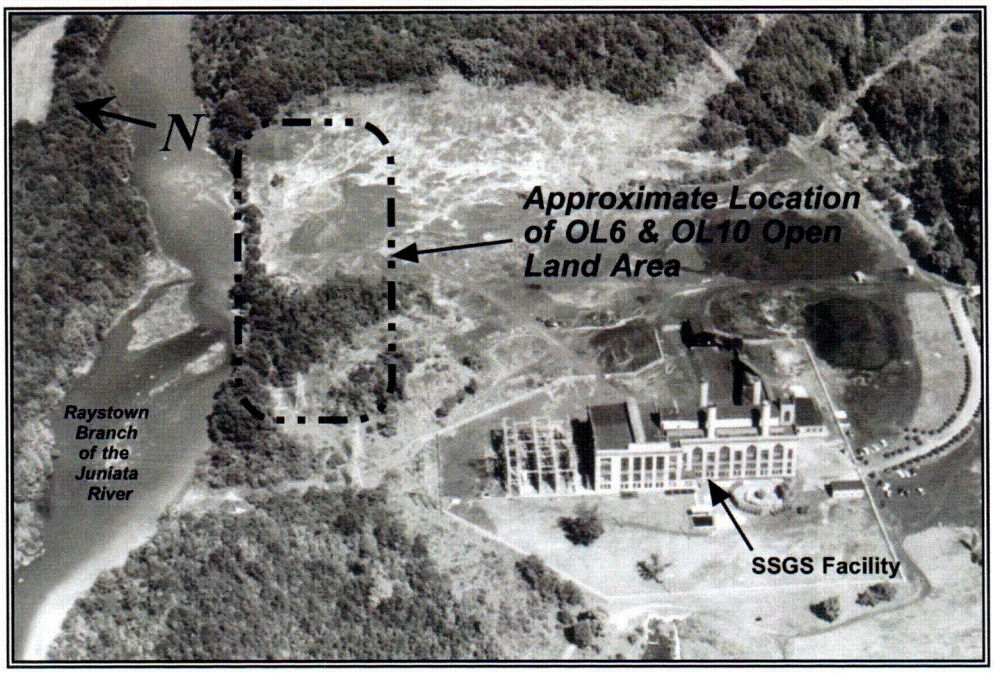
Final Status Survey Report

For

Saxton Nuclear Experimental Corporation

Open Land Area Survey Units, OL6 and OL10



The Saxton Coal Fired Steam Generating Station - Photo from Operational Period

Prepared by GPU Nuclear, Inc.

July 2005

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Executive Summary

This report presents the results and conclusions of the Final Status Survey (FSS) conducted by GPU Nuclear, Inc. within the SNEC facility OL6 and OL10 open land areas (survey units OL6, OL10-1, OL10-2 and OL10-3). This report provides summary results from volumetric scanning and sampling of soils within the aforementioned areas. This survey work was performed in May of 2005. All survey work was performed in accordance with the SNEC License Termination Plan (LTP) (**Reference 9.1**).

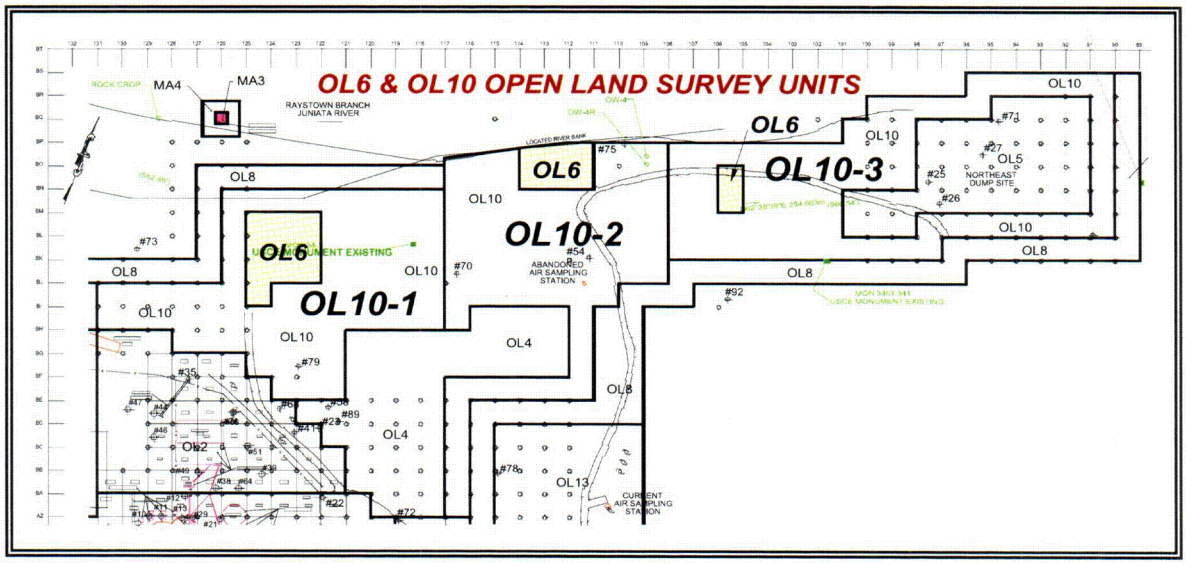

Figure 2, A section of the SNEC Facility site grid map showing the location of the OL6 and OL10 survey units.

