

June 8, 2005
E910-05-017

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 for Open Land Area OL5

The purpose of this letter is to submit for your review the attached FSS Report for Open Land Area OL5. One CD-ROM is included in this submission. The CD-ROM labeled: FSS Report for Open Land Area OL5 – Publicly Available" contains the following 5files:

Document Title	File Name	File Size (Mbytes)
Main Report	001 FSS Report – OL5.pdf	0.286
Appendix A (pages 1 to 9)	002 OL5 – Appendix A (1-9).pdf	29.6
Appendix A (attachments 1-1 to 6-8)	003 OL5 – Appendix A (attachments 1-1 to 6-8).pdf	36.4
Appendix A (attachment 7-1 to 9-1)	004 OL5 – Appendix A (attachments 3-1 to 9-1).pdf	22.9
Appendix B to Appendix F	005 OL5 – Appendix B to Appendix F.pdf	23.3

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 OL5



Prepared by GPU Nuclear, Inc.

May 2005

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Executive Summary

This report presents the results and conclusions of the final status survey (FSS) of the Class 1 open land areas around the Saxton Nuclear Experimental Corporation (SNEC) facility designated as OL5. This FSS includes surveys of open land areas northeast of the SNEC site and was conducted in May of 2005.

The FSS was performed in accordance with revision 4 of the SNEC License Termination Plan (LTP). The survey area (OL5) was divided into four survey units. Each unit consisted of relatively flat open land with a few trees present throughout. 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 all or part of thirty-eight 100 square meter grids covering about 94% of the actual land area
- 2) Forty-seven soil samples collected and then analyzed by laboratory gamma spectroscopy

One alarm point (AP) was found by NaI scanning in OL5-3. Subsequent investigation sampling showed the residual activity in the area to be less than the DCGLw.

The collected FSS survey data demonstrate that the 3800 square meters of the OL5 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 OL5 to the northeast of the SNEC facility. 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 four Class 1 survey units of open land surface. This report only addresses the FSS performed on this specific land area designated as OL5 on reference 9.1. The format of this report follows the guidance contained in reference 9.2.

2.0 Survey Area Description

Survey Area OL5 is Class 1 impacted open land located about 300 meters northeast of the original SNEC site area. The survey unit encompasses about 3800 square meters of open land. Because the area exceeds the size guidance in the SNEC LTP for Class 1 survey units (2000 square meters recommended maximum), the survey area has been divided into four survey units. Layout of the survey area and individual units relative to the site layout are shown in attachment 1-1 of appendix A. The four survey units are discussed below. They are all Class 1 impacted survey units. The OL5 designation is taken from the drawing, reference 9.1.

Survey unit OL5-1 is an open land area in the northeast section of the site. It is about 270 meters northeast of the original SNEC site and is the westernmost of the four OL5 survey units. The survey unit is approximately 600 square meters. Appendix A contains drawings showing the layout of the survey unit.

Survey unit OL5-2 is an open land area in the northeast section of the site. It is about 300 meters northeast of the original SNEC site and is the west of center of the four OL5 survey units. The survey unit is approximately 1200 square meters. Appendix A contains drawings showing the layout of the survey unit.

Survey unit OL5-3 is an open land area in the northeast section of the site. It is about 320 meters northeast of the original SNEC site and is the east of center of the four OL5 survey units. The survey unit is approximately 1000 square meters. Appendix A contains drawings showing the layout of the survey unit.

Survey unit OL5-4 is an open land area in the northeast section of the site. It is about 330 meters northeast of the original SNEC site and is the easternmost of

the four OL5 survey units. The survey unit is approximately 1000 square meters. Appendix A contains drawings showing the layout of the survey unit.

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. 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.

3.2 Survey Area Remediation Status

Nal detector surveys of the northeast woods area indicated elevated activity. Subsequently, layers of material with activity in excess of the DCGLw were found in the area where materials from SNEC had been transported and disposed of during operation. Although the area was used for disposal of SNEC materials, and activity greater than the DCGL was found in the area, there were no objects present that exceeded current power reactor standards for routine release of

materials as uncontaminated. A large portion of the material excavated was not SNEC related and apparently was placed there by private individuals. As a result of the presence of this 'northeast dump', the area was extensively sampled and excavated for remediation.

