FirstEnergy

SNEC CALCULATION COVER SHEET

CALCULATION DESCRIPTION

Calculation Number	Revision Number	Effective Date	Page Number
E900-03-031	0	6/7/04	1 of 7

Subject

Shonka Survey of Debris & Soil Piles

Question 1 - Is this calculation defined as "In QA Scope"? Refer to definition 3.5. Yes ☒ No ☐

Question 2 - Is this calculation defined as a "Design Calculation"? Refer to definitions 3.2 and 3.3. Yes ☒ No ☐

Question 3 - Does the calculation have the potential to affect an SSC as described in the USAR? Yes ☐ No ☒

NOTES: If a "Yes" answer is obtained for Question 1, the calculation must meet the requirements of the SNEC Facility Decommissioning Quality Assurance Plan. If a "Yes" answer is obtained for Question 2, the Calculation Originator's immediate supervisor should not review the calculation as the Technical Reviewer. If a "YES" answer is obtained for Question 3, SNEC Management approval is required to implement the calculation. Calculations that do not have the potential to affect SSC's may be implemented by the TR.

DESCRIPTION OF REVISION

APPROVAL SIGNATURES

Calculation Originator	P. Donnachie/	Date	6/3/04
Technical Reviewer	R. Holmes/	Date	6/3/04
Additional Review		Date	
Additional Review		Date	
SNEC Management Approval	Payne	Date	6/10/04

1.0 PURPOSE

1.1 The purpose of this calculation is to provide the survey design guidance to be followed for conducting final status surveys (FSS) for accumulated backfill materials. Backfill materials consist of approximately 11,200 tons of building debris from the Saxton Steam Generating Station (SSGS) Footprint, garage and warehouse and 5,000 tons of soil from the SNEC CV Yard. The building debris had been crushed to less than 4 inches in diameter. These materials will be processed, batched and monitored for use as fill for excavations that will remain following site decommissioning. **This material is classified as Class 1.**

1.2 Shonka Research Associates, Inc (SRA) has been contracted to build, operate, and summarize data from a radiation monitoring system called the Subsurface Multi-spectral Contamination Monitor (SMCM). This system was developed with funding from the NRC (NRC-04-92-096. "Continued Development of a High Sensitivity Landfill Monitor: The Results of a Phase II SBIR Grant", December 1994). The SMCM combines into one instrument the capabilities of both scanning surveys with in-situ gamma spectrometry. The SMCM is a scanning spectrometer.

1.3 The scanned debris and soil will be separated into approximately 250-ton piles called batches. Although there were a number of different types of materials present among the piles, each individual pile is a homogeneous mixture of the same type of material. Each batch will be summarized in a Survey Request (SR) Report.

1.4 Shonka Research Associates (SRA) will conduct scan surveys using procedures reviewed and approved by SNEC.

2.0 SUMMARY OF RESULTS

2.1 The following information will be used to conduct the applicable FSS for this survey design:

2.1.1 All Class 1 materials will be 100% scanned with the SMCM.

2.1.2 Scan speed will be set in accordance with SRA procedures.

2.1.3 Per Tables 1 and 2 the more conservative effective Cs-137 $DCGL_w$ for this design is determined to be **4.2 pCi/g**. This administrative $DCGL_w$ is 75% of the calculated value (5.6 pCi/g) from Table 2 for the median radionuclide mix in debris. Two sets of analytical data were reviewed to determine radionuclide mix percentages, i.e. CV soil and debris/sediment from the SSGS footprint. The mix fractions are as follows:

Soil – Cs-137 (62.5%), H-3 (35.7%), Co-60 (<1%), Sr-90 (<1%), Pu-238/239 (<1%) & Am-241 (< 1%)

Debris – Cs-137 (28.6%), Ni-63 (69.4%), Co-60 (<1%), Sr-90 (<1%), Pu-238/239 (<1%) & Am-241 (<1%)

The debris material data provided the more conservative mix percentages and therefore was used in this design to calculate the above $DCGL_w$.

2.1.4 The SMCM will be used IAW SRA procedures listed in Reference 3.6 section. 100% surface scan is required of the material within 13" of the surface. This survey will be

performed by Shonka Research Associates using a series of four 5" by 2" Sodium Iodide Detectors.