Survey data was collected from the OL6, OL10-1, OL10-2 and OL10-3 survey units according to data collection requirements specified in the survey design (**Reference 9.2** and **Appendix A-1**).

During FSS activities, the following types of measurements were performed on materials found in these areas.

1. NaI detector scanning measurements were performed in approximately 6,800 m^2 of the OL10-1 area, 6,860 m^2 of the OL10-2 area, and 7,000 m^2 of the OL10-3 area. In addition, 1,775 m^2 of the OL6 area was scanned. The OL10 survey units are considered Class 2-survey units and the OL6 area is a Class 1-survey unit. Scan coverage requirements for these survey units are provided in **Reference 9.1**, **Table 5-5**.

2. Not counting quality control and replicate sampling, a total of twenty (20) soil/soil-like samples were obtained from the OL6 survey unit. In addition, eighteen (18) samples

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were collected in the OL10-1 survey unit, twenty five (25) samples were selected from the OL10-2 survey unit, and fifteen (15) samples were taken in the OL10-3 survey unit. All sample locations were selected using the random start, triangular grid systematic spacing methodology. Every sample was analyzed by gamma-ray spectroscopy to determine the presence of radionuclides that resulted from SNEC facility operations. Two (2) quality control samples were taken in each survey unit, and Cs-137 is used as the surrogate radionuclide of interest.

FSS scan survey results were less than the action level for most of the applicable areas described in this report. Two (2) small areas exceeded the assigned alarm point of > 350 gross counts per minute (gcpm), using a 2" by 2" sodium iodide detector. When sampled, no analysis result from samples collected in either of the two alarm point locations exceeded the DCGLw. All soil and soil-like material samples taken at every sampling depth from every survey unit, were below the applicable DCGLw. Therefore, this collection of FSS data demonstrate that these survey units meet the radiological criteria for unrestricted use specified in 10 CFR 20.1402 **(Reference 9.3)**.

Based on the results of this final status survey effort, GPU Nuclear, Inc. concludes that the OL6 and OL10 open land areas meet the NRC requirements for release to unrestricted use.

1.0 Purpose and Scope

This report presents the results and conclusions of the final status survey performed on the following areas:

- Open Land Survey Unit OL6 – Class 1 areas
- Open Land Survey Unit OL10-1, OL10-2 and OL10-3 – Class 2 areas

This survey effort provides the information required by 10 CFR 50.82(a)(11) (**Reference 9.4**) and SNEC's License Termination Plan (LTP), and demonstrate that this area meets the radiological criteria for unrestricted use specified in 10 CFR 20.1402.

2.0 Survey Area Description

The open land areas of OL6 and OL10 reside north and northeast of the former SNEC Containment Vessel location. Collectively, these areas are approximately 22,435 square meters and are divided into both Class 1 and Class 2-survey units. These survey units are contained in the area enclosed by site grid markers AZ-131 and BS-131 on the west, and on the east by grid markers AZ-90, and BS-90 (**Reference 9.5**).

All together, OL6 is composed of three small areas that total about 1,775 square meters. These three areas are collectively one (1) survey unit designated OL6. Each one of these OL6 areas is encompassed in one of the three OL10 survey units. The OL10 survey area is divided into the three (3) survey units listed below:

- OL10-1 - 6,800 square meters
- OL10-2 – 6,860 square meters
- OL10-3 – 7,000 square meters

All of these areas are sparsely covered with grass, trees, boulders and small shrubs. Soils from these areas contain a significant quantity of Saxton Steam Generating Station (SSGS) fly ash and coal dirt. Unpaved roads pass through and along these areas, and roadway composition is the same as the surrounding soil/soil-like materials. OL10-3 surrounds the former OL5 dumpsite, and a large amount of OL10 borders the Raystown Branch of the Juniata River. In OL10-2, an elevation change of about three (3) meters or more occurs near the site's 118 vertical grid line and extends to about the 109 vertical grid marker. This elevation change begins gradually in the south at about the BK horizontal grid line and continues north to the riverbank where a steep drop-off ends at the river

below. Exploration and characterization efforts in and near this mounded area have exposed building debris and other man-made materials that were buried here from previous demolition activities that included the SSGS and SNEC Nuclear facilities. Characterization results have not shown any elevated Cs-137 concentrations in these materials at any depth in the OL10 survey units, but the OL6 areas that are encompassed by the OL10 survey units have been remediated.

3.0 Operating History

3.1 OL6/OL10 Area Use

The SNEC Historical Site Assessment (HSA) (**Reference 9.6,** page 30) discusses the discovery of miscellaneous materials and artifacts in the Northeast Dumpsite area (OL5). The SNEC facilities investigations of the OL6/OL10 areas have confirmed that similar materials were buried in these areas. The presence of building debris, laboratory reagent containers, rusted drums, and asbestos indicate that at least part of the area was used as a burial site when the SSGS facility and the SNEC reactor site terminated operations. These miscellaneous materials were identified during the characterization process, and for the most part, were determined to have no radiological consequence. However, the OL6 area contained some contaminated materials that were identified and remediated down to a meter or more below the surface.