4.0 Site Release Criteria

The site release criteria applied to the open land areas of OL5 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 these survey units is provided in Appendix A. Since the survey units were all Class 1, scan measurements were conducted over approximately 100% of the surface of each 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, attachment 7 of appendix A). These points were located

on survey maps using the Visual Sample Plan program (reference 9.7, 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 single surrogate Cs137 effective DCGL for all four survey units, developed from radionuclide mix analyses from soil samples taken from within the survey unit that were collected before the Final Status Survey. The mix was based on radionuclide mix data (including the hard-to-detects listed in Table 5-1 of the LTP) from the OL5-2 and OL5-3 area (attachment 2 of appendix A).

Cs137, Sr90, and Co60 were positively detected 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	OL5-1	OL5-2	OL5-3	OL5-4
SNEC Design Calc. #	E900-05-016	E900-05-016	E900-05-016	E900-05-016
MARSSIM Classification	1	1	1	1
Survey Unit Area (m ²)	600	1200	1000	1000
Statistical Test	Sign	Sign	Sign	Sign
Type 1 decision error (α)	0.05	0.05	0.05	0.05
Type 2 decision error (β)	0.1	0.1	0.1	0.1
LBGR (pCi/gm)	3.8	3.8	3.8	3.8
Estimated σ (pCi/gm)	0.3	0.3	0.3	0.3
Relative Shift (Δ/σ)	3.0	3.0	3.0	3.0
Number of static points	11	12	12	12
DCGLw (Cs137 pCi/gm)	6.28	6.28	6.28	6.28
75% Action Level(pCi/gm)	4.7	4.7	4.7	4.7
Scan MDC (pCi/gm)	6.2	6.2	6.2	6.2
SNEC Survey Request #	SR212	SR213	SR214	SR215
Scan Survey Instrument	L2350-1 w/ 44-10	L2350-1 w/ 44-10	L2350-1 w/ 44-10	L2350-1 w/ 44-10

6.0 Final Status Survey Results

The following sections provide the survey summary results for each survey unit as required by the respective design. Summary data was taken from surveys references 9.10, 9.11, 9.12, and 9.13 which are filed in the SNEC history files.

6.1 Survey Unit OL5-1

6.1.1 OL5-1 Scan survey

Scan measurements were made in 6 grids using a 2 inch by 2 inch NaI detector with an MDCscan of 6.2 pCi/gm (attachment 4 of appendix A). The Action Level was 4.7 pCi/gm and the adjusted surrogate Cs137 DCGLw for this survey unit was 6.28 pCi/gm (table 1, page 2 appendix A). The area factor can be used to compare the MDCscan to the DCGLw. In this case, the MDCscan was below the DCGLw (but above the Action Level) so no sample number adjustment was needed.

Of the 6 grids scanned, scanning coverage was essentially 100%. Approximately 600 square meters actually scanned in the 600 square meter survey unit, or about 100 percent.

The scans conducted in all 6 grids did not identify any activity in the soils greater than the MDCscan. The action level was >175 net cpm (table 2, page2 attachment A) . No area greater than 175 net cpm was found in OL5-1.

6.1.2 OL5-1 soil samples

Eleven random start triangular grid systematic soil sample locations were defined for the survey unit, based on a conservative relative shift of about 3. No biased samples were required.

None of the design fixed point soil samples in OL5-1 had results in excess of 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 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. Based on this, no changes to the survey design or additional samples are required.