2.1.5 Following an alarm from the SMCM, a scan survey shall be performed using a Ludlum 2350 (or equivalent) meter with a 2' by 2" NaI detector on the suspect material. Any material indicating activity greater than or equal to 2000 NCPM will be removed and contained.

2.1.6 Material Sampling – Obtain approximately 500 cc of material from each truckload. A composite will be obtained for each batch of samples. A 1.5-liter sample will be obtained of this composited material.

3.0 REFERENCES

3.1 SNEC Facility License Termination Plan.

3.2 Procedure E900-IMP-4500.59, "Final Site Survey Planning and DQA".

3.3 SNEC procedure E900-IMP-4520.04, "Survey Methodology to Support SNEC License Termination".

3.4 SNEC procedure E900-IMP-4520.06, "Survey Unit Inspection in Support of FSS Design".

3.5 NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual", August 2000.

3.6 SRA Procedures.

3.6.1 SMCM Procedure 002, Rev 3, "Fixed In Situ Data Collection in Support of a SMCM Survey."

3.6.2 SMCM Procedure 004, Rev 1, "Source Response Checks and Performance Based Checks of any NaI Detector Configuration Installed on the SMCM."

3.6.3 SMCM Procedure 005, Rev 1, "Calibration and Confirmation of a SMCM Incremental Encoder."

3.6.4 SMCM Procedure 006, Rev 0, "Requirements for Completion of a Survey Using the SMCM."

3.6.5 SMCM Procedure 007, Rev 0, "Calibration of NaI Detector."

4.0 ASSUMPTIONS AND BASIC DATA

4.1 SRA procedures will be used to perform scan surveys.

4.2 Remediation History

The building debris has been crushed to less than 4 inches in diameter. This material consists of garage and warehouse demolition debris comprised mostly of brick and mortar. The debris from the Saxton Steam Generating Station (SSGS) footprint, which was excavated to allow survey of below grade structure(s) is comprised mostly of brick and concrete with minor amounts of tile and grout.

The soil that was surveyed as part of this design was taken from three site areas. First was the East Soil Pile, which consisted of consolidated soil and sample debris material. This pile was comprised of soil/concrete/rocks from various excavations throughout the decommissioning project including remnants of the Control and Auxiliary Building unearthed during the Decommissioning Support Facility (DSF) excavation, the interceptor trench and the CV yard excavation. Secondly, soil was excavated from areas around the CV and other impacted surface soils from the site. The third component of the soil consisted of sediment pumped from the SSGS intake and discharge tunnels.

4.3 Special measurements including gamma-ray spectroscopy are required in this survey design.

4.4 The survey design checklist is listed in **Attachment 1**.

5.0 CALCULATIONS

- The required DCGLw = 5.6 X 0.75 = 4.2 pCi/g.

6.0 APPENDICES

6.1 **Attachment 1**, Survey Design Checklist.