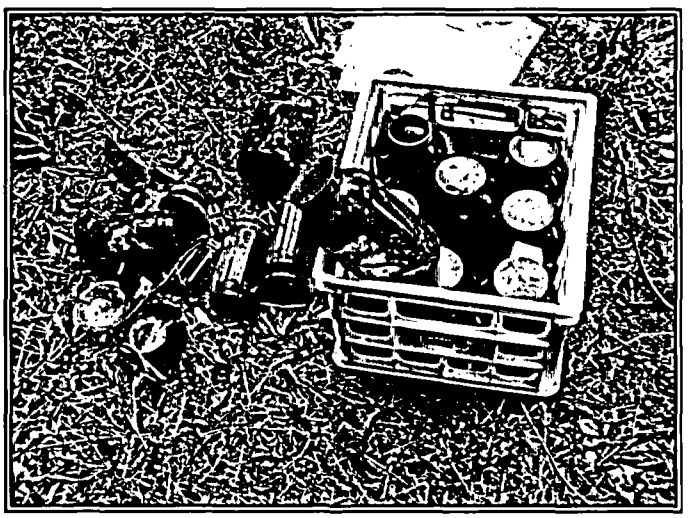

Figure 3. Photo of Empty Reagent Jars Found in One OL10 Survey Unit.

3.2 Ol6/OL10 Open Land Area Remediation Status

While no radiological remediation was performed in the OL10 area, remediation activities were used to lower the mean concentration of Cs-137 in the three small OL6 areas (see **Figure 2**), to a concentration less than the applicable DCGLw.

3.3 SNEC Facility Operating History

The Saxton Nuclear Experimental Corporation (SNEC) facility featured a pressurized water reactor (PWR), which was licensed to operate at 23.5 megawatts thermal (23.5 MWth). 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 build 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 storage condition. The fuel was removed in 1972 and shipped to a (now DOE) facility at Savannah River, South Carolina, 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 reactor, containment vessel and support buildings have all been removed from the site. The building and structures that supported reactor operation were partially decontaminated by 1974. In the late 1980's and through the 1990's, additional decontamination, disassembly and removal of the containment vessel support buildings, large and small components and other miscellaneous support equipment was complete. By 1992 decontamination and dismantlement of the reactor support structures was complete. Large components such as the pressurizer, steam generator, and reactor vessel were removed in late 1998. The removal of the steel Containment Vessel (CV) (to ~ 4' below grade), and backfill was complete by late 2003. More recently, decontamination, disassembly and demolition of the remaining SNEC facility buildings including remnants of the coal fired Saxton Steam Generating Station (SSGS) has taken place. The SNEC facility is currently in the process of performing the Final Status Survey for unrestricted release leading to license termination.

4.0 Site Release Criteria

The site release criteria as applied to the OL6 and OL10 open land areas, correspond to the radiological dose criteria for unrestricted use per 10 CFR 20.1402. 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 and meet site or survey unit release criteria were derived by analyses using either the building occupancy (surface area) or resident farmer (volumetric) scenarios. The dose modeling for these scenarios is explained in Chapter 6 of the SNEC LTP, Revision 3. The derived concentration guideline levels (DCGLs) determined in the LTP form the basis for satisfying the site release criteria.

As described in Chapter 6 of the SNEC LTP (**Reference 9.1**), a correction to the gross activity DCGLw is made to address de-listed radionuclides and provide a reasonable SNEC established safety factor. The SNEC facility has instituted an administrative limit of 75% for the allowable dose (DCGL) for all measurement results. Thus the de-listed radionuclide dose is accounted for by using the 75% administrative limit.

4.1 OL6/OL10 Area Specific DCGLw Values

Not counting quality control (QC) samples, at least eighty (80) samples were taken in and near the OL10 survey units during the most recent characterization campaign. Most of these results were at or near background levels for Cs-137, exhibiting a mean concentration of 0.45 ± 0.33 pCi/g (see **Appendix A-1, Attachment 8-1**). Additionally, greater than thirty (30) samples were taken during remediation efforts in the OL6 areas. The mean concentration from thirty of these samples was 2.6 ± 1.7 pCi/g Cs-137 (see **Appendix A-1, Attachment 8-1**). These values were used as variability input parameters for the Compass computer program (**Reference 9.7**).

Four (4) representative samples from within three adjacent areas (OL4, OL5 & OL6) were sent to an off-site laboratory to obtain the analysis results for the eleven (11) radionuclides associated with SNEC decommissioning process (see **Appendix A-1, Attachment 2-1** to

2-3). These results were decayed and pooled to provide the Cs-137 surrogate value shown in **Table 1.**

Table 1, OL6 and OL10 – DCGLw VALUES

Volumetric DCGLw (pCi/g) for Cs-137
6.54 (4.9 A.L.) (mix is ~99% Cs-137)

NOTE: A.L. is the site Administrative Limit (75% of the effective DCGLw for the area).