Table 2 - Soil sample results for OL5-1

Sample Number	Cs137 pCi/gm
1	<0.08
2	<0.06
3	<0.08
4	<0.10
5	<0.07
6	<0.11
7	<0.10
8	<0.13
9	0.09
10	<0.10
11	<0.14
Mean	0.10
Std Dev	0.03
Min	<0.06
Max	<0.14

6.2 Survey Unit OL5-2

6.2.1 OL5-2 Scan survey

Scan measurements were made in 12 grids using a 2 inch by 2 inch NaI detector with an MDCscan of 6.2 pCi/gm (attachment 4 of appendix A). The Action Level was 4.7 pCi/gm and the adjusted surrogate Cs137 DCGLw for this survey unit was 6.28 pCi/gm (table 1, page 2 appendix A). The area factor can be used to compare the MDCscan to the DCGLw. In this case, the MDCscan was below the DCGL (but above the Action Level) so no sample number adjustment was needed.

Of the 12 grids scanned, portions were inaccessible for various reasons, particularly because the grid extended into the river. The SNEC LTP (reference 9.3) specifically identifies issues of personnel safety as acceptable reasons to not achieve 100 % survey coverage. Of the 12 grids, a total of about 83 square meters was not scanned due to interferences. This results in approximately 1117 square meters actually scanned in the 1200 square meter survey unit, or about 93 percent.

The scans conducted in all 12 grids did not identify any activity in the soils greater than the MDCscan. The action level was >175 net cpm (table 2, page2 attachment A). No area greater than 175 net cpm was found in OL5-2.

6.2.2 OL5-2 soil samples

Twelve random start triangular grid systematic soil sample locations were defined for the survey unit, based on a conservative relative shift of about 3. No biased samples were required.

None of the design fixed point soil samples assigned to OL5-2 had results in excess of the adjusted surrogate DCGLw. The table below (Table 3) 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 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. Based on this, no changes to the survey design or additional samples are required.

Table 3 - Soil sample results for OL5-2

Sample Number	Cs137 pCi/gm
1	<0.09
2	<0.12
3	<0.10
4	<0.11
5	<0.15
6	<0.17
7	0.12
8	<0.14
9	<0.14
10	<0.16
11	0.15
12	<0.09
Mean	0.13
Std Dev	0.03
Min	<0.09
Max	<0.17

6.3 Survey Unit OL5-3

6.3.1 OL5-3 Scan survey

Scan measurements were made in 10 grids using a 2 inch by 2 inch NaI detector with an MDCscan of 6.2 pCi/gm (attachment 4 of appendix A). The Action Level was 4.7 pCi/gm and the adjusted surrogate Cs137 DCGLw for this survey unit was 6.28 pCi/gm (table 1, page 2 appendix A). The area factor can be used to compare the MDCscan to the DCGLw. In this case, the MDCscan was below the DCGL (but above the Action Level) so no sample number adjustment was needed.

Of the 10 grids scanned, portions were inaccessible for various reasons, particularly because of a precipitous slope down to the river. The SNEC LTP (reference 9.3) specifically identifies issues of personnel safety as acceptable reasons to not achieve 100 % survey coverage. Of the 10 grids, a total of about 97 square meters was not scanned due to interferences. This results in approximately 903 square meters actually scanned in the 1000 square meter survey unit, or about 90 percent.

The scans conducted in one of the ten grids did identify activity in the soils greater than the action level. The action level was >175 net cpm (table 2, page 2 attachment A). One alarm point was found which measured about 453 total cpm (with a background of 222 cpm). This exceeded the background plus the alarm point slightly. The remainder of the survey unit was less than the action level.

6.3.2 OL5-3 soil samples

Twelve soil sample locations were defined for the survey unit, based on a conservative relative shift of about 3.

The two northernmost sample points were relocated south several meters because the original design layout had placed them on a steep slope (nearly vertical and about 15 meters high) descending to the river.

None of the design fixed point soil samples in OL5-3 had results in excess of the adjusted surrogate DCGLw. The table below (Table 4) 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 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. Based on this, no changes to the survey design or additional samples are required.

