2	Class 1 Area – 100%
Scan Investigation Level	1.0 pCi/g Cs-137 0.36 pCi/g Co-60	ISOCS investigation levels with detector at 3-meter height (Reference 6)
	2.2 pCi/g Cs-137 0.8 pCi/g Co-60	ISOCS investigation levels with detector at 2-meter height (Reference 6)
DCGL	2.39 pCi/g Cs-137 0.86 pCi/g Co-60	References 4 and 7
Design $DCGL_{EMC}$	4.54 pCi/g Cs-137 1.63 pCi/g Co-60	DCGL x Area Factor for Class 1 survey unit, per LTP Section 5.6.3

C. SURVEY RESULTS

A total of 41 direct measurements were performed in Survey Unit 6. The results are presented in Table 2. All direct measurements were below the DCGL.

ISOCS gamma scans were performed at 44 locations using an investigation level of 1.0 pCi/g Cs-137 and 0.36 pCi/g Co-60. In addition, ISOCS gamma scans were performed at 8 locations using an investigation level of 2.2 pCi/g Cs-137 and 0.8 pCi/g Co-60. The gamma scans were performed for a sufficient count time to achieve a Minimum Detectable Activity of approximately 25% of the DCGL. All identified scan activity levels were below the investigation levels. Therefore, no investigations were required.

[1] LTP Revision 3, Table 5-1C for RCA Yard West, R0100.

TABLE 2
DIRECT MEASUREMENTS

Sample Number	Cs-137 (pCi/g)	Uncertainty (pCi/g)	Co-60 (pCi/g)	Uncertainty (pCi/g)	Unitized Value of Unity Rule
FR0111061S001	< 7.23E-02		< 6.17E-02		1.02E-01
FR0111061S002	< 6.56E-02		< 5.34E-02		8.95E-02
FR0111061S003	**4.91E-01**	5.94E-02	< 4.96E-02		2.63E-01
FR0111061S004	**1.54E+00**	1.26E-01	< 5.37E-02		7.07E-01
FR0111061S005	**4.36E-01**	5.63E-02	< 5.41E-02		2.45E-01
FR0111061S006	< 6.48E-02		< 5.78E-02		9.43E-02
FR0111061S007	**1.11E-01**	3.05E-02	**1.35E-01**	2.56E-02	2.04E-01
FR0111061S008	**1.18E-01**	3.75E-02	< 4.99E-02		1.07E-01
FR0111061S009	**3.49E-01**	4.52E-02	< 4.58E-02		1.99E-01
FR0111061S010	< 7.92E-02		< 7.19E-02		1.17E-01
FR0111061S011	< 4.74E-02		< 5.32E-02		8.17E-02
FR0111061S012	**4.79E-01**	6.03E-02	**4.14E-01**	4.28E-02	6.82E-01
FR0111061S013	< 4.46E-02		< 4.77E-02		7.41E-02
FR0111061S014	< 5.76E-02		< 4.88E-02		8.08E-02
FR0111061S015	< 6.39E-02		< 6.21E-02		9.89E-02
FR0111061S016	< 6.11E-02		< 4.91E-02		8.27E-02
FR0111061S017	< 4.15E-02		< 4.56E-02		7.04E-02
FR0111061S018	< 5.70E-02		< 6.37E-02		9.79E-02
FR0111061S019	< 4.25E-02		< 5.23E-02		7.86E-02
FR0111061S020	**9.85E-02**	3.68E-02	< 5.71E-02		1.08E-01
FR0111061S021	**6.23E-02**	2.98E-02	< 7.09E-02		1.08E-01
FR0111061S022	< 9.67E-02		< 7.08E-02		1.23E-01
FR0111061S023	< 4.80E-02		< 4.79E-02		7.58E-02
FR0111061S024	< 6.14E-02		< 6.02E-02		9.57E-02
FR0111061S025	**1.07E-01**	3.12E-02	< 6.01E-02		1.15E-01
FR0111061S026	< 7.13E-02		< 7.00E-02		1.11E-01
FR0111061S027	**1.60E-01**	3.61E-02	< 5.60E-02		1.32E-01
FR0111061S028	**4.25E-01**	7.25E-02	< 6.81E-02		2.57E-01
FR0111061S029	< 5.94E-02		< 5.61E-02		9.01E-02
FR0111061S030	**1.23E-01**	3.30E-02	< 5.14E-02		1.11E-01
FR0111061S031	< 6.00E-02		< 6.19E-02		9.71E-02
FR0111061S032	< 5.04E-02		< 6.51E-02		9.68E-02
FR0111061S033	**8.85E-02**	3.88E-02	< 5.48E-02		1.01E-01
FR0111061S034	< 5.19E-02		< 6.34E-02		9.54E-02
FR0111061S035	< 4.37E-02		< 4.91E-02		7.54E-02
FR0111061S036	< 6.41E-02		< 6.78E-02		1.06E-01
FR0111061S037	**1.47E+00**	1.29E-01	< 7.43E-02		7.01E-01
FR0111061S038	< 6.05E-02		< 5.31E-02		8.71E-02
FR0111061S039	< 7.43E-02		< 6.29E-02		1.04E-01
FR0111061S040	< 6.29E-02		< 5.86E-02		9.45E-02
FR0111061S041	**1.71E-01**	3.40E-02	< 4.97E-02		1.29E-01
Mean	**1.88E-01**		**6.83E-02**		**1.58E-01**
Median	**6.56E-02**		**5.71E-02**		**1.02E-01**
Standard Deviation	**3.26E-01**		**5.72E-02**		**1.60E-01**
Range	**4.15E-02 to 1.54E+00**		**4.56E-02 to 4.14E-01**		**7.04E-02 to 7.07E-01**

"<" indicates MDA value. Bold indicates positive detection value.

D. SURVEY UNIT INVESTIGATIONS PERFORMED AND RESULTS

No investigations were required.

E. SURVEY UNIT DATA ASSESSMENT

An analysis of the direct sample measurement results, including the mean, median, standard deviation, and sample result range, is provided in Table 2. Of the 41 soil samples collected, 16 identified Cs-137 activity below the DCGL value of 2.39 pCi/g while 2 samples identified Co-60 activity below the DCGL value of 0.86 pCi/g. All other values were below the MDA. Identified sample activities or Minimum Detectable Activities are listed in Table 2. The mean and median activities were less than the DCGL for both Co-60 and Cs-137. The highest reported value was less than 75% of the unitized DCGL.

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 mean fallout Cs-137 value (0.19 pCi/g)[2] for disturbed soil from the survey unit sample mean activity (0.188 pCi/g). This would equate to an annual dose rate of 0.0 mrem/year. Taking into account the average residual contamination level for Co-60, the annual dose rate would equate to 0.61 mrem/year[3]. However, for purposes of demonstrating compliance with the radiological criteria for license termination and the enhanced State criteria, background activity was not subtracted from the 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 (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. The sample standard deviation is smaller than the design sigma; therefore no additional samples were required.

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[2] See Attachment E to Maine Yankee Procedure PMP 6.7.8 (Reference 5).

[3] This annual dose equivalent is based on LTP Table 6-11 which shows the RA contaminated soil contribution (for soils contaminated at the DCGL) to be 7.67 mrem/y. Therefore, the annual dose rate would equate to

$$Annual\ Dose\ Rate = 7.67\ x \left(\frac{0.0683}{0.86}\right) = 0.61\ mrem/y$$

2. The Quantile Plot was generated from the unity value 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 well below the DCGLs of 2.39 pCi/g for Cs-137 and 0.86 pCi/g for Co-60 for land inside the restricted area.

3. A Histogram Plot was also developed based on the unity values. This plot shows a log-normal distribution.

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 1 land survey area; the FSS results were consistent with that classification. The direct measurement sample standard deviation was less than the design sigma. Thus, a sufficient number of sample measurements were taken and no additional measurements were required.

H. LTP CHANGES SUBSEQUENT TO SURVEY UNIT FSS

The FSS of Survey Unit 6 was designed, performed and evaluated in the August-September 2004 time frame. The design was performed to the criteria of the LTP Revision 3 (References 2 and 4). LTP Change No. 05-001 (Reference 7) modified the Table 6-11, "Contaminated Material DCGL," to reflect an increased Deep Soil DCGL of 0.86 pCi/g for Co-60. As a result, the retrospective dose calculation was modified to include 2.04 mrem/y from Deep Soil and 5.63 mrem/y from Surface Soil. No subsequent LTP changes with potential impact to this survey unit need to be evaluated.

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 DCGLs of 2.39 pCi/g Cs-137 and 0.86 pCi/g Co-60.

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 log-normal distribution.

The scan survey design for this survey unit was developed in accordance with the LTP Revision 3 Addenda (References 2 and 4) with significant aspects of the design discussed in Section B and Table 1. ISOCS scans performed at a distance of 3 meters in a systematic grid pattern throughout the survey unit did not identify activity above the scan investigation levels of 1.0 pCi/g Cs-137 and 0.36 pCi/g Co-60. Scans conducted on sloped surfaces did not identify activity above the scan investigation levels of 2.2 pCi/g Cs-137 and 0.8 pCi/g Co-60 for those scans performed at a distance of 2 meters.

It is concluded that FR 0111 Survey Unit 6 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 and Addenda provided by Maine Yankee letter to the NRC, MN-02-061, dated November 26, 2002

2. NRC letter to Maine Yankee, dated February 28, 2003

3. Maine Yankee letter to the NRC, MN-03-049, dated September 11, 2003 (LTP Supplement to LTP Revision 3)

4. Issuance of License Amendment No. 170, NRC letter to Maine Yankee, dated February 18, 2004

5. Maine Yankee PMP 6.7.8, FSS Data Processing and Reporting, Attachment E, Approach for Dealing With Background Radioactivity for Maine Yankee Final Status Surveys

6. Maine Yankee Calculation No. EC-003-04, Use of Canberra In Situ Object Counting System (ISOCS) for FSS Surveys

7. Maine Yankee LTP Change Number 05-001, Deep Soil Co-60 DCGL

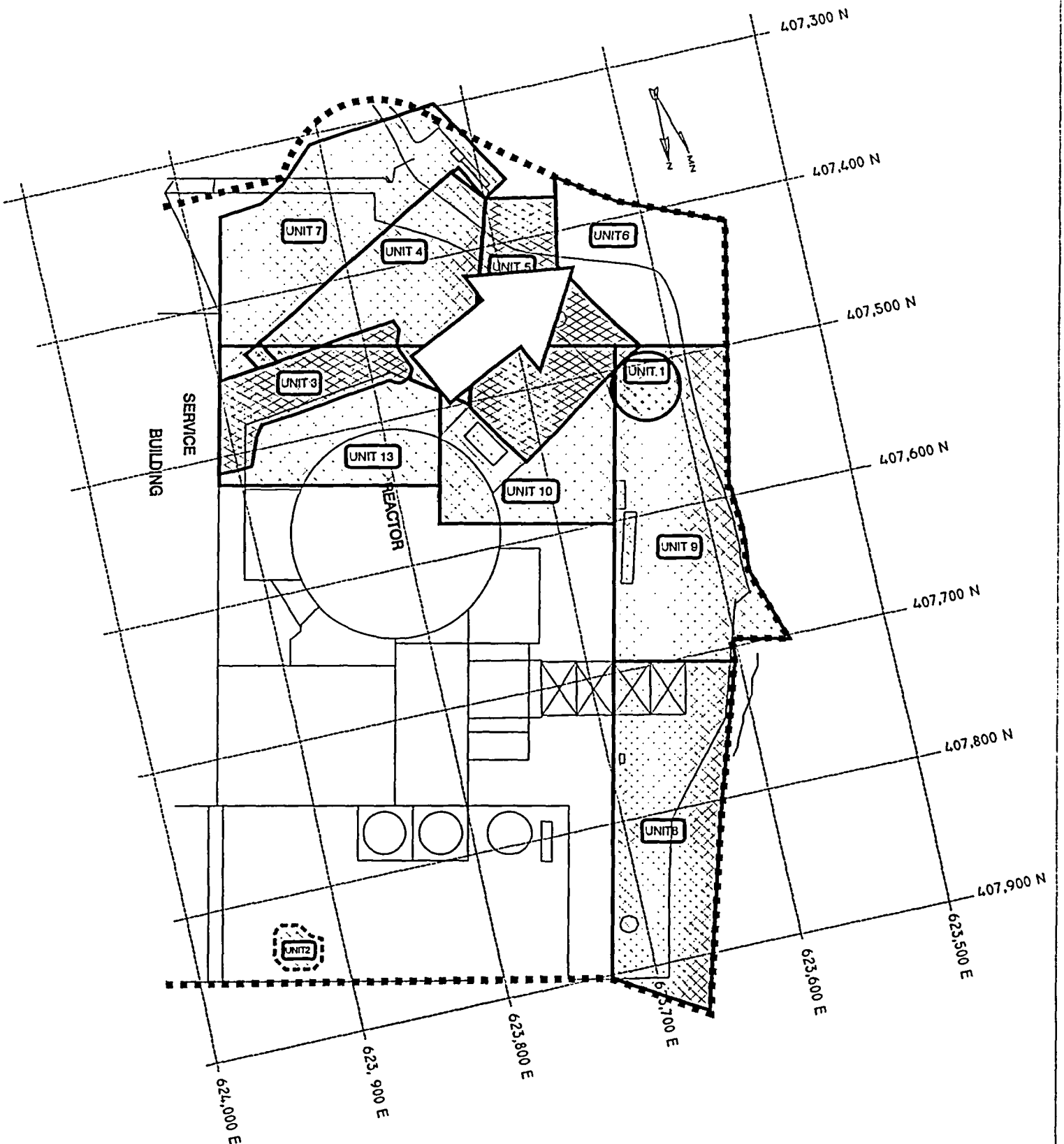
Attachment 1

Survey Unit Maps

Maine Yankee Decommissioning Team

Maine Yankee Decommissioning Project Survey Map Map ID# FR0111U6-SITE

Survey Type: Characterization Turnover ■ Final Status Survey Survey Area Name: Site Locator

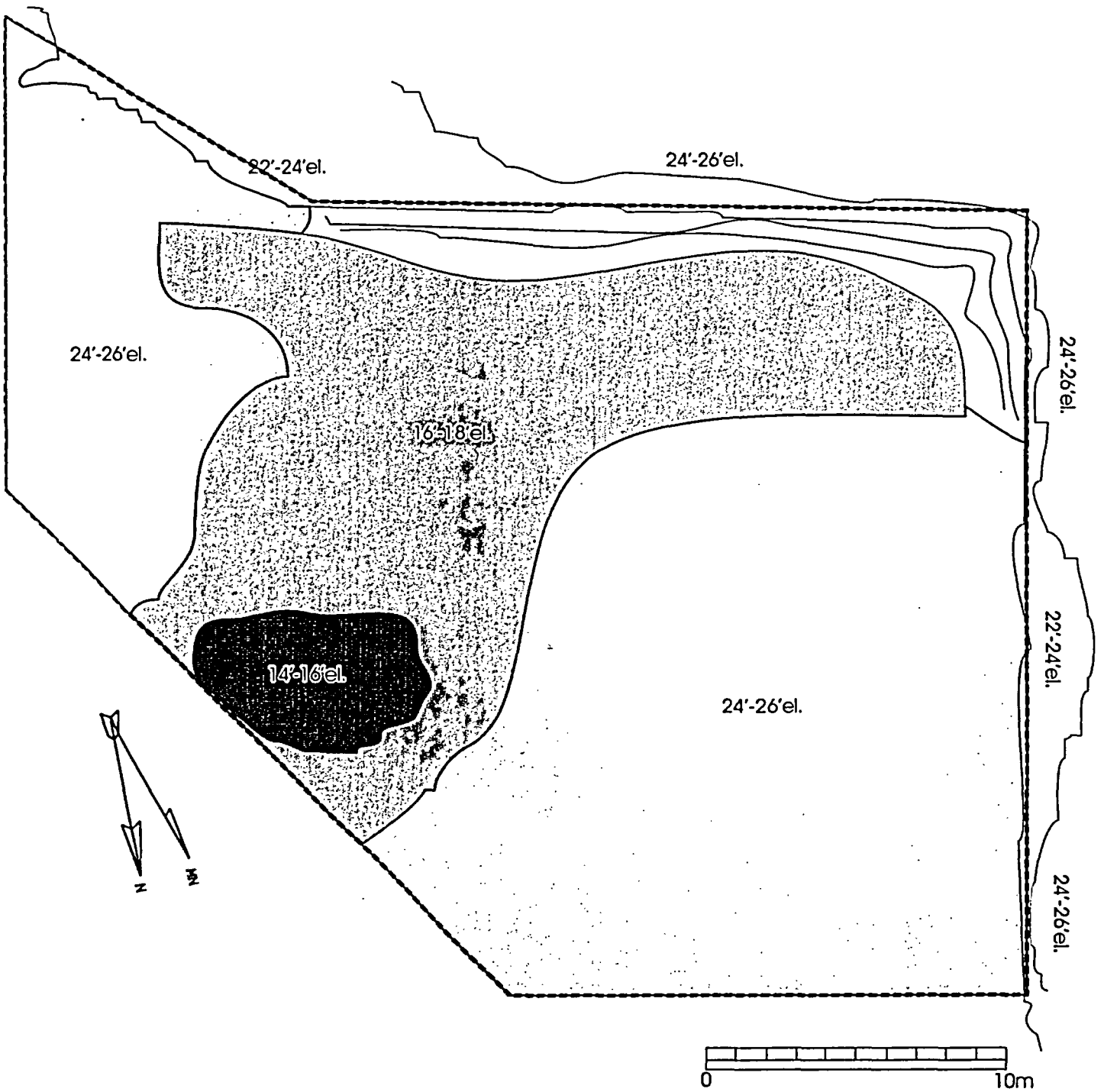


Maine Yankee Decommissioning Team

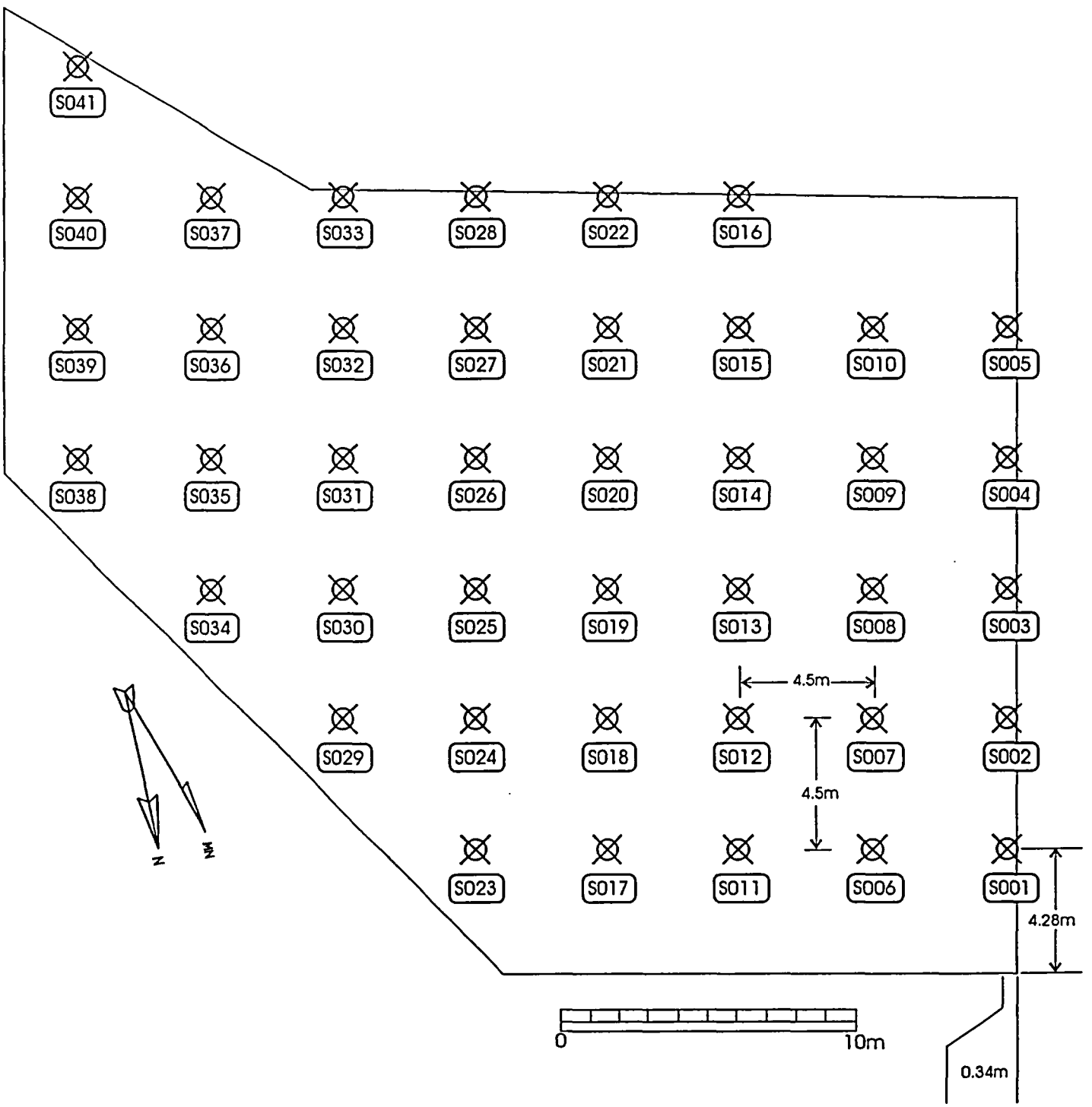
Maine Yankee Decommissioning Project Survey Map Map ID# FR0111U6-INFO

Survey Type: Characterization Turnover ■ Final Status Survey Survey Area Name: Excavation Depths

Prepared By: Larry N. Dockins Date: 8/23/04



Maine Yankee Decommissioning Team	***Maine Yankee Decommissioning Project Survey Map***	Map ID# FR0111U6-DIRT
Survey Type: Characterization ☐ Turnover ■ Final Status Survey	Survey Area Name: Directs - Volumetric	
	Prepared By: Larry N. Dockins Date: 8/23/04	



Maine Yankee Decommissioning Team

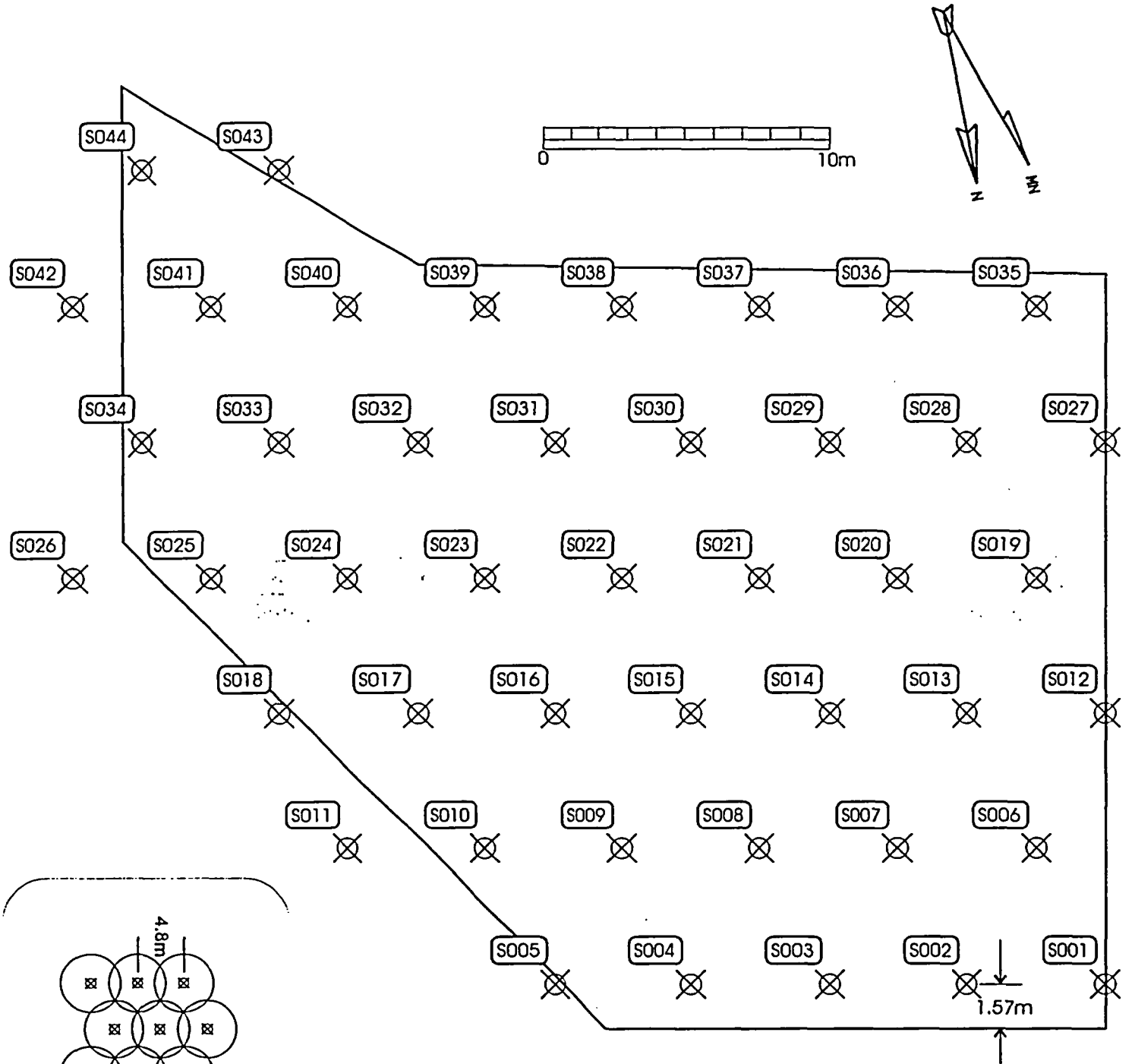
Maine Yankee Decommissioning Project Survey Map

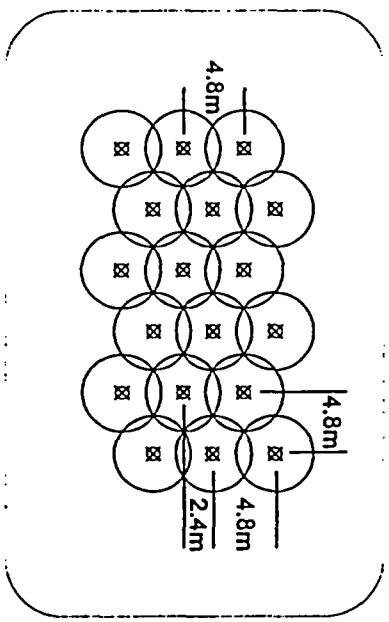
Map ID# FR0111U6-SCANS

Survey Type: Characterization Turnover ■ Final Status Survey

Survey Area Name: Area Scans - ISOCS

Prepared By: Larry N. Dockins Date: 8/24/04





Maine Yankee
Decommissioning Team

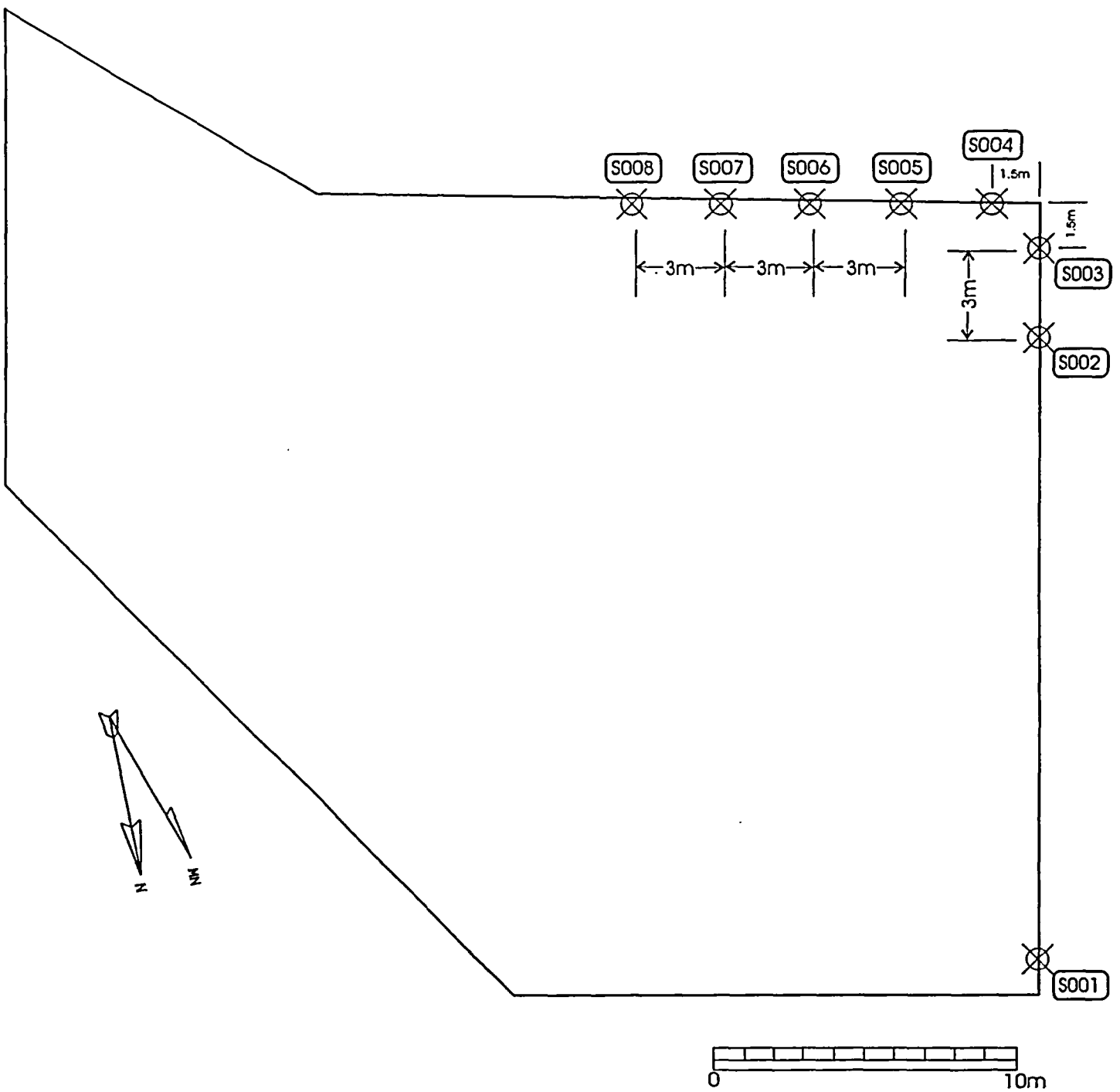
Maine Yankee Decommissioning Project Survey Map

Map ID# FR0111U6-VERTICAL

Survey Type: Characterization Turnover ■ Final Status Survey

Survey Area Name: Vertical Scan Locations

Prepared By: Larry N. Dockins Date: 8/24/04



Attachment 2

Survey Unit Instrumentation

TABLE 2-1

INSTRUMENT INFORMATION

ISOCS Detectors (Field Measurements)

Detector No.	MDC (pCi/g)
7722	0.11 to 0.40
7607	0.11 to 0.40

HPGe Detectors (Laboratory Analysis)

Detector No.	MDC (pCi/g)
FSS1	0.04 to 0.1
FSS2	0.04 to 0.1

TABLE 2-2

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

Detector	Instrument	Comments
Scan MDC	ISOCS: 0.11 to 0.4 pCi/g	~25% DCGL
DCGL	2.39 pCi/g Cs-137 0.86 pCi/g Co-60	Approved DCGL for land areas inside the Restricted Area, (References 4 and 7)
Investigation Level (ISOCS @ 3 m)	1.0 pCi/g Cs-137 0.36 pCi/g Co-60	(Reference 6)
Investigation Level (ISOCS @ 2 m)	2.2 pCi/g Cs-137 0.8 pCi/g Co-60	(Reference 6)
Design $DCGL_{EMC}$	4.54 pCi/g Cs-137 1.63 pCi/g Co-60	DCGL x Area Factor for Class 1 survey unit, per LTP Section 5.6.3