5.0 Final Status Survey Design/DQO Process

Survey Designs (SD's) (**Appendix A**) are developed IAW applicable sections of the SNEC License Termination Plan (LTP) and site procedures (**Reference 9.8**). During development, characterization activities are reviewed along with any post-remediation survey or sampling activities (as applicable). Survey unit variability is established from the best available or most representative measurement and/or sampling result. The Compass computer program is then used to develop MDCscan parameters (for structural surfaces), the number of survey or sampling points in each survey unit, and other DQO design parameters. For open land areas, methodology from NUREG-1507 (**Reference 9.9**) is used to calculate MDCscan values that are then input to the Compass computer program. For structural surfaces, representative background values are extracted from previous measurements of non-impacted like-materials of similar age whenever possible. For open land areas, background concentrations of relevant SNEC radionuclides are not subtracted from sample data sets prior to developing individual survey unit surrogate levels (of Cs-137). Thus the effective DCGLw values for open land areas are conservatively biased.

For most survey units, the number of Compass calculated sample and/or survey locations are augmented to provide *"more than the minimum required coverage"*. Sample and/or survey point locations are plotted on drawings of individual survey areas using the Visual Sample Plan (VSP) computer code (**Reference 9.10**). Diagrams showing sample and/or survey point locations are clearly depicted on survey maps along with any necessary physical dimensions from known site area landmarks. Diagrams are then provided to individual survey teams through the use of the Survey Request (SR's) procedure process (**Reference 9.11**). SR's are issued as field working guidance documents. Before implementation, all SD's and SR's are reviewed and approved by the SNEC RSO (or his representative). Data Quality Objectives (DQO's) for the OL6 and OL10 areas are presented in the following table.

Table 2, DQO/Design Parameters/Results

Survey Unit	OL6	OL10-1	OL10-2	OL10-3
Survey Design Calculation. No.	E900-05-027			
SNEC Survey Request No.	SR-216	SR-217	SR-218	SR-219
Survey Area Classification	Class 1	Class 2	Class 2	Class 2
Total Estimated Area in Survey Unit (m^2)	1,775	6,800	6,860	7,000
Material Type	Soil and Soil-Like Materials			
Scanning Goal (m^2)	1,775 (100%)	3,400 (50%)	3,430 (50%)	3,500 (50%)
Actual Area Scanned (m^2)	~1,768 (99.6%)	~3,774 (55.5%)	~3,711 (54.1%)	~3,178 (45.4%)
Applicable Statistical Test	Sign			
Type I Decision Error (α)	0.05			
Type II Decision Error (β)	0.10			
Gross Activity DCGLw (pCi/g Cs-137)*	6.54 (4.9 A.L.)			
LBGR (pCi/g Cs-137)	2.6	4.4	4.4	4.4
Estimated σ (pCi/g Cs-137)	1.7	0.33	0.33	0.33
Actual σ From Survey Unjt(cpm)	0.22	0.13	0.07	0.04
Δ/σ (Planning Value)	1.35	1.52	1.52	1.52
Samples Required by Compass	16	14	14	14
Samples Specified by VSP**	20	18	19	18
Estimated Scan MDC (pCi/g Cs-137)	5.97			
Scan Speed (cm/sec)	25			
Survey Instrument Type***	L-2350-1, w/44-10 2" by 2" NaI with Cs-137 Window Setting			
Instrument counts/disintegration (cpm/mR/h)	≥ 206,000			
Scanning Alarm Point (gcpm)	> 350			
Detector Gap to Surface (inches)	4			

* A.L. is the SNEC Facility Administrative Limit (75% of the applicable DCGLw).

** VSP is Visual Sample Plan. VSP is used to plot points on diagrams. Typically several additional points are added during this process to compensate for potential losses in the field.

*** This instrument uses a narrow window detector setting that improves the signal to noise ratio for Cs-137.

5.1 Description of Survey Units

Figure 2 shows that the OL6 and OL10 areas are approximately 22,436 square meters in total area. OL6 is actually three small areas that have been collectively surveyed as one survey unit named OL6. Survey units are generally formed by grouping contiguous site areas with a similar history or use, and the same classification or contamination potential. These three (3) areas are enough alike in composition and location to be considered one survey unit. The three (3) OL6 areas are surrounded by the OL10-1, OL10-2 and OL10-3 survey units, and are similar in composition except that each of these smaller areas required remediation.

Native soil, cinders, coal ash, and significant quantities of building debris make up the majority of material types in these areas. However, OL10-2 and OL10-3 appear to contain more building debris than the OL10-1 area. The entire OL10 area borders the Raystown Branch of the Juniata River on the northern side and sections of this area exhibit a steep drop off that in some places reaches fifteen (15) or more meters above the river below. Survey work at or near the edge of the bank area was considered to hazardous to perform. In the OL10-3 survey unit, three sample points that were part of the random start systematic triangular grid system were dropped rather than expose survey personnel to a fall hazard.