Table 4 - Soil sample results for OL5-3

Sample Number	Cs137 pCi/gm
1	<0.12
2	<0.10
3	<0.14
4	<0.14
5	0.19
6	<0.08
7	0.36
8	<0.08
9	<0.07
10	<0.11
11	<0.14
12	<0.14
Mean	0.14
Std Dev	0.08
Min	<0.07
Max	0.36

6.3.3 Elevated measurement investigation

During scan measurements in OL5-3 grid BP094, one alarm point (in excess of the action level of 175 net cpm) was identified. The elevated area was small, about 1 square foot, and in an area consisting of normal soil mixed with flyash. An area of about two square meters was defined around the alarm point to the edge where the count rate was back down to normal background. This two square meters, therefore is not all at the elevated activity of the alarm points (APs) but represent the area needed for the count rate to be unaffected by the elevated spot.

In order to assess the residual radioactivity in the AP, a sample was collected exactly at the AP location. In addition, in order to demonstrate that the area was adequately bounded by the two square meter area, three samples were collected at the edge of the area boundary. The table below (Table 5) shows the Cs137 results (no other licensed isotopes were detected) of these samples.

Table 5 – OL5-3 elevated area investigation sampling

Sample location	Activity (pCi/gm)
BP94 AP1	0.11
West edge	0.38
Southeast edge	<0.11
Northeast Edge	<0.15

The edge samples show that the elevated area is clearly delineated by the defined boundary. Both the edge sample results and the AP sample result are also consistent with the remainder of the survey unit. The AP identified by NaI detector scanning is likely a result of normal variations in background associated with the mix of rock, soil, and flyash.

Because the AP sample results were less than the DCGLw, no elevated measurement comparison test is required,

6.4 Survey Unit OL5-4

6.4.1 OL5-4 Scan survey

Scan measurements were made in 10 grids using a 2 inch by 2 inch NaI detector with an MDCscan of 6.2 pCi/gm (attachment 4 of appendix A). The Action Level was 4.7 pCi/gm and the adjusted surrogate Cs137 DCGLw for this survey unit was 6.28 pCi/gm (table 1, page 2 appendix A). The area factor can be used to compare the MDCscan to the DCGLw. In this case, the MDCscan was below the DCGL (but above the Action Level) so no sample number adjustment was needed.

Of the 10 grids scanned, portions were inaccessible for various reasons, particularly due to a precipitous drop to the river. The SNEC LTP (reference 9.3) specifically identifies issues of personnel safety as acceptable reasons to not achieve 100 % survey coverage. Of the 10 grids, a total of about 38 square meters was not scanned due to interferences. This results in approximately 962 square meters actually scanned in the 1000 square meter survey unit, or about 96 percent.

The scans conducted in all 10 grids did not identify any activity in the soils greater than the MDCscan. The action level was >175 net cpm (table 2, page2 attachment A). No area greater than 175 net cpm was found in OL5-4.

6.4.2 OL5-4 soil samples

Twelve soil sample locations were defined for the survey unit, based on a conservative relative shift of about 3.

None of the design fixed point soil samples in OL5-4 had results in excess of the adjusted surrogate DCGLw. The table below (Table 6) 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 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. Based on this, no changes to the survey design or additional samples are required.

Table 6 - Soil sample results for OL5-4

Sample Number	Cs137 pCi/gm
1	<0.14
2	0.18
3	<0.09
4	<0.09
5	<0.07
6	<0.11
7	<0.07
8	<0.10
9	<0.07
10	<0.15
11	<0.17
12	<0.12
Mean	0.11
Std Dev	0.04
Min	<0.07
Max	0.18

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

OL5-1 had no alarm points during scan surveys of 100% of the surface. Scan MDCs were adequate. Eleven soil samples were all less than the DCGLw. Scan fraction and number of soil samples meets LTP and MARSSIM requirements.

OL5-2 had no alarm points during scan surveys of 93% of the surface. Scan MDCs were adequate. Twelve soil samples were all less than the DCGLw. Scan fraction and number of soil samples meets LTP and MARSSIM requirements.

OL5-3 had one alarm point in grid BM094. The results of investigation show that the survey unit passes with no EMC test required since the AP sample result was less than the DCGLw. The OL5-3 survey unit area had scan surveys of 90% of the surface. Scan MDCs were adequate. Twelve soil samples were all less than the DCGLw. Scan fraction and number of soil samples meets LTP and MARSSIM requirements.

