

June 8, 2005
E910-05-016

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Gentlemen,

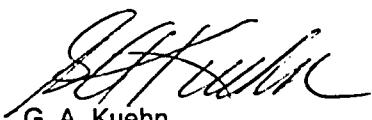
Subject Saxton Nuclear Experimental Corporation (SNEC)
Operating License No., DPR-4
Docket No. 50-146
FSS Report Open Land Area MA2

The purpose of this letter is to submit for your review the attached FSS Report for Open Land Area MA2. One CD-ROM is included in this submission. The CD-ROM labeled: FSS Report for Open Land Area MA2 – Publicly Available" contains the following 4 files:

Document Title	File Name	File Size (Mbytes)
Main Report	001 FSS Report – MA2.pdf	0.278
Appendix A (pages 1 to 8)	002 MA2 – Appendix A (1-8).pdf	33.9
Appendix A (attachments 1-1 to 2-6)	003 MA2 – Appendix A (attachments 1-1 to 2-6).pdf	11.6
Appendix A (attachment 3-1 to 9-1)	004 MA2 – Appendix A (attachments 3-1 to 9-1).pdf	26.0

If you have any questions on this information, please contact Mr. Art Paynter at (814) 635-4384.

Sincerely,



G. A. Kuehn

Program Director, SNEC

cc: NRC Project Manager
 NRC Project Scientist, Region 1
 Mr. Tim Bauer, ORISE Project Leader

A020

Final Status Survey Report

For

**Saxton Nuclear Experimental Corporation
Open Land Area MA2**



Prepared by GPU Nuclear, Inc.

May 2005

Table Of Contents

Executive Summary

- 1.0 Purpose and Scope**
- 2.0 Survey Area Description**
- 3.0 Operating History**
 - 3.1 Plant Operations**
 - 3.2 Survey Area Remediation Status**
- 4.0 Site Release Criteria**
- 5.0 Final Status Survey Design / DQO Process**
- 6.0 Final Status Survey Results**
 - 6.1 Summary for Survey Unit MA2**
- 7.0 Data Assessment**
 - 7.1 Assessment Criteria**
 - 7.2 Summary of Overall Results**
 - 7.3 Survey Variations**
 - 7.4 Quality Control Measurements**
- 8.0 Final Survey Conclusions**
- 9.0 References**
- 10.0 Appendices**

Executive Summary

This report presents the results and conclusions of the final status survey (FSS) of the Class 3 open land area at the Saxton Nuclear Experimental Corporation (SNEC) facility designated as MA2. This FSS includes surveys of open land area at the discharge end of the Saxton Steam Generating Station (SSGS) outfall of the SNEC site and was conducted in April of 2005.

The FSS was performed in accordance with the SNEC License Termination Plan (LTP) (reference 9.3). The survey area (MA2) was less than the area limitations in the SNEC LTP. Therefore the entire 600 square meter area was treated as one survey unit. Data was collected from each survey unit in accordance with the specific survey design data collection requirements. The following is a summary of the measurements performed:

- 1) Direct NaI(Tl) scans of part of one 100 square meter grid covering about 15% of the actual land area
- 2) Ten soil samples collected and then analyzed by laboratory gamma spectroscopy

The initial design of the survey indicated 12 random fixed point sample locations. Two of these points (numbers 11 and 12) were actually underwater in the river and were not sampled.

The collected FSS survey data demonstrate that the approximately 600 square meters of the MA2 survey area meets the radiological release criteria for unrestricted use specified in 10CFR20.1402. Therefore GPU Nuclear, Inc. concludes that the area meets the NRC requirements and may be released for unrestricted use.

1.0 Purpose and Scope

This report presents the results and conclusions of the final status survey of the open land area designated MA2 to the north of the SNEC facility at the SSGS discharge. It provides the information required by 10CFR50.82(a)(11) and the SNEC license termination plan (LTP, reference 9.3) to demonstrate that this area meets the radiological criteria for unrestricted use specified in 10CFR20.1402.

This report describes the radiological data collected in one Class 3 survey unit of open land surface. This report only addresses the FSS performed on this specific land area designated as MA2 on reference 9.1. The format of this report follows the guidance contained in reference 9.2.

2.0 Survey Area Description

Survey Area MA2 is Class 3 impacted open land north of the SNEC site at the SSGS discharge into the river. The survey unit encompasses about 600 square meters of open land. Because the area is well below the size guidance in the SNEC LTP for Class 3 survey units (10000 square meters recommended maximum), the survey area was treated as one survey unit. Layout of the survey unit relative to the site layout are shown in Attachment 1-1 of Appendix A. The survey unit is discussed below. The MA2 designation is taken from the drawing, reference 9.1 and the SNEC LTP (reference 9.3).