5.2 Survey Design for the OL6/OL10 Open Land Areas

The survey design for OL6/OL10 areas is provided as **Appendix A-1**. Since the OL10 survey areas are Class 2 open land areas, the initial scanning goal was set at 50% of the total area available. Each of the three OL10 survey units contains a small section of the OL6 survey unit. Scan locations in the Class 2 areas were judgmentally selected to border these Class 1 areas as shown in **Appendix A-1, Attachment 5-1**. The minimum percent of scan coverage obtained for any Class 2 survey unit (OL10-1, OL10-2 or OL10-3) was about 45%, which is considered adequate. The OL6 survey unit is a Class 1 area, and 100% scan coverage is required for all three OL6 locations. This assignment is in accordance with **Reference 9.1, Table 5-5**.

The number of random start, triangular grid, systematically spaced sample points were determined using the Compass computer program (**Reference 9.7**). The minimum number of sample points selected by Compass for any survey unit was fourteen (14) (for OL10-1, OL10-2 and OL10-3). Each sample was to be one meter in depth to match the site area dose model discussed in Chapter 6 of the SNEC LTP (**Reference 9.1**). In the mounded area of OL10-2, a deeper sampling regime was assigned. Sample collection in this area was to penetrate the mound and collect base soil materials at select sample locations. At some locations this required the use of a backhoe rather than an auger. All sample points were placed on survey maps of the OL6/OL10 area using the Visual Sample Plan (VSP) computer code (**Reference 9.10**). These locations can be seen in **Appendix A-1, Attachment 7-1** through **7-6**.

6.0 Final Status Survey Results

6.1 Summary of Survey Results for OL6/OL10 Open Land Areas

Approximately 50% of the three OL10 survey units were scanned during FSS activities (see **Appendix A-2** through **A-5**). FSS scanning requirements for a Class 2 open land area are typically 10 to 100% (**Reference 9.1, Table 5-5**). In the Class 1 (OL6) areas, 100% of the available area was scanned which also meets the requirements of **Reference 9.1**. Therefore, all scan coverage requirements for these areas as listed in the survey design and the SNEC LTP have been met.

Two (2) instrument alarms were encountered in grid BI-125 (part of OL6) and in the adjacent grid BH-125 (part of OL10-1). These alarm points were sampled along with the area around the alarm points to verify the Cs-137 concentration. These results are provided in **Table 4** and **6**, and shown that the applicable DCGLw has not been exceeded in either case. Since the DCGLw was not exceeded the Classifications for both areas are correct. No further actions were needed to show compliance with SNEC LTP requirements.

In all, well over one hundred (100) characterization and FSS samples have been taken in the OL10 survey units. No sample analysis result yielded values above the DCGLw in OL10 areas. On the other hand, OL6 areas were remediated because all three locations were radiologically contaminated above the DCGLw. Once decontamination efforts were complete however, no residual activity remained that exceeded the DCGLw. The sample data used to establish the variability of OL6 was taken during the remediation phase and as a result the variability of the survey unit was significantly elevated. Samples taken in OL6 during FSS activities show a significantly lower Cs-137 concentration and as a result the variability is greatly reduced (see **Table 2** and **Appendix A-1, Attachment 8-1**).

All sampling depths were in accordance with the SNEC site dose model of one (1) meter, except as noted in Section 7.2.2. FSS sample data are provided in **Table 3** through **8**. Note that the variability of FSS samples identified in **Table 3** through **8** are below the initial variability estimate used in the survey-planning phase for all four (4) survey units (see **Table 2** initial sigma values).

6.2 OL6 Random Start, Triangular Grid, Systematically Spaced Soil Sample Results

Table 3, OL6 - SR-216 Sample Results

	Sample No.	Grid No.	Sample Point	Cs-137 (pCi/g)	Sample Depth
1	SXSL10396	BI-125	SP-1	< 0.125	1 m
2	SXSL10397	BJ-125	SP-2	0.34	1 m
3	SXSL10398	BJ-124	SP-3	< 0.127	1 m
4	SXSL10399	BJ-123	SP-4	0.13	1 m
5	SXSL10400	BK-125	SP-5	0.54	1 m
6	SXSL10401	BK-124	SP-6	0.81	1 m
7	SXSL10402	BK-124	SP-6 (QC)	0.64	1 m
8	SXSL10403	BK-123	SP-7	< 0.18	1 m
9	SXSL10404	BL-125	SP-8	0.43	1 m
10	SXSL10405	BL-124	SP-9	0.22	1 m
11	SXSL10406	BL-123	SP-10	0.12	1 m
12	SXSL10409	BL-125	SP-11	< 0.122	1 m
13	SXSL10410	BL-124	SP-12	< 0.0571	1 m
14	SXSL10411	BL-123	SP-13	< 0.161	1 m
15	SXSL10412	BN-114	SP-14	0.36	1 m
16	SXSL10413	BN-113	SP-15	< 0.089	1 m
17	SXSL10414	BN-112	SP-16	< 0.121	1 m
18	SXSL10415	BO-114	SP-17	0.66	1 m
19	SXSL10416	BO-112	SP-18	0.26	1 m
20	SXSL10417	BM-106	SP-19	< 0.124	1 m
21	SXSL10418	BM-106	SP-19 (QC)	< 0.145	1 m
22	SXSL10419	BN-106	SP-20	< 0.146	1 m
	[redacted]		Average⇒	0.27	[redacted]
			Sigma⇒	0.22	
			Minimum⇒	0.06	
			Maximum⇒	0.81	