Attachment 3

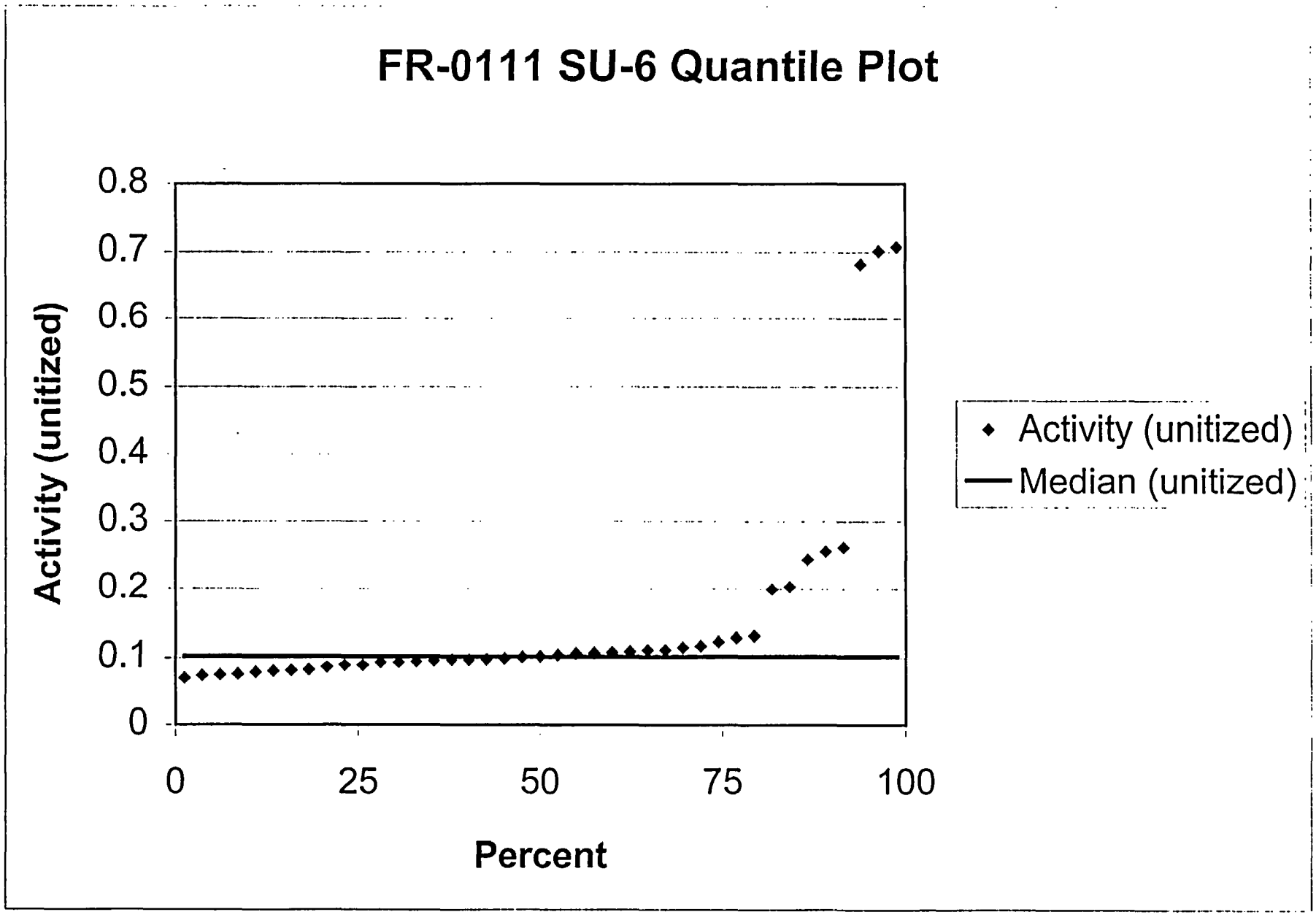
Investigation Table
(No Investigations Performed)

Attachment 4

Statistical Data

Survey Package FR0111 Unit 6 UNITY Soil Sign Test Summary

Evaluation Input Values		Comments
Survey Package:	FR0111	Yard West Excavations
Survey Unit:	06	
Evaluator:	DA	
$DCGL_w$:	1.00E+00	Unity
$DCGL_{emc}$:	1.90E+00	AF x Unity
LBGR:	5.00E-01	50% of DCGL
Sigma:	5.56E-01	Unitized (1.33 pCi/g / 2.39 pCi/g)
Type I error:	0.05	
Type II error:	0.05	
Nuclide:	UNITY	
Soil Type:	N/A	
Calculated Values		**Comments**
$Z_{1-\alpha}$:	1.645	
$Z_{1-\beta}$:	1.645	
Sign p:	0.788145	
Calculated Relative Shift:	0.8	
Relative Shift Used:	0.8	Uses 3.0 if Relative Shift is >3
N-Value:	33	
N-Value+20%:	40	
Sample Data Values		**Comments**
Number of Samples:	41	
Median:	1.02E-01	
Mean:	1.58E-01	
Net Sample Standard Deviation:	1.60E-01	
Total Standard Deviation:	1.60E-01	
Maximum:	7.07E-01	
Sign Test Results		**Comments**
Adjusted N Value:	41	
S+ Value:	41	
Critical Value:	26	
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	Survey Unit Passes


FR-0111 SU-6 Quantile Plot
Activity (unitized)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
25
50
75
100
Percent
Activity (unitized)
Median (unitized)

One-Sample T-Test Report

Page/Date/Time	2 1/17/05 7:25:12 AM
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Variable	C2

Plots Section

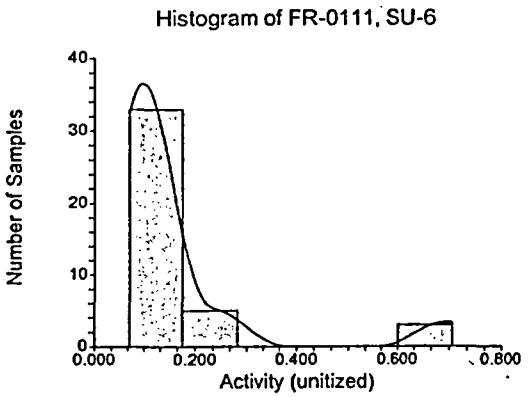
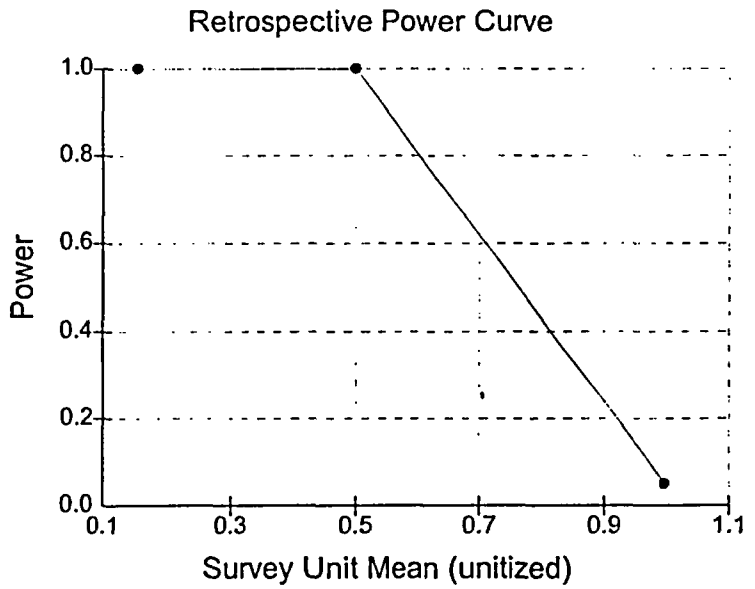


Chart Section



MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0111 YARD WEST EXCAVATIONS
SURVEY UNIT 7

Prepared By:	D. Anderson **FSS Engineer** - Signature D. ANDERSON Printed Name	Date: 1/5/05
Reviewed By:	 **FSS Specialist** - Signature Larry Dockins Printed Name	Date: 1/5/05
Reviewed By:	 **Independent Review** - Signature W J Cooper Printed Name	Date: 1/11/05
Approved By:	 **Superintendent, FSS** - Signature George Fillebrown Printed Name	Date: 1/20/05
Approved By:	 **FSS, MOP** - Signature James R. Packer Printed Name	Date: 1/20/05

MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0111 YARD WEST EXCAVATIONS
SURVEY UNIT 7

A. SURVEY UNIT DESCRIPTION

FR 0111 Yard West Excavations Survey Unit 7 occupied the southeast corner of the original Restricted Area "backyard". The 1,336 m^2 area extended along the south boundary of FR 0111 Survey Units 3 and 4 to the west edge of the Service Building slab and south to the Restricted Area boundary. The survey unit was located at coordinates 407,350N and 623,800E using Maine State Coordinate System (West Zone) NAD 1927. The location of the survey unit in relation to the Containment Building and the surrounding FR 0111 survey units is shown on Map FR0111U7-SITE (Attachment 1).

Survey Unit 7 excavation was created by the removal of contaminated sub-surface soil from locations S007, S010, and S011 as identified in Characterization Package CR 5000. The south end of the survey unit overlapped into areas previously surveyed as part of the Forebay seal pit (FR 0400) and Foxbird Island (FR 1000). Elevations within the excavated area generally ranged from 14-ft. to 18-ft. Holes on the north and west boundaries of the survey unit extended down to an approximate grade of El. 8-ft. to 12-ft. An abstract of the terrain levels and excavated depths is shown on map FR0111U7-INFO (Attachment 1).

B. SURVEY UNIT DESIGN INFORMATION

Survey Unit 7 met the LTP Revision 3 definition for a Class 1 survey unit. The survey unit design parameters are shown in Table 1. Given a relative shift of 0.8, it was determined that 40 direct measurements were required for the Sign Test. Because the measurement locations were based on a systematic square grid with a random start point, the N=40 design led to a survey unit map with 41 locations. The direct point locations are illustrated on map FR0111U7-DIRT (Attachment 1). Direct measurements (soil samples) were collected from required locations and analyzed with laboratory gamma spectroscopy instrumentation.

In accordance with the LTP, scans covering 100% of the 1,336 m^2 area were required for the Class 1 survey unit. This was accomplished by use of an *in situ* gamma spectroscopy detector (ISOCS) configured at a 3-meter distance from the surface to obtain overlapping 28-m^2 fields of view. Locations of the 70 survey scans are shown on map FR0111U7-SCANS.

Additional ISOCS scans were performed in the following geometries to ensure all terrain levels within the survey unit were scanned:

- Thirteen ISOCS scans were performed on the concrete for the former circulating water pipe encasement in the northeast portion of the survey unit. Ten vertical gamma scans were performed on the horizontal concrete slab surface using the 90-degree collimator at a distance of 2 meters. Three horizontal gamma scans were performed on the vertical concrete slab surfaces using the 90-degree collimator at a distance of 2 meters. Gamma scans were performed to obtain overlapping 12 m^2 fields of view. Locations of the gamma scans are provided on map FR0111U7-CONC (Attachment 1).

- Horizontal ISOCS scans were performed on the vertical bank surfaces along the southeast border of the survey unit using the 90-degree collimator at a distance of 2 meters from the soil to obtain 12 m^2 fields of view. Locations of the 5 gamma scans are provided on map FR0111U7-VERT (Attachment 1).

- An ISOCS scan was performed at the plane of the excavation on the west boundary of the survey unit using the 180-degree collimator to obtain 16.7 m^2 field of view. Location of the gamma scan is provided on map FR0111U7-HOLE (Attachment 1).

The combination of all ISOCS scans ensured 100% scan coverage of all exposed surfaces within Survey Unit 7. The survey instruments used 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, the investigation level, and the $DCGL_{EMC}$. As shown in this table, the scan MDC is less than the scan investigation level, thus providing high confidence (95% or higher) that an elevated area would be detected in the scanning process. Further, since the investigation level was always less than the design $DCGL_{EMC}$, no EMC sample size adjustment was necessary.

TABLE 1

SURVEY UNIT DESIGN PARAMETERS

Survey Unit	Design Criteria	Basis
Area	1,336 m^2	Class 1, < 2,000 m^2
Number of Direct Measurements Required	40	Based on an LBGR of 1.2 pCi/g, sigma[1] of 1.33 pCi/g and a relative shift of 0.8. Type I = Type II = 0.05
Sample Area	33.4 m^2	1,336 m^2 / 40 = 33.4 m^2
Sample Grid Spacing	5.78 m	$(33.4)^{1/2}$
Scan Grid Area	ISOCS scan at various distances	See Section B
Area Factor	1.7	Class 1 Area, LTP Table 6-12
Scan Area	1,336 m^2	Class 1 Area – 100%
Scan Investigation Level	1.0 pCi/g Cs-137 0.36 pCi/g Co-60	ISOCS investigation levels with detector at 3-meter height and for hole geometry. (Reference 6)
	2.2 pCi/g Cs-137 0.8 pCi/g Co-60	ISOCS investigation levels with detector at 2-meter height (Reference 6)
DCGL	2.39 pCi/g Cs-137 0.86 pCi/g Co-60	References 4 and 7
Design $DCGL_{EMC}$	4.06 pCi/g Cs-137 1.46 pCi/g Co-60	DCGL x Area Factor for Class 1 survey unit, per LTP Section 5.6.3

C. SURVEY RESULTS

A total of 41 direct measurements were performed in Survey Unit 7. The results are presented in Table 2. All direct measurements were below the DCGL.

ISOCS gamma scans were performed at 71 locations using an investigation level of 1.0 pCi/g Cs-137 and 0.36 pCi/g Co-60. In addition, ISOCS gamma scans were performed at 18 locations using an investigation level of 2.2 pCi/g Cs-137 and 0.8 pCi/g Co-60. The gamma scans were performed for a sufficient count time to achieve a Minimum Detectable Activity of approximately 25% of the DCGL. All identified scan activity levels were below the investigation levels. Therefore, no investigations were required as a result of these scans. However, an investigation was performed based on professional judgment and was documented using survey investigation package XR 0111-07. Refer to Section D for further discussion of the investigation performed.

[1] LTP Revision 3, Table 5-1C for RCA Yard West, R0100.

TABLE 2
DIRECT MEASUREMENTS

Sample Number	Cs-137 (pCi/g)	Uncertainty (pCi/g)	Co-60 (pCi/g)	Uncertainty (pCi/g)	Unitized Value of Unity Rule
FR0111071S001	< 4.45E-02		< 4.55E-02		7.15E-02
FR0111071S002	< 4.69E-02		< 5.29E-02		8.11E-02
FR0111071S003	< 4.99E-02		< 5.33E-02		8.29E-02
FR0111071S004	< 4.06E-02		< 4.48E-02		6.91E-02
FR0111071S005	< 4.72E-02		< 5.80E-02		8.72E-02
FR0111071S006	< 4.75E-02		< 4.73E-02		7.49E-02
FR0111071S007	< 4.69E-02		< 5.13E-02		7.93E-02
FR0111071S008	< 4.98E-02		< 4.55E-02		7.37E-02
FR0111071S009	< 5.35E-02		< 4.92E-02		7.96E-02
FR0111071S010	**7.51E-02**	2.79E-02	< 4.39E-02		8.25E-02
FR0111071S011	< 4.80E-02		< 4.84E-02		7.64E-02
FR0111071S012	< 5.46E-02		< 4.94E-02		8.03E-02
FR0111071S013	< 5.09E-02		< 4.64E-02		7.53E-02
FR0111071S014	**1.33E+00**	1.13E-01	< 5.81E-02		6.24E-01
FR0111071S015	< 4.91E-02		< 4.68E-02		7.50E-02
FR0111071S016	< 3.97E-02		< 4.92E-02		7.38E-02
FR0111071S017	< 4.67E-02		< 4.83E-02		7.57E-02
FR0111071S018	< 4.28E-02		< 5.00E-02		7.60E-02
FR0111071S019	< 4.25E-02		< 3.74E-02		6.13E-02
FR0111071S020	< 4.41E-02		< 5.00E-02		7.66E-02
FR0111071S021	**8.89E-02**	2.66E-02	< 4.64E-02		9.11E-02
FR0111071S022	**1.16E-01**	3.28E-02	**2.15E-01**	3.05E-02	2.98E-01
FR0111071S023	**1.28E-01**	3.57E-02	< 4.35E-02		1.04E-01
FR0111071S024	< 4.65E-02		< 4.39E-02		7.05E-02
FR0111071S025	< 5.14E-02		< 5.55E-02		8.60E-02
FR0111071S026	< 4.37E-02		< 4.81E-02		7.42E-02
FR0111071S027	< 4.01E-02		< 4.48E-02		6.89E-02
FR0111071S028	< 4.19E-02		< 4.71E-02		7.23E-02
FR0111071S029	< 4.92E-02		< 4.69E-02		7.51E-02
FR0111071S030	< 6.50E-02		< 6.52E-02		1.03E-01
FR0111071S031	**2.52E-01**	3.75E-02	< 4.39E-02		1.57E-01
FR0111071S032	**9.34E-02**	3.44E-02	< 5.42E-02		1.02E-01
FR0111071S033	**1.10E-01**	3.31E-02	< 4.81E-02		1.02E-01
FR0111071S034	< 4.36E-02		< 4.81E-02		7.42E-02
FR0111071S035	< 4.80E-02		< 5.10E-02		7.94E-02
FR0111071S036	< 6.33E-02		< 6.04E-02		9.67E-02
FR0111071S037	< 5.46E-02		< 5.67E-02		8.88E-02
FR0111071S038	**1.28E-01**	2.87E-02	< 4.77E-02		1.09E-01
FR0111071S039	< 5.30E-02		< 4.42E-02		7.36E-02
FR0111071S040	< 4.52E-02		< 4.43E-02		7.04E-02
FR0111071S041	**2.45E-01**	4.11E-02	< 5.86E-02		1.71E-01
Mean	**9.89E-02**		**5.34E-02**		**1.03E-01**
Median	**4.92E-02**		**4.81E-02**		**7.93E-02**
Standard Deviation	**2.03E-01**		**2.64E-02**		**9.21E-02**
Range	**3.97E-02 to 1.33E+00**		**3.74E-02 to 2.15E-01**		**6.13E-02 to 6.24E-01**

"<" indicates MDA value. Bold indicates positive detection value.

D. SURVEY UNIT INVESTIGATIONS PERFORMED AND RESULTS

During remediation activities within the Restricted Area in the first half of 2004, a portion of storm drain piping on either side of the Demineralized Water Storage Tank (DWST) foundation was removed. Remaining storm drain piping embedded in the foundation was scheduled for removal during the foundation demolition. The DWST foundation was subsequently demolished to the 17-ft. Elevation. However, storm drain piping below the 17-ft. El. was inadvertently allowed to remain in place. Upon the discovery of elevated soil activity close to the end of the embedded pipe, CR 04-125 was initiated to identify the failure to remove the embedded pipe. The remnant piping was determined to fall within FR 0111 Survey Unit 7. It was subsequently removed and remediation surveys continued.

At one time, the northeast section of Survey Unit 7 contained a rubble pile that served as the primary loading site for railroad cars. During the performance of remediation surveys within the area, pieces of concrete rubble continued to surface within the northern half of the survey unit and surveys indicated increased activity levels. Further remediation was performed in this area by removing an additional 1 to 2-ft. of soil until the underlying clay layer was completely exposed. During remediation, elevated Cs-137 activity (16.5 pCi/g) was discovered at a State of Maine identified location just outside the recently remediated portion of Survey Unit 7. The elevated activity was remediated and the entire survey unit prepared for final status surveys. ISOCS gamma scan surveys were performed and the analysis results identified elevated Cs-137 activity at location S045 (0.73 pCi/g Cs-137) below the scan investigation level. Because some questions remained as to whether remediation had been performed to a sufficient depth at the state identified location, professional judgment dictated the initiation of investigation package XR 0111 SU7 to perform additional biased soil sampling. Two samples were collected approximately 1-ft. from the state identified location with 1 sample obtained from the 0 to 15 cm depth (S001SS0015 at 6 to 8 in.) and the second sample collected from the 30 to 45 cm depth (S001SS3045 at 12 to 18 in.). Four additional sets of soil samples were collected at equal angles 1 meter from the S001 location at the same depths. Analysis of the soil samples determined that the highest activity was obtained from the original S001 location and that the activity was indicative of an approximate 2 m^2 area. Locations of the samples are provided on map XR0111U7-XPKG (Attachment 1). All 5 sets of direct measurements indicated residual activity levels appeared to decrease with depth. Of the 10 samples collected, Co-60 was not identified in any of the samples. Cs-137 activity was noted to exceed the DCGL in one sample (S001SS0015), but met the $DCGL_{EMC}$ criteria. Sample measurement results are provided in Table 3-1 (Attachment 3).

During the survey package investigation, SSPAs were used to spot-check the localized vicinity for isolated areas of elevated activity. At the original State of Maine identified location, which was approximately 1-ft from the S001 investigation location, elevated SSPA counts were noted. As a result of the elevated readings, soil was removed until SPA-3 readings decreased. A soil sample was obtained from those soils that were removed last, most likely from a depth of 18 to 24-in. The sample results identified Cs-137 activity (5.86 pCi/g) above the DCGL but less than the $DCGL_{EMC}$. The result is consistent with characterization samples collected in this area that did not show detectable activity below a 2-ft. depth. The highest Cs-137 measurement obtained between the S001 sample location and state identified location is addressed in Table 3-1 (Attachment 3). The elevated Cs-137 activity was evaluated using the Elevated Measurement Comparison Unity test and was determined to be 45.9% of unity, passing the EMC test.

E. SURVEY UNIT DATA ASSESSMENT

An analysis of the direct sample measurement results, including the mean, median, standard deviation, and sample result range, is provided in Table 2. Of the 41 soil samples collected, 10 identified Cs-137 activity below the DCGL value of 2.39 pCi/g while 1 sample identified Co-60 activity below the DCGL value of 0.86 pCi/g. All other values were below the MDA. Identified sample activities or Minimum Detectable Activities are listed in Table 2. The mean and median activities were less than the DCGL for both Co-60 and Cs-137. The average of the DCGL unity fractions was 0.103 and the maximum reported unity value was less than 65% of the unitized DCGL. The sample standard deviation was smaller than the design sigma; therefore, no additional measurements were required. The Elevated Measurement Comparison Unity test includes one direct sample. The measurement was compared against the EMC criteria and determined to be 45.9% of unity, passing the EMC test.

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 mean fallout Cs-137 value (0.19 pCi/g)[2] for disturbed soil from the survey unit sample mean activity(0.0989 pCi/g). This would equate to an annual dose rate of 0.0 mrem/year. Taking into account the average residual contamination level for Co-60, the annual dose rate would equate to 0.48 mrem/year[3]. However, for purposes of demonstrating compliance with the radiological criteria for license termination and the enhanced State criteria, background activity was not subtracted from the 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 (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. The sample standard deviation is smaller than the design sigma; therefore no additional samples were required.

---

[2] See Attachment E to Maine Yankee Procedure PMP 6.7.8 (Reference 5).

[3] This annual dose equivalent is based on LTP Table 6-11 which shows the RA contaminated soil contribution (for soils contaminated at the DCGL) to be 7.67 mrem/y. Therefore, the annual dose rate would equate to

$$Annual\ Dose\ Rate = 7.67\ x \left(\frac{0.0534}{0.86}\right) = 0.48\ mrem\ /\ y$$

2. The Quantile Plot was generated from the unity value 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 well below the DCGLs of 2.39 pCi/g for Cs-137 and 0.86 pCi/g for Co-60 for land inside the restricted area.

3. A Histogram Plot was also developed based on the unity values. This plot shows a log-normal distribution.

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 1 land survey area; the FSS results were consistent with that classification. The direct measurement sample standard deviation was less than the design sigma. Thus, a sufficient number of sample measurements were taken and no additional measurements were required.

H. LTP CHANGES SUBSEQUENT TO SURVEY UNIT FSS

The FSS of Survey Unit 7 was designed, performed and evaluated in the September 2004 time frame. The design was performed to the criteria of the LTP Revision 3 (References 2 and 4). LTP Change No. 05-001 (Reference 7) modified the Table 6-11, "Contaminated Material DCGL," to reflect an increased Deep Soil DCGL of 0.86 pCi/g for Co-60. As a result, the retrospective dose calculation was modified to include 2.04 mrem/y from Deep Soil and 5.63 mrem/y from Surface Soil. No subsequent LTP changes with potential impact to this survey unit need to be evaluated.

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 DCGLs of 2.39 pCi/g Cs-137 and 0.86 pCi/g Co-60.

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 log-normal distribution.

The scan survey design for this survey unit was developed in accordance with the LTP Revision 3 Addenda (Reference 1) with significant aspects of the design discussed in Section B and Table 1. ISOCS scans performed at a distance of 3 meters in a systematic grid pattern throughout the survey unit did not identify activity above the scan investigation levels of 1.0 pCi/g Cs-137 and 0.36 pCi/g Co-60. Scans conducted at a distance of 2 meters on concrete surfaces and vertical trench surfaces did not identify activity above the scan investigation levels of 2.2 pCi/g Cs-137 and 0.8 pCi/g Co-60.

One elevated investigation soil measurement was evaluated and determined to pass the EMC unity rule per LTP methodology.

It is concluded that FR 0111 Survey Unit 7 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 and Addenda provided by Maine Yankee letter to the NRC, MN-02-061, dated November 26, 2002

2. NRC letter to Maine Yankee, dated February 28, 2003

3. Maine Yankee letter to the NRC, MN-03-049, dated September 11, 2003 (LTP Supplement to LTP Revision 3)

4. Issuance of License Amendment No. 170, NRC letter to Maine Yankee, dated February 18, 2004

5. 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

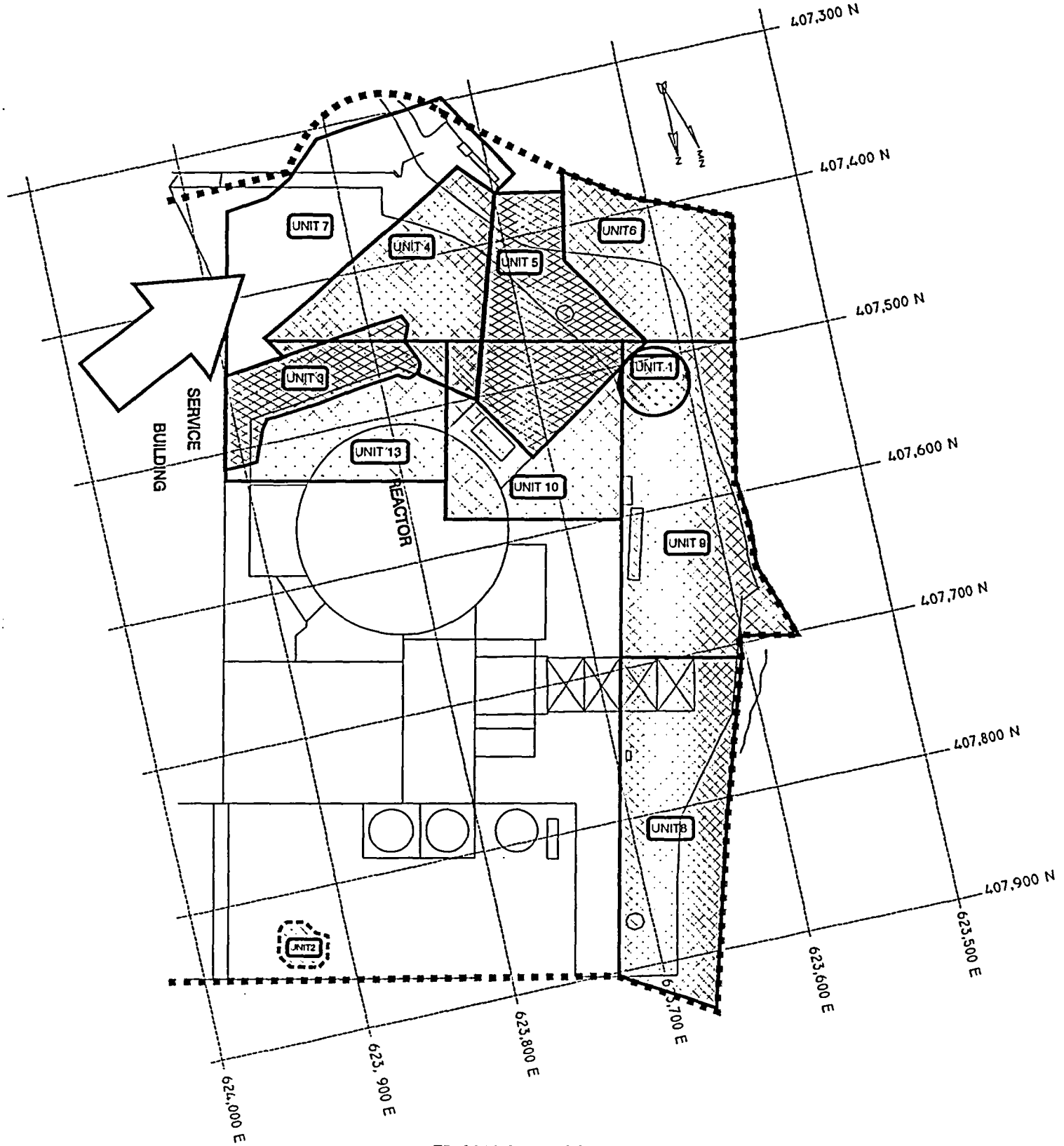
6. Maine Yankee Calculation No. EC-003-04, Use of Canberra In Situ Object Counting System (ISOCS) for FSS Surveys

7. Maine Yankee LTP Change Number 05-001, Deep Soil Co-60 DCGL

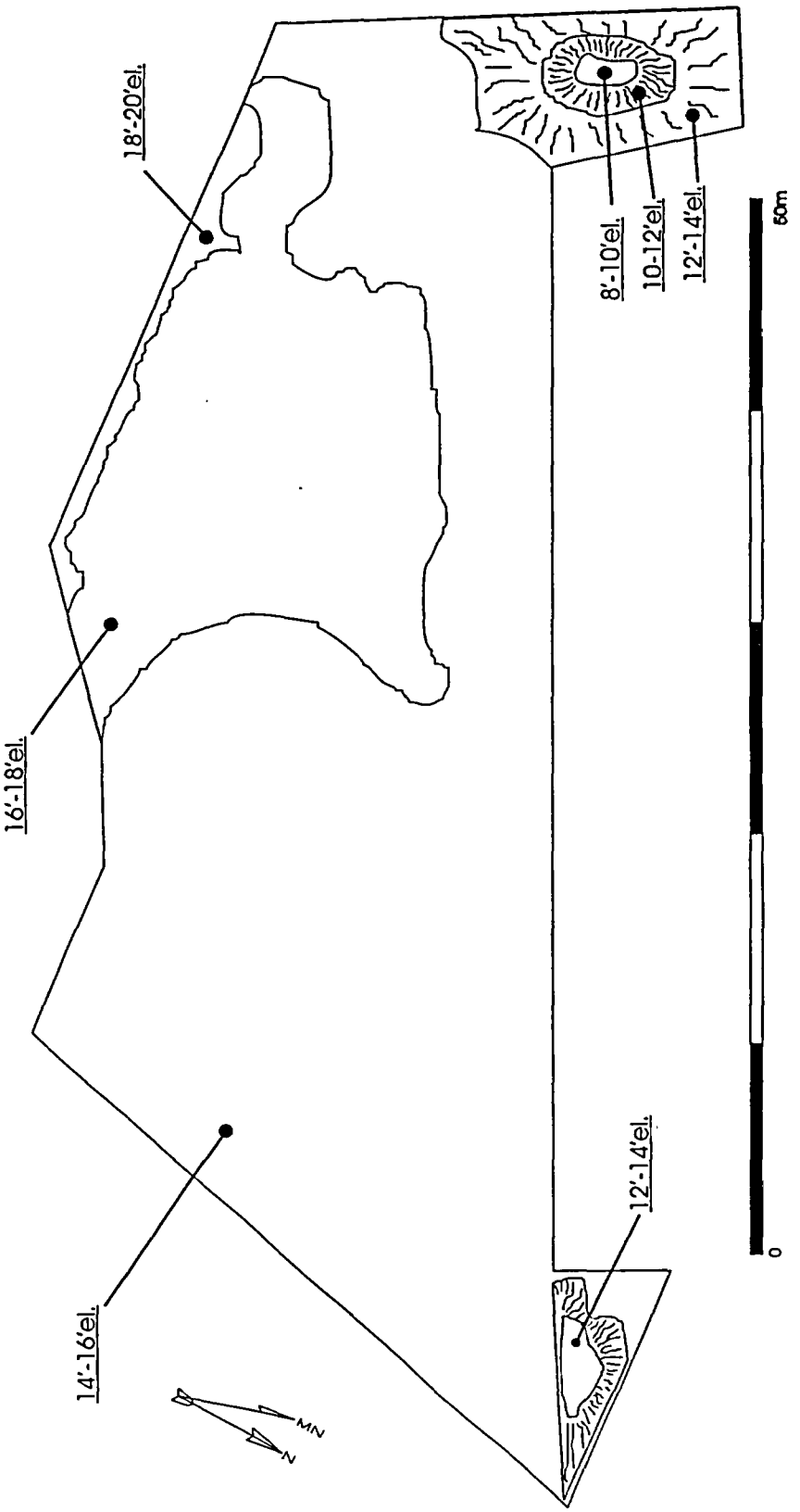
Attachment 1

Survey Unit Maps

Maine Yankee Decommissioning Team	***Maine Yankee Decommissioning Project Survey Map***	Map ID# FR0111U7-SITE
Survey Type: ☐ Characterization ☐ Turnover ■ Final Status Survey	Survey Area Name: Site Locator	