3.0 Operating History

3.1 Plant Operation

The Saxton Nuclear Experimental Corporation (SNEC) facility included a pressurized water reactor (PWR), which was licensed to operate at 23.5 megawatts thermal (23.5 MWTh). The reactor, containment vessel and support buildings have all been removed. The facility is owned by the Saxton Nuclear Experimental Corporation and is licensed by GPU Nuclear, Inc. The SNEC facility is maintained under a Title 10 Part 50 license and associated Technical Specifications. In 1972, the license was amended to possess but not operate the SNEC reactor.

The facility was built from 1960 to 1962 and operated from 1962 to 1972 primarily as a research and training reactor. Steam from the SNEC reactor was directed to the adjacent Saxton Steam Generating Station (SSGS) to generate electricity. After shutdown in 1972, the facility was placed in a condition equivalent to the current SAFSTOR status. Since then, it has been maintained in a monitored condition. The fuel was removed in 1972 and shipped to a (now DOE) facility at

Savannah River, SC, who is now the owner of the fuel. As a result of this, neither SNEC nor GPU Nuclear, Inc. has any further responsibility for the spent fuel from the SNEC facility. The building and structures that supported reactor operation were partially decontaminated by 1974.

In the late 1980s and through the 1990s, additional decontamination and disassembly of the containment vessel and support buildings and final equipment and large component removal was completed. Final decontamination and dismantlement of the reactor support structures and buildings was completed in 1992. Large component structures, pressurizer, steam generator, and reactor vessel were removed in late 1998. Containment vessel removal (to below grade) and backfill was completed in late 2003. Currently, decontamination, disassembly and demolition of the SNEC facility buildings and equipment has been completed and the facility is in the process of Final Status Survey for unrestricted release and license termination.

This survey unit, the SSGS discharge area, is included in the FSS since the SNEC facility shared systems with the SSGS and SNEC activity was present in the SSGS and discharge tunnel.

3.2 Survey Area Remediation Status

There has been no known remediation of the MA2 SSGS discharge area. However, because there was some remediation conducted in the SSGS, this area has been designated as a Class 3 survey unit.

4.0 Site Release Criteria

The site release criteria applied to the open land areas of MA2 correspond to the radiological dose criteria for unrestricted use per 10CFR20.1402. The dose criteria is met "if the residual radioactivity that is distinguishable from background radiation results in a Total Effective Dose Equivalent (TEDE) to an average member of the critical group that does not exceed 25 mrem/yr, including that from groundwater sources of drinking water, and that the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA)".

Levels of residual radioactivity that correspond to the allowable dose to meet the site or survey unit release criteria for open land were derived by analyses using a resident farmer family scenario. The dose modeling for this scenario is explained in the SNEC LTP (reference 9.3). The derived concentration guideline levels (DCGL) shown in Table 5-1 of the SNEC LTP form the basis for satisfying the site release criteria.

Residual radioactivity sample results for the soils were used to calculate a surrogate Cs137 DCGL. The adjusted surrogate DCGL was developed using the

methodology described in the SNEC LTP section 5.2.3.2.3 based on nuclide specific DCGLs from Table 5-1 of the LTP.

An adjustment was made to the surrogate Cs137 DCGL to address the de-listed radionuclides as described in the LTP section 6.2.2.3. SNEC has instituted an administrative limit of 75% of the DCGL for all measurement results. The de-listed radionuclides are conservatively accounted for in this 25% reduction since the de-listed radionuclides were only 4.7% of the dose contribution. These adjustment factors are discussed in section 6 of the SNEC LTP.

5.0 Final Status Survey Design and DQO

The SNEC calculation providing the design of the survey for this survey unit is provided in Appendix A. Since the survey unit is Class 3, scan measurements were conducted over approximately 15% of the surface of the survey unit. Scans were conducted using a narrow window optimized for Cs137 to reduce background.

The number of sample points was determined by using the COMPASS computer program (reference 9.6 and attachment 7 of appendix A). These points were located on survey maps using the Visual Sample Plan program (reference 9.7 and attachment 6 of appendix A). Samples are collected to a depth of 1 meter to match the site surface dose model used in the SNEC LTP (reference 9.3).