As stated previously, one alarm point (AP) was reached in the OL6 survey unit surrounded by OL10-1 (see **Figure 2**). The alarm was reported as 529 to 623 gcpm, which is above the AP of > 350 gcpm. The AP was investigated by sampling the elevated area and several other locations at a one (1) meter radius around the AP. These sample results are provided in **Table 4**.

Table 4, OL6 - SR-216 Alarm Point Investigation Results

Sample No.	Grid No.	Sample Point	Cs-137 (pCi/g)	Sample Depth
SXSL10395	BI-125	AP-1	1.53	1 m
SXSL10394	BI-125	SP-1	< 0.515	1 m
SXSL10393	BI-125	SP-2	< 0.119	1 m
SXSL10392	BI-125	SP-3	0.26	1 m
[redacted]		Average⇒	0.61	[redacted]
		Sigma⇒	0.64	
		Minimum⇒	0.12	
		Maximum⇒	1.53	

Sample Point	NaI gcpm	Area m^2
AP-1	529, 623	0.55

Since all analysis results for Cs-137 were below the DCGLw, and are more typical of site background concentrations, no additional samples were taken. This area borders the alarm point found in the surrounding OL10-1 survey unit.

6.3 OL10-1 Random Start, Triangular Grid, Systematically Spaced Soil Sample Results

Table 5, OL10-1 - SR-217 Sample Results

	Sample No.	Grid No.	Sample Point	Cs-137 (pCi/g)	Sample Depth
1	SXSL10429	BE-124	SP-1	< 0.121	1 m
2	SXSL10430	BE-122	SP-2	< 0.104	1 m
3	SXSL10431	BG-127	SP-3	< 0.142	1 m
4	SXSL10432	BG-125	SP-4	< 0.549	1 m
5	SXSL10433	BG-123	SP-5	0.12	1 m
6	SXSL10434	BI-130	SP-6	0.19	~ 6" SYGM*
7	SXSL10435	BI-128	SP-7	0.21	~ 6" SYGM*
8	SXSL10436	BI-126	SP-8	0.31	1 m
9	SXSL10437	BI-126	SP-8 (QC)	0.38	1 m
10	SXSL10438	BI-124	SP-9	0.20	1 m
11	SXSL10439	BI-122	SP-10	< 0.109	1 m
12	SXSL10440	BI-120	SP-11	0.20	1 m
13	SXSL10441	BI-118	SP-12	< 0.15	1 m
14	SXSL10442	BK-121	SP-13	< 0.106	1 m
15	SXSL10443	BK-119	SP-14	0.13	1 m
16	SXSL10444	BK-119	SP-14 (QC)	0.11	1 m
17	SXSL10445	BM-126	SP-15	0.50	1 m
18	SXSL10446	BM-122	SP-16	0.09	1 m
19	SXSL10447	BM-120	SP-17	< 0.136	1 m
20	SXSL10448	BM-118	SP-18	< 0.118	1 m
	[redacted]		Average⇒	0.20	[redacted]
			Sigma⇒	0.13	
			Minimum⇒	0.09	
			Maximum⇒	0.55	

* Note: SYGM = Switch Yard Grounding Mat Interference

The alarm point (AP) found in the OL10-1 survey unit was reported as 468 to 498 gcpm, which is above the AP of > 350 gcpm. The AP was investigated by sampling the elevated area and several other locations at a one (1) meter radius around the AP. These sample results are provided in **Table 6**.

Table 6, OL10-1 - SR-217 Alarm Point Investigation Results

Sample No.	Grid No.	Sample Point	Cs-137 (pCi/g)	Sample Depth
SXSL10391	BH-125	AP-1	3.13	1 m
SXSL10388	BH-125	SP-1	< 0.107	1 m
SXSL10389	BH-125	SP-2	1.11	1 m
SXSL10390	BH-125	SP-3	< 0.095	1 m
[redacted]		Average⇒	1.11	[redacted]
		Sigma⇒	1.43	
		Minimum⇒	0.09	
		Maximum⇒	3.13	

Sample Point	Nal gcpm	Area m^2
AP-1	468, 498	2

Analysis of samples taken in the areas where alarm points were exceeded were below the DCGLw for Cs-137. No additional samples were taken.