Maine Yankee Decommissioning Team	***Maine Yankee Decommissioning Project Survey Map***	Map ID# FR0111U7-INFO
Survey Type: ☐ Characterization ☐ Turnover ■ Final Status Survey	Survey Area Name: Excavation Depths	
	Prepared By: Larry N. Dockins Date: 8/31/04	



Maine Yankee Decommissioning Team

Survey Type: ☐ Characterization ☐ Turnover ■ Final Status Survey

Maine Yankee Decommissioning Project Survey Map

Map ID# FR0111U7-DIRT

Survey Area Name: Direct Locations

Prepared By: Larry N. Dockins Date: 8/31/04

Maine Yankee
Decommissioning Team

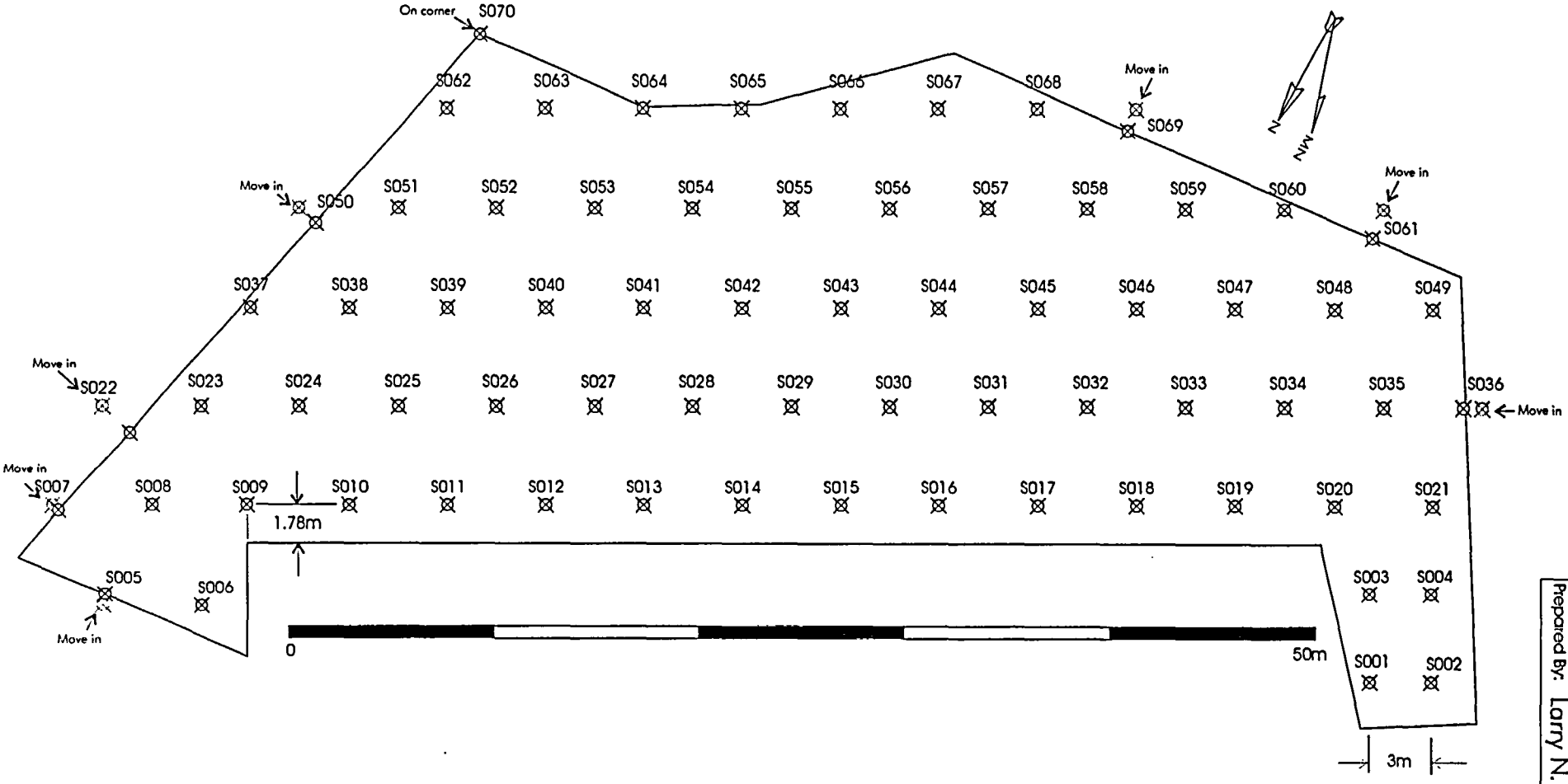
Maine Yankee Decommissioning Project Survey Map

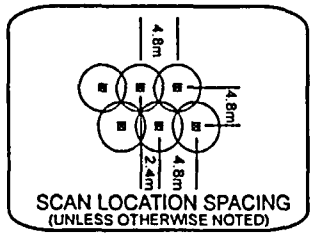
Map ID# FR0111U7-SCANS

Survey Type: ☐ Characterization ☐ Turnover ■ Final Status Survey

Survey Area Name: Area Scans - ISOCS

Prepared By: Larry N. Dockins Date: 8/31/04





Note: Points outside the area are necessary to ensure overlapping scan coverage. However, they may be moved in to the boundary's edge.

Maine Yankee Decommissioning Team

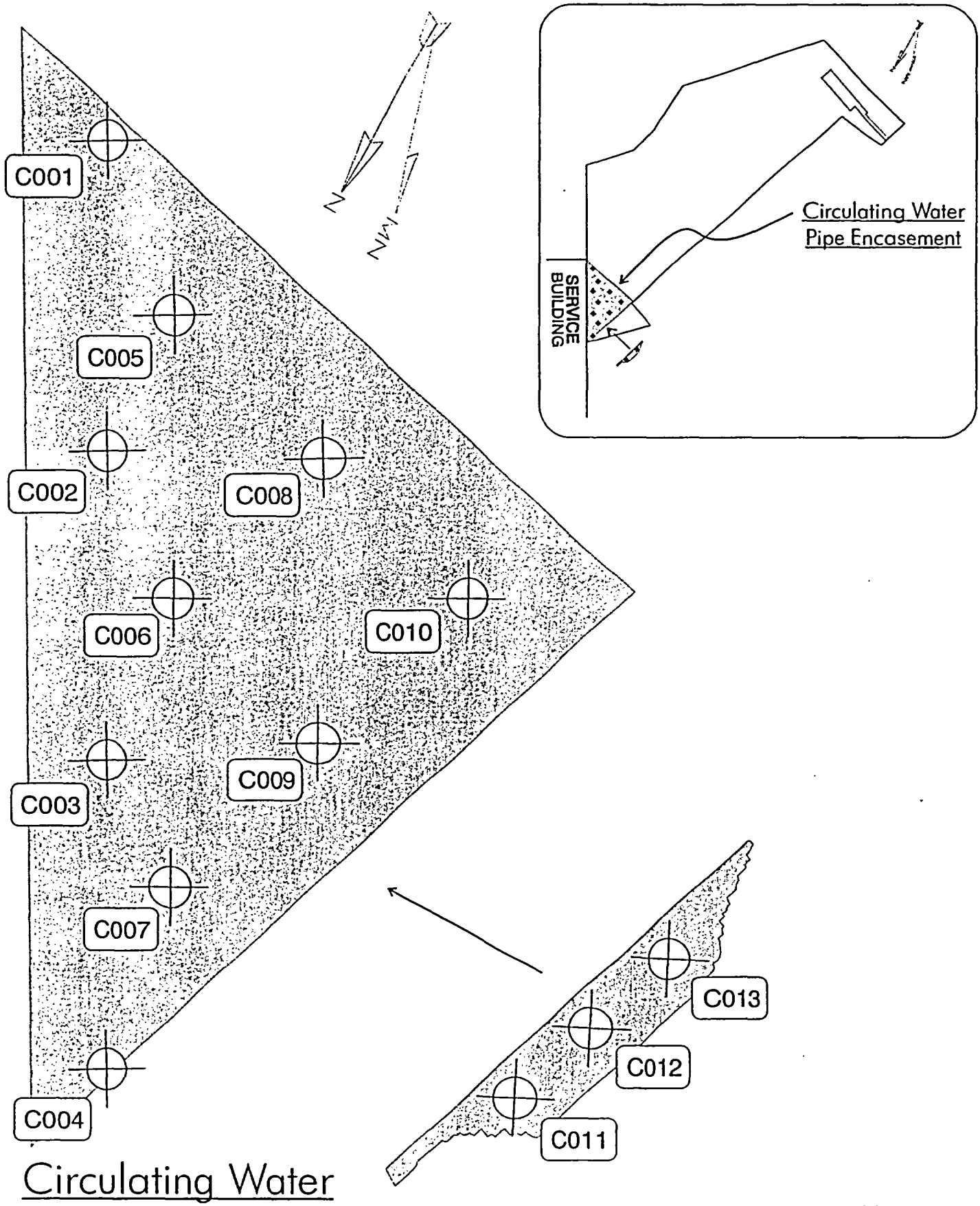
Maine Yankee Decommissioning Project Survey Map

Map ID# FR0111U7-CONC

Survey Type: Characterization — Turnover — ■ Final Status Survey

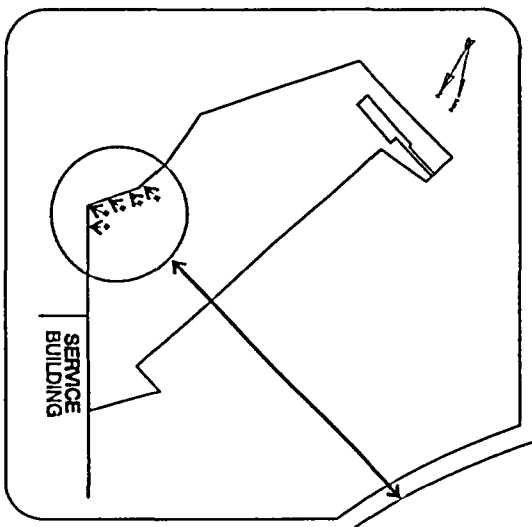
Survey Area Name: 2m Concrete Scan (90° collimator)

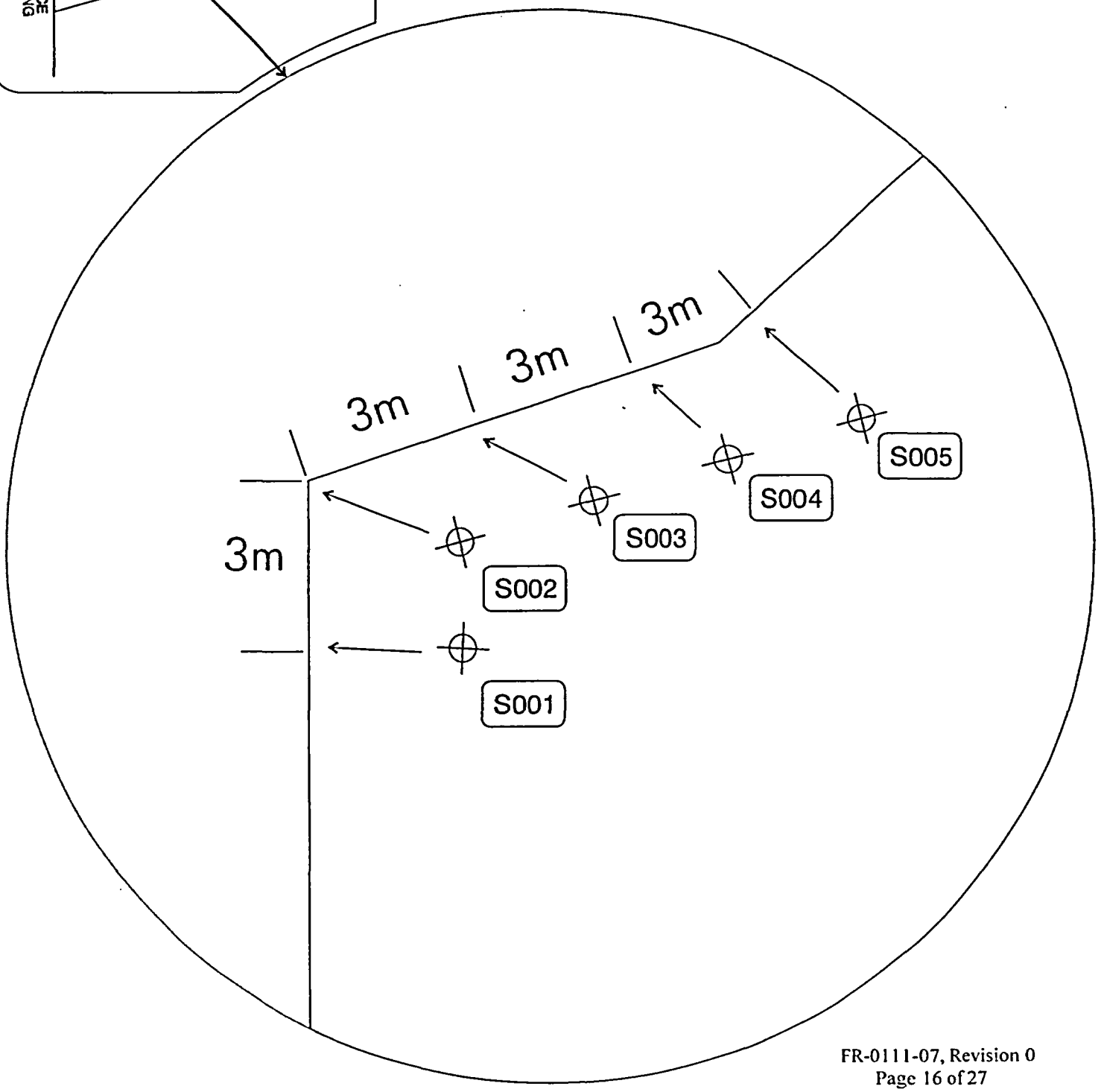
Prepared By: Larry N. Dockins Date: 8/31/04



Circulating Water Pipe Encasement

Maine Yankee Decommissioning Team	**Maine Yankee Decommissioning Project Survey Map**	Map ID# FR0111U7-VERT
Survey Type: ☐ Characterization ☐ Turnover ■ Final Status Survey	Survey Area Name: 2m Vertical Soil Surface Scan	
	Prepared By: Larry N. Dockins Date: 9/7/04	





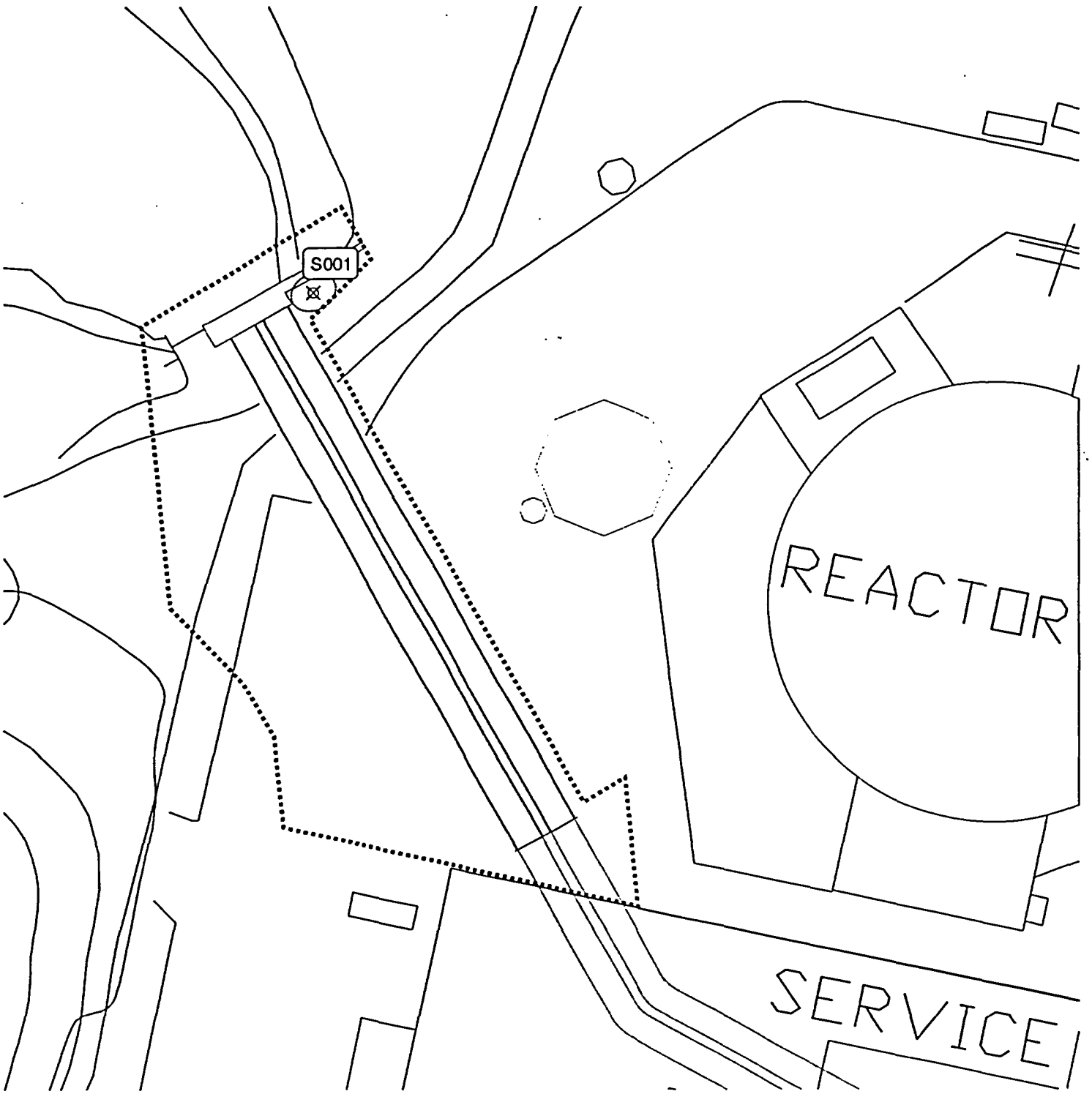
Maine Yankee Decommissioning Team

Maine Yankee Decommissioning Project Survey Map Map ID# FR0111U7-HOLE

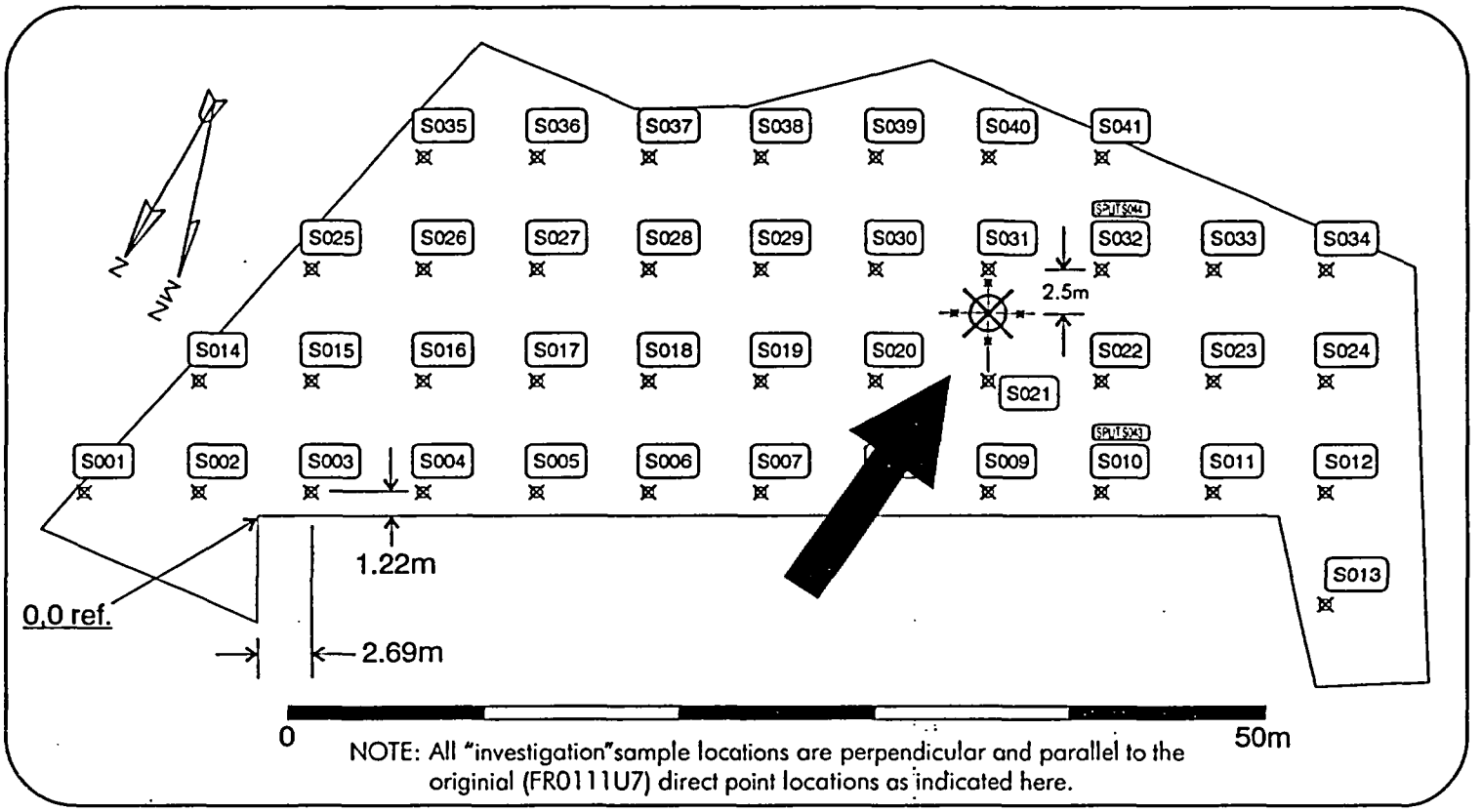
Survey Type: ☐ Characterization ☐ Turnover ■ Final Status Survey

Survey Area Name: Hole Scan (180° collimator)

Prepared By: Larry N. Dockins Date: 8/31/04



Maine Yankee Decommissioning Team	**Maine Yankee Decommissioning Project Survey Map**	Map ID# XR0111U7-XPKG
Survey Type: ☐ Characterization ☐ Turnover ■ Final Status Survey	Survey Area Name: Direct Locations	
	Prepared By: Larry N. Dockins Date: 9/28/04	



NOTE: All "investigation" sample locations are perpendicular and parallel to the originial (FR0111U7) direct point locations as indicated here.

XR0111071S004SS0015 (0-15cm depth)
XR0111071S004SS3045 (30-45cm depth)

1m

XR0111071S001SS0015 (0-15cm depth)
XR0111071S001SS3045 (30-45cm depth)

XR0111071S003SS0015 (0-15cm depth)
XR0111071S003SS3045 (30-45cm depth)

1m 1m

XR0111071S005SS0015 (0-15cm depth)
XR0111071S005SS3045 (30-45cm depth)

1m

XR0111071S002SS0015 (0-15cm depth)
XR0111071S002SS3045 (30-45cm depth)

Attachment 2

Survey Unit Instrumentation

TABLE 2-1

INSTRUMENT INFORMATION

ISOCS Detectors (Field Measurements)

Detector Number	MDC (pCi/g)
7722	0.12 to 0.50
7607	0.12 to 0.50

HPGe Detectors (Laboratory Analysis)

Detector Number	MDC (pCi/g)
FSS1	0.04 to 0.07
FSS2	0.04 to 0.07

TABLE 2-2

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

Detector	Instrument	Comments
Scan MDC	ISOCS: 0.12 to 0.50 pCi/g	~ 25% DCGL
DCGL	2.39 pCi/g Cs-137 0.86 pCi/g Co-60	Approved DCGL for land areas inside the Restricted Area, (References 4 and 7)
Investigation Level (ISOCS @ 3 m)	1.0 pCi/g Cs-137 0.36 pCi/g Co-60	(Reference 6)
Investigation Level (ISOCS @ 2 m)	2.2 pCi/g Cs-137 0.8 pCi/g Co-60	(Reference 6)
Design $DCGL_{EMC}$	4.06 pCi/g Cs-137 1.46 pCi/g Co-60	DCGL x Area Factor for Class 1 survey unit, per LTP Section 5.6.3

Attachment 3

Investigation Table

TABLE 3-1

INVESTIGATION TABLE

Sample Number	Co-60 pCi/g	Cs-137 pCi/g	Elevated Area in m^2	Area Factor	$DCGL_{EMC}$ Unity AF	Unitized Value of Unity Rule	$DCGL_{EMC}$ Unity
S001 (SS3045)	< 4.70E-02	**1.03E+00** ± 8.50E-02	N/A	N/A	N/A	N/A	< DCGL
S001 (18 to 24-in.)	< 6.15E-02	**5.86E+00** ± 4.06E-01	2	6.8	6.8	2.42E+00	3.56E-01
S002 (SS0015)	< 4.78E-02	**4.83E-01** ± 5.63E-02	N/A	N/A	N/A	N/A	< DCGL
S002 (SS3045)	< 4.04E-02	<4.01E-02	N/A	N/A	N/A	N/A	< DCGL
S003 (SS0015)	< 4.75E-02	**9.28E-01** ± 8.56E-02	N/A	N/A	N/A	N/A	< DCGL
S003 (SS3045)	< 4.07E-02	**2.59E-01** ± 3.92E-02	N/A	N/A	N/A	N/A	< DCGL
S004 (SS0015)	< 4.64E-02	**1.19E+00** ± 1.02E-01	N/A	N/A	N/A	N/A	< DCGL
S004 (SS3045)	< 4.42E-02	**2.09E-01** ± 3.38E-02	N/A	N/A	N/A	N/A	< DCGL
S005 (SS0015)	< 4.33E-02	**1.11E-01** ± 2.91E-02	N/A	N/A	N/A	N/A	< DCGL
S005 (SS3045)	< 3.94E-02	**1.05E-01** ± 2.68E-02	N/A	N/A	N/A	N/A	< DCGL
				Co-60 Mean pCi/g	Cs-137 Mean pCi/g	Unitized Mean pCi/g	
				5.34E-02	9.89E-02	1.03E-01	1.03E-01
						EMC Unity Sum	4.59E-01

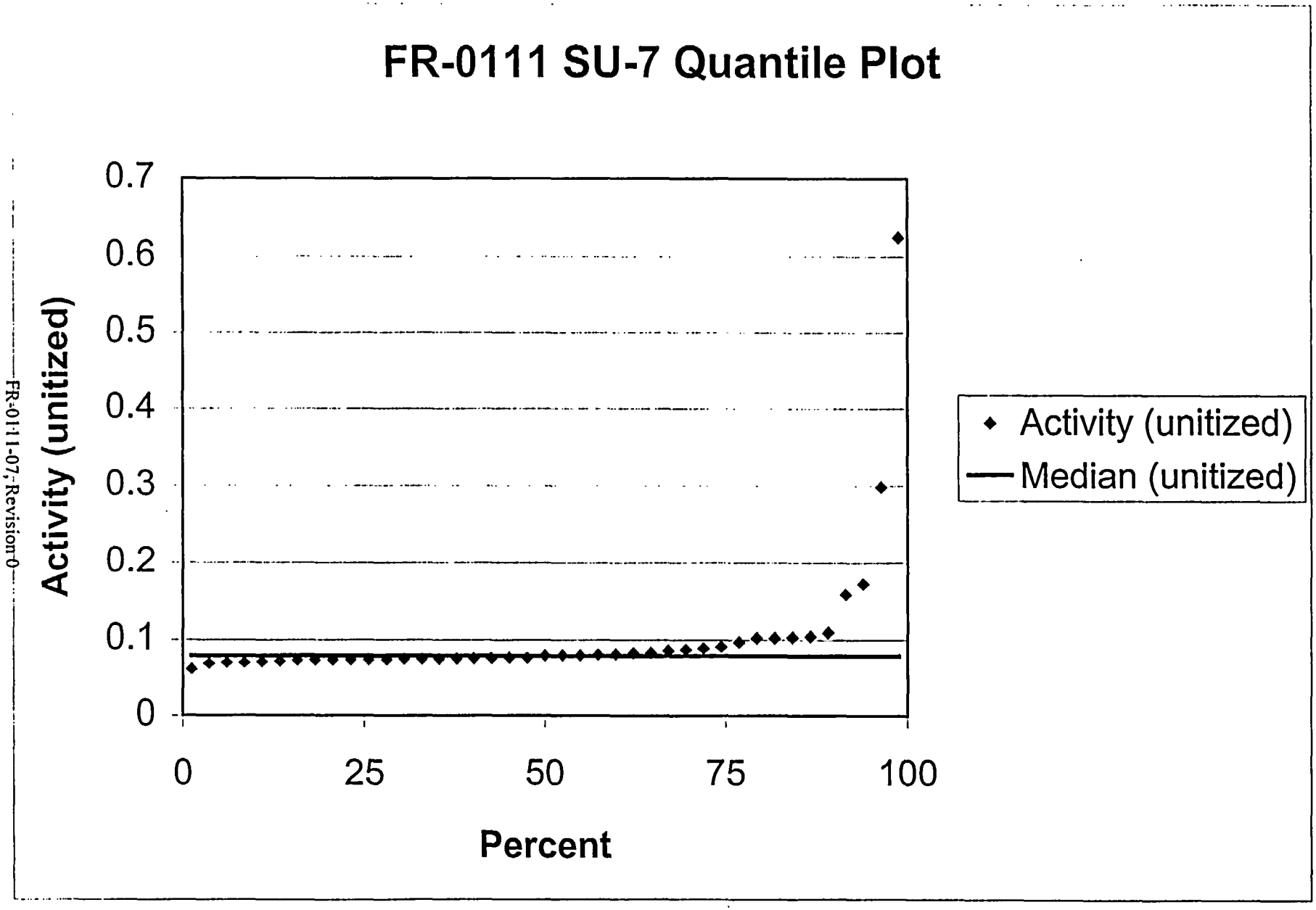
Notes: 1. The Unitized Value of Unity Rule value and $DCGL_{EMC}$ Unity Value were calculated by subtracting the survey unit mean from the sample results. The survey unit mean was calculated using the data shown in Table 2.