The survey design uses a surrogate Cs137 effective DCGL developed from radionuclide mix analyses from soil samples collected before the Final Status Survey in the vicinity of the survey unit. For MA2 the mix was based on radionuclide mix data (including the hard-to-detects listed in Table 5-1 of the LTP) from inside of the SSGS discharge tunnel (attachment 2 of appendix A).

Cs137, Am241, Co60, Ni63, Pu238, and Pu239 were positively detected at low concentrations in one or more of these samples and are accounted for in the adjusted surrogate DCGL. The following table (Table 1) presents the Data Quality Objectives (DQO) and other relevant information from the survey design package.

Table 1 – DQO/Design

DQO/Design Parameter	MA2
SNEC Design Calc. #	E900-05-018
MARSSIM Classification	3
Survey Unit Area (m ²)	600
Statistical Test	Sign
Type 1 decision error (α)	0.05
Type 2 decision error (β)	0.1
LBGR (pCi/gm)	2.1
Estimated σ (pCi/gm)	0.95
Relative Shift (Δ/σ)*	2.9
Number of static points	12
DCGLw (Cs137 pCi/gm)	6.52
75%Action Level (pCi/gm)	4.89
Scan MDC (pCi/gm)	5.67
SNEC Survey Request #	SR201
Scan Survey Instrument	L2350-1 w/ 44-10

* - Relative Shift is based on the 75% Action Level

6.0 Final Status Survey Results

The following section provides the survey summary results for the survey unit as required by the respective design. Summary data was taken from reference 9.10 which is filed in the SNEC history files.

6.1 Survey Unit MA2

6.1.1 Scan survey

Scan measurements were made in one grid using a 2 inch by 2 inch NaI detector with an MDCscan of 5.67 pCi/gm (attachment 4 of appendix A). The Action Level for this survey unit was 4.89 pCi/gm and the DCGLw was 6.52 pCi/gm (table 1, page 2 of appendix A). Although this is a Class 3 survey unit and the EMC process does not specifically apply, the area factor can be used to compare the MDCscan to the DCGLw. In this case, the MDCscan was below the DCGLw so no sample number adjustment was needed.

Of the grid scanned, a portion was inaccessible because of a large pile of natural debris (a brush pile). Therefore, a total of about 8 square meters was not scanned due to interferences. This results in approximately 92 square meters actually scanned in the 600 square meter survey unit, or about 15 percent.

The scan conducted did not identify any activity in the soils greater than the MDCscan. The action level was >160 net cpm (table 2, page 3 of appendix A). No area greater than 160 net cpm was found in MA2.

6.1.2 soil samples

Ten random start triangular grid systematic soil samples were collected from the survey area. Since the minimum number of samples based on the variability and LBGR was 9 (11 with the 20% margin added), there were sufficient samples collected for MARSSIM requirements. No biased samples were required.

Twelve soil sample locations were defined for the survey unit, based on a relative shift of about 2.9. This relative shift was based on a LBGR of 2.1 pCi/gm. This is slightly lower than the typical 50% of DCGL expected in reference 9.4. However, using a 50% value for LBGR would not change the number of samples required. In addition, the actual variability in the survey unit was substantially lower than that used for the design, also showing that the number of samples was appropriate. Ten samples were actually collected because the two northernmost sample locations were in the river and therefore were not sampled.

None of the ten fixed point soil samples collected in MA2 had results in excess of the Action Level or the adjusted surrogate DCGLw. The table below (Table 2) shows the Cs137 results (no other licensed isotopes were detected) for each sample, along with the mean, standard deviation and range of the soil sample data. Results that are less than MDA are assumed to be positive at the MDA value for the statistics in the table. This will overestimate the mean.

The standard deviation of the samples collected from the survey unit was much less than the variability assumed in the survey design. Therefore, the assessment of variability, relative shift , and number of samples required is consistent between the survey design and the survey results. Although 12 samples were in the original design, the 10 collected is sufficient for requirements of the sign test. Based on this, no changes to the survey design or additional samples are required.

Table 2 - Soil sample results for MA2

Sample Number	Cs137 pCi/gm
1	0.42
2	0.21
3	0.54
4	0.45
5	<0.07
6	0.24
7	0.31
8	0.26
9	<0.22
10	0.25
Mean	0.30
Std Dev	0.14
Min	<0.07
Max	0.54

7.0 Data Assessment

7.1 Assessment Criteria

The final status survey data has been reviewed to verify authenticity, appropriate documentation, quality, and technical acceptability. The review criteria for data acceptability are:

- 1) The instruments used to collect the data were capable of detecting the radiation of the radionuclide of interest at or below the investigation levels.
- 2) The calibration of the instruments used to collect the data was current and radioactive sources used for calibration were traceable to recognized standards or calibration organizations.
- 3) Instrument response was checked before and, when required, after instrument use each day data was collected.
- 4) Survey team personnel were properly trained in the applicable survey techniques and training was documented.
- 5) The MDCs and the assumptions used to develop them were appropriate for the instruments and the survey methods used to collect the data.