Table 1

SNEC Soil/Debris Pile Data

	SNEC Sample No	LAB No.	Location/Description	T1/2 (d)	T1/2 (d)	T1/2 (d)	T1/2 (d)	T1/2 (d)	T1/2 (d)	T1/2 (d)
				157861	1925	11000	36662	32051	8813648	10445
				Am-241	Co-60	Cs-137	Ni-63	Pu-238	Pu-239	Sr-90
1	SX00380033	Teledyne-Tel-18598	Discharge Tunnel 6" Drain Line Scaling	5.39E	18.65E	4418.18E	53.64E	1.55E	2.50E	7.33E
2	SX00377	BWXT, 0108078-01	SSGS 790 El., East - Debris From Pump Stand Small Pipe	0.110	3.273	3024.921	8.522	0.059	0.060	0.039
3	SXCF828	BWXT, 0111056-04	SSGS, East, Debris #1	0.289	1.592	632.928	7.633	0.045	0.145	0.048
4	SXS0723	BWXT, 0111056-02	SSGS-SE Sump, AU-133, SR-0003	0.014	0.414	151.780	7.100	0.003	0.004	0.019
5	SX00001521	Teledyne-82546; L19594-2	SSGS-4" Cross Over Line - Sump to Sump - 790' El.	0.057	0.391	112.143	8.281	0.145	0.057	0.140
6	SX00380031	10400	Discharge Tunnel Wall Scaling	0.199	0.524	110.508		0.039	0.040	
7	SX00000366	Teledyne-Tel-38253	SSGS Footprint East Turbine Sump Area AU-133 (Pumped)	0.199	0.258	91.845	19.625	0.196	0.200	0.066
8	SX00000727	Teledyne-82545; L19594-1	SSGS South East Sump Sediment AU-133	0.039	0.404	84.800	7.840	0.065	0.038	0.149
9	SX00AA0321	11454	Sediment Freeze - SSGS East Sump @ 27', AU-133, Well #1	0.098	2.053	79.619		0.029	0.040	
10	SX-SD00410	11574	SSGS Footprint, Well #7 Pumped Sediment	0.070	1.078	72.676		0.294	0.170	
11	SX00380034	10431	1st Seal Chamber Crud Pile Below 3" Vertical Drain Line	0.050	0.055	57.068		0.039	0.040	
12	SXSD38258	111155	SSGS DT Seal Chamber #3 Sediment	0.020		39.874		0.001	0.007	
13	SXS0744	BWXT, 0111056-03	SSGS Mezzanine, East, SR-0004	0.707	1.750	37.871	81.466	0.325	0.330	0.172
14	SXCW735	BWXT, 0111056-11	SSGS Tunnel, North Wall - 5-8' From Floor	0.044	0.054	21.563	7.772	0.046	0.044	0.029
15	SX00380022	Teledyne-Tel-18598	Discharge Tunnel Sediment - End of Tunnel	0.398	1.865	19.512	29.259	0.292	0.300	7.330
16	SXSD1182	BWXT, 0111056-05	SSGS Footprint, East, SR-0004, NW Sump	0.135	0.113	11.176	8.979	0.003	0.008	0.037
17	SX00000367	114218	SSGS Footprint West Turbine Sump Area AU-134 (Pumped)	0.129	0.140	6.292		0.007	0.012	0.019
18	SXSD261 & 262	111154	SSGS DT Floor Sediment Composite @ 100 & 328'	0.035	0.165	5.518		0.000	0.004	
19	SX00000368	114219	SSGS Footprint Collection Tank Area AW-132 (Pumped)	0.040	0.140	5.165		0.015	0.016	0.019
20	SXS0758	BWXT, 0111056-06	SSGS North Sump Penetration - 4" Pipe	0.053	0.220	4.208	7.582	0.010	0.004	0.048
21	SXSD38252	111152	SSGS DT 18" Pipe Internal @ 136'	0.040		3.524		0.002	0.020	
22	SX00000365D	114221	SSGS DT 18" Line	0.030	0.049	2.909		0.007	0.007	0.019
23	SX00000365	114220	SSGS DT 18" Line	0.070	0.049	2.815		0.010	0.007	0.018