Attachment 4

Statistical Data

Survey Package FR0111 Unit 7 UNITY Soil Sign Test Summary

Evaluation Input Values		Comments
Survey Package:	FR0111	Yard West Excavations
Survey Unit:	07	
Evaluator:	DA	
$DCGL_w$:	1.00E+00	Unity
$DCGL_{emc}$:	1.70E+00	AF x Unity
LBGR:	5.00E-01	50% of DCGL
Sigma:	5.56E-01	Unitized (1.33 pCi/g / 2.39 pCi/g)
Type I error:	0.05	
Type II error:	0.05	
Nuclide:	UNITY	
Soil Type:	N/A	
Calculated Values		**Comments**
$Z_{1-\alpha}$:	1.645	
$Z_{1-\beta}$:	1.645	
Sign p:	0.788145	
Calculated Relative Shift:	0.8	
Relative Shift Used:	0.8	Uses 3.0 if Relative Shift is >3
N-Value:	33	
N-Value+20%:	40	
Sample Data Values		**Comments**
Number of Samples:	41	
Median:	7.93E-02	
Mean:	1.03E-01	
Net Sample Standard Deviation:	9.21E-02	
Total Standard Deviation:	9.21E-02	
Maximum:	6.24E-01	
Sign Test Results		**Comments**
Adjusted N Value:	41	
S+ Value:	41	
Critical Value:	26	
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	Survey Unit Passes


FR-0111 SU-7 Quantile Plot
Activity (unitized)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
25
50
75
100
Percent
Activity (unitized)
Median (unitized)

One-Sample T-Test Report

Page/Date/Time	2 1/18/05 9:06:28 AM
Database	C:\Program Files\NCSS97\FR0111 SU-7.S0
Variable	C2

Plots Section

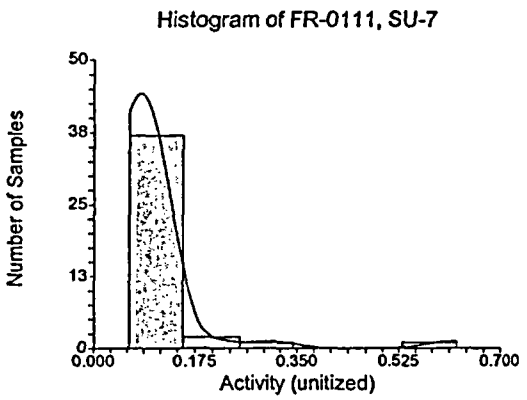
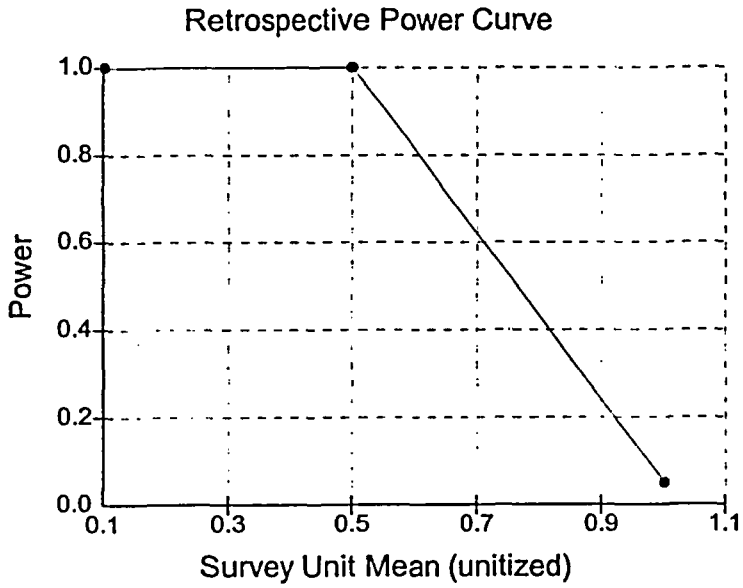


Chart Section



MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0111 YARD WEST EXCAVATIONS
SURVEY UNIT 8

Prepared By:	D. Anderson **FSS Engineer** - Signature D. ANDERSON Printed Name	Date: 1/6/05
Reviewed By:	Larry N Dockins **FSS Specialist** - Signature Larry N. Dockins Printed Name	Date: 1/6/05
Reviewed By:	 **Independent Review** - Signature W J Cooper Printed Name	Date: 1/17/05
Approved By:	 **Superintendent, FSS** - Signature George F. Tilsbury Printed Name	Date: 1/19/05
Approved By:	 **FSS, MOP** - Signature James R. Ricker Printed Name	Date: 1/19/05

MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0111 YARD WEST EXCAVATIONS
SURVEY UNIT 8

A. SURVEY UNIT DESCRIPTION

FR 0111 Yard West Excavations Survey Unit 8 occupied the northwest corner of the original Restricted Area "backyard". The 1,528 m^2 area was bordered on the north by the Restricted Area fence, on the west by the 115 kV switchyard, on the east by FR 0111 Survey Units 11 and 12, and on the south by FR 0111 Survey Unit 9. The survey unit was located at coordinates 407,800 N and 623,650 E using Maine State Coordinate System (West Zone) NAD 1927. The location of the survey unit in relation to the Containment Building and the surrounding FR 0111 survey units is shown on Map FR0111U8-SITE (Attachment 1).

Survey Unit 8 excavation was created as a result of the removal of contaminated sub-surface soil from locations S046, S056, S065, S070, and S071 as identified in Characterization Package CR 5000. The area was adjacent to the Restricted Area roadway and encompassed the area under the yard crane (CR-3) and the footprint of the former High Radiation Bunker. With the removal and demolition of the western portion of the yard crane footings and the High Radiation Bunker, the soils in the southeast corner of the survey unit were left at approximately 10 ft. below grade. A trench resulting from storm drain system removal traversed the west side of the survey unit from north to south and ranged in depth from 6 ft. to 8 ft. A portion of the electrical cable duct bank from the 115 kV switchyard was removed, adding to the uneven terrain. Remaining portions of the duct bank were surveyed with the surrounding land. An abstract of the terrain levels and excavated depths is shown on map FR0111U8-INFO (Attachment 1).

B. SURVEY UNIT DESIGN INFORMATION

Survey Unit 8 met the LTP Revision 3 definition for a Class 1 survey unit. The survey unit design parameters are shown in Table 1. Given a relative shift of 0.8, it was determined that 40 direct measurements were required for the Sign Test. The measurement locations were based on a systematic square grid with a random start point and are illustrated on map FR0111U8-DIRT (Attachment 1). Direct measurements (soil samples) were collected from required locations and analyzed with laboratory gamma spectroscopy instrumentation.

In accordance with the LTP, scans covering 100% of the 1,528 m^2 area were required for the Class 1 survey unit. This was accomplished by use of an *in situ* gamma spectroscopy detector (ISOCS) configured at a 3-meter distance from the surface to obtain overlapping 28-m^2 fields of view. The ISOCS detector was positioned perpendicular to the surface being surveyed. Locations of the 117 survey scans are shown on map FR0111U8-SCANS.

The ISOCS scans were configured to ensure 100% scan coverage of all exposed surfaces within Survey Unit 8. The survey instruments used 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, the investigation level, and the $DCGL_{EMC}$. The scan MDCs for Co-60 and Cs-137 were less than their respective scan investigation levels, providing high confidence (95% or higher) that an elevated area would be detected in the scanning process. Further, since the investigation level was always less than the design $DCGL_{EMC}$, no EMC sample size adjustment was necessary.

TABLE 1

SURVEY UNIT DESIGN PARAMETERS

Survey Unit	Design Criteria	Basis
Area	1,528 m^2	Class 1, < 2,000 m^2
Number of Direct Measurements Required	40	Based on an LBGR of 1.2 pCi/g, sigma[1] of 1.33 pCi/g, and a relative shift of 0.8. Type I = Type II = 0.05
Sample Area	38.2 m^2	1,528 m^2 / 40 = 38.2 m^2
Sample Grid Spacing	6.18 m	$(38.2)^{1/2}$
Scan Grid Area	ISOCS scan at 3-meters	Reference 6
Area Factor	1.65	Class 1 Area, LTP Table 6-12
Scan Area	1,528 m^2	Class 1 Area – 100%
Scan Investigation Level	1.0 pCi/g Cs-137 0.36 pCi/g Co-60	ISOCS investigation levels with detector at 3-meter height (Reference 6)
DCGL	2.39 pCi/g Cs-137 0.86 pCi/g Co-60	References 4 and 7
Design $DCGL_{EMC}$	3.94 pCi/g Cs-137 1.42 pCi/g Co-60	DCGL x Area Factor for Class 1 survey unit, per LTP Section 5.6.3

C. SURVEY RESULTS

As required, 40 direct measurements were performed in Survey Unit 8. The results are presented in Table 2. All direct measurements were below the DCGL.

ISOCS gamma scans were performed at 117 locations using an investigation level of 1.0 pCi/g Cs-137 and 0.36 pCi/g Co-60. The gamma scans were performed for a sufficient count time to achieve a Minimum Detectable Activity (MDA) of approximately 25% of the DCGL for the majority of ISOCs scans. For 5 gamma scans performed on soils with up to 3 inches of water present, an MDA of approximately 40% of the DCGL was achieved. All identified scan activity levels were below the investigation levels. Therefore, no investigations were required.

[1] LTP Revision 3, Table 5-1C for RCA Yard West, R0100.

TABLE 2
DIRECT MEASUREMENTS

Sample Number	Cs-137(pCi/g)	Uncertainty (pCi/g)
FR0111081S001	< 6.13E-02	
FR0111081S002	**7.41E-01**	6.98E-02
FR0111081S003	< 6.13E-02	
FR0111081S004	**1.31E-01**	3.13E-02
FR0111081S005	< 5.10E-02	
FR0111081S006	< 5.90E-02	
FR0111081S007	< 6.30E-02	
FR0111081S008	< 5.21E-02	
FR0111081S009	< 5.13E-02	
FR0111081S010	< 6.69E-02	
FR0111081S011	< 6.49E-02	
FR0111081S012	< 5.11E-02	
FR0111081S013	< 5.12E-02	
FR0111081S014	< 6.35E-02	
FR0111081S015	**3.24E-01**	4.38E-02
FR0111081S016	**1.48E-01**	3.72E-02
FR0111081S017	< 4.74E-02	
FR0111081S018	< 4.89E-02	
FR0111081S019	< 5.48E-02	
FR0111081S020	< 5.17E-02	
FR0111081S021	< 5.22E-02	
FR0111081S022	< 4.64E-02	
FR0111081S023	< 6.10E-02	
FR0111081S024	**1.63E-01**	3.57E-01
FR0111081S025	< 5.35E-02	
FR0111081S026	< 5.14E-02	
FR0111081S027	< 4.43E-02	
FR0111081S028	< 4.56E-02	
FR0111081S029	< 4.86E-02	
FR0111081S030	< 4.47E-02	
FR0111081S031	< 6.12E-02	
FR0111081S032	< 4.84E-02	
FR0111081S033	< 4.77E-02	
FR0111081S034	< 4.88E-02	
FR0111081S035	< 4.93E-02	
FR0111081S036	< 4.25E-02	
FR0111081S037	< 4.23E-02	
FR0111081S038	< 4.71E-02	
FR0111081S039	< 5.21E-02	
FR0111081S040	**4.94E-01**	6.03E-02
Mean	**9.47E-02**	
Median	**5.19E-02**	
Standard Deviation	**1.34E-01**	
Range	**4.23E-02 to 7.41E-02**	

"<" indicates MDA value. Bold indicates positive detection value.
Samples were also analyzed for Co-60. All were less than MDA.

D. SURVEY UNIT INVESTIGATIONS PERFORMED AND RESULTS

No investigations were required.

E. SURVEY UNIT DATA ASSESSMENT

An analysis of the direct sample measurement results, including the mean, median, standard deviation, and sample result range, is provided in Table 2. Of the 40 soil samples collected, 6 identified Cs-137 activity below the DCGL value of 2.39 pCi/g while Co-60 was not identified in any of the samples. All other values were below the MDA. Identified sample activities or Minimum Detectable Activities are listed in Table 2. The mean and median activities for Cs-137 were less than the DCGL while the highest reported value was less than 35% of the DCGL.

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 mean fallout Cs-137 value (0.19 pCi/g)[2] for disturbed soil from the survey unit sample mean activity (0.0947 pCi/g). The net result is negative. This would equate to an annual dose rate of 0.0 mrem/year. However, for purposes of demonstrating compliance with the radiological criteria for license termination and the enhanced State criteria, background activity was not subtracted from the 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 (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. The sample standard deviation is smaller than the design sigma; therefore no additional samples were required.

2. The Quantile Plot was generated from the 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 well below the DCGL of 2.39 pCi/g for land inside the restricted area.

---

[2] See Attachment E to Maine Yankee Procedure PMP 6.7.8 (Reference 5).

3. A Histogram Plot was also developed based on the direct measurement data values. This plot shows a log-normal distribution.

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 1 land survey area; the FSS results were consistent with that classification. The direct measurement sample standard deviation was less than the design sigma. Thus, a sufficient number of sample measurements were taken and no additional measurements were required.

H. LTP CHANGES SUBSEQUENT TO SURVEY UNIT FSS

The FSS of Survey Unit 8 was designed, performed and evaluated in the October 2004 time frame. The design was performed to the criteria of the LTP Revision 3 (References 2 and 4). LTP Change No. 05-001 (Reference 7) modified the Table 6-11, "Contaminated Material DCGL," to reflect an increased Deep Soil DCGL of 0.86 pCi/g for Co-60. As a result, the retrospective dose calculation was modified to include 2.04 mrem/y from Deep Soil and 5.63 mrem/y from Surface Soil. No subsequent LTP changes with potential impact to this survey unit need to be evaluated.

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 2.39 pCi/g Cs-137.

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 log-normal distribution.

The scan survey design for this survey unit was developed in accordance with the LTP Revision 3 Addenda (References 2 and 4) with significant aspects of the design discussed in Section B and Table 1. ISOCS scans performed, at a distance of 3 meters from the surface, throughout the survey unit did not identify activity above the scan investigation levels of 1.0 pCi/g Cs-137 and 0.36 pCi/g Co-60. Therefore, no investigations were performed.

It is concluded that FR 0111 Survey Unit 8 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 and Addenda provided by Maine Yankee letter to the NRC, MN-02-061, dated November 26, 2002

2. NRC letter to Maine Yankee, dated February 28, 2003

3. Maine Yankee letter to the NRC, MN-03-049, dated September 11, 2003 (LTP Supplement to LTP Revision 3)

4. Issuance of License Amendment No. 170, NRC letter to Maine Yankee, dated February 18, 2004

5. 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

6. Maine Yankee Calculation EC-003-04, Use of Canberra In Situ Object Counting System (ISOCS) for FSS Surveys

7. Maine Yankee LTP Change Number 05-001, Deep Soil Co-60 DCGL

Attachment 1

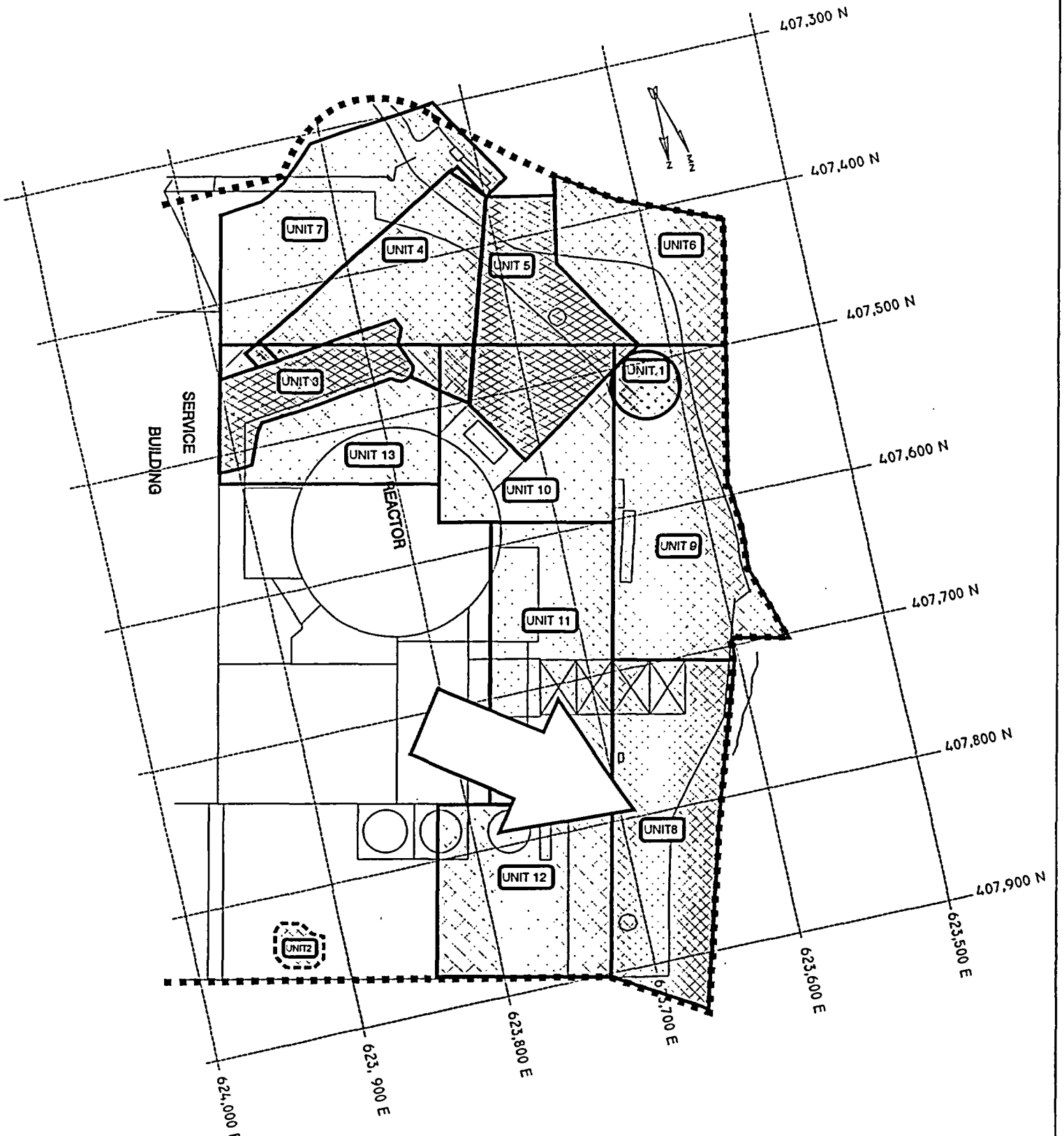
Survey Unit Maps

Maine Yankee Decommissioning Team

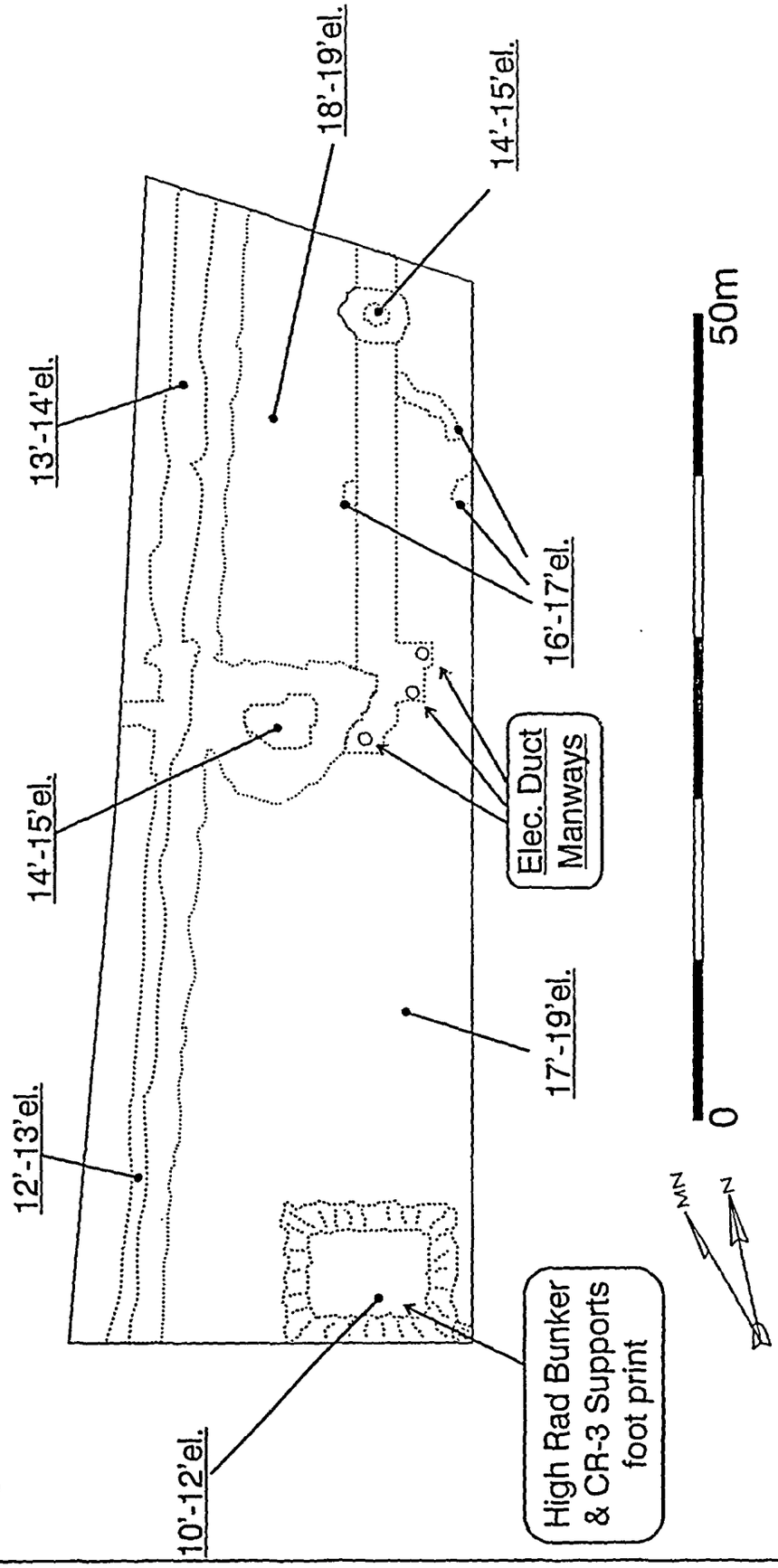
Maine Yankee Decommissioning Project Survey Map Map ID# FR0111U8-SITE

Survey Type: Characterization Turnover ■ Final Status Survey Survey Area Name: Site Locator

Prepared By: Larry N. Dockins Date: 1/17/05



Maine Yankee Decommissioning Team	***Maine Yankee Decommissioning Project Survey Map***	Map ID# FR0111U8-INFO
Survey Type: Characterization Turnover ■ Final Status Survey	Survey Area Name: Excavation Depths	
	Prepared By: Larry N. Dockins Date: 10/20/04	



Maine Yankee Decommissioning Team

Survey Type: Characterization | Turnover | Final Status Survey

Maine Yankee Decommissioning Project Survey Map

Survey Area Name: Direct Locations

Map ID# FR0111U8-DIRT

Prepared By: Larry N. Dockins Date: 10/6/04

Direct Point Location Spacing

Maine Yankee Decommissioning Team

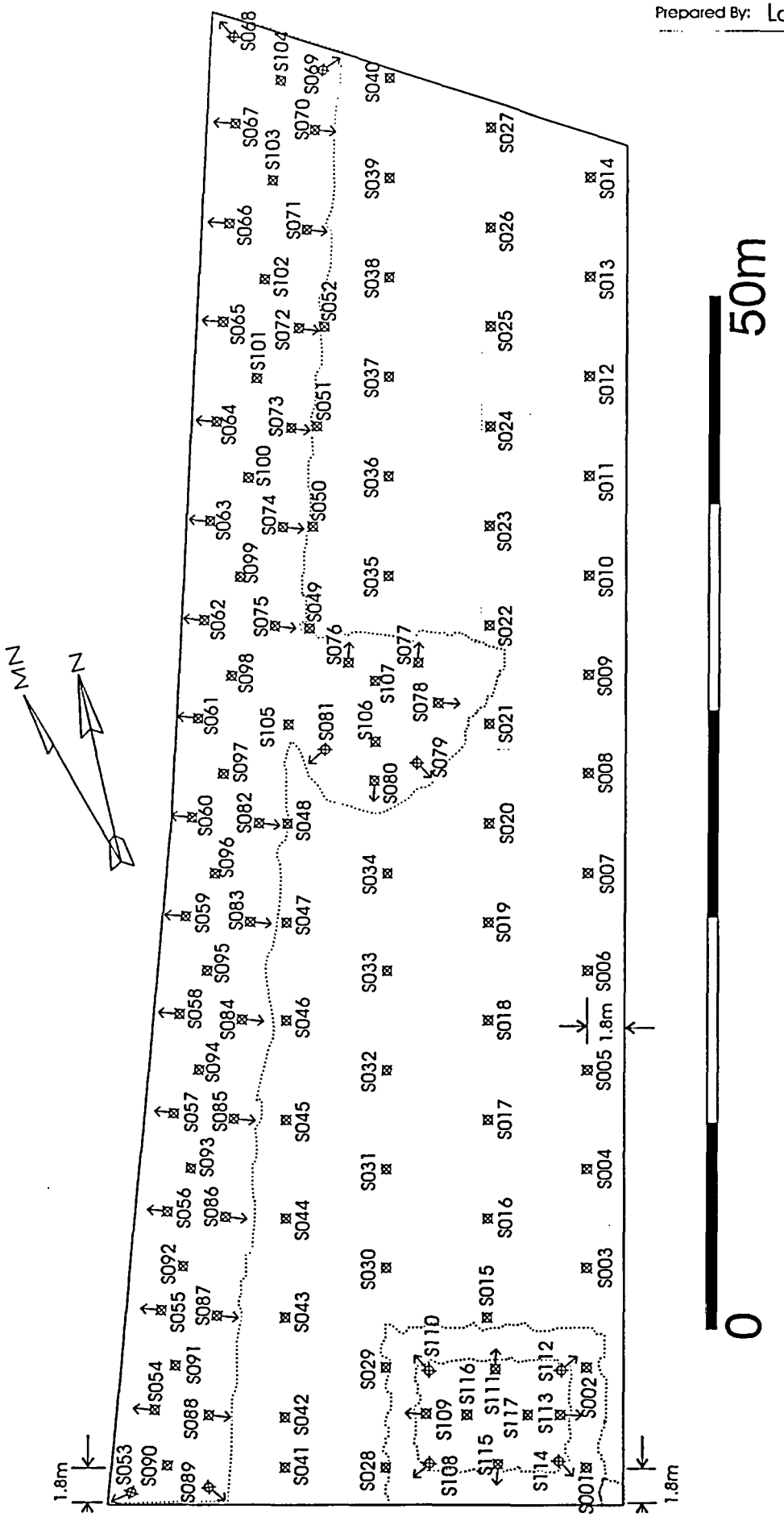
Maine Yankee Decommissioning Project Survey Map

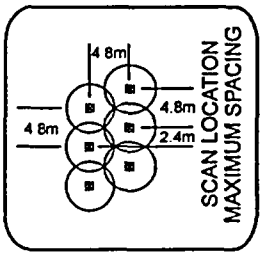
Map ID# FR0111U8-SCANS

Survey Type: Characterization Turnover ■ Final Status Survey

Survey Area Name: Area Scans - ISOCS

Prepared By: Larry N. Dockins Date: 10/5/04





Attachment 2

Survey Unit Instrumentation

TABLE 2-1

INSTRUMENT INFORMATION

ISOCS Detectors (Field Measurements)

Detector Number	MDC (pCi/g)
7722	0.10 to 0.70
7607	0.10 to 0.70

HPGe Detectors (Laboratory Analysis)

Detector Number	MDC (pCi/g)
FSS1	0.04 to 0.08
FSS2	0.04 to 0.08

TABLE 2-2

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

Detector	Instrument	Comments
Scan MDC	ISOCS: 0.10 to 0.70 pCi/g	Typically 25% DCGL
DCGL	2.39 pCi/g Cs-137 0.86 pCi/g Co-60	Approved DCGL for land areas inside the Restricted Area, (References 4 and 7)
Investigation Level (ISOCS @ 3 m)	1.0 pCi/g Cs-137 0.36 pCi/g Co-60	(Reference 6)
Design $DCGL_{EMC}$	3.94 pCi/g Cs-137 1.42 pCi/g Co-60	DCGL x Area Factor for Class 1 survey unit, per LTP Section 5.6.3

Attachment 3

Investigation Table

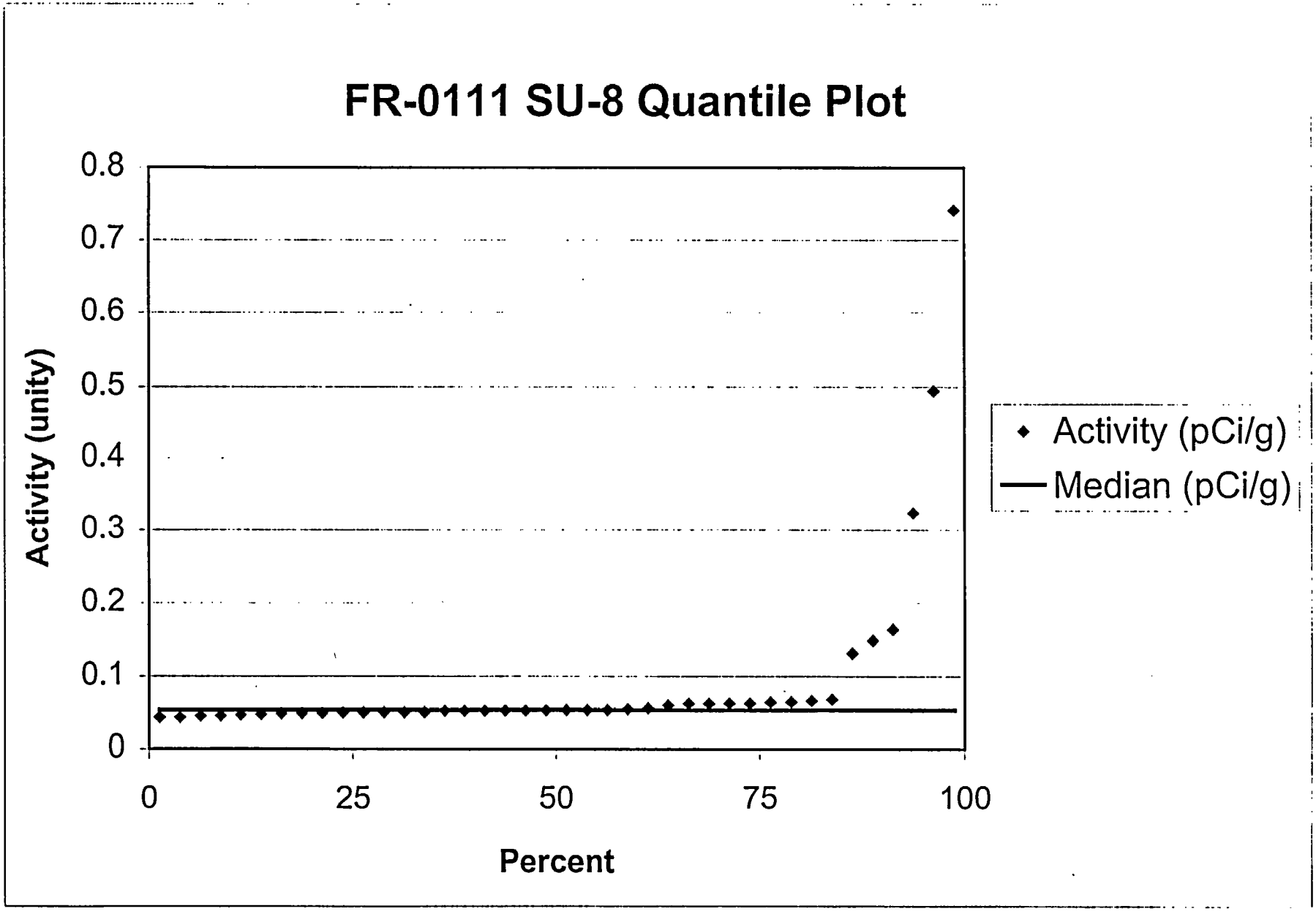
(No Investigations Performed)