- 6) The survey methods used to collect the data were appropriate for the media and types of radiation being measured.
- 7) Special instrument methods used to collect data were applied as warranted by survey conditions, and were documented in accordance with an approved site Survey Request procedure.
- 8) The custody of samples that were sent for off-site analysis were tracked from the point of collection until final results were provided.
- 9) The final status survey data consists of qualified measurement results representative of current facility status and were collected in accordance with the applicable survey design package.

If a discrepancy existed where one or more criteria were not met, the discrepancy was reviewed and corrective action taken (as appropriate) in accordance with site procedures.

The statistical test does not need to be performed for this final status survey since the data clearly show that the survey unit meets the release criteria because all measurements in the survey units are less than or equal to the DCGLw.

7.2 Summary of Overall Results

MA2 had no alarm points during scan surveys of 15% of the surface. Scan MDCs were adequate. Ten soil samples were all less than the DCGLw. Scan fraction and number of soil samples meets LTP (reference 9.3) and MARSSIM (reference 9.4) requirements.

7.3 Survey Variations (design, survey request, LTP)

7.3.1 Approximately 8 square meters in the grid that was scanned was inaccessible. The remaining scanned portion constituted 15 percent of the survey unit area, well within coverage requirements for Class 3 survey units.

7.3.2 Soil samples from two locations (sample points 11 and 12) of MA2 were not collected due to the actual location of these sample points being in the river. The remaining ten samples is sufficient for minimum sample number requirements per MARSSIM (reference 9.4).

7.4 QC comparisons

7.4.1 Scan surveys

Ten square meters of the scanned grid (BP136) was rescanned for QC. The QC rescans did not identify any activity above alarm points and so are in agreement with the primary scans. Since 92 square meters were originally surveyed, this constitutes about 11 percent which exceeds the 5% minimum QC fraction specified in the LTP (reference 9.3).

7.4.2 Soil Samples

One sample from the MA2 survey design received QC split gamma spectroscopy analyses on the soil sample. The duplicate had good agreement as shown in the table below (Table 3). One QC splits out of ten samples exceeds the 5% minimum criterion specified in the LTP (reference 9.3).

Table 3 – MA2 QC Split comparison

Sample Point	Sample Result (pCi/gm)	QC Result (pCi/gm)
MA2 9	<0.22	0.10

8.0 Final Survey Conclusions

The Open Land Area MA2 final status survey was performed in accordance with the SNEC LTP (reference 9.3), site procedures, design calculations, and Survey Request requirements. FSS data was collected to meet and/or exceed the quantity specified or required for each survey unit design. The survey data for each survey unit meets the following conditions:

- 1) The average residual radioactivity in the soils is less than the derived surrogate DCGLw in the survey unit.
- 2) All measurements were less than the DCGLw in the survey unit areas.

These conditions satisfy the release criteria established in the SNEC LTP and the radiological criteria for unrestricted use given in 10CFR20.1402. Therefore it is concluded that the SNEC Open Land Area designated MA2 is suitable for unrestricted release.

9.0 References

- 9.1 SNEC Facility Site area grid map Drawing number SNECRM-020
- 9.2 SNEC procedure E900-ADM-4500.60 "Final Status Survey Report"
- 9.3 SNEC License Termination Plan
- 9.4 NUREG 1575 "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM), revision 1 August 2000
- 9.5 SNEC Calculation E900-05-018 "Miscellaneous Area FSS Design – MA2"
- 9.6 COMPASS computer program, Version 1.0.0, Oak Ridge Institute for Science and Education
- 9.7 VISUAL SAMPLE PLAN computer program, Version 3.0, Battelle Memorial Institute
- 9.8 SNEC procedure E900-IMP-4500.59, "Final Site Survey Planning and DQA"
- 9.9 SNEC procedure E900-IMP-4520.04, "Survey Methodology to Support SNEC License Termination"
- 9.10 SNEC Survey Request (SR) # SR201 for FSS of MA2

10.0 Appendices

Appendix A - SNEC Calculation E900-05-018 "Miscellaneous Area FSS Design –

MA2" (8 pages plus numerous attachments)

Appendix B - COMPASS DQA report for MA2 (2 pages)