OL5-4 had no alarm points during scan surveys of 96% of the surface. Scan MDCs were adequate. Twelve soil samples were all less than the DCGLw. Scan fraction and number of soil samples meets LTP and MARSSIM requirements.

7.3 Survey Variations (design, Survey Request, LTP)

7.3.1 Approximately 83 square meters total of the grids scanned for OL5-2 was inaccessible. The remaining scanned portion constituted 93 percent of the survey unit area.

7.3.2 Approximately 97 square meters total of the grids scanned for OL5-3 was inaccessible. The remaining scanned portion constituted 90 percent of the survey unit area.

7.3.3 Approximately 38 square meters total of the grids scanned for OL5-4 was inaccessible. The remaining scanned portion constituted 96 percent of the survey unit area.

7.3.4 Sample point 11 of OL5-3 was relocated 9 meters south to avoid a steep cliff down to the river. This was approved by the survey design engineer.

7.3.5 Sample point 12 of OL5-3 was relocated 5.2 meters south to avoid a steep cliff down to the river. This was approved by the survey design engineer.

7.3.6 An elevated measurement area was found by scanning in grid BM094 in OL5-3. Subsequent investigation showed the activity in the area to be less than the DCGLw.

7.4 QC comparisons

7.4.1 Scan surveys

Numerous grids were partially rescanned as QC duplicates. The QC rescans did not identify any activity above alarm points and so are in agreement with the primary scans. Coverage area of 60 m² in each of the four survey units exceeds the minimum criterion of the LTP.

7.4.2 Soil Samples

One sample from OL5-1, and two samples from each of OL5-2, OL5-3, and OL5-4 received QC split gamma spectroscopy analyses on the soil samples. These split samples had good agreement as shown in the table below (Table 7). Seven QC splits out of 47 samples exceeds the minimum criterion of the LTP.

Table 7 – OL5 QC Split comparison

Sample Point	Sample Result (pCi/gm)	QC Result (pCi/gm)
OL5-1 6	<0.11	<0.16
OL5-2 5	<0.15	<0.14
OL5-2 12	<0.09	<0.13
OL5-3 2	<0.10	<0.12
OL5-3 11	<0.14	<0.10
OL5-4 3	<0.09	<0.14
OL5-4 12	<0.12	<0.10

8.0 Final Survey Conclusions

The final status survey (FSS) of Open Land Area survey units OL5-1, OL5-2, OL5-3, and OL5-4 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 both survey units.
- 2) All measurements were less than the DCGLw in all four of 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 OL5 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 E900-05-016 "Northeast Dump Open Land Area OL5 - Survey Design"
- 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) # SR212 for FSS of OL5-1
- 9.11 SNEC Survey Request (SR) # SR213 for FSS of OL5-2
- 9.12 SNEC Survey Request (SR) # SR214 for FSS of OL5-3
- 9.13 SNEC Survey Request (SR) # SR215 for FSS of OL5-4

10.0 Appendices

- Appendix A - SNEC Calculation E900-05-016 "Northeast Dump Open Land Area OL5 – Survey Design" (9 pages plus numerous attachments)
- Appendix B - COMPASS DQA report for OL5-1 (2 pages)
- Appendix C - COMPASS DQA report for OL5-2 (2 pages)
- Appendix D - COMPASS DQA report for OL5-3 (3 pages)
- Appendix E - COMPASS DQA report for OL5-4 (2 pages)
- Appendix F - SNEC Calculation E900-05-016 "Northeast Dump Open Land Area OL5 – Survey Design" revision 1 (1 page plus one attachment)

Appendix B, C, D, E, F



DQA Surface Soil

Assessment Summary

Site:	North-East Dump Area	
Planner(s):	W J Cooper	
Survey Unit Name:	Open Land Areas of OL5 Survey unit	
Report Number:	2	
Survey Unit Samples:	11	
Reference Area Samples:	0	
Test Performed:	Sign	Test Res
Judgmental Samples:	0	EMC Re
Assessment Conclusion:	<i>Reject Null Hypothesis (Survey Un</i>	

Retrospective Power Curve





DQA Surface Soil Report

Survey Unit Data

NOTE: Type = "S" indicates survey unit sample.
Type = "R" indicates reference area sample.