Attachment 4

Statistical Data

Survey Package FR 0111 Unit 8 Soil Sign Test Summary

Evaluation Input Values		Comments
Survey Package:	FR 0111	Yard West Excavations
Survey Unit:	08	
Evaluator:	DA	
$DCGL_w$:	2.39E+00	Cs-137 DCGL
$DCGL_{emc}$:	3.94E+00	AF x DCGL
LBGR:	1.20E+00	50% of DCGL
Sigma:	1.33E+00	LTP Rev 3, Table 5-1C for RCA Yd. W
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:	0.788145	
Calculated Relative Shift:	0.8	
Relative Shift Used:	0.8	Uses 3.0 if Relative Shift is >3
N-Value:	33	
N-Value+20%:	40	
Sample Data Values		**Comments**
Number of Samples:	40	
Median:	5.19E-02	
Mean:	9.47E-02	
Net Sample Standard Deviation:	1.34E-01	
Total Standard Deviation:	1.34E-01	
Maximum:	7.41E-01	
Sign Test Results		**Comments**
Adjusted N Value:	40	
S+ Value:	40	
Critical Value:	25	
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	Survey Unit Passes


FR-0111 SU-8 Quantile Plot
Activity (unity)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
25
50
75
100
Percent
Activity (pCi/g)
Median (pCi/g)

One-Sample T-Test Report

Page/Date/Time	2 1/6/05 12:51:16 PM
Database	C:\Program Files\NCSS97\FR0111 SU-8.S0
Variable	C2

Plots Section

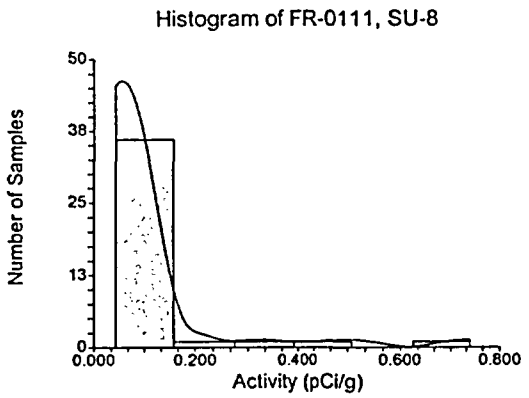
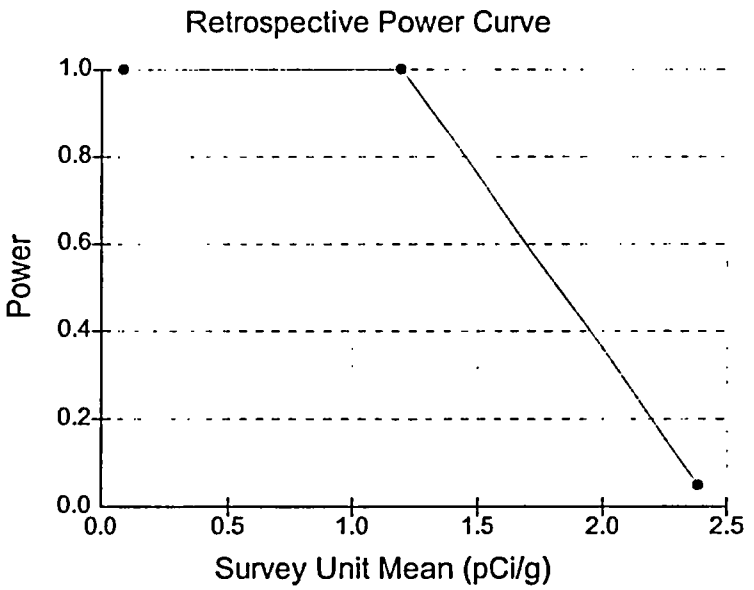


Chart Section



MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0111 YARD WEST EXCAVATIONS
SURVEY UNIT 9

Prepared By:	D. Anderson **FSS Engineer** - Signature D. ANDERSON Printed Name	Date: 1/10/05
Reviewed By:	Larry Dockins **FSS Specialist** - Signature Larry Dockins Printed Name	Date: 1/17/05
Reviewed By:	 **Independent Review** - Signature W J Cooper Printed Name	Date: 1/17/05
Approved By:	 **Superintendent, FSS** - Signature George F. Gilsbury Printed Name	Date: 1/20/05
Approved By:	 **FSS, MOP** - Signature James R. Packer Printed Name	Date: 1/20/05

MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0111 YARD WEST EXCAVATIONS
SURVEY UNIT 9

A. SURVEY UNIT DESCRIPTION

FR 0111 Yard West Excavations Survey Unit 9 was centered along the west boundary of the Restricted Area between outfall 6 and the Restricted Area roadway. The 1,622 m^2 area was bordered on the north by FR 0111 Survey Unit 8, on the south by FR 0111 Survey Unit 6, on the east by FR 0111 Survey Units 10 and 11, and on the west by the Restricted Area fence. The survey unit was located at coordinates 407,600N and 623,625E using Maine State Coordinate System (West Zone) NAD 1927. The location of the survey unit in relation to the Containment Building and the surrounding FR 0111 survey units is shown on Map FR0111U9-SITE (Attachment 1).

Survey Unit 9 excavation was created as a result of the removal of contaminated sub-surface soil from locations S072, S081, S088, and S089 as identified in Characterization Package CR 5000. The extraction and removal of storm drain piping as well as RCRA soil removal added substantially to the extent of excavation performed within the area. Demolition of the west yard crane (CR-3) footings and the High Radiation Bunker in FR 0111 Survey Unit 8 adjacent to Survey Unit 9 also contributed to the amount of soil excavated from the area. A small portion of exposed fire main (metal piping) was included in the survey. The survey unit also encompassed the remediation and survey area previously defined by FR 0111 Survey Unit 1, after the original excavation was backfilled. An abstract of the terrain levels and excavated depths is shown on map FR0111U9-INFO (Attachment 1).

B. SURVEY UNIT DESIGN INFORMATION

Survey Unit 9 met the LTP Revision 3 definition for a Class 1 survey unit. The survey unit design parameters are shown in Table 1. Given a relative shift of 0.8, it was determined that 40 direct measurements were required for the Sign Test. Because the measurement locations were based on a systematic square grid with a random start point, the N=40 design led to a survey unit map with 43 locations and are illustrated on map FR0111U9-DIRT (Attachment 1). Direct measurements (soil samples) were collected from required locations and analyzed with laboratory gamma spectroscopy instrumentation.

In accordance with the LTP, scans covering 100% of the 1,622 m^2 area were required for the Class 1 survey unit. This was accomplished by use of an *in situ* gamma spectroscopy detector (ISOCS) configured at a 3-meter distance from the surface to obtain overlapping 28-m^2 fields of view. The ISOCS detector was positioned perpendicular to the soil surface. Locations of the 114 survey scans are shown on map FR0111U9-SCAN.

The ISOCS scans were configured to ensure 100% scan coverage of all exposed surfaces within Survey Unit 9. The survey instruments used 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, the investigation level, and the $DCGL_{EMC}$. The scan MDCs for Co-60 and Cs-137 are less than their respective scan investigation levels, thus providing high confidence (95% or higher) that an elevated area would be detected in the scanning process. Further, since the investigation level was always less than the design $DCGL_{EMC}$, no EMC sample size adjustment was necessary.

TABLE 1

SURVEY UNIT DESIGN PARAMETERS

Survey Unit	Design Criteria	Basis
Area	1,622 m^2	Class 1, < 2,000 m^2
Number of Direct Measurements Required	40	Based on an LBGR of 1.2 pCi/g, sigma[1] of 1.33 pCi/g, and a relative shift of 0.8. Type I = Type II = 0.05
Sample Area	40.55 m^2	1,622 m^2 / 40 = 40.55 m^2
Sample Grid Spacing	6.3 m	$(40.55)^{1/2}$
Scan Grid Area	ISOCS scan at 3-meters	Reference 6
Area Factor	1.5	Class 1 Area, LTP Table 6-12
Scan Area	1,622 m^2	Class 1 Area – 100%
Scan Investigation Level	1.0 pCi/g Cs-137 0.36 pCi/g Co-60	ISOCS investigation levels with detector at 3-meter height (Reference 6)
DCGL	2.39 pCi/g Cs-137 0.86 pCi/g Co-60	References 4 and 7
Design $DCGL_{EMC}$	3.59 pCi/g Cs-137 1.29 pCi/g Co-60	DCGL x Area Factor for Class 1 survey unit, per LTP Section 5.6.3

C. SURVEY RESULTS

A total of 43 direct measurements were performed in Survey Unit 9. The results are presented in Table 2. All direct measurements were below the DCGL.

ISOCS gamma scans were performed at 114 locations using an investigation level of 1.0 pCi/g Cs-137 and 0.36 pCi/g Co-60. The gamma scans were performed for a sufficient count time to achieve a Minimum Detectable Activity (MDA) of approximately 35% of the DCGL. All identified scan activity levels were below the investigation levels. Therefore, no investigations were required.

A fraction (< 12%) of the scan grids contained either pipe or water up to 3 inches that covered a portion of the land surfaces. As a result, the ISOCS analyses were reconfigured and re-evaluated to account for the appropriate shielding effects of water or metal. The resulting MDCs were determined to be acceptable with regard to the previously established scan investigation levels for Co-60 and Cs-137.

[1] LTP Revision 3, Table 5-1C for RCA Yard West, R0100

TABLE 2
DIRECT MEASUREMENTS

Sample Number	Cs-137 (pCi/g)	Uncertainty (pCi/g)	Co-60 (pCi/g)	Uncertainty (pCi/g)	Unitized Value of Unity Rule
FR0111091S001	< 6.12E-02		< 5.74E-02		9.24E-02
FR0111091S002	**1.12E-01**	2.71E-02	< 5.91E-02		1.16E-01
FR0111091S003	< 5.82E-02		< 5.70E-02		9.06E-02
FR0111091S004	**1.07E-01**	3.85E-02	< 5.67E-02		1.11E-01
FR0111091S005	< 7.11E-02		< 6.57E-02		1.06E-01
FR0111091S006	< 5.51E-02		< 4.78E-02		7.86E-02
FR0111091S007	< 6.15E-02		< 7.69E-02		1.15E-01
FR0111091S008	< 4.66E-02		< 4.80E-02		7.53E-02
FR0111091S009	< 7.11E-02		< 6.34E-02		1.03E-01
FR0111091S010	< 6.20E-02		< 6.81E-02		1.05E-01
FR0111091S011	< 5.00E-02		< 4.57E-02		7.41E-02
FR0111091S012	< 5.14E-02		< 5.33E-02		8.35E-02
FR0111091S013	< 4.44E-02		< 4.75E-02		7.38E-02
FR0111091S014	< 6.43E-02		< 6.05E-02		9.73E-02
FR0111091S015	< 5.46E-02		< 5.21E-02		8.34E-02
FR0111091S016	< 6.82E-02		< 6.30E-02		1.02E-01
FR0111091S017	**7.60E-02**	3.29E-02	< 6.20E-02		1.04E-01
FR0111091S018	< 7.30E-02		< 6.72E-02		1.09E-01
FR0111091S019	< 5.69E-02		< 6.01E-02		9.37E-02
FR0111091S020	< 5.37E-02		< 5.52E-02		8.67E-02
FR0111091S021	< 5.81E-02		< 4.95E-02		8.19E-02
FR0111091S022	< 5.79E-02		< 5.71E-02		9.06E-02
FR0111091S023	< 5.50E-02		< 5.54E-02		8.74E-02
FR0111091S024	< 5.31E-02		< 4.67E-02		7.65E-02
FR0111091S025	< 4.26E-02		< 4.62E-02		7.15E-02
FR0111091S026	**1.97E-01**	4.67E-02	< 5.98E-02		1.52E-01
FR0111091S027	**1.09E-01**	3.57E-02	< 5.34E-02		1.08E-01
FR0111091S028	< 4.40E-02		< 4.88E-02		7.52E-02
FR0111091S029	< 4.96E-02		< 5.53E-02		8.51E-02
FR0111091S030	< 6.27E-02		< 5.77E-02		9.33E-02
FR0111091S031	**1.78E-01**	3.90E-02	< 5.72E-02		1.41E-01
FR0111091S032	< 5.43E-02		< 5.83E-02		9.05E-02
FR0111091S033	< 5.33E-02		< 5.78E-02		8.95E-02
FR0111091S034	< 4.16E-02		< 4.64E-02		7.14E-02
FR0111091S035	< 5.53E-02		< 6.44E-02		9.80E-02
FR0111091S036	**2.41E-01**	4.38E-02	< 6.04E-02		1.71E-01
FR0111091S037	**1.21E-01**	3.97E-02	< 5.13E-02		1.10E-01
FR0111091S038	< 5.74E-02		< 5.73E-02		9.06E-02
FR0111091S039	< 5.03E-02		< 4.96E-02		7.87E-02
FR0111091S040	< 4.08E-02		< 4.18E-02		6.57E-02
FR0111091S041	< 4.91E-02		< 5.03E-02		7.90E-02
FR0111091S042	< 5.70E-02		< 5.42E-02		8.69E-02
FR0111091S043	**2.76E-01**	4.32E-02	**1.40E-01**	3.82E-02	2.79E-01
Mean	**7.68E-02**		**5.78E-02**		**9.94E-02**
Median	**5.74E-02**		**5.70E-02**		**9.06E-02**
Standard Deviation	**5.22E-02**		**1.47E-02**		**3.51E-02**
Range	**4.08E-02 to 2.76E-01**		**4.18E-02 to 1.40E-01**		**6.57E-02 to 2.79E-01**

"<" indicates MDA value. Bold indicates positive detection value.

D. SURVEY UNIT INVESTIGATIONS PERFORMED AND RESULTS

No investigations were required.

E. SURVEY UNIT DATA ASSESSMENT

An analysis of the direct sample measurement results, including the mean, median, standard deviation, and sample result range, is provided in Table 2. Of the 43 soil samples collected, 9 identified Cs-137 activity below the DCGL value of 2.39 pCi/g while only 1 sample identified Co-60 activity below the DCGL value of 0.86 pCi/g. All other values were below the MDA. Identified sample activities or Minimum Detectable Activities are listed in Table 2. The mean and median activities were less than the DCGL for both Co-60 and Cs-137. The average of the DCGL unity fractions was 0.0994 and the maximum reported unity value was less than 30% of the unitized DCGL. The sample standard deviation was smaller than the design sigma; therefore, no additional measurements 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 mean fallout Cs-137 value (0.19 pCi/g)[2] for disturbed soil from the survey unit sample mean activity (0.0768 pCi/g). This would equate to an annual dose rate of 0.0 mrem/year. Taking into account the average residual contamination level for Co-60, the annual dose rate would equate to 0.52 mrem/year[3]. However, for purposes of demonstrating compliance with the radiological criteria for license termination and the enhanced State criteria, background activity was not subtracted from the 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 (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. The sample standard deviation is smaller than the design sigma; therefore no additional samples were required.

---

[2] See Attachment E to Maine Yankee Procedure PMP 6.7.8 (Reference 5).

[3] This annual dose equivalent is based on LTP Table 6-11 which shows the RA contaminated soil contribution (for soils contaminated at the DCGL) to be 7.67 mrem/y. Therefore, the annual dose rate would equate to

$$Annual\ Dose\ Rate = 7.67\ x \left(\frac{0.0578}{0.86} \right) = 0.52\ mrem / y$$

2. The Quantile Plot was generated from the unity 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 well below the DCGL of 2.39 pCi/g for Cs-137 and 0.86 pCi/g for Co-60 for land inside the restricted area.

3. A Histogram Plot was also developed based on the unity data values. This plot shows a log-normal distribution.

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 1 land survey area; the FSS results were consistent with that classification. The direct measurement sample standard deviation was less than the design sigma. Thus, a sufficient number of sample measurements were taken and no additional measurements were required.

H. LTP CHANGES SUBSEQUENT TO SURVEY UNIT FSS

The FSS of Survey Unit 9 was designed, performed and evaluated in the November 2004 time frame. The design was performed to the criteria of the LTP Revision 3 (References 2 and 4). LTP Change No. 05-001 (Reference 7) modified the Table 6-11, "Contaminated Material DCGL," to reflect an increased Deep Soil DCGL of 0.86 pCi/g for Co-60. As a result, the retrospective dose calculation was modified to include 2.04 mrem/y from Deep Soil and 5.63 mrem/y from Surface Soil. No subsequent LTP changes with potential impact to this survey unit need to be evaluated.

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 DCGLs of 2.39 pCi/g Cs-137 and 0.86 pCi/g Co-60.

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 log-normal distribution.

The scan survey design for this survey unit was developed in accordance with the LTP Revision 3 Addenda (References 2 and 4) with significant aspects of the design discussed in Section B and Table 1. ISOCS scans performed at a distance of 3 meters from the surface did not identify activity above the scan investigation levels of 1.0 pCi/g Cs-137 and 0.36 pCi/g Co-60.

It is concluded that FR 0111 Survey Unit 9 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 and Addenda provided by Maine Yankee letter to the NRC, MN-02-061, dated November 26, 2002

2. NRC letter to Maine Yankee, dated February 28, 2003

3. Maine Yankee letter to the NRC, MN-03-049, dated September 11, 2003 (LTP Supplement to LTP Revision 3)

4. Issuance of License Amendment No. 170, NRC letter to Maine Yankee, dated February 18, 2004

5. Maine Yankee PMP 6.7.8, FSS Data Processing and Reporting, Attachment E, Approach for Dealing With Background Radioactivity for Maine Yankee Final Status Surveys

6. Maine Yankee Calculation No. EC-003-04, Use of Canberra In Situ Object Counting System (ISOCS) for FSS Surveys

7. Maine Yankee LTP Change Number 05-001, Deep Soil Co-60 DCGL

Attachment 1

Survey Unit Maps

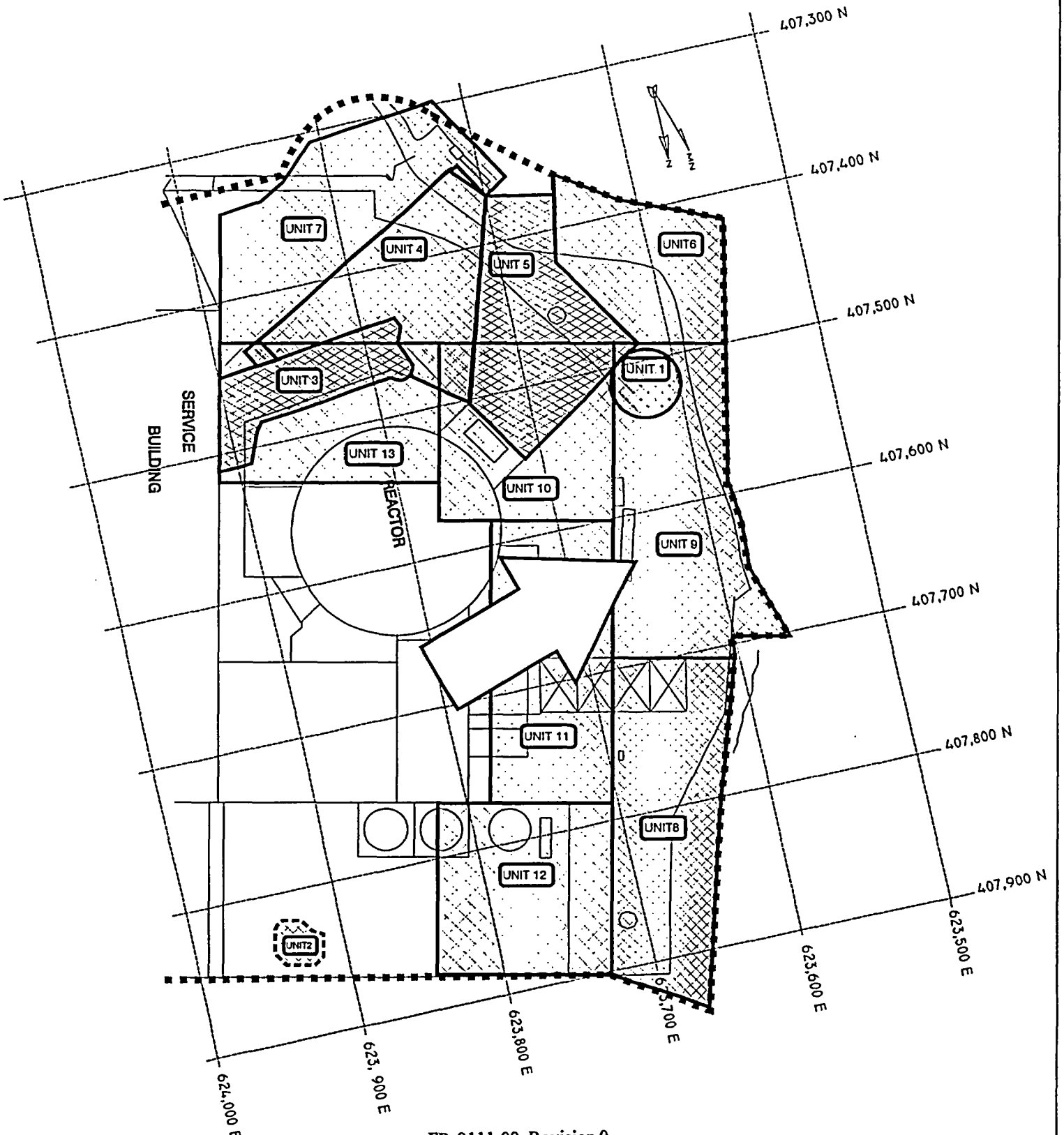
Maine Yankee Decommissioning Team

Maine Yankee Decommissioning Project Survey Map

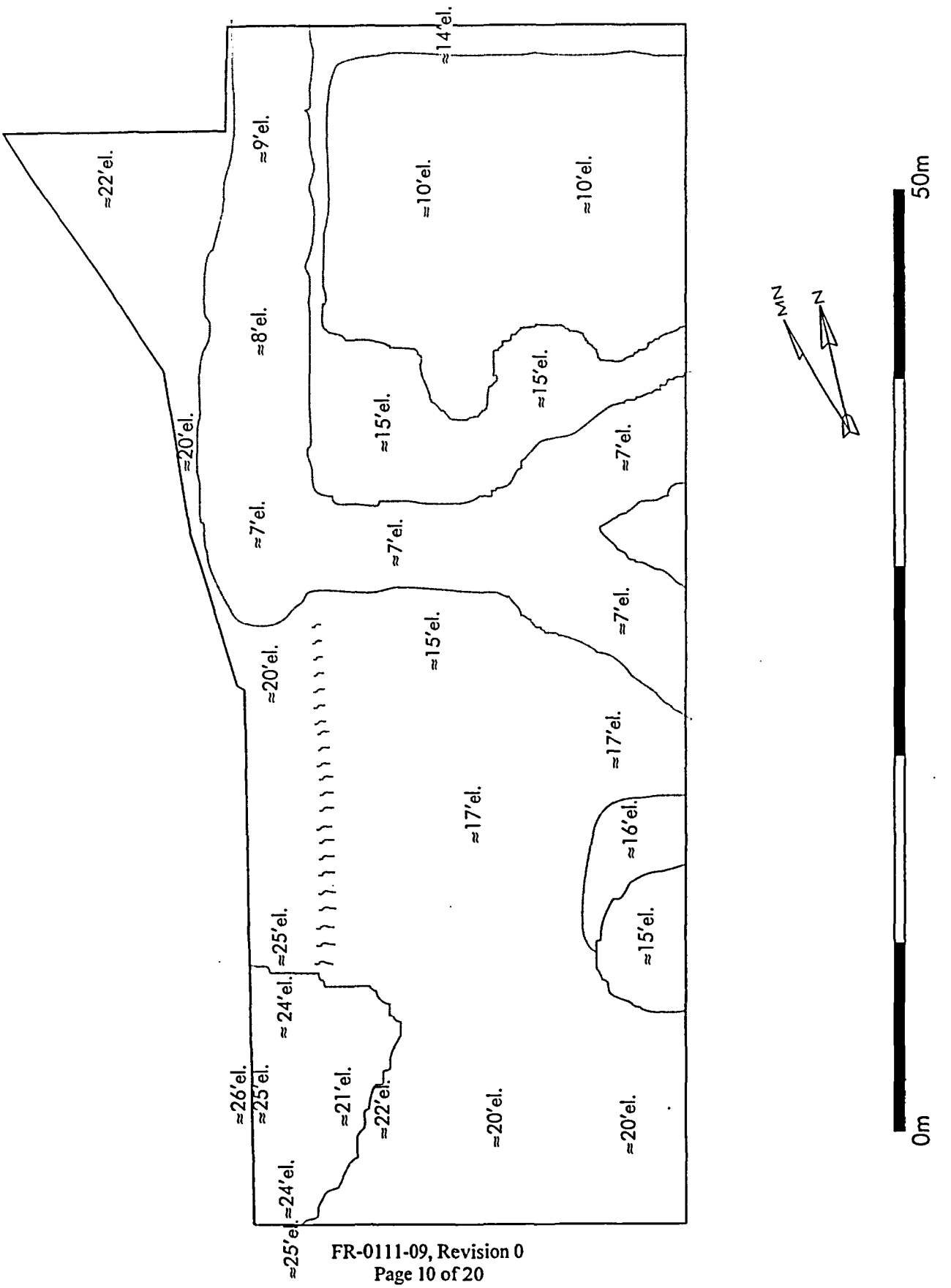
Map ID# FR0111U9-SITE

Survey Type: Characterization Turnover ■ Final Status Survey Survey Area Name: Site Locator

Prepared By: Larry N. Dockins Date: 1/17/05



Maine Yankee Decommissioning Team	***Maine Yankee Decommissioning Project Survey Map***	Map ID# FR0111U9-INFO
Survey Type: Characterization Turnover ■ Final Status Survey	Survey Area Name: Excavation Depths	
	Prepared By: Larry N. Dockins Date: 11/10/04	



Maine Yankee Decommissioning Team

Maine Yankee Decommissioning Project Survey Map

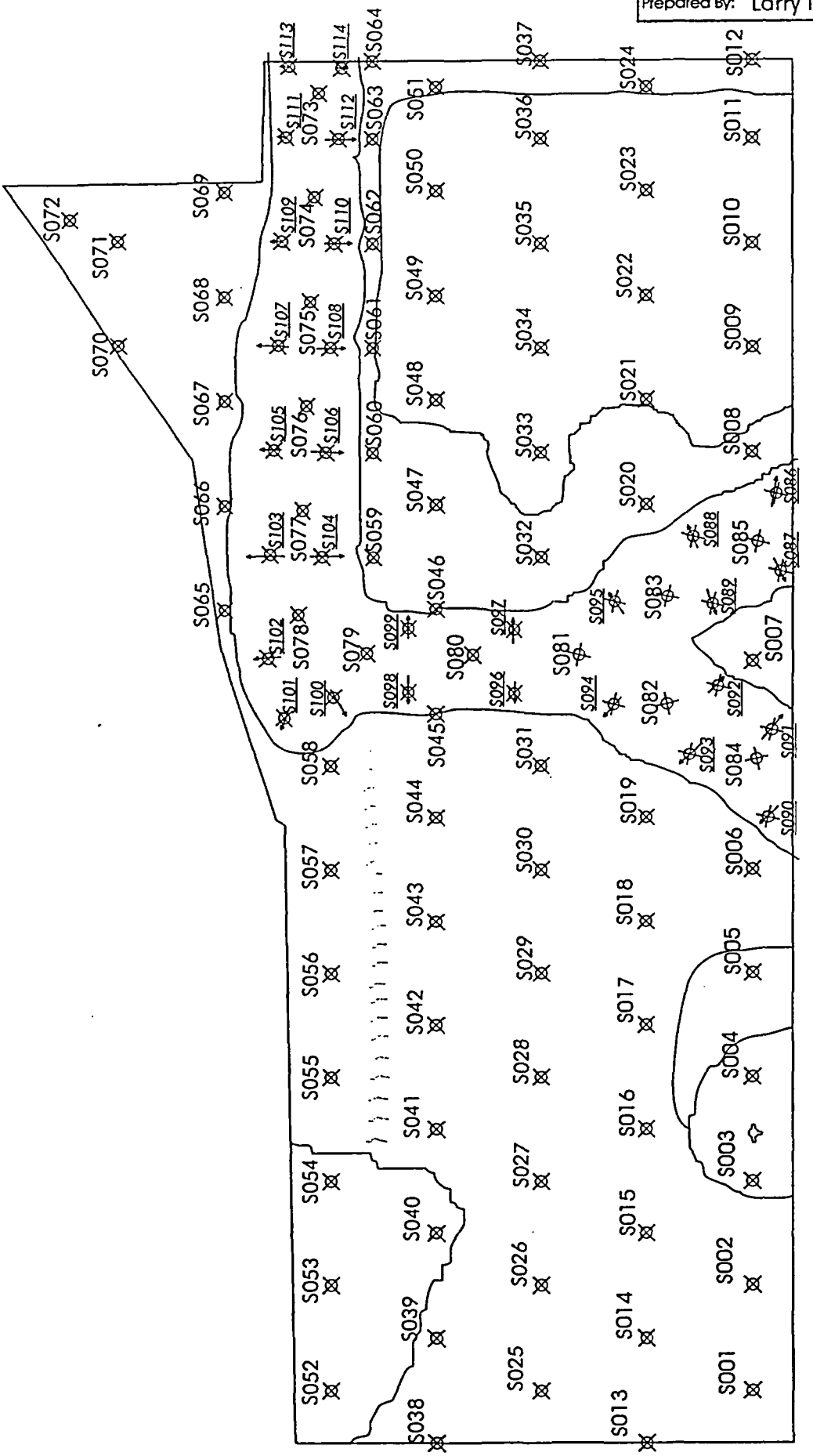
Map ID# FR0111U9-DIRT

Survey Type: Characterization | Turnover | ■ Final Status Survey

Survey Area Name: Direct Locations

Prepared By: Larry N. Dockins Date: 11/3/04

Maine Yankee Decommissioning Team	***Maine Yankee Decommissioning Project Survey Map***	Map ID# FR0111U9-SCAN
Survey Type: Characterization Turnover Final Status Survey	Survey Area Name: Scan Locations	
	Prepared By: Larry N. Dockins Date: 11/3/04	



Attachment 2

Survey Unit Instrumentation

TABLE 2-1

INSTRUMENT INFORMATION

ISOCS Detectors (Field Measurements)

Detector No.	MDC (pCi/g)
7722	0.15 to 0.70
7607	0.15 to 0.70

HPGe Detectors (Laboratory Analysis)

Detector No.	MDC (pCi/g)
FSS1	0.03 to 0.08
FSS2	0.03 to 0.08

TABLE 2-2

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

Detector	Instrument	Comments
Scan MDC	**ISOCS:** 0.15 to 0.70 pCi/g	~35% DCGL
DCGL	2.39 pCi/g Cs-137 0.86 pCi/g Co-60	Approved DCGL for land areas inside the Restricted Area, (References 4 and 7)
Investigation Level (ISOCS @ 3 m)	1.0 pCi/g Cs-137 0.36 pCi/g Co-60	(Reference 6)
Design $DCGL_{EMC}$	3.59 pCi/g Cs-137 1.29 pCi/g Co-60	DCGL x Area Factor for Class 1 survey unit, per LTP Section 5.6.3