6.4 OL10-2 Random Start, Triangular Grid, Systematically Spaced Soil Sample Results

Table 7, OL10-2 - SR-218 Sample Results

	Sample No.	Grid No.	Sample Point	Cs-137 (pCi/g)	Sample Depth
1	SXSL10471	BA-117	SP-1	0.21	1 m
2	SXSL10472	BE-117	SP-2	0.10	1 m
3	SXSL10473	BE-115	SP-3	0.17	1 m
4	SXSL10474	BE-113	SP-4	0.24	1 m
5	SXSL10475	BG-112	SP-5	0.23	1 m
6	SXSL10476	BI-117	SP-6	0.23	1 m
7	SXSL10477	BI-115	SP-7	< 0.126	1 m
8	SXSL10478	BI-113	SP-8	0.17	1 m
9	SXSL10479	BI-113	SP-8 (QC)	0.16	1 m
10	SXSL10480	BI-111	SP-9	0.09	1 m
11	SXSL10481	BK-114	SP-11	< 0.133	1 m
12	SXSL10482	BK-116	SP-10	0.37	1 m, Base Soil
13	SXSL10483	BK-112	SP-12A	< 0.0697	1 m
14	SXSL10484	BK-112	SP-12B	< 0.0923	2 m
15	SXSL10485	BK-112	SP-12C	< 0.0768	3 m, Max. Depth of Sampling Eq.
16	SXSL10486	BO-116	SP-18A	< 0.129	1 m, Debris & Fill
17	SXSL10487	BO-116	SP-18B	< 0.0886	2 m, Debris & Fill
18	SXSL10488	BO-116	SP-18C	< 0.111	3 m, Max. Depth of Sampling Eq.
19	SXSL10489	BM-113	SP-16A	< 0.0926	1 m
20	SXSL10490	BM-113	SP-16B	< 0.105	2 m
21	SXSL10491	BM-113	SP-16C	< 0.0533	3 m, Max. Depth of Sampling Eq.
22	SXSL10511	BK-110	SP-13	< 0.104	1 m
23	SXSL10512	BM-117	SP-14	0.10	1 m
24	SXSL10513	BM-115	SP-15	0.16	1 m
25	SXSL10514	BM-111	SP-17	< 0.105	1 m
26	SXSL10515	BO-110	SP-19	< 0.106	1 m
27	SXSL10516	BO-110	SP-19 (QC)	< 0.128	1 m
	[redacted]		Average⇒	0.14	[redacted]
			Sigma⇒	0.07	
			Minimum⇒	0.05	
			Maximum⇒	0.37	

The OL10-2 area contains a mounded region that was previously described in Section 2.0. In this area, one (1) meter sampling depths were augmented by additional samples taken down to base soil materials when ever possible. This same methodology was used during the characterization phase to explore and sample sections of the OL10-2 survey unit to ensure no hidden pockets of contaminated materials were at depths below one (1) meter. The results of this multi-depth sampling effort are listed in **Table 7**. In some cases the track-hoe sampling equipment could not reach the base soil layer below the debris mound. However, all samples collected during this process yielded Cs-137 values that were well below the DCGLw and this effort is considered adequate for this area.

6.5 OL10-3 Random Start, Triangular Grid, Systematically Spaced Soil Sample Results

Table 8, OL10-3 - SR-219 Sample Results

	Sample No.	Grid No.	Sample Point	Cs-137 (pCi/g)	Sample Depth
1	SXSL10449	BK-107	SP-1	< 0.074	1 m
2	SXSL10450	BK-105	SP-2	< 0.0735	1 m
3	SXSL10451	BK-103	SP-3	0.15	0.5 m (Refusal)
4	SXSL10452	BK-101	SP-4	< 0.0797	1 m
5	SXSL10453	BK-99	SP-5	< 0.129	1 m
6	SXSL10454	BK-99	SP-5 (QC)	< 0.133	1 m
7	SXSL10455	BM-108	SP-6	< 0.151	1 m
8	SXSL10456	BM-104	SP-7	< 0.0599	1 m
9	SXSL10457	BM-102	SP-8	< 0.0441	1 m
10	SXSL10458	BO-107	SP-9	< 0.0898	1 m
11	SXSL10459	BO-105	SP-10	< 0.0663	1 m
12	SXSL10460	BO-103	SP-11	< 0.0766	1 m
13	SXSL10461	BO-101	SP-12	< 0.146	1 m
14	SXSL10462	BO-99	SP-13	0.20	1 m
15	SXSL10463	BO-99	SP-13 (QC)	< 0.119	1 m
16	SXSL10464	BQ-91	SP-17	< 0.14	1 m
17	SXSL10465	BM-91	SP-18	< 0.0775	1 m
	FSS-1734		Average⇒	0.11	May-05
			Sigma⇒	0.04	
			Minimum⇒	0.04	
			Maximum⇒	0.20	

NOTE: Sample points SP-14, SP-15 & SP-16 (not shown) deleted because of steep river bank location.

The OL10-3 area surrounds the Class 1 OL5 area that was the subject of extensive site clean-up efforts. The OL5 area was a dumpsite where used industrial supplies and other miscellaneous materials were discarded. The boundary of the dumpsite was eventually identified and as a result, the Class 2 OL10-3 survey unit was established to buffer the OL5 area. The OL10-3 area also borders the river where a steep drop-off of about fifteen (15) meters or more ends at the river below. Survey work was limited in this area because of safety concerns. As a result, several samples that were part of the random start systematic spacing triangular grid system were not collected (see note at the base of **Table 8**).