24	SXSD38259	111157	SSGS Discharge Tunnel Floor Sediment @ 32'	0.021	0.305	2.578		0.004	0.012	
25	SXS0721	BWXT, 0111056-01	SSGS North Sump	0.004	0.054	2.433	7.158	0.004	0.003	0.010
26	SXSD1622	BWXT, 0201037-01 Revised	Intake Tunnel Sediment - South - Suction @ 60', CC Sample	0.147	0.052	2.125		0.038	0.041	0.029
27	SXSD2351	BWXT, 0201037-04 Revised	Intake Tunnel Sediment - South - Wall Composite 0 - 100'	0.004	0.035	2.125		0.009	0.011	0.019
28	SXSD1598	BWXT, 0201037-02 Revised	Intake Tunnel Sediment - North - North Wall Mid Section @ 55'	0.004	0.017	2.027		0.008	0.007	0.010
29	SXSD255 & 256	111153	SSGS DT 8" & 15" Pipe Internal Composite (160 & 163')	0.018	0.185	1.924		0.002	0.008	
30	SXSD38257	111155	SSGS DT Seal Chamber @ 40' Sediment	0.298	0.162	1.827		0.005	0.009	
31	SX00L00339	114214	SSGS Footprint AU-134, 0-3, Well #2	0.100	0.034	1.405		0.001	0.006	0.028
32	SXS0744	10354	SSGS Tunnel 18" Pipe, Sample From Robotic Entry	0.597	0.010	1.313		0.010	0.040	
33	SXCF971	BWXT, 0111056-09	SSGS Seal Chamber #2, SR-0013	0.032	0.008	1.009	7.500	0.015	0.015	0.192
34	SX00L00337	114217	SSGS Footprint AW-132 @ 27', Well #5	0.009	0.028	0.440		0.002	0.006	0.028
35	SX00L00331	114215	-- SSGS Footprint AT-139, 9-12', Well #4	0.020	0.034	0.309		0.001	0.005	0.017
36	SXCF1210	BWXT, 0111056-08	SSGS Footprint, Center Section, Core Bore #2, Debris #1	0.048	0.032	0.260	7.249	0.048	0.049	0.058
37	SX00L00334	114216	SSGS Footprint AT-139 @ 6'	0.020	0.034	0.253		0.007	0.005	0.019
38	SXSL2659	Teledyne-71940; L17838-8, L20331	SSGS Boiler Pad Debris Pile - 1/2 Way Up	0.051	0.017	0.244	3.267	0.037	0.038	0.029
39	SXSD2252	BWXT, 0201037-03 Revised	Intake Tunnel Sediment - East @ 220'	0.003	0.026	0.234		0.005	0.006	0.010
40	SX00000369	Teledyne-Tel-38254	SSGS Footprint In Intake Tunnel AT-139 (Pumped)	0.199	0.106	0.207	19.625	0.038	0.100	0.047
41	SXSL2670	Teledyne-71948; L17838-6	SSGS Boiler Pad Soil Pile - Top Center		0.020	0.177				0.029
42	SXS0823	BWXT, 0111056-07	SSGS Tunnel, Rubble @ 700', SR-0008	0.006	0.008	0.144	6.934	0.003	0.003	0.048
			Yellow cells indicate positive data. All other data MDC	Am-241	Co-60	Cs-137	Ni-63	Pu-238	Pu-239	Sr-90
			Mean=	2.40E-01	8.81E-01	2.15E+02	1.86E+01	8.52E-02	1.09E-01	5.19E-01
			Sigma=	8.35E-01	2.97E+00	8.15E+02	2.01E+01	2.49E-01	3.90E-01	1.82E+00
			2 Sigma + Mean=	1.91E+00	6.81E+00	1.84E+03	5.89E+01	5.84E-01	8.89E-01	4.16E+00
			Median=	5.28E-02	1.09E-01	3.22E+00	7.81E+00	9.78E-03	1.50E-02	2.93E-02
			Max=	5.37E+00	1.87E+01	4.42E+03	8.15E+01	1.56E+00	2.50E+00	7.33E+00
			Min=	2.99E-03	7.92E-03	1.44E-01	3.29E+00	4.87E-04	3.00E-03	9.52E-03