Attachment 3

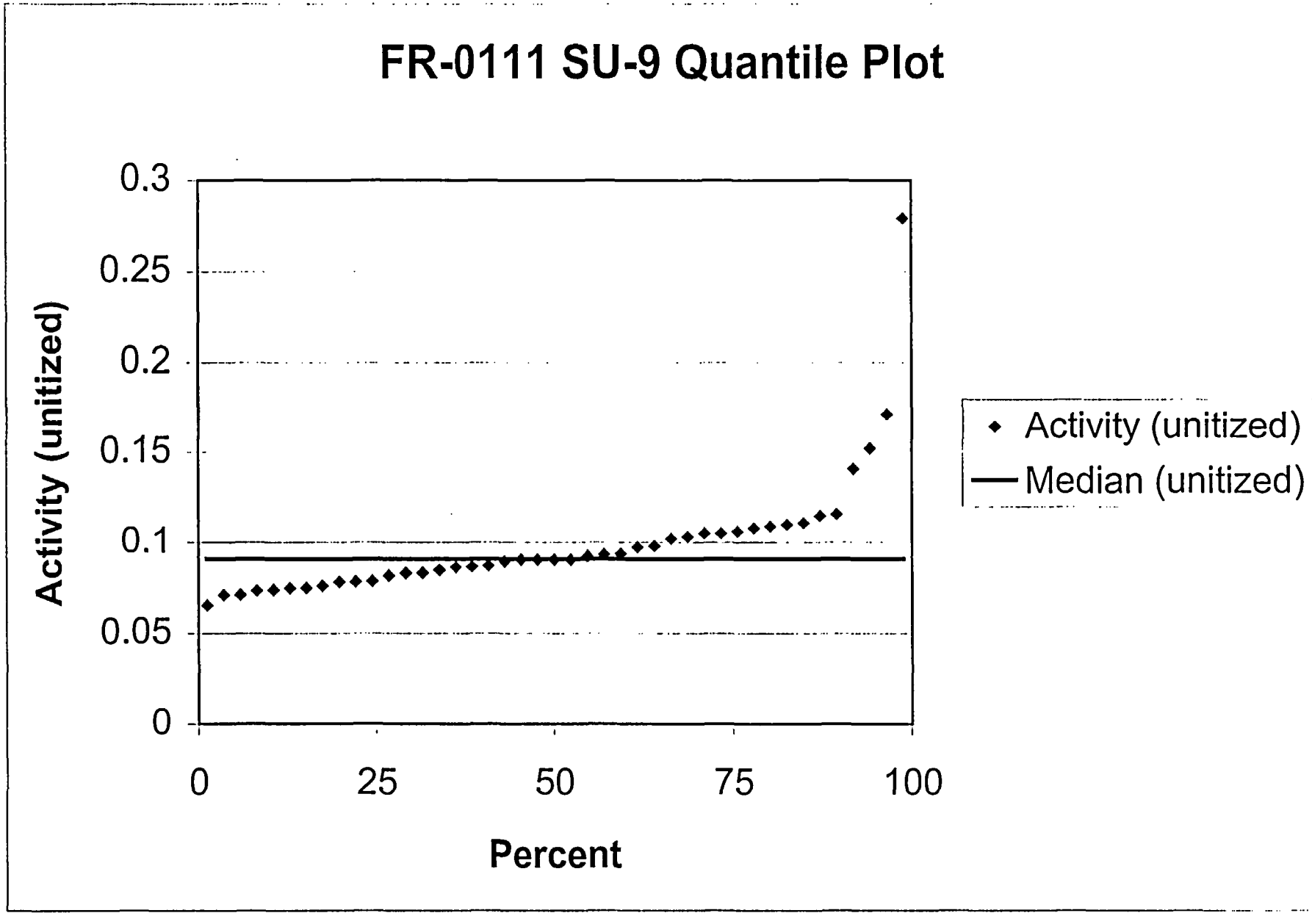
Investigation Table
(No Investigations Performed)

Attachment 4

Statistical Data

Survey Package FR0111 Unit 9 UNITY Soil Sign Test Summary

Evaluation Input Values		Comments
Survey Package:	FR0111	Yard West Excavations
Survey Unit:	09	
Evaluator:	DA	
$DCGL_w$:	1.00E+00	Unity
$DCGL_{emc}$:	1.50E+00	AF x Unity
LBGR:	5.00E-01	50% of DCGL
Sigma:	5.56E-01	Unitized (1.33 pCi/g / 2.39 pCi/g)
Type I error:	0.05	
Type II error:	0.05	
Nuclide:	UNITY	
Soil Type:	N/A	
Calculated Values		**Comments**
$Z_{1-\alpha}$:	1.645	
$Z_{1-\beta}$:	1.645	
Sign p:	0.788145	
Calculated Relative Shift:	0.8	
Relative Shift Used:	0.8	*Uses 3.0 if Relative Shift is >3*
N-Value:	33	
N-Value+20%:	40	
Sample Data Values		**Comments**
Number of Samples:	43	
Median:	9.06E-02	
Mean:	9.94E-02	
Net Sample Standard Deviation:	3.51E-02	
Total Standard Deviation:	3.51E-02	
Maximum:	2.79E-01	
Sign Test Results		**Comments**
Adjusted N Value:	43	
S+ Value:	43	
Critical Value:	27	
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	Survey Unit Passes


FR-0111 SU-9 Quantile Plot
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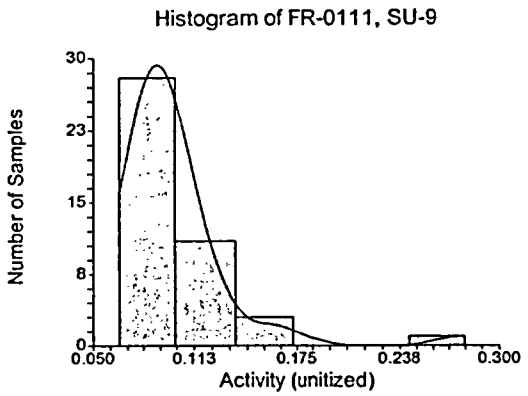
0.25
0.2
0.15
0.1
0.05
0
0
25
50
75
100
Percent
Activity (unitized)
Median (unitized)

Page/Date/Time 2 12/21/04 11:19:27 AM
Database
Variable C2

Plots Section



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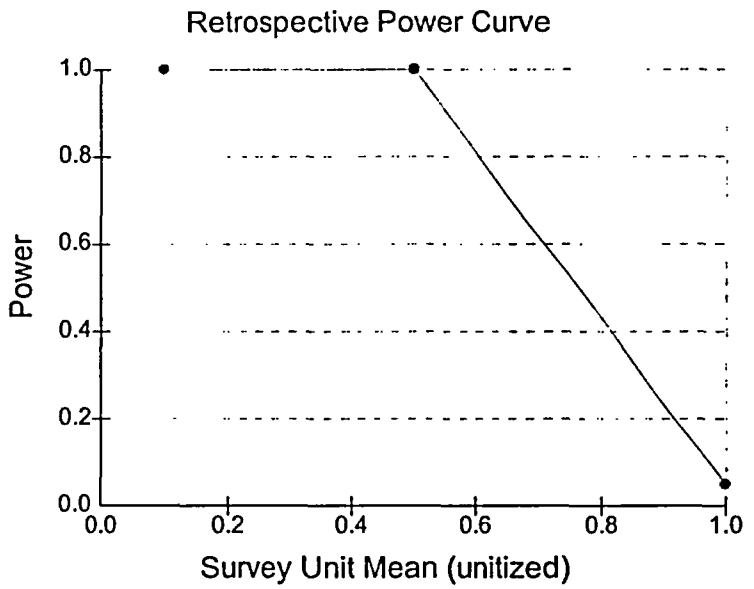

MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0111 YARD WEST EXCAVATIONS
SURVEY UNIT 10

Prepared By:	D. Anderson **FSS Engineer** - Signature D. ANDERSON Printed Name	Date: 1/12/05
Reviewed By:	Larry Dockins **FSS Specialist** - Signature Larry Dockins Printed Name	Date: 1/17/05
Reviewed By:	 **Independent Review** - Signature W J Cooper Printed Name	Date: 1/17/05
Approved By:	 **Superintendent, FSS** - Signature G. Pillsbury Printed Name	Date: 1/20/05
Approved By:	 **FSS, MOP** - Signature James R. Packer Printed Name	Date: 1/20/05

MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0111 YARD WEST EXCAVATIONS
SURVEY UNIT 10

A. SURVEY UNIT DESCRIPTION

FR 0111 Yard West Excavations Survey Unit 10 was located southwest of the former Containment Building and encompassed portions of areas that were originally surveyed under packages FR 0111 Survey Units 4 and 5 as well as FA 1900 Survey Unit 1 (HV-7&9). The 1,332 m^2 area was bordered on the north by FR 0111 Survey Unit 11, on the south by FR 0111 Survey Units 4 and 5, on the east by FR 0111 Survey Units 13 and 14, and on the west by FR 0111 Survey Unit 9. The survey unit was located at coordinates 407,525N and 623,700E using Maine State Coordinate System (West Zone) NAD 1927. The location of the survey unit in relation to the Containment Building and the surrounding FR 0111 survey units is shown on map FR0111U10-SITE (Attachment 1).

Survey Unit 10 excavation was created by demolition of the equipment hatch concrete foundation, storm drain piping removal, and demolition and removal of the Containment Building dome and liner. The Containment dome was originally filled with sand to the 20-ft. El. Following demolition of the dome and removal of subsequent rubble, the remaining walls, liner and sand fill were removed to the 17-ft. El., leaving a portion of the sub level Containment wall and liner within the survey unit. Since the equipment hatch was removed during the remediation process and it's footprint included in FR 0111 Survey Unit 10, the equipment hatch will not be surveyed as a separate entity (FA 1300). An abstract of the terrain levels and excavated depths is shown on map FR0111U10-INFO (Attachment 1).

B. SURVEY UNIT DESIGN INFORMATION

Survey Unit 10 met the LTP Revision 3 definition for a Class 1 survey unit. The survey unit design parameters are shown in Table 1. Given a relative shift of 0.8, it was determined that 40 direct measurements were required for the Sign Test. Because the measurement locations were based on a systematic square grid with a random start point, the N=40 design led to a survey unit map with 42 locations which are illustrated on map FR0111U10-DIRT (Attachment 1). Direct measurements (soil samples) were collected from required locations and analyzed with laboratory gamma spectroscopy instrumentation.

In accordance with the LTP, scans covering 100% of the 1,332 m^2 area were required for the Class 1 survey unit. This was accomplished by use of an *in situ* gamma spectroscopy detector (ISOCS) configured at a 3-meter distance from the surface to obtain overlapping 28-m^2 fields of view. The ISOCS detector was positioned perpendicular to the surface. Locations of the 102 survey scans are shown on map FR0111U10-SCAN.

The ISOCS scans were configured to ensure 100% scan coverage of all exposed surfaces within Survey Unit 10. The survey instruments used 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, the investigation level, and the $DCGL_{EMC}$. The scan MDC is less than the scan investigation level, thus providing high confidence (95% or higher) that an elevated area would be detected in the scanning process. Further, since the investigation

level was always less than the design $DCGL_{EMC}$, no EMC sample size adjustment was necessary.

TABLE 1

SURVEY UNIT DESIGN PARAMETERS

Survey Unit	Design Criteria	Basis
Area	1,332 m^2	Class 1, < 2,000 m^2
Number of Direct Measurements Required	40	Based on an LBGR of 1.2 pCi/g, sigma[1] of 1.33 pCi/g and a relative shift of 0.8. Type I = Type II = 0.05
Sample Area	33.3 m^2	1,332 m^2 / 40 = 33.3 m^2
Sample Grid Spacing	5.75 m	$(33.3)^{1/2}$
Scan Grid Area	ISOCS scan at 3-meters	See Section B
Area Factor	1.5	Class 1 Area, LTP Table 6-12
Scan Area	1,332 m^2	Class 1 Area – 100%
Scan Investigation Level	1.0 pCi/g Cs-137 0.36 pCi/g Co-60	ISOCS investigation levels with detector at 3-meter height (Reference 6)
DCGL	2.39 pCi/g Cs-137 0.86 pCi/g Co-60	References 4 and 7
Design $DCGL_{EMC}$	3.59 pCi/g Cs-137 1.29 pCi/g Co-60	DCGL x Area Factor for Class 1 survey unit, per LTP Section 5.6.3

C. SURVEY RESULTS

A total of 42 direct measurements were performed in Survey Unit 10. Ten samples contained only Cs-137 with levels of residual activity below the DCGL. Three samples contained both Cs-137 and Co-60 with results below the unitized DCGL. One of the direct measurements was below the DCGLs for Cs-137, Co-60, and Eu-152 but exceeded the unitized DCGL value (S010 was reported to contain 0.452 pCi/g Co-60, 0.495 pCi/g Cs-137 and 0.684 pCi/g Eu-152). All other measurements were below the MDA. The results are presented in Table 2. Measurement S010 was investigated using survey investigation package XR 0111-10 and is discussed in Section D.

ISOCS gamma scans were performed at 102 locations using an investigation level of 1.0 pCi/g Cs-137 and 0.36 pCi/g Co-60. The gamma scans were performed for a sufficient count time to achieve a Minimum Detectable Activity (MDA) of approximately 50% of the DCGL. All identified scan activity levels and MDAs were below the investigation levels. Therefore, no investigation surveys were performed as a result of the scan surveys.

[1] LTP Revision 3, Table 5-1C for RCA Yard West, R0100

The soil DCGL for Eu-152 was derived using the NUREG-1727 Soil Screening Values. A DCGL of 0.71 pCi/g Eu-152 is deemed appropriate based on an annual dose rate of 2.04 mrem/y due to Deep Soil (Reference 7).

TABLE 2
DIRECT MEASUREMENTS

Sample Number	Cs-137 (pCi/g)	Uncert. (pCi/g)	Co-60 (pCi/g)	Uncert. (pCi/g)	Eu-152 (pCi/g)	Uncert. (pCi/g)	Unitized Value of Unity Rule
FR0111101S001	< 4.00E-02		< 4.59E-02				7.01E-02
FR0111101S002	< 4.01E-02		< 4.91E-02				7.39E-02
FR0111101S003	**1.99E-01**	3.63E-02	**1.50E-01**	3.89E-02			2.58E-01
FR0111101S004	< 3.92E-02		< 4.34E-02				6.69E-02
FR0111101S005	< 5.43E-02		< 4.77E-02				7.82E-02
FR0111101S006	< 3.94E-02		< 4.82E-02				7.25E-02
FR0111101S007	< 5.05E-02		< 6.05E-02				9.15E-02
FR0111101S008	< 4.52E-02		< 5.55E-02				8.34E-02
FR0111101S009	**1.44E-01**	3.69E-02	< 5.86E-02				1.28E-01
FR0111101S010	**4.95E-01**	5.88E-02	**4.52E-01**	4.26E-02	**6.84E-01**	6.73E-02	1.70E+00
FR0111101S011	**1.22E-01**	2.97E-02	< 5.31E-02				1.13E-01
FR0111101S012	< 4.48E-02		< 4.39E-02				6.98E-02
FR0111101S013	< 5.20E-02		< 4.46E-02				7.36E-02
FR0111101S014	< 5.61E-02		< 5.58E-02				8.84E-02
FR0111101S015	< 3.81E-02		< 4.06E-02				6.32E-02
FR0111101S016	**1.15E-01**	3.04E-02	**4.08E-01**	4.05E-02			5.22E-01
FR0111101S017	**1.50E-01**	4.47E-02	< 1.01E-01				1.80E-01
FR0111101S018	< 4.74E-02		< 4.61E-02				7.34E-02
FR0111101S019	< 4.26E-02		< 4.06E-02				6.50E-02
FR0111101S020	**1.01E-01**	2.69E-02	< 4.46E-02				9.41E-02
FR0111101S021	**1.03E-01**	2.96E-02	< 5.57E-02				1.08E-01
FR0111101S022	**3.37E-02**	1.92E-02	< 6.30E-02				8.74E-02
FR0111101S023	**8.69E-02**	2.95E-02	< 5.90E-02				1.05E-01
FR0111101S024	< 4.58E-02		< 4.78E-02				7.47E-02
FR0111101S025	**5.29E-02**	2.29E-02	**9.99E-02**	3.32E-02			1.38E-01
FR0111101S026	< 4.00E-02		< 4.60E-02				7.02E-02
FR0111101S027	**1.49E-01**	2.98E-02	< 5.25E-02				1.23E-01
FR0111101S028	**1.73E-01**	3.59E-02	< 5.35E-02				1.35E-01
FR0111101S029	< 4.36E-02		< 4.35E-02				6.88E-02
FR0111101S030	< 3.82E-02		< 4.44E-02				6.76E-02
FR0111101S031	< 4.46E-02		< 4.26E-02				6.82E-02
FR0111101S032	< 3.64E-02		< 4.39E-02				6.63E-02
FR0111101S033	< 4.78E-02		< 5.22E-02				8.07E-02
FR0111101S034	< 4.18E-02		< 4.01E-02				6.41E-02
FR0111101S035	**1.90E-01**	3.68E-02	< 4.69E-02				1.34E-01
FR0111101S036	< 4.91E-02		< 5.58E-02				8.54E-02

Sample Number	Cs-137 (pCi/g)	Uncert. (pCi/g)	Co-60 (pCi/g)	Uncert. (pCi/g)	Eu-152 (pCi/g)	Uncert. (pCi/g)	Unitized Value of Unity Rule
FR0111101S037	< 4.52E-02		< 4.29E-02				6.88E-02
FR0111101S038	< 4.43E-02		< 4.63E-02				7.24E-02
FR0111101S039	< 4.63E-02		< 5.17E-02				7.95E-02
FR0111101S040	< 5.21E-02		< 5.36E-02				8.41E-02
FR0111101S041	< 4.00E-02		< 4.70E-02				7.14E-02
FR0111101S042	< 3.96E-02		< 4.05E-02				6.37E-02
Mean	**8.00E-02**		**7.18E-02**				**1.40E-01**
Median	**4.69E-02**		**4.80E-02**				**7.88E-02**
Standard Deviation	**8.02E-02**		**8.35E-02**				**2.57E-01**
Range	**3.37E-02 to 4.95E-01**		**4.01E-02 to 4.52E-01**				**6.32E-02 to 1.70E+00**

"<" indicates MDA value. Bold indicates positive detection value.

D. SURVEY UNIT INVESTIGATIONS PERFORMED AND RESULTS

Based on the scan results, no investigations were required. However, the direct measurement obtained from location S010 exceeded the unity value and was investigated with *in situ* gamma spectroscopy in addition to soil sampling. An ISOCS gamma scan was performed at 0.7 meters above the S010 location using the 90-degree collimator to obtain a 1.5 m^2 field of view. The gamma scan was performed for a sufficient count time to achieve a Minimum Detectable Activity of approximately 50% of the DCGL. The gamma analysis identified Co-60, Cs-137 and Eu-152 at levels below the respective DCGLs. Location of the *in situ* scan is provided on map XR0111U10-SCAN/DIRT (Attachment 1).

Direct measurements were also obtained to bound the elevated area of activity. One investigation sample was collected at the S010 location with 4 additional samples collected at equal angles 1 meter from the original direct measurement. Locations of the samples are provided on map XR0111U10-SCAN/DIRT (Attachment 1). Of the five samples collected, 3 identified Co-60 activity below the 0.86 pCi/g DCGL, 3 identified Cs-137 activity below the 2.39 pCi/g DCGL and 2 identified Eu-152 below the 0.71 pCi/g DCGL. The center sample taken from the original direct measurement location produced the highest results with a unity value of 1.62 (3.95E-01 pCi/g Co-60, 5.68E-01 pCi/g Cs-137 and 6.53E-01 pCi/g Eu-152), slightly less than the original S010 measurement. Analysis of the soil samples determined that the highest activity was obtained from the original S010 location and that the activity was indicative of an approximate 2 m^2 area. Applying an area factor for 2 m^2 to the localized activity allowed the original sample results to be evaluated using the Elevated Measurement Comparison Unity test. The results were determined to be less than 35% of unity, passing the EMC test. The results of the investigation measurements are addressed in Table 3-1 (Attachment 3). The center investigation sample is not included in Table 3-1 as the original sample results were higher and therefore were used as the measurement for the elevated activity.

E. SURVEY UNIT DATA ASSESSMENT

An analysis of the direct sample measurement results, including the mean, median, standard deviation, and sample result range, is provided in Table 2. Positively detected values are bolded in the table. Since Co-60 and Cs-137 are the primary nuclides of concern, non-detect values were assumed to be present at the MDA. Non-detect values for Eu-152 were assumed not to be present since Eu-152 is not normally found in the soil and the survey results indicate localized contamination from decommissioning activities. Of the 42 soil samples collected, 14 identified Cs-137 activity below the DCGL value of 2.39 pCi/g, 4 samples identified Co-60 activity below the DCGL value of 0.86 pCi/g and 1 sample identified Eu-152 activity below the DCGL value of 0.71 pCi/g. All other values were below the MDA. Identified sample activities or Minimum Detectable Activities are listed in Table 2, except as noted above. The mean and median activities were less than the DCGLs for Cs-137, Co-60 and Eu-152. The average of the DCGL unity fractions was 0.140, indicating that the direct measurements averaged 14.0% of the DCGL limit. One direct measurement (S010) exceeded the unitized DCGL by approximately 70%. The location was investigated and found to be acceptable.

Based on the sign test contained in Attachment 4, it is apparent that the general residual radioactivity within the survey unit is less than the DCGL and is in compliance with the release criteria. Because the original S010 direct measurement is more than three standard deviations above the mean value for the survey unit direct measurements, it appears to be an outlier of small size. The investigation conducted in survey package XR 0111-10 included the collection of additional samples at equal angles 1 meter from the original S010 location. All four samples indicated a decrease in activity from that obtained at S010, thereby indicating that the elevated activity was limited to an approximate 2 m^2 area. In accordance with the LTP Revision 3, Table 6-12, the area factor for a 2 m^2 area is 6.8. This area factor was applied to the S010 measurement results to assess the acceptability of the elevated activity. All remaining direct measurements are less than the unity DCGL of 1. As shown in Table 3-1 (Attachment 3), the investigation results were found to be less than 35% of unity and therefore considered acceptable.

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 mean fallout Cs-137 value (0.19 pCi/g)[2] for disturbed soil from the survey unit sample mean activity (0.08 pCi/g). This would equate to an annual dose rate of 0.0 mrem/year. Taking into account the average residual contamination level for Co-60, the annual dose rate would equate to 0.64 mrem/year[3]. Eu-152 is not included in this calculation because it was identified in only one localized place. Also, for purposes of demonstrating compliance with the radiological criteria for license termination and the enhanced State criteria, background activity was not subtracted from the sample analysis activity values.

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[2] See Attachment E to Maine Yankee Procedure PMP 6.7.8 (Reference 5).

[3] This annual dose equivalent is based on LTP Table 6-11 which shows the RA contaminated soil contribution (for soils contaminated at the DCGL) to be 7.67 mrem/y. Therefore, the annual dose rate would equate to

$$\text{Annual Dose Rate} = 7.67 \times \left(\frac{0.0718}{0.86}\right) = 0.64 \text{ mrem/y}$$

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, an Area Factor of 1.7 was used rather than the design AF of 1.5, since the 1.5 value is overly conservative for a sample area of 33.3 m^2. The direct measurements clearly pass the sign test; however, several elements required further evaluation. As discussed in Section E, the subject release criteria have been satisfied. In addition, the sample standard deviation is smaller than the design sigma; therefore no additional samples were required.

2. The Quantile Plot was generated from the unity 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 DCGLs of 2.39 pCi/g for Cs-137 and 0.86 pCi/g for Co-60 for land inside the restricted area. One outlier is due to the identification of Eu-152 at S010 below the DCGL value of 0.71 pCi/g.

3. A Histogram Plot was also developed based on the unity data values. This plot shows 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.

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

The survey was designed as a Class 1 land survey area; the FSS results were consistent with that classification. The direct measurement sample standard deviation was less than the design sigma. Thus, a sufficient number of sample measurements were taken and no additional measurements were required.

H. LTP CHANGES SUBSEQUENT TO SURVEY UNIT FSS

The FSS of Survey Unit 10 was designed, performed and evaluated in the November-December 2004 time frame. The design was performed to the criteria of the LTP Revision 3 (References 2 and 4). LTP Change No. 05-001 (Reference 7) modified the Table 6-11, "Contaminated Material DCGL," to reflect an increased Deep Soil DCGL of 0.86 pCi/g for Co-60. As a result, the retrospective dose calculation was modified to include 2.04 mrem/y from Deep Soil and 5.63 mrem/y from Surface Soil. No subsequent LTP changes with potential impact to this survey unit need to be evaluated.

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 DCGLs of 2.39 pCi/g Cs-137, 0.86 pCi/g Co-60 and 0.71 pCi/g Eu-152. One direct measurement exceeded the unitized DCGL. This location was investigated and found acceptable.

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 elevated measurement obtained from S010 was investigated and evaluated using the appropriate area factor and determined to satisfy the elevated measurement comparison unity rule per LTP methodology.

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 one outlier.

The scan survey design for this survey unit was developed in accordance with the LTP Revision 3 Addenda (References 2 and 4) with significant aspects of the design discussed in Section B and Table 1. ISOCS scans performed at a distance of 3 meters in a systematic grid pattern throughout the survey unit did not identify activity above the scan investigation levels of 1.0 pCi/g Cs-137 and 0.36 pCi/g Co-60. Therefore, no investigations were required as a result of the scan process.

It is concluded that FR 0111 Survey Unit 10 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 and Addenda provided by Maine Yankee letter to the NRC, MN-02-061, dated November 26, 2002

2. NRC letter to Maine Yankee, dated February 28, 2003

3. Maine Yankee letter to the NRC, MN-03-049, dated September 11, 2003 (LTP Supplement to LTP Revision 3)

4. Issuance of License Amendment No. 170, NRC letter to Maine Yankee, dated February 18, 2004

5. Maine Yankee PMP 6.7.8, FSS Data Processing and Reporting, Attachment E, Approach for Dealing With Background Radioactivity for Maine Yankee Final Status Surveys

6. Maine Yankee Calculation No. EC-003-04, Use of Canberra In Situ Object Counting System (ISOCS) for FSS Surveys

7. Maine Yankee LTP Change Number 05-001, Deep Soil C0-60 DCGL

Attachment 1

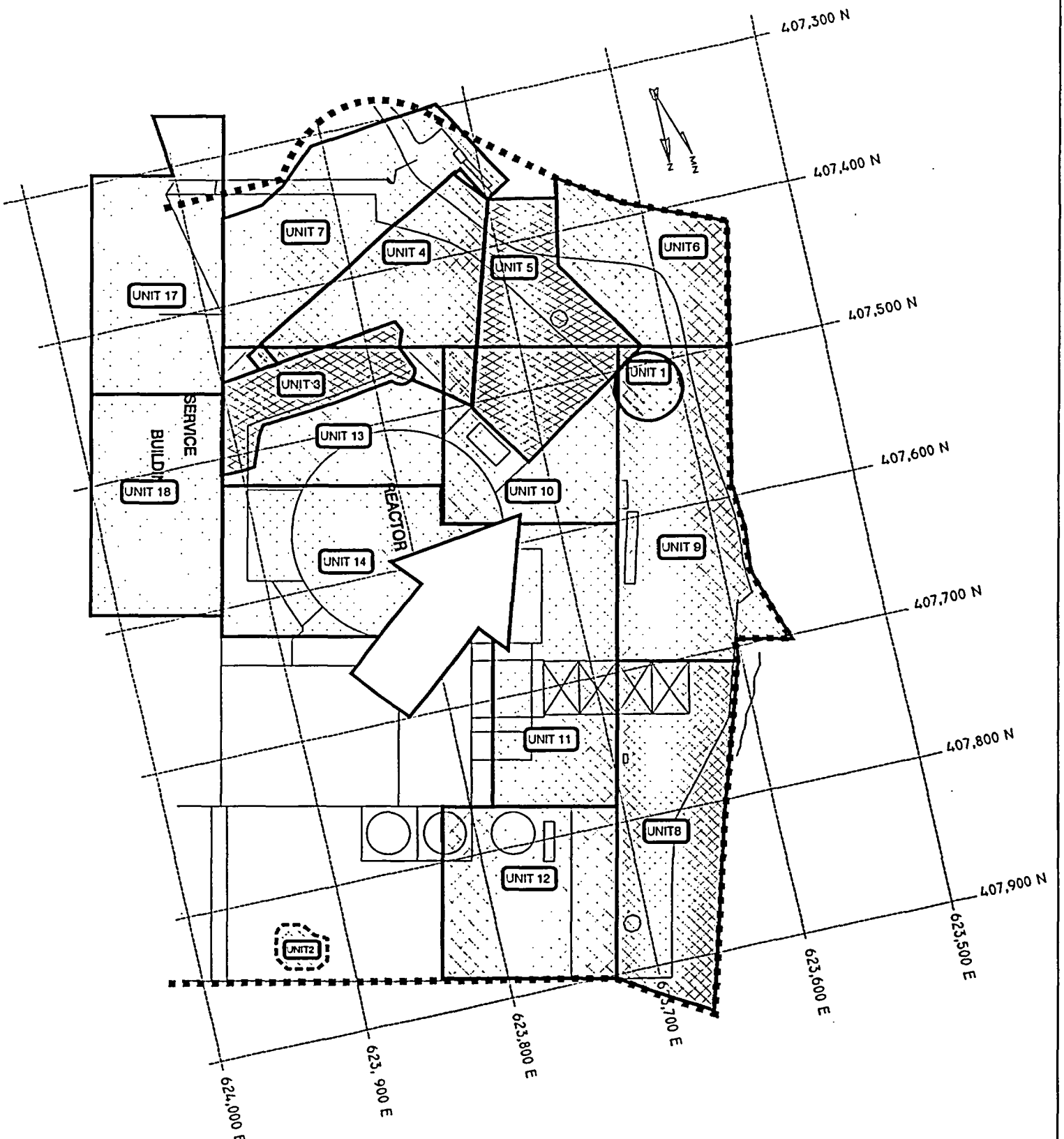
Survey Unit Maps

Maine Yankee Decommissioning Team

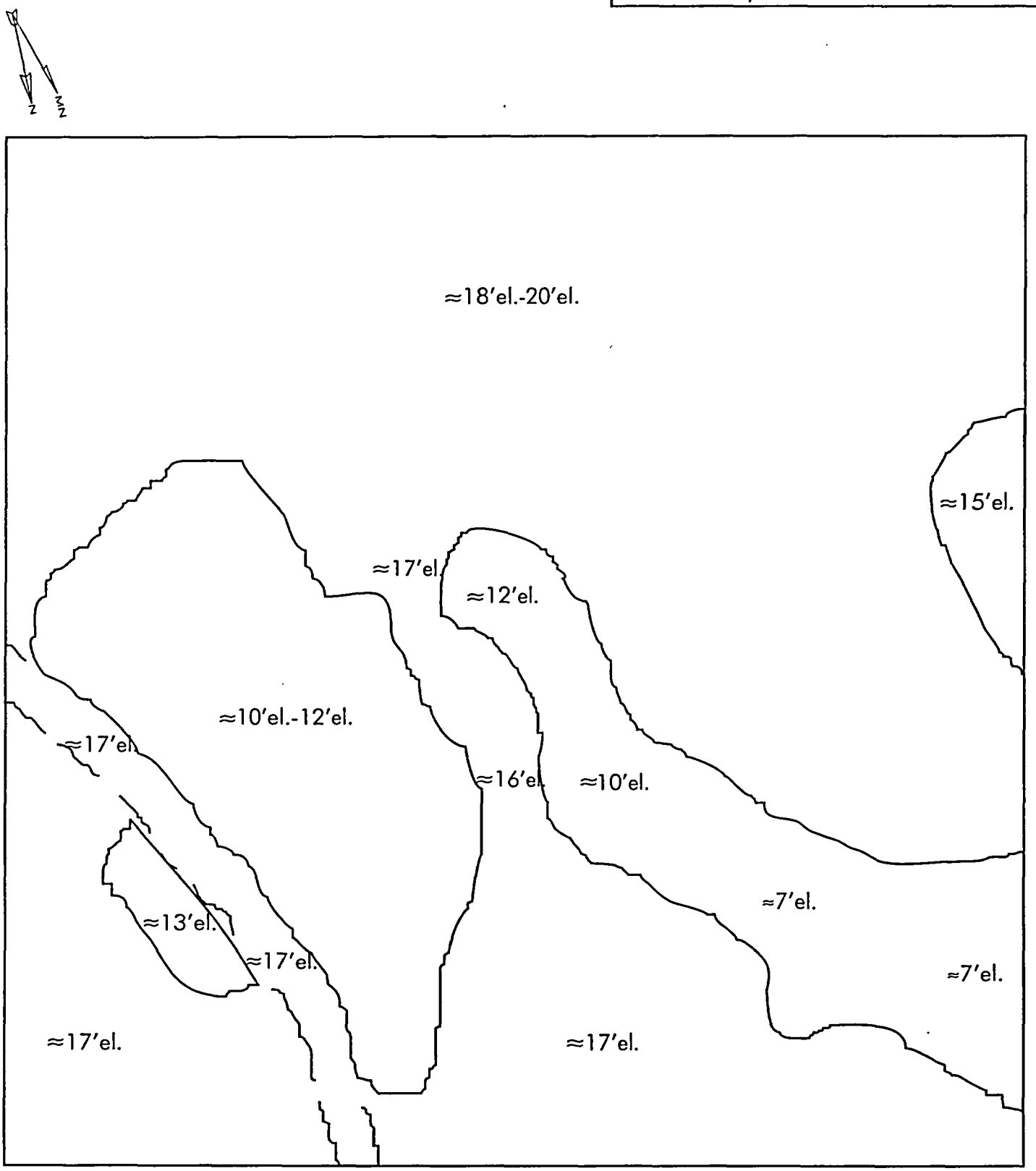
Maine Yankee Decommissioning Project Survey Map : Map ID#FR0111U10-SITE