Sample Number	Type	Cs-137 (pCi/g)
1	S	0.08
2	S	0.06
3	S	0.08
4	S	0.1
5	S	0.07
6	S	0.11
7	S	0.1
8	S	0.13
9	S	0.09
10	S	0.1
11	S	0.14

Basic Statistical Quantities Summary

Statistic	Survey Unit	Background	DQO Results
Sample Number	11	N/A	N=11
Mean (pCi/g)	0.10	N/A	0.24
Median (pCi/g)	0.10	N/A	N/A
Std Dev (pCi/g)	0.02	N/A	0.3
High Value (pCi/g)	0.14	N/A	N/A
Low Value (pCi/g)	0.06	N/A	N/A

Appendix B
OL5

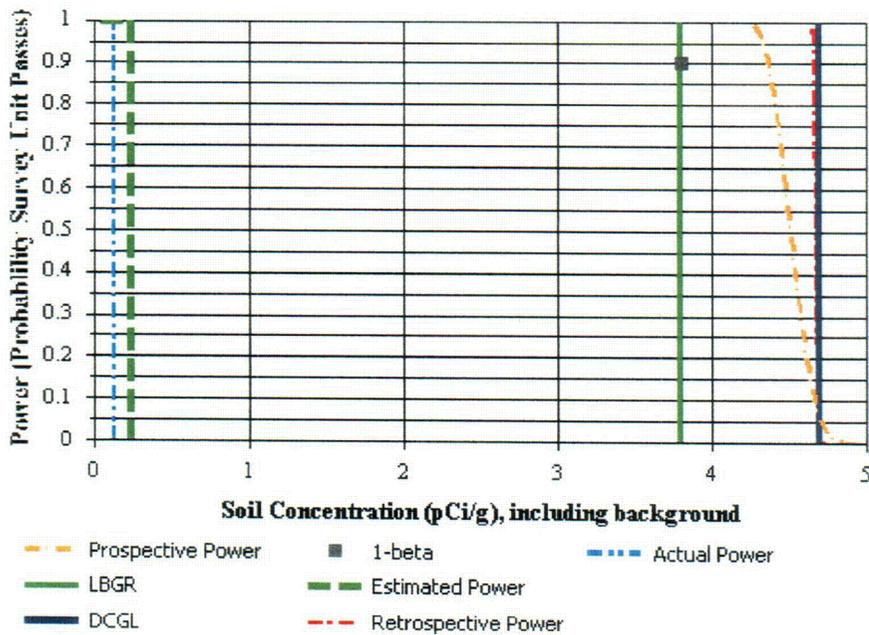


DQA Surface Soil Report

Assessment Summary

Site:	North-East Dump Area		
Planner(s):	W J Cooper		
Survey Unit Name:	Open Land Areas of OL5 Survey UNit OL5-2		
Report Number:	1		
Survey Unit Samples:	12		
Reference Area Samples:	0		
Test Performed:	Sign	Test Result:	Not Performed
Judgmental Samples:	0	EMC Result:	Not Performed
Assessment Conclusion:	Reject Null Hypothesis (Survey Unit PASSES)		

Retrospective Power Curve



Appendix C
OL5-2

C02



DQA Surface Soil Report

Survey Unit Data

NOTE: Type = "S" indicates survey unit sample.
Type = "R" indicates reference area sample.