Table 2

Effective DCGL Calculator for Cs-137 (in pCi/g)

SNEC AL	75%	Total Activity Limit DCGLw		Administrative Limit	
		19.59	pCi/g	14.69	pCi/g

SAMPLE NUMBER(s)-> Median SSGS Area Sample Result Data

Cs-137 Limit		Cs-137 Administrative Limit	
5.61	pCi/g	4.21	pCi/g

57.40%	25.0	mremfy TEDE Limit
14.55%	4.0	mremfy Drinking Water (DW) Limit

☑ Check for 25 mremfy

	Isotope	Sample Input (pCi/g, uCi, etc.)	% of Total	25 mremfy TEDE Limits (pCi/g)	4 mremfy DW Limits (pCi/g)	A - Allowed pCi/g for 25 mremfy TEDE	B - Allowed pCi/g for 4 mremfy DW	Value Checked from Column A or B	This Sample mremfy TEDE	This Sample mremfy DW	
1	Am-241	0.053	0.470%	9.9	2.3	0.09	0.36	0.09	0.13	0.09	Am-241
2	C-14		0.000%	2.0	5.4	0.00	0.00	0.00	0.00	0.00	C-14
3	Co-60	0.109	0.969%	3.5	67.0	0.19	0.75	0.19	0.78	0.01	Co-60
4	Cs-137	3.22	28.633%	6.6	337	5.61	22.13	5.61	12.20	0.03	Cs-137
5	Eu-152		0.000%	10.1	1440	0.00	0.00	0.00	0.00	0.00	Eu-152
6	H-3		0.000%	132	31.1	0.00	0.00	0.00	0.00	0.00	H-3
7	Ni-63	7.81	69.448%	747	19000	13.61	53.67	13.61	0.26	0.00	Ni-63
8	Pu-238	0.010	0.087%	1.8	0.41	0.02	0.07	0.02	0.14	0.10	Pu-238
9	Pu-239	0.015	0.133%	1.6	0.37	0.03	0.10	0.03	0.23	0.16	Pu-239
10	Pu-241		0.000%	86	19.8	0.00	0.00	0.00	0.00	0.00	Pu-241
11	Sr-90	0.029	0.261%	1.2	0.61	0.05	0.20	0.05	0.61	0.19	Sr-90
		1.12E+01	100.000%			19.59	77.27	19.59	14.351	0.582	
						Maximum Permissible pCi/g (25 mremfy)	Maximum Permissible pCi/g (4 mremfy)		To Use This Information, Sample Input Units Must Be In pCi/g		

Exhibit 1

Survey Design Checklist

Calculation No. 6900-03-014	Location Code See attached design for location codes		
ITEM	REVIEW FOCUS	Status (Circle One)	Reviewer Initials & Date
1	Has a survey design calculation number been assigned and is a survey design summary description provided?	(Yes) N/A	6/10/04
2	Are drawings/diagrams adequate for the subject area (drawings should have compass headings)?	Yes, (N/A)	6/10/04
3	Are boundaries properly identified and is the survey area classification clearly indicated?	Yes, (N/A)	6/10/04
4	Has the survey area(s) been properly divided into survey units IAW EXHIBIT 10	Yes, (N/A)	6/10/04
5	Are physical characteristics of the area/location or system documented?	Yes, (N/A)	6/10/04
6	Is a remediation effectiveness discussion included?	Yes, (N/A)	6/10/04
7	Have characterization survey and/or sampling results been converted to units that are comparable to applicable DCGL values?	(Yes) N/A	6/10/04
8	Is survey and/or sampling data that was used for determining survey unit variance included?	Yes, (N/A)	6/10/04
9	Is a description of the background reference areas (or materials) and their survey and/or sampling results included along with a justification for their selection?	Yes, (N/A)	6/10/04
10	Are applicable survey and/or sampling data that was used to determine variability included?	Yes, (N/A)	6/10/04
11	Will the condition of the survey area have an impact on the survey design, and has the probable impact been considered in the design?	(Yes) N/A	6/10/04
12	Has any special area characteristic including any additional residual radioactivity (not previously noted during characterization) been identified along with its impact on survey design?	(Yes) N/A	6/10/04
13	Are all necessary supporting calculations and/or site procedures referenced or included?	(Yes) N/A	6/10/04
14	Has an effective DCGLw been identified for the survey unit(s)?	(Yes) N/A	6/10/04
15	Was the appropriate $DCGL_{EMC}$ included in the survey design calculation?	(Yes) N/A	6/10/04
16	Has the statistical tests that will be used to evaluate the data been identified?	Yes, (N/A)	6/10/04
17	Has an elevated measurement comparison been performed (Class 1 Area)?	Yes, (N/A)	6/10/04
18	Has the decision error levels been identified and are the necessary justifications provided?	Yes, N/A	6/10/04
19	Has scan instrumentation been identified along with the assigned scanning methodology?	(Yes) N/A	6/10/04
20	Has the scan rate been identified, and is the MDCscan adequate for the survey design?	(Yes) N/A	6/10/04
21	Are special measurements e.g., in-situ gamma-ray spectroscopy required under this design, and is the survey methodology, and evaluation methods described?	(Yes) N/A	6/10/04
22	Is survey instrumentation calibration data included and are detection sensitivities adequate?	(Yes) N/A	6/10/04
23	Have the assigned sample and/or measurement locations been clearly identified on a diagram or CAD drawing of the survey area(s) along with their coordinates?	Yes, (N/A)	6/10/04
24	Are investigation levels and administrative limits adequate, and are any associated actions clearly indicated?	(Yes), N/A	6/10/04
25	For sample analysis, have the required MDA values been determined.?	(Yes), N/A	6/10/04
26	Has any special sampling methodology been identified other than provided in Reference 6.3?	(Yes) N/A	6/10/04

NOTE: a copy of this completed form or equivalent, shall be included within the survey design calculation.