Survey Type: Characterization Turnover ■ Final Status Survey Survey Area Name: Site Locator

Prepared By: Larry N. Dockins Date: 1/17/05

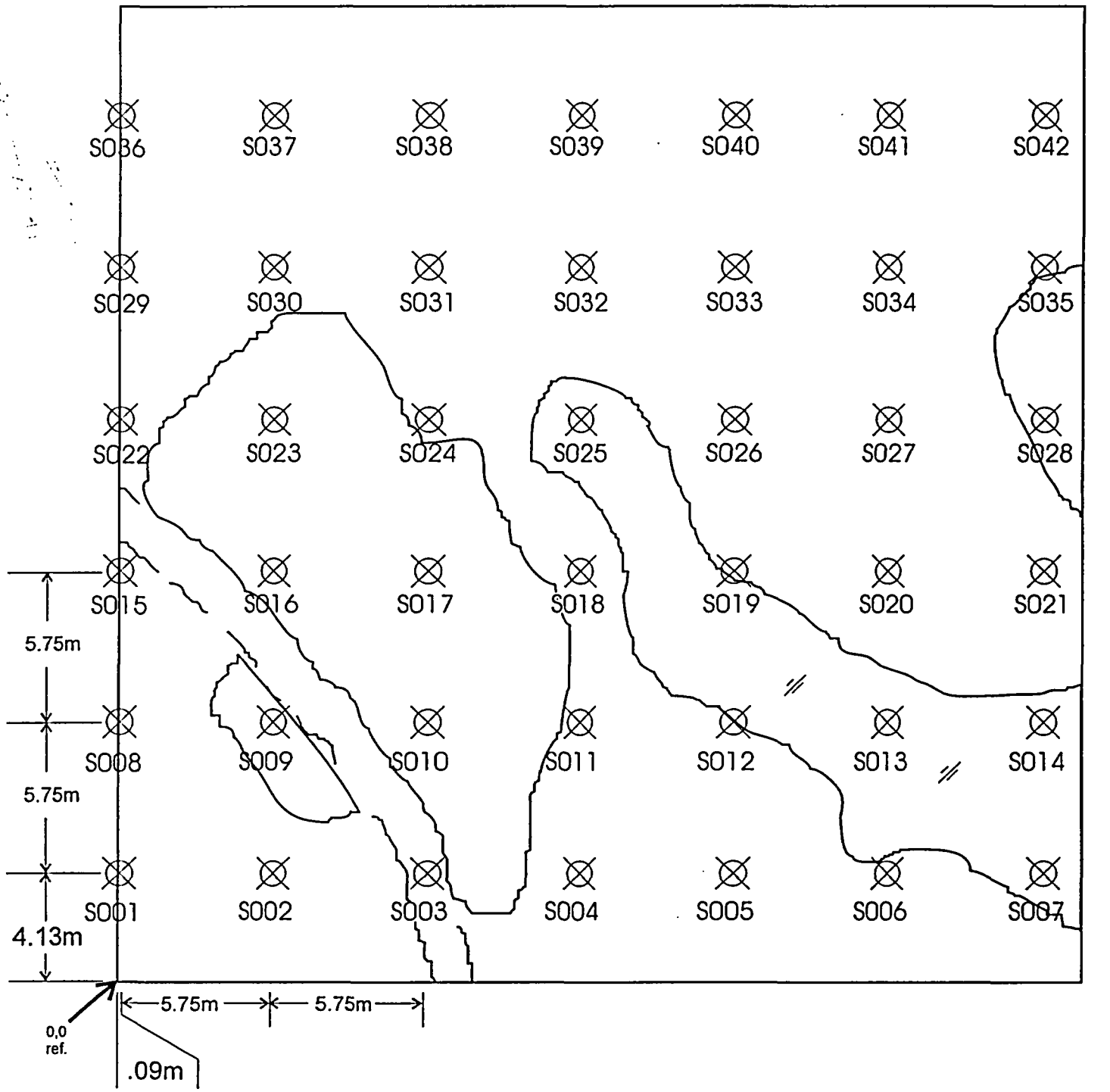


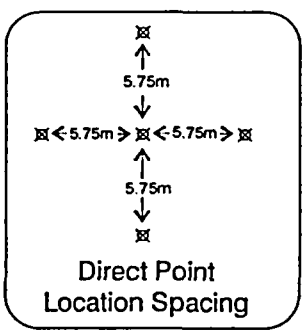
Maine Yankee Decommissioning Team	***Maine Yankee Decommissioning Project Survey Map***	Map ID#FR0111U10-INFO
Survey Type: Characterization Turnover Final Status Survey	Survey Area Name: Excavation Depths	
	Prepared By: Larry N. Dockins Date: 12/23/04	



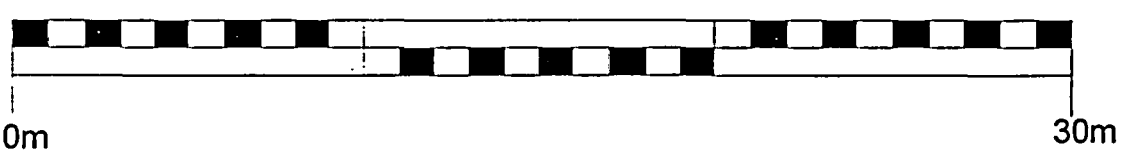
0m 30m

Maine Yankee Decommissioning Team	***Maine Yankee Decommissioning Project Survey Map***	Map ID# FR0111U10-DIRT
Survey Type: Characterization Turnover ■ Final Status Survey	Survey Area Name: Direct Locations	
	Prepared By: Larry N. Dockins Date: 11/30/04	



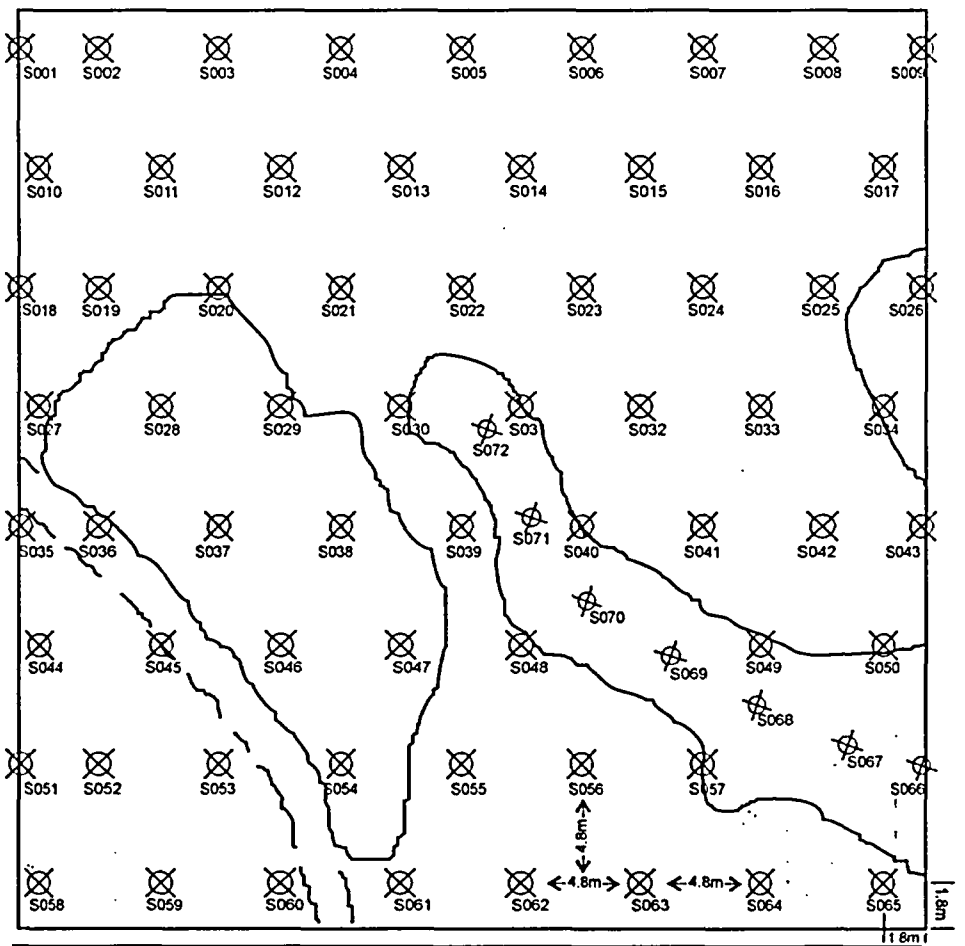


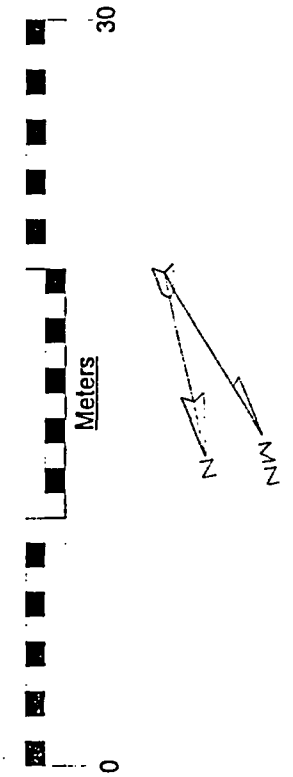
Direct Point Location Spacing

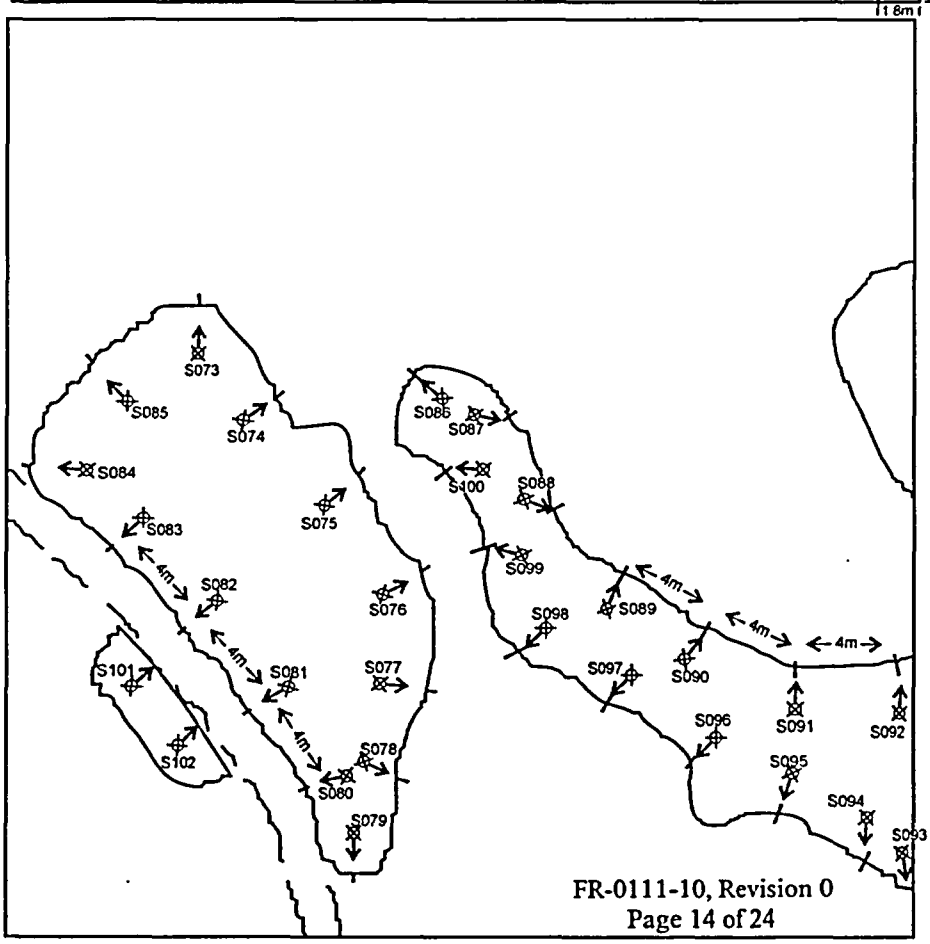


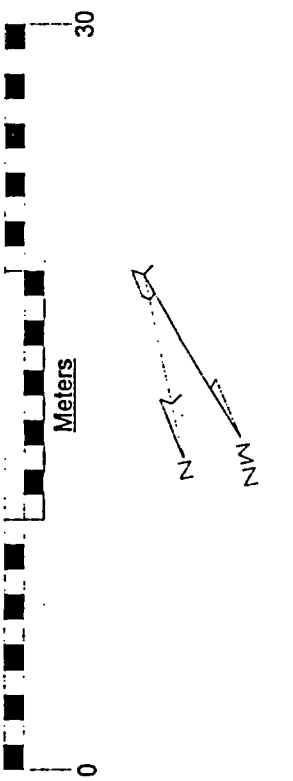
Maine Yankee Decommissioning Team	***Maine Yankee Decommissioning Project Survey Map***	Map ID#FR0111U10-SCAN
Survey Type: Characterization Turnover Final Status Survey	Survey Area Name: Scan Locations	

Prepared By: Larry N. Dockins Date: 11/30/04

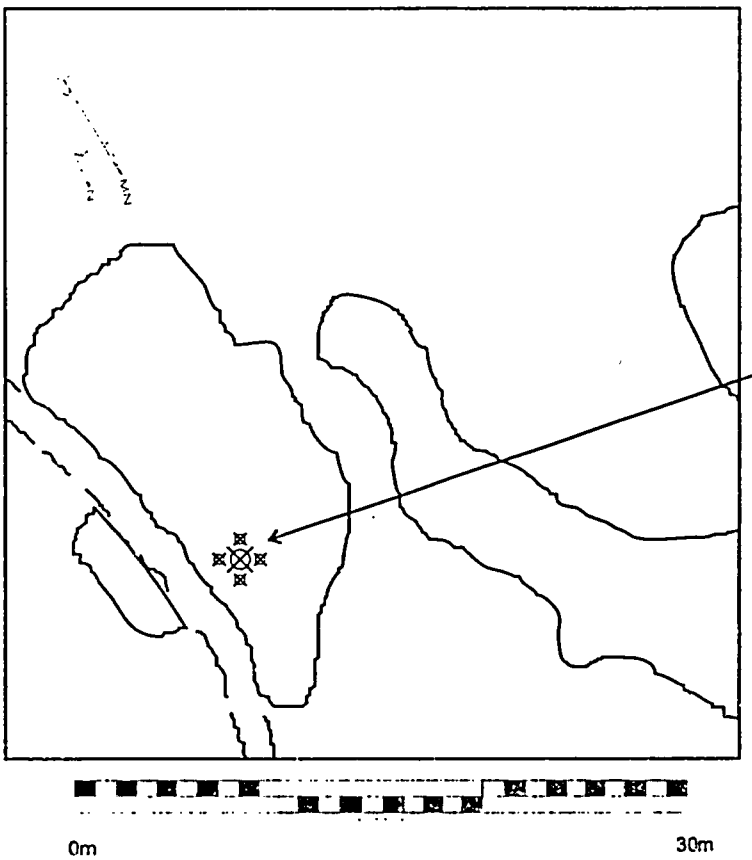


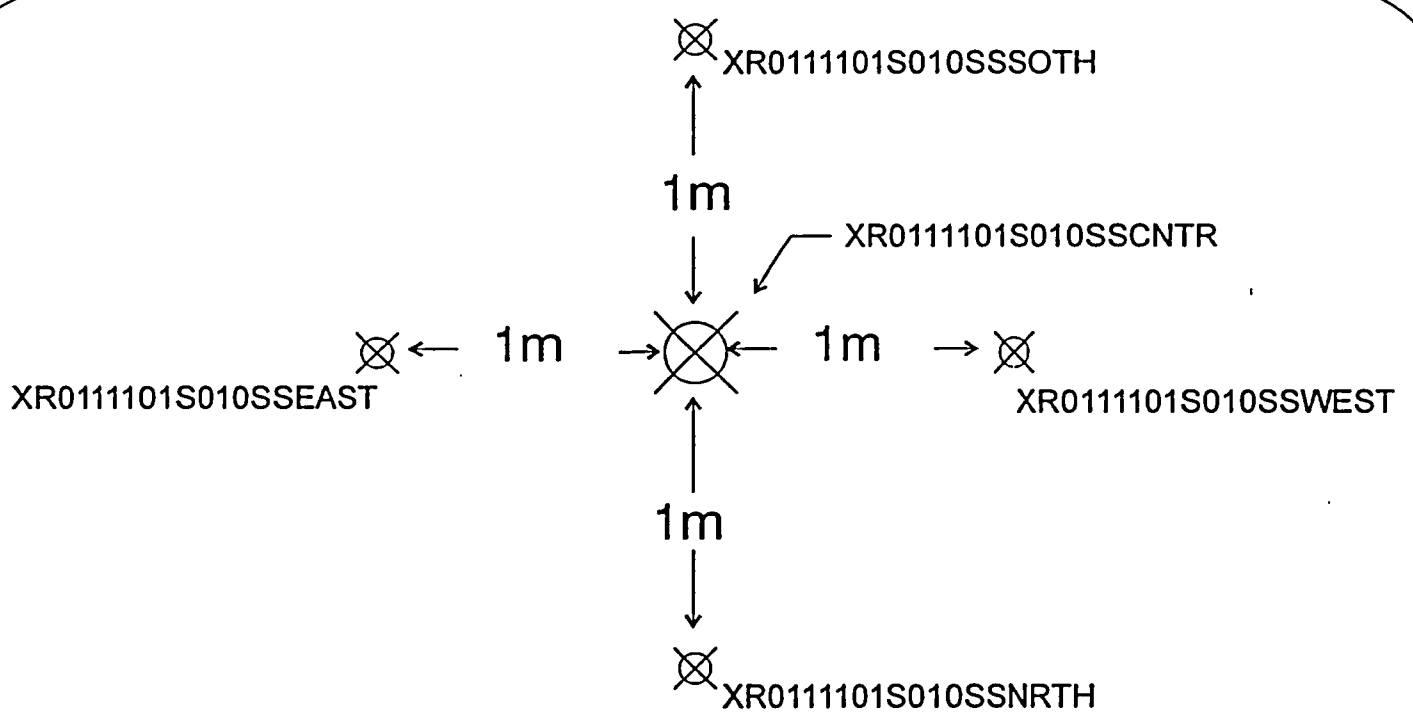






Maine Yankee Decommissioning Team	*Maine Yankee Decommissioning Project Survey Map*	Map ID# XR0111U10-SCAN/DIRT
Survey Type: Characterization Turnover ■ Final Status Survey	Survey Area Name: Investigation Locations	
	Prepared By: Larry N. Dockins Date: 12/7/04	





Point Spacing and Soil Sample ID

Attachment 2

Survey Unit Instrumentation

TABLE 2-1

INSTRUMENT INFORMATION

ISOCS Detectors (Field Measurements)

Detector No.	MDC (pCi/g)
7722	0.13 to 0.90
7607	0.13 to 0.90

HPGe Detectors (Laboratory Analysis)

Detector No.	MDC (pCi/g)
FSS1	0.03 to 0.10
FSS2	0.03 to 0.10

TABLE 2-2

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

Detector	Instrument	Comments
Scan MDC	**ISOCS:** 0.13 to 0.90 pCi/g	~ 50% DCGL
DCGL	2.39 pCi/g Cs-137 0.86 pCi/g Co-60	Approved DCGL for land areas inside the Restricted Area, (References 4 and 7)
Investigation Level (ISOCS @ 3 m)	1.0 pCi/g Cs-137 0.36 pCi/g Co-60	(Reference 6)
Design $DCGL_{EMC}$	3.59 pCi/g Cs-137 1.29 pCi/g Co-60	DCGL x Area Factor for Class 1 survey unit, per LTP Section 5.6.3

Attachment 3

Investigation Table

TABLE 3-1

INVESTIGATION TABLE

Sample Number	Co-60 pCi/g	Cs-137 pCi/g	Eu-152[4] pCi/g	Elevated Area in m^2	Area Factor	$DCGL_{EMC}$ Unity AF[5]	Unitized Value of Unity Rule	$DCGL_{EMC}$ Unity[6]
S010[7]	**4.52E-01** ± 4.26E-02	**4.95E-01** ± 5.88E-02	**6.84E-01** ± 6.73E-02	2	6.8	6.8	1.59E+00	2.34E-01
S010SSSOTH	**1.76E-01** ± 2.77E-02	**1.36E-01** ± 3.43E-02	**4.75E-01** ± 5.37E-02	N/A	N/A	N/A	N/A	< DCGL
S010SSEAST	**5.51E-01** ± 6.18E-02	**6.63E-01** ± 8.67E-02	N/A	N/A	N/A	N/A	N/A	< DCGL
S010SSNRTH	< 7.03E-02	< 7.19 E-02	N/A	N/A	N/A	N/A	N/A	< DCGL
S010SSWEST	< 6.23E-02	< 6.01E-02	N/A	N/A	N/A	N/A	N/A	< DCGL
					Co-60 Mean pCi/g	Cs-137 Mean pCi/g	Unitized Mean pCi/g	
					6.26E-02	6.99E-02	1.02E-01	1.02E-01
							EMC Unity Sum	**3.36E-01**

[4] Non-detect values for Eu-152 were not included in unity calculation as discussed in Section E.

[5] Area Factor based on LTP Rev. 3 Table 6-12.

[6] The Unitized Value of Unity Rule value and $DCGL_{EMC}$ unity value were calculated by subtracting the Co-60 and Cs-137 survey unit means from the sample results. Eu-152 survey unit mean was not subtracted from the survey unit unity value. The survey unit mean was calculated using the data shown in Table 2, except that the results for S010 were excluded from the survey unit mean.

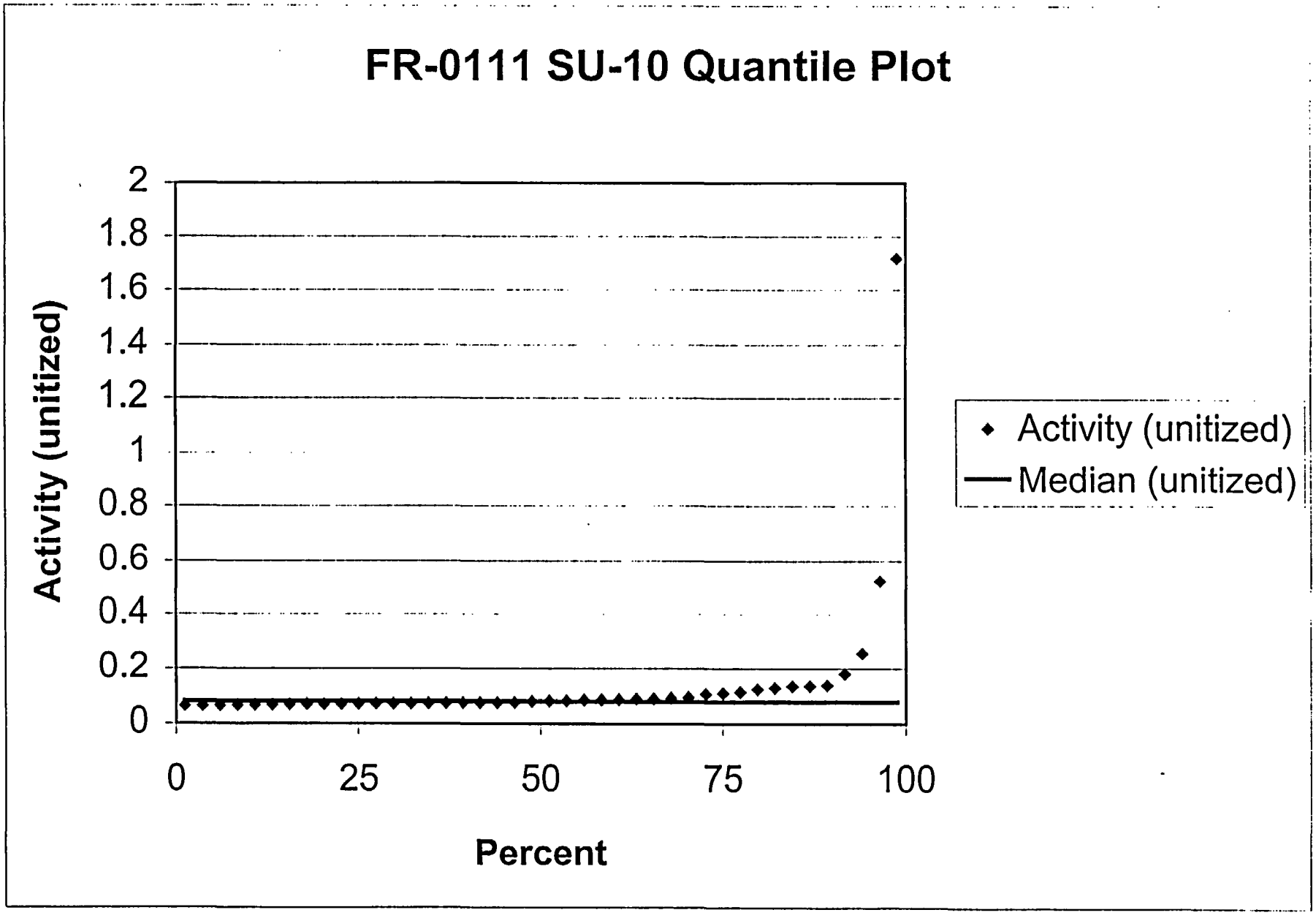
[7] S010 is the value from the direct sampling, included because the direct unity value was > DCGL and was generally greater than the investigation results.

Attachment 4

Statistical Data

Survey Package FR0111 Unit 10 UNITY Soil Sign Test Summary

Evaluation Input Values		Comments
Survey Package:	FR0111	Yard West Excavations
Survey Unit:	10	
Evaluator:	DA	
$DCGL_w$:	1.00E+00	Unity
$DCGL_{emc}$:	1.70E+00	Actual Area Factor applied
LBGR:	5.00E-01	50% of DCGL
Sigma:	5.56E-01	Unitized (1.33 pCi/g / 2.39 pCi/g)
Type I error:	0.05	
Type II error:	0.05	
Nuclide:	UNITY	
Soil Type:	N/A	
Calculated Values		**Comments**
$Z_{1-\alpha}$:	1.645	
$Z_{1-\beta}$:	1.645	
Sign p:	0.788145	
Calculated Relative Shift:	0.8	
Relative Shift Used:	0.8	Uses 3.0 if Relative Shift is >3
N-Value:	33	
N-Value+20%:	40	
Sample Data Values		**Comments**
Number of Samples:	42	
Median:	7.88E-02	
Mean:	1.40E-01	
Net Sample Standard Deviation:	2.57E-01	
Total Standard Deviation:	2.57E-01	
Maximum:	1.70E+00	
Sign Test Results		**Comments**
Adjusted N Value:	42	
S+ Value:	41	
Critical Value:	26	
Sign test results:	Pass	
Criteria Satisfaction		**Comments**
Sufficient samples collected:	Pass	
Maximum value <$DCGL_w$:	Investigate	See Sections D & E of Release Record.
Median value <$DCGL_w$:	Pass	
Mean value <$DCGL_w$:	Pass	
Maximum value <$DCGL_{emc}$:	Pass	See Sections D & E of Release Record.
Total Standard Deviation <=Sigma:	Pass	
Criteria comparison results:	Investigate	See Section I of Release Record.
Final Status		**Comments**
The survey unit passes all conditions:	Investigate	Survey Unit Passes


FR-0111 SU-10 Quantile Plot
Activity (unitized)
2
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 (unitized)
Median (unitized)

Page/Date/Time 2 1/12/05 1:32:11 PM
Database C:\Program Files\NCSS97\FR0111 SU-10.S0
Variable C2

Plots Section

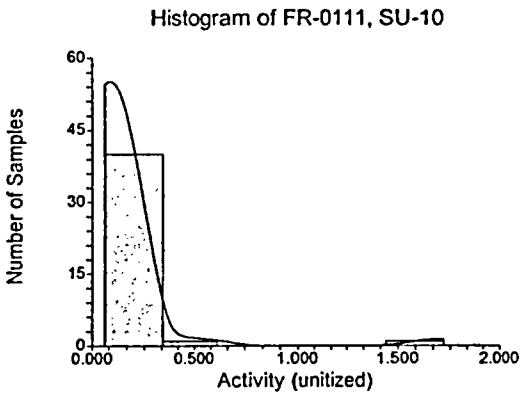
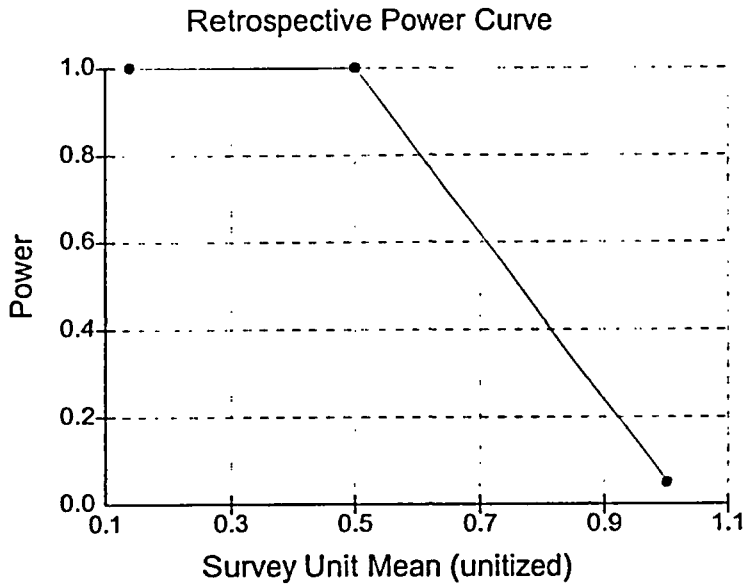


Chart Section



MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0111 YARD WEST EXCAVATIONS
SURVEY UNIT 13

Prepared By:	D. Anderson **FSS Engineer** - Signature D. ANDERSON Printed Name	Date: 1/13/05
Reviewed By:	Larry Dockins **FSS Specialist** - Signature Larry Dockins Printed Name	Date: 1/17/05
Reviewed By:	 **Independent Review** - Signature W J Cooper Printed Name	Date: 1/17/05
Approved By:	 **Superintendent, FSS** - Signature George Pillsbury Printed Name	Date: 1/20/05
Approved By:	 **FSS, MOP** - Signature James R. Pocock Printed Name	Date: 1/20/05

MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0111 YARD WEST EXCAVATIONS
SURVEY UNIT 13

A. SURVEY UNIT DESCRIPTION

FR 0111 Yard West Excavations Survey Unit 13 was located southeast of the former Containment Building and encompassed portions of areas that were originally surveyed under packages FR 0111 Survey Units 3, 4 and 7. These survey units were backfilled prior to being included with FR 0111 Survey Unit 13. The 1,290.5 m^2 rectangular area was bordered on the north by FR 0111 Survey Unit 14, on the south by FR 0111 Survey Units 3, 4, and 7, on the west by FR 0111 Survey Unit 10 and on the east by FR 0111 Survey Units 17 and 18. The survey unit was located at coordinates 407,500N and 623,850E using Maine State Coordinate System (West Zone) NAD 1927. The location of the survey unit in relation to the Containment Building and the surrounding FR 0111 survey units is shown on Map FR0111U13-SITE (Attachment 1).