Sample Number	Type	Cs-137 (pCi/g)
1	S	0.09
2	S	0.12
3	S	0.1
4	S	0.11
5	S	0.15
6	S	0.17
7	S	0.12
8	S	0.14
9	S	0.14
10	S	0.16
11	S	0.15
12	S	0.09

Basic Statistical Quantities Summary

Statistic	Survey Unit	Background	DQO Results
Sample Number	12	N/A	N=11
Mean (pCi/g)	0.13	N/A	0.24
Median (pCi/g)	0.13	N/A	N/A
Std Dev (pCi/g)	0.03	N/A	0.3
High Value (pCi/g)	0.17	N/A	N/A
Low Value (pCi/g)	0.09	N/A	N/A

Appendix C
OL5-2

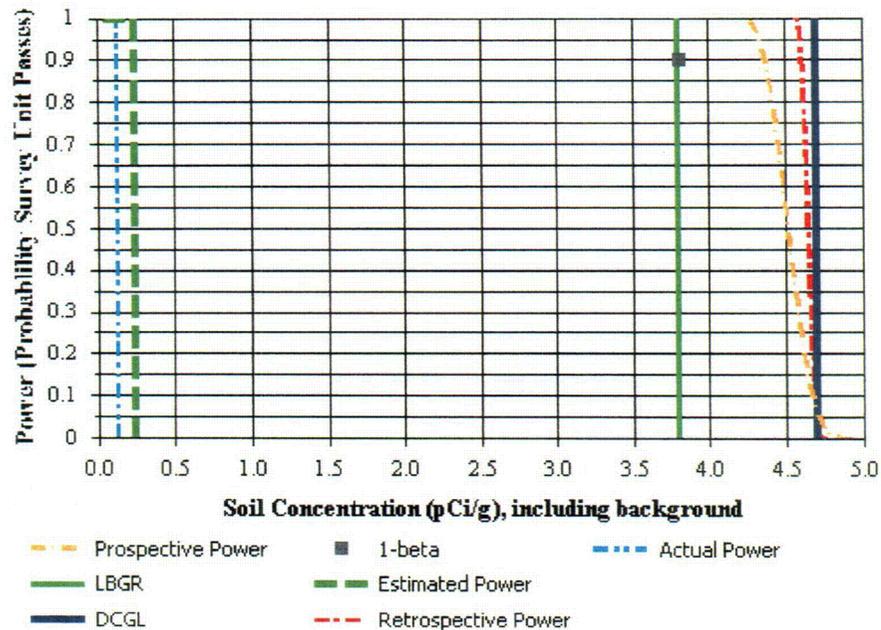


DQA Surface Soil Report

Assessment Summary

Site:	North-East Dump Area		
Planner(s):	W J Cooper		
Survey Unit Name:	Open Land Areas of OL5 Survey UNits OL5-3 & OL5-4 <i>gr</i>		
Report Number:	6		
Survey Unit Samples:	12		
Reference Area Samples:	0		
Test Performed:	Sign	Test Result:	Not Performed
Judgmental Samples:	1	EMC Result:	Not Performed
Assessment Conclusion:	Reject Null Hypothesis (Survey Unit PASSES)		

Retrospective Power Curve



Appendix D
OL5



DQA Surface Soil Report

Survey Unit Data

NOTE: Type = "S" indicates survey unit sample.
Type = "R" indicates reference area sample.

Sample Number	Type	Cs-137 (pCi/g)
1	S	0.12
2	S	0.1
3	S	0.14
4	S	0.14
5	S	0.19
6	S	0.08
7	S	0.36
8	S	0.08
9	S	0.07
10	S	0.11
11	S	0.14
12	S	0.14

Basic Statistical Quantities Summary

Statistic	Survey Unit	Background	DQO Results
Sample Number	12	N/A	N=11
Mean (pCi/g)	0.14	N/A	0.24
Median (pCi/g)	0.13	N/A	N/A
Std Dev (pCi/g)	0.08	N/A	0.3
High Value (pCi/g)	0.36	N/A	N/A
Low Value (pCi/g)	0.07	N/A	N/A

Appendix D
OL5



DQA Surface Soil Report

Elevated Measurement Comparison (EMC)

Sum of All Contaminants: Not Performed

EMC Result: Not Performed

EMC Description	Area (m ²)	Contaminant	Average Concentration (pCi/g)
ap1 Equation 8-2 Result for Cs-137: 0.04	1	Cs-137	1.1

Note:

The value for the alarm point soil sample was entered into COMPASS as 1.1 pCi/g instead of the actual value of 0.11 pCi/g because COMPASS would not accept the actual value for the concentration in the soil. Therefore in order to get the report to complete, the alarm point soil value was entered as noted. This makes the 'equation 8-2' result higher (conservative) than it should be for the actual data from the survey unit. The actual value for the 'equation 8-2' elevated measurements comparison test is shown below:

Residual contamination in the alarm point: 0.11 pCi/g
DCGLw : 6.28 pCi/g (using the DCGL not the action level)
AF: 28.7 (1 sq meter)
Average residual in the entire survey unit: 0.14 pCi/g

Equation 8-2:
 $(0.14 / 6.28) + ((0.11 - 0.14)/(28.7 * 6.28))$

since the second term is actually negative, it is set to zero:

$$0.14 / 6.28 = 0.02$$



DQA Surface Soil Report

Assessment Summary

Site: North-East Dump Area

Planner(s): W J Cooper

Survey Unit Name: Open Land Areas of OL5 Survey UNits ~~OL5-3~~ & OL5-4

Report Number: 4

Survey Unit Samples: 12

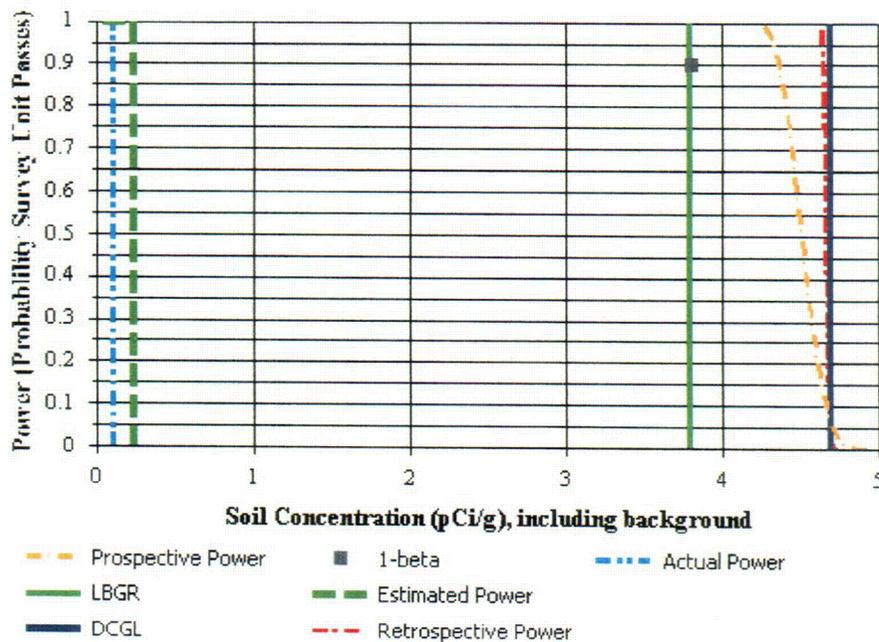
Reference Area Samples: 0

Test Performed: Sign Test Result: Not Performed

Judgmental Samples: 0 EMC Result: Not Performed

Assessment Conclusion: **Reject Null Hypothesis (Survey Unit PASSES)**

Retrospective Power Curve



Appendix E
OL5



DQA Surface Soil Report

Survey Unit Data

NOTE: Type = "S" indicates survey unit sample.
Type = "R" indicates reference area sample.

Sample Number	Type	Cs-137 (pCi/g)
1	S	0.14
2	S	0.18
3	S	0.09
4	S	0.09
5	S	0.07
6	S	0.11
7	S	0.07
8	S	0.1
9	S	0.07
10	S	0.15
11	S	0.17
12	S	0.12

Basic Statistical Quantities Summary

Statistic	Survey Unit	Background	DQO Results
Sample Number	12	N/A	N=11
Mean (pCi/g)	0.11	N/A	0.24
Median (pCi/g)	0.11	N/A	N/A
Std Dev (pCi/g)	0.04	N/A	0.3
High Value (pCi/g)	0.18	N/A	N/A
Low Value (pCi/g)	0.07	N/A	N/A

Appendix E
OL5