Sample results from the OL10-3 survey unit did not show significant levels of Cs-137. In fact most of the FSS sample results from this area were below the minimum detectable concentration for Cs-137. As a result, this survey unit meets the release criteria.

7.0 Data Assessment

7.1 Assessment Criteria

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) MDC values 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 was tracked from the point of collection until final results were provided.

9) 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.

7.2 Survey Variations (Design, Survey Request, LTP)

7.2.1 OL10-2 Mounded Area Sampling

The OL10-2 survey unit contains a mounded area that includes a significant portion of building debris and other miscellaneous discarded materials. The mounded area is at it's highest along the river and slopes downward toward the center of the site. The depth of this mound is at least three (3) meters in many locations and may be more in others. The sampling plan was to dig through and sample this mound until base native soil materials were encountered. This was done not only for FSS work, but also during scoping and characterization activities as well. However, in some locations the depth of the mounded materials was deeper than SNEC sampling equipment could reach. Nevertheless, additional samples seemed unwarranted since no significant finds of radiologically elevated materials were confirmed other than in one portion of OL6, which is located on the top of the mounded area near the river bank (see **Figure 2**).

7.2.2 Less Than 1 Meter Sample Depths

In OL10-1, several samples were taken at less than one (1) meter depths because of the presence of the Switch Yard grounding mat which limits sampling to less than sixteen (16) inches (more or less). See **Table 5**.

7.2.3 Deleted Sample Points

In OL10-3, sample points fourteen (14) through sixteen (16) were not taken because of the danger of falling off the riverbank. Scanning was also limited in this area for the same reason. In addition, one sample location reached refusal at about 0.5 meters. See **Table 8**.

7.2.4 Scan Areas Around Class 1 Areas

Scanned areas (grids) in the Class 2 OL10 survey units were chosen to contain and surround Class 1 areas whenever possible. Therefore, these areas were selected judgmentally.

7.3 Quality Control Measurements

Repeat scan measurements and samples were performed and met the applicable acceptance criteria established in Section 4.6 of SNEC Procedure E900-IMP-4520.04 (**Reference 9.11**). Quality Control (QC) measurements are reported in each of the applicable **Appendices** (**A-2** through **A-5**) and in the data tables of Section 6. All QC measurements are taken in accordance with the requirements of **Reference 9.1** and

applicable site procedures, which requires that at least 5% of all samples and scans be re-done. No discrepancies are reported and at least 5% or more of all samples and scan measurements were repeated with acceptable results.

7.4 Assessment Summary

Statistical testing of the data does not need to be performed for this final status survey since the data clearly show that the survey unit(s) meet the site release criteria. These survey units clearly meet the criterion because of the following:

1. ☒ All measurements in these survey units are less than or equal to the $DCGL_W$, or
2. ☐ A background reference area was used, and the difference between the maximum survey unit measurement and the lowest background reference area measurement are less than or equal to the DCGL.

8.0 Final Status Survey Conclusions

The FSS for the OL6 and OL10 open land areas was performed in accordance with the SNEC LTP and site implementing procedures. Final status survey data were collected to meet and/or exceed the quantity and quality specified for these areas as prescribed by the applicable survey design. The survey data for each survey unit met the following conditions:

1. The average residual radioactivity within the OL6 and OL10 areas is less than the assigned DCGLw.
2. Since all measurements were less than the DCGLw, no $DCGL_{EMC}$ criteria need be applied.
3. No additional remediation was needed in these areas after FSS activities were complete to reduce levels of residual radioactivity below concentrations necessary to meet site DCGLw values.

These conditions satisfy the release criteria established in the SNEC LTP and the radiological criteria for unrestricted use given in 10 CFR 20.1402. Therefore, it is concluded that the SNEC OL6/OL10 areas as described in this report are suitable for unrestricted release.

9.0 References

9.1 SNEC License Termination Plan

9.2 SNEC Calculation E900-05-027, "OL6 and OL10 Open Land Area – Survey Design".

9.3 Code of Federal Regulations, 10 CFR 20.1402.

9.4 Code of Federal Regulations, 10 CFR 50.82(a)(11).

9.5 SNEC Facility Site Area Grid Map - Drawing Number SNECRM-020.

9.6 SNEC Facility Historical Site Assessment Report, March 2000.

9.7 COMPASS computer program, Version 1.0.0, Oak Ridge Institute for Science and Education.

9.8 SNEC Procedure E900-IMP-4500.59, "Final Site Survey Planning and DQA"

9.9 NUREG-1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions".

9.10 Visual Sample Plan computer program, Version 3.0, Battelle Memorial Institute.

9.11 SNEC Procedure E900-IMP-4520.04, "Survey Methodology to Support SNEC License Termination"

9.12 SNEC Procedure E900-ADM-4500.60 "Final Status Survey Report".

9.13 NUREG 1575 "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM), revision 1 August 2000