Survey Unit 13 excavation contained a portion of the sand filled Containment interior, as well as the Spray Building (FA 1700) and Personnel Hatch (FA 1400) footprints. The Containment Building was filled with sand to the 20-ft. Elevation prior to demolition. Following demolition of the concrete walls and dome and removal of the subsequent rubble, the remaining containment footprint and surrounding areas were excavated to the 17-ft. El. Survey Unit 13 also encompasses new clean fill portions of land that were previously excavated and surveyed under packages FR 0111 Survey Units 3, 4 and 7. The survey unit consisted of generally level terrain. An abstract of the terrain levels is shown on map FR0111U13-INFO (Attachment 1).

B. SURVEY UNIT DESIGN INFORMATION

Survey Unit 13 met the LTP Revision 3 definition for a Class 1 survey unit. The survey unit design parameters are shown in Table 1. Given a relative shift of 0.8, it was determined that 40 direct measurements were required for the Sign Test. The measurement locations were based on a systematic square grid with a random start point and are illustrated on map FR0111U13-DIRT (Attachment 1). Direct measurements (soil samples) were collected from required locations and analyzed with laboratory gamma spectroscopy instrumentation.

In accordance with the LTP, scans covering 100% of the 1,290.5 m^2 area were required for the Class 1 survey unit. This was accomplished by use of an *in situ* gamma spectroscopy detector (ISOCS) configured at a 3-meter distance from the surface to obtain overlapping 28-m^2 fields of view. Locations of the 70 survey scans are shown on map FR0111U13-SCAN.

The ISOCS scans were configured to ensure 100% scan coverage of all exposed surfaces within Survey Unit 13. The survey instruments used 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, the investigation level, and the $DCGL_{EMC}$. As shown in this table, the scan MDC is less than the scan investigation level, thus providing high confidence (95% or higher) that an elevated area would be detected in the scanning process. Further, since the investigation level was always less than the design $DCGL_{EMC}$, no EMC sample size adjustment was necessary.

TABLE 1

SURVEY UNIT DESIGN PARAMETERS

Survey Unit	Design Criteria	Basis
Area	1,290.5 m^2	Class 1, < 2,000 m^2
Number of Direct Measurements Required	40	Based on an LBGR of 1.2 pCi/g, sigma[1] of 1.33 pCi/g and a relative shift of 0.8. Type I = Type II = 0.05
Sample Area	32.26 m^2	1,290.5 m^2 / 40 = 32.26 m^2
Sample Grid Spacing	5.68 m	$(32.26)^{1/2}$
Scan Grid Area	ISOCS scan at 3-meters	See Section B
Area Factor	1.7	Class 1 Area, LTP Table 6-12
Scan Area	1,290.5 m^2	Class 1 Area – 100%
Scan Investigation Level	1.0 pCi/g Cs-137 0.36 pCi/g Co-60	ISOCS investigation levels with detector at 3-meter height (Reference 6)
DCGL	2.39 pCi/g Cs-137 0.86 pCi/g Co-60	References 4 and 7
Design $DCGL_{EMC}$	4.06 pCi/g Cs-137 1.46 pCi/g Co-60	DCGL x Area Factor for Class 1 survey unit, per LTP Section 5.6.3

C. SURVEY RESULTS

As required, 40 direct measurements were performed in Survey Unit 13. The results are presented in Table 2. All direct measurements were below the DCGL.

ISOCS gamma scans were performed at 70 locations using an investigation level of 1.0 pCi/g Cs-137 and 0.36 pCi/g Co-60. The gamma scans were performed for a sufficient count time to achieve a Minimum Detectable Activity (MDA) of approximately 35% of the DCGL. All scan activity levels were below the MDAs which were below the prescribed investigation levels. Therefore, no investigations were required.

[1] LTP Revision 3, Table 5-1C for RCA Yard West, R0100

TABLE 2

DIRECT MEASUREMENTS

Sample Number	Cs-137 (pCi/g)	Uncertainty (pCi/g)
FR0111131S001	<4.85E-02	
FR0111131S002	<4.20E-02	
FR0111131S003	<4.21E-02	
FR0111131S004	<4.82E-02	
FR0111131S005	<3.85E-02	
FR0111131S006	<3.67E-02	
FR0111131S007	<4.61E-02	
FR0111131S008	<3.84E-02	
FR0111131S009	<4.49E-02	
FR0111131S010	<4.56E-02	
FR0111131S011	<4.68E-02	
FR0111131S012	<4.67E-02	
FR0111131S013	<3.79E-02	
FR0111131S014	**1.01E+00**	8.99E-02
FR0111131S015	<4.08E-02	
FR0111131S016	**7.82E-02**	2.75E-02
FR0111131S017	<3.83E-02	
FR0111131S018	<4.23E-02	
FR0111131S019	<4.50E-02	
FR0111131S020	<4.22E-02	
FR0111131S021	<4.01E-02	
FR0111131S022	<3.99E-02	
FR0111131S023	<4.79E-02	
FR0111131S024	<3.74E-02	
FR0111131S025	<4.18E-02	
FR0111131S026	<3.84E-02	
FR0111131S027	<4.12E-02	
FR0111131S028	<4.19E-02	
FR0111131S029	<3.89E-02	
FR0111131S030	<4.80E-02	
FR0111131S031	<3.87E-02	
FR0111131S032	<4.38E-02	
FR0111131S033	<3.74E-02	
FR0111131S034	<3.83E-02	
FR0111131S035	<3.87E-02	
FR0111131S036	<4.11E-02	
FR0111131S037	<3.89E-02	
FR0111131S038	<4.22E-02	
FR0111131S039	<4.12E-02	
FR0111131S040	<4.34E-02	
Mean	**6.69E-02**	
Median	**4.19E-02**	
Standard Deviation	**1.53E-01**	
Range	**3.67E-02 to 1.01E+00**	

"<" indicates MDA value. Bold indicates positive detection value.
Samples were also analyzed for Co-60. All were less than MDA.

D. SURVEY UNIT INVESTIGATIONS PERFORMED AND RESULTS

No investigations were required.

E. SURVEY UNIT DATA ASSESSMENT

An analysis of the direct sample measurement results, including the mean, median, standard deviation, and sample result range, is provided in Table 2. Of the 40 soil samples collected, 2 identified Cs-137 activity below the DCGL value of 2.39 pCi/g while Co-60 was not identified in any of the samples. All other values were below the MDA. Identified sample activities or Minimum Detectable Activities are listed in Table 2. The mean and median activities for Cs-137 were less than the DCGL while the highest reported value was less than 50% of the DCGL.

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 mean fallout Cs-137 value (0.19 pCi/g)[2] for disturbed soil from the survey unit sample mean activity (0.0669 pCi/g). This would equate to an annual dose rate of 0.0 mrem/year[3]. However, for purposes of demonstrating compliance with the radiological criteria for license termination and the enhanced State criteria, background activity was not subtracted from the 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 (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. The sample standard deviation is smaller than the design sigma; therefore no additional samples were required.

---

[2] See Attachment E to Maine Yankee Procedure PMP 6.7.8 (Reference 5)

[3] This annual dose equivalent is based on LTP Table 6-11 which shows the RA contaminated soil contribution (for soils contaminated at the DCGL) to be 7.67 mrem/y.

2. The Quantile Plot was generated from the 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 well below the DCGL of 2.39 pCi/g for land inside the restricted area.

3. A Histogram Plot was also developed based on the direct measurement data values. This plot shows a 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.

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

The survey was designed as a Class 1 land survey area; the FSS results were consistent with that classification. The direct measurement sample standard deviation was less than the design sigma. Thus, a sufficient number of sample measurements were taken and no additional measurements were required.

H. LTP CHANGES SUBSEQUENT TO SURVEY UNIT FSS

The FSS of Survey Unit 13 was designed, performed and evaluated in the December 2004 time frame. The design was performed to the criteria of the LTP Revision 3 (References 2 and 4). LTP Change No. 05-001 (Reference 7) modified the Table 6-11, "Contaminated Material DCGL," to reflect an increased Deep Soil DCGL of 0.86 pCi/g for Co-60. As a result, the retrospective dose calculation was modified to include 2.04 mrem/y from Deep Soil and 5.63 mrem/y from Surface Soil. No subsequent LTP changes with potential impact to this survey unit need to be evaluated.

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 2.39 pCi/g Cs-137.

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 Revision 3 Addenda (References 2 and 4) with significant aspects of the design discussed in Section B and Table 1. ISOCS scans performed at a distance of 3 meters in a systematic grid pattern throughout the survey unit did not identify activity above the scan investigation levels of 1.0 pCi/g Cs-137 and 0.36 pCi/g Co-60.

It is concluded that FR 0111 Survey Unit 13 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 and Addenda provided by Maine Yankee letter to the NRC, MN-02-061, dated November 26, 2002

2. NRC letter to Maine Yankee, dated February 28, 2003

3. Maine Yankee letter to the NRC, MN-03-049, dated September 11, 2003 (LTP Supplement to LTP Revision 3)

4. Issuance of License Amendment No. 170, NRC letter to Maine Yankee, dated February 18, 2004

5. Maine Yankee PMP 6.7.8, FSS Data Processing and Reporting, Attachment E, Approach for Dealing With Background Radioactivity for Maine Yankee Final Status Surveys

6. Maine Yankee Calculation No. EC-003-04, Use of Canberra In Situ Object Counting System (ISOCS) for FSS Surveys

7. Maine Yankee LTP Change Number 05-001, Deep Soil Co-60 DCGL

Attachment 1

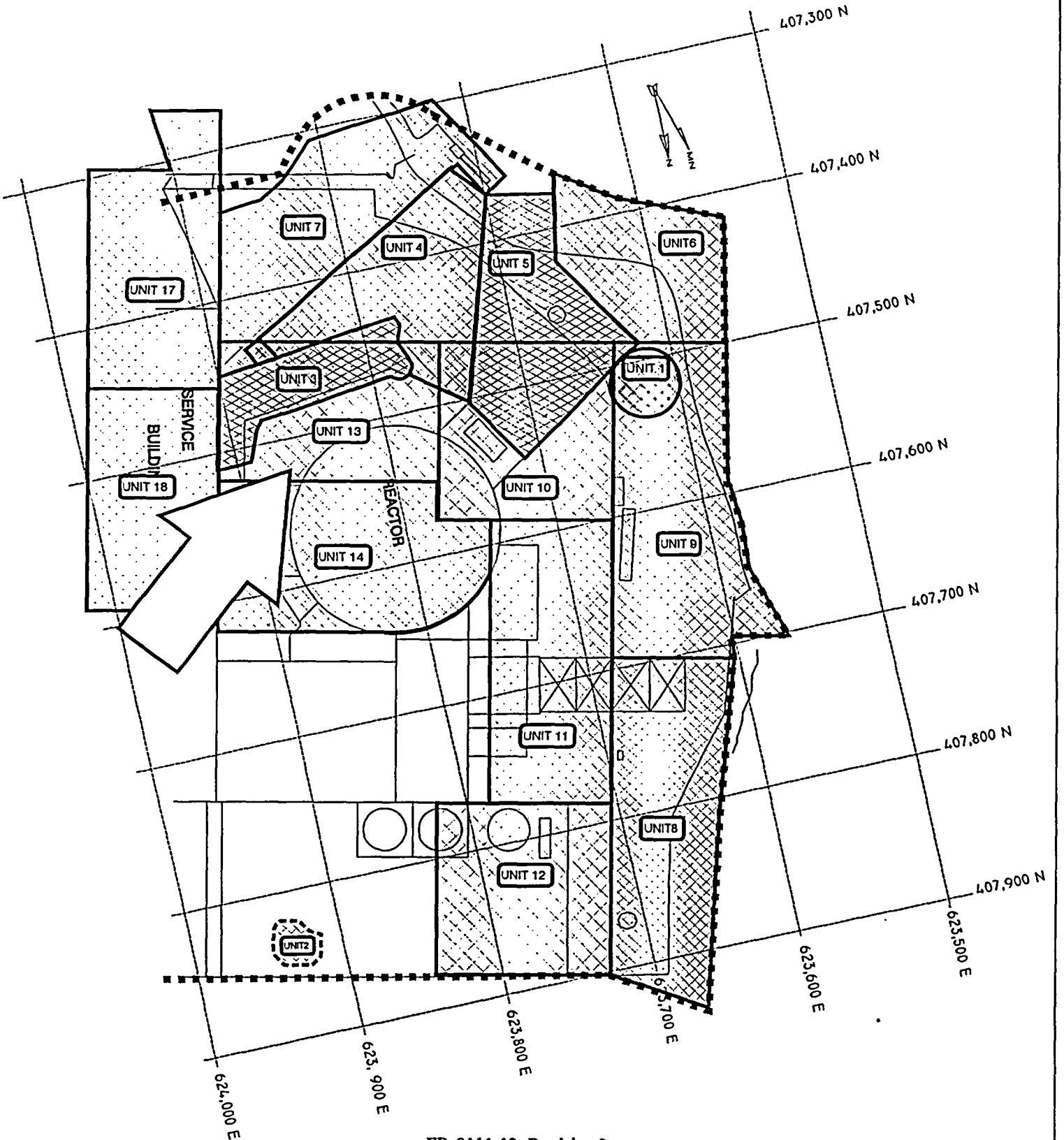
Survey Unit Maps

Maine Yankee Decommissioning Team

Maine Yankee Decommissioning Project Survey Map Map ID#FR0111U13-SITE

Survey Type: Characterization Turnover ■ Final Status Survey Survey Area Name: Site Locator

Prepared By: Larry N. Dockins Date: 1/17/05

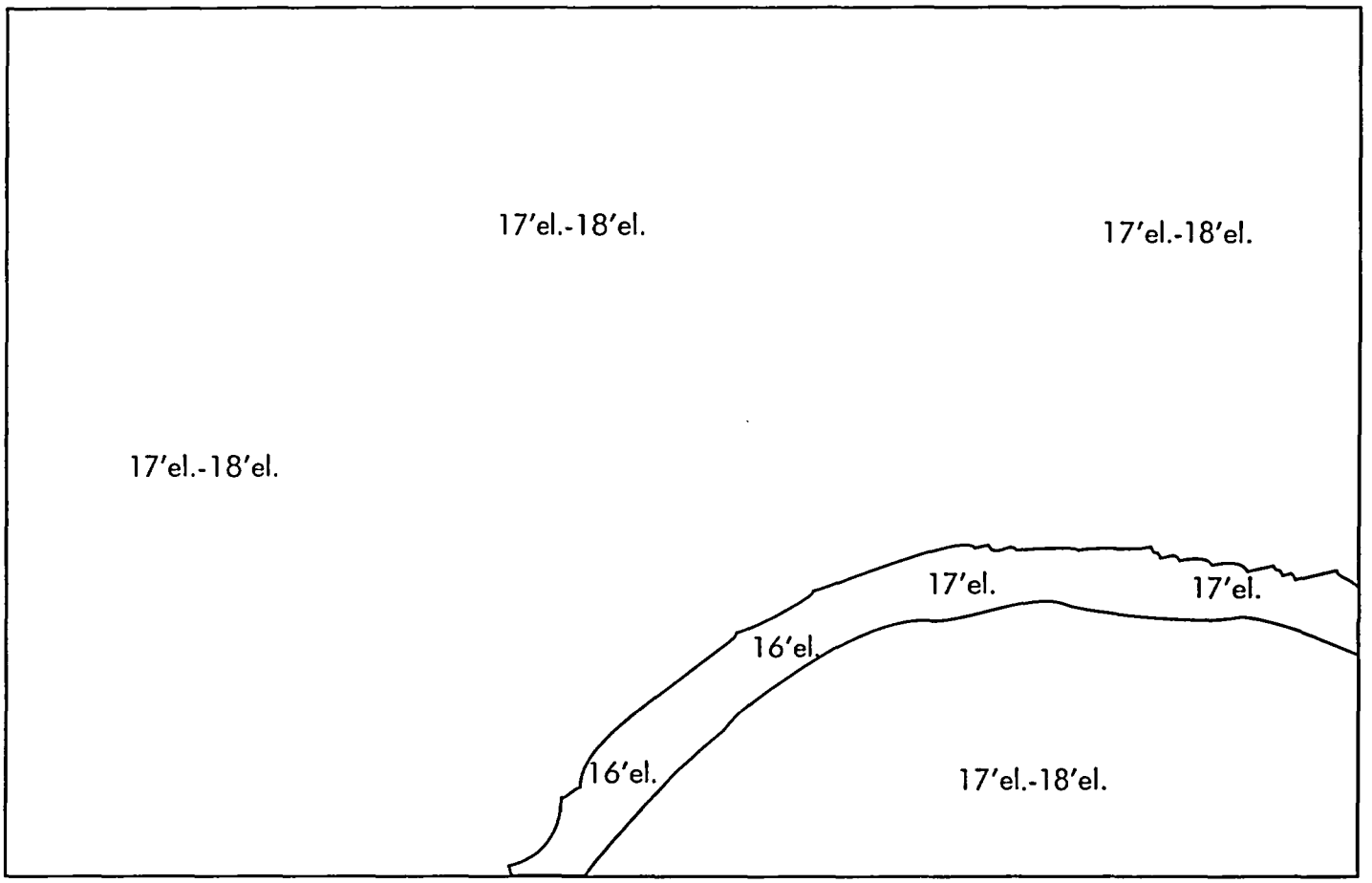


Maine Yankee Decommissioning Team

Maine Yankee Decommissioning Project Survey Map Map ID# FR0111U13-INFO

Survey Type: Characterization Turnover ■ Final Status Survey Survey Area Name: Excavation Depths

Prepared By: Larry N. Dockins Date: 12/30/04



Maine Yankee Decommissioning Team

Maine Yankee Decommissioning Project Survey Map

Map ID# FR0111U13-DIRT

Survey Type: Characterization | Turnover | ■ Final Status Survey

Survey Area Name: Direct Locations

Prepared By: Larry N. Dockins Date: 12/19/04

Maine Yankee Decommissioning Team

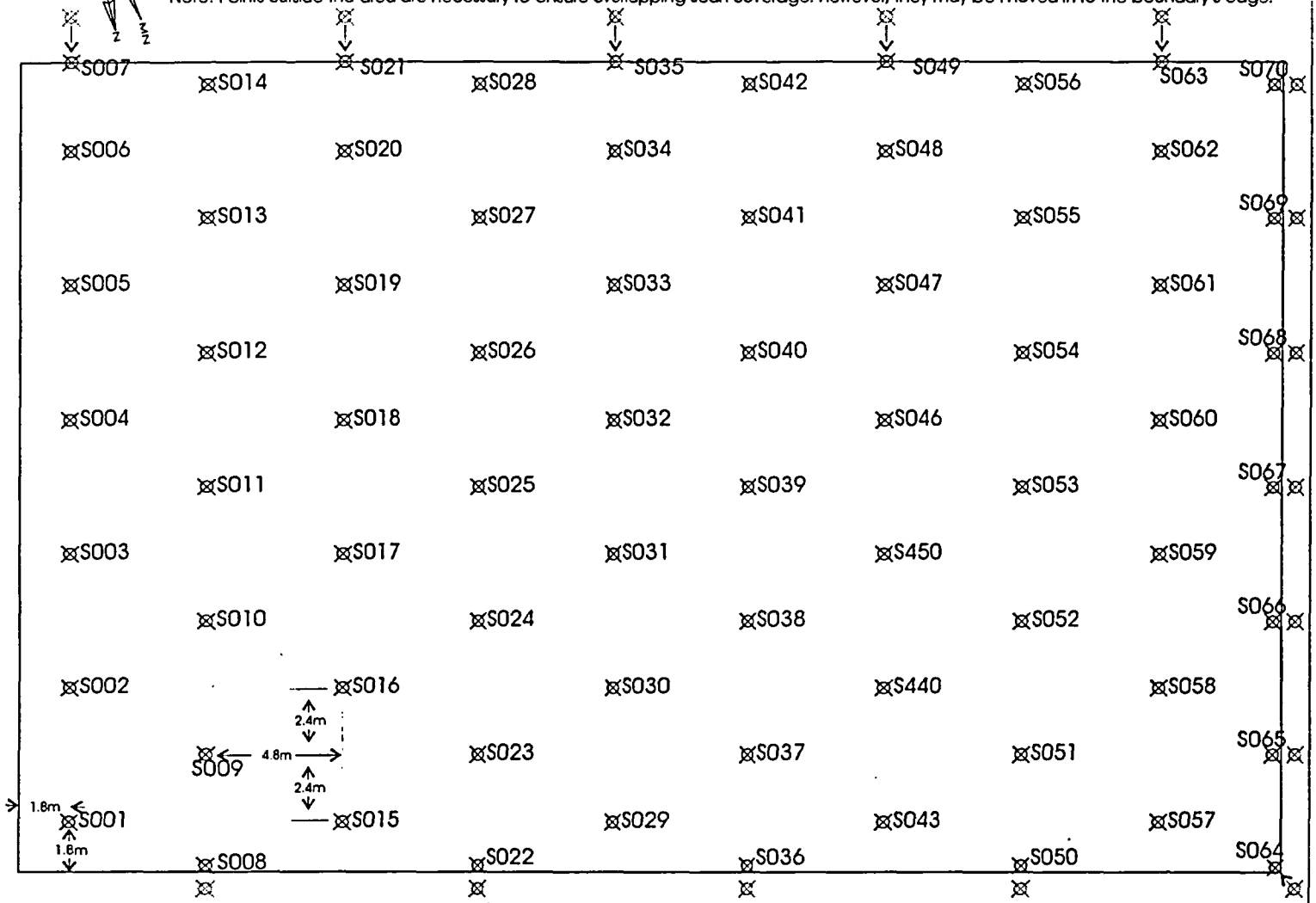
Maine Yankee Decommissioning Project Survey Map

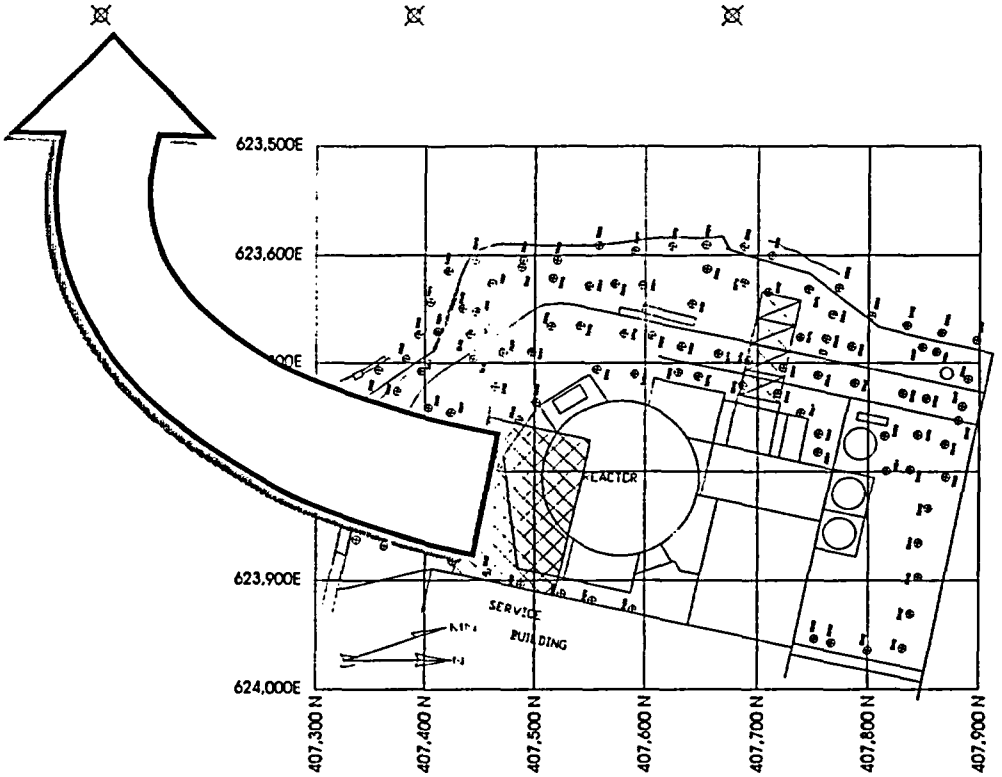
Map ID# FR0111U13-SCAN

Survey Type: Characterization Turnover ■ Final Status Survey Survey Area Name: Scan Locations

Prepared By: Larry N. Dockins Date: 12/18/04

Note: Points outside the area are necessary to ensure overlapping scan coverage. However, they may be moved in to the boundary's edge.





Attachment 2

Survey Unit Instrumentation

TABLE 2-1

INSTRUMENT INFORMATION

ISOCS Detectors (Field Measurements)

Detector No.	MDC (pCi/g)
7722	0.14 to 0.30
7607	0.14 to 0.30
7780	0.14 to 0.30

HPGe Detectors (Laboratory Analysis)

Detector No.	MDC (pCi/g)
FSS1	0.03 to 0.07
FSS2	0.03 to 0.07

TABLE 2-2

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

Detector	Instrument	Comments
Scan MDC	**ISOCS:** 0.14 to 0.30 pCi/g	~ 35% DCGL
DCGL	2.39 pCi/g Cs-137 0.86 pCi/g Co-60	Approved DCGL for land areas inside the Restricted Area, (References 4 and 7)
Investigation Level (ISOCS @ 3 m)	1.0 pCi/g Cs-137 0.36 pCi/g Co-60	(Reference 6)
Design $DCGL_{EMC}$	4.06 pCi/g Cs-137 1.46 pCi/g Co-60	DCGL x Area Factor for Class 1 survey unit, per LTP Section 5.6.3

Attachment 3

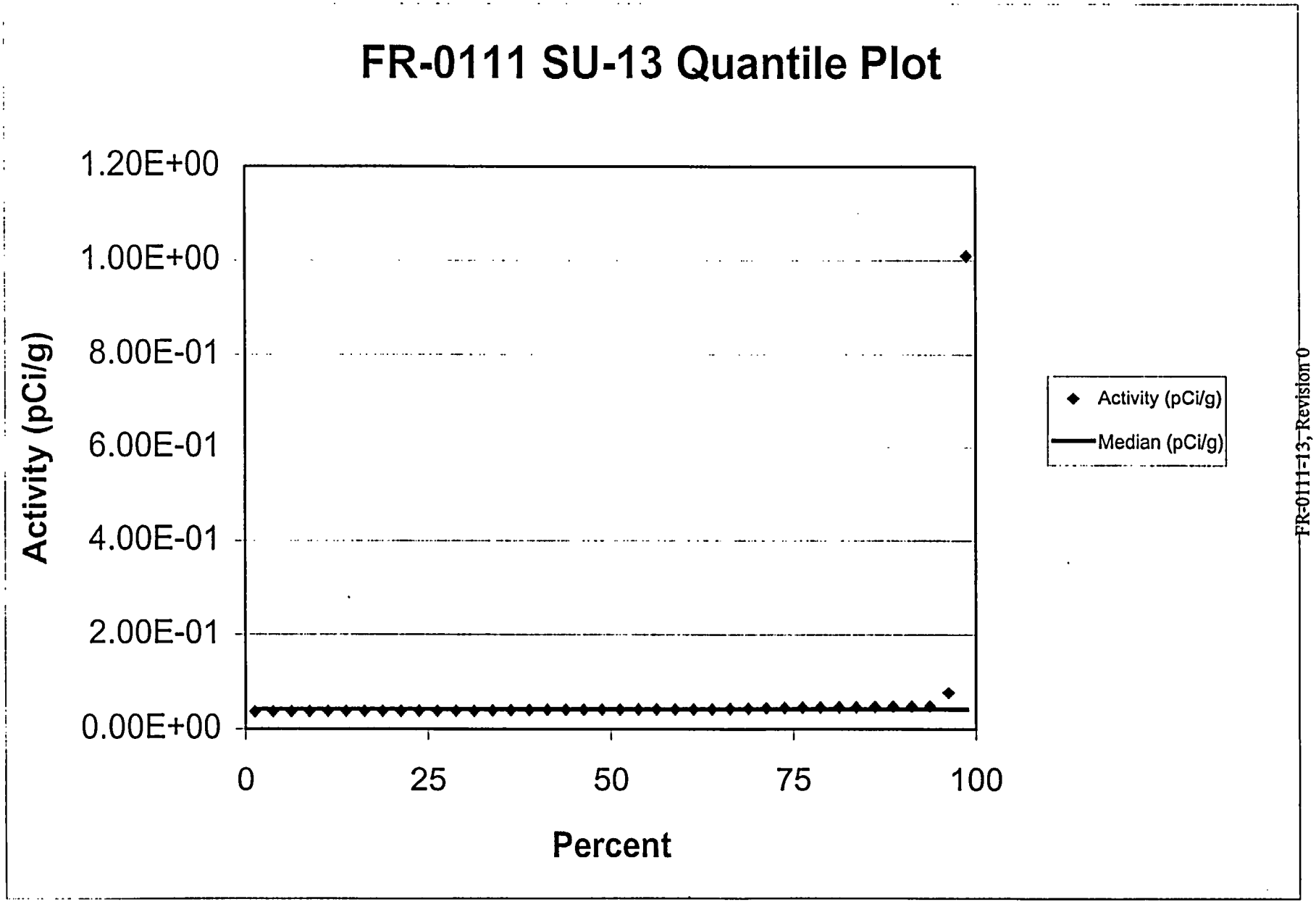
Investigation Table
(No Investigations Performed)

Attachment 4

Statistical Data

Survey Package FR 0111 Unit 13 Soil Sign Test Summary

Evaluation Input Values		Comments
Survey Package:	FR 0111	Yard West Excavations
Survey Unit:	13	
Evaluator:	DA	
$DCGL_w$:	2.39E+00	Cs-137 DCGL
$DCGL_{emc}$:	4.06E+00	AF x DCGL
LBGR:	1.20E+00	50% of DCGL
Sigma:	1.33E+00	LTP Rev 3, Table 5-1C for RCA Yd. W
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:	0.788145	
Calculated Relative Shift:	0.8	
Relative Shift Used:	0.8	Uses 3.0 if Relative Shift is >3
N-Value:	33	
N-Value+20%:	40	
Sample Data Values		**Comments**
Number of Samples:	40	
Median:	4.19E-02	
Mean:	6.69E-02	
Net Sample Standard Deviation:	1.53E-01	
Total Standard Deviation:	1.53E-01	
Maximum:	1.01E+00	
Sign Test Results		**Comments**
Adjusted N Value:	40	
S+ Value:	40	
Critical Value:	25	
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	Survey Unit Passes


FR-0111 SU-13 Quantile Plot
1.20E+00
1.00E+00
8.00E-01
6.00E-01
4.00E-01
2.00E-01
0.00E+00
Activity (pCi/g)
0
25
50
75
100
Percent
Activity (pCi/g)
Median (pCi/g)

Page/Date/Time 2 1/3/05 10:05:15 AM
Database
Variable C2

Plots Section

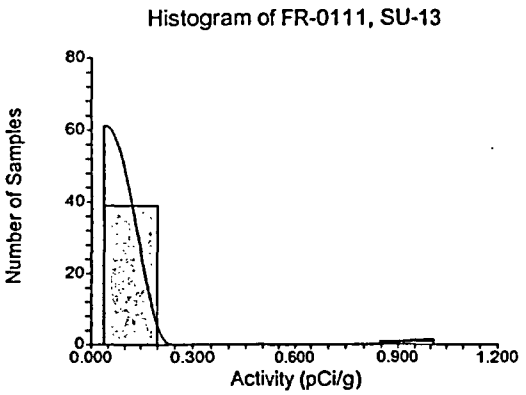


Chart Section