DCGL Calculation Logic-CV Yard Soil & Boulders (Decay Update)

I. **Survey Unit:** SNEC Containment Vessel (CV) Yard Soil and Boulders

II. **Description:** The purpose of this calculation is to determine a representative isotopic mix for the CV Yard Soil and associated Boulders from available sample analyses. The effective surface and volumetric $DCGL_w$s are then determined from the mean percent of applicable samples.

III. **Data Selection Logic Tables:** The radionuclide selection logic and subsequent DCGL calculations are provided in seven (7) tables. These tables were developed using Microsoft Excel. Table explanation is as follows.

Table 1: Reduced Listing – This table, which has been extracted from a larger database, provides a list of the most representative sample analyses. Results are from scoping, characterization, and pre/post remediation surveys. The samples consist of soil and soil-like media that was taken in support of the aforementioned surveys. As applicable, a sample number, sample location/description, radionuclide concentration, analysis date are provided for each sample. Positive nuclide concentrations are noted with yellow/shaded background fields while MDA values are noted in the gray shaded fields. Values in red typeface are on-site analysis results.

Table 2: Reduced Listing - Decayed - This table decays the data from Table 1. Half-life values (days) are listed above each respective nuclide column. Samples are decayed from the respective analysis date to December 15, 2004. Positive results are denoted in a yellow background field while MDA values are noted in the gray shaded fields. Values in red typeface are on-site analysis results.

Table 3: Reduced Listing Decayed - MDAs Removed – This table provides the best overall representation of the data. Non-positive nuclide columns have been removed as well as all the MDA values. Therefore, 11 nuclides have been reduced to four (4).

Table 4: Mean Percent of Total for Positive Nuclides – This table provides the calculation methodology for determining the relative fractions of the total activity contributed by each radionuclide. From this information the mean, sigma, and mean % of total are calculated. From this information the mean, sigma, and mean % of total are calculated. The mean % of total values is used to calculate the surface gross activity $DCGL_w$ per MARSSIM equation 4-4. See Table 6. Note that the mean percent values were averaged using only the positive sample results in each column. In some cases only a single nuclide value (e.g. Sr-90) had a positive result. This value is listed as the value in the mean result field, and results in higher "mean percent of total" values for single positive radionuclides in the mix, which is a conservative.

Table 5: Ratio to Cs-137 for Positive Nuclides – This table provides the calculation methodology for determining the surrogate ratio to Cs-137 for each radionuclide. From this information the mean, sigma, and mean % of total are calculated. The mean % of total values is used to calculate the volumetric $DCGL_w$ per MARSSIM equation I-14. See Table 7. Note that the mean percent values were averaged using only the positive sample results in each column. In some cases only a single nuclide value (e.g. Sr-90) had a positive result. This value is listed as the value in the mean result field. This results in higher "mean percent of total" values in the mix, which are conservative.

Note: From Tables 4 and 5, only the "mean % of total" values are used as input to the "Effective DCGL Calculation Spreadsheet" as illustrated in Tables 6 and 7.

Table 6: Effective DCGL Calculator for Cs-137 (in dpm/100 cm^2) – This table provides the surface gross activity $DCGL_w$ calculation results from data derived from Table 4.

Table 7: Effective DCGL Calculator for Cs-137 (in pCi/g) – This table provides the surrogate volumetric modified Cs-137 $DCGL_w$ calculation results from data derived from Table 5.

IV. **Summary** – Since the CV Yard and Boulders are volumes of soil or rock material, existing in place or in a pile, the release limit is primarily based on the volumetric $DCGL_w$. Using the above data selection logic tables the calculated Cs-137 volumetric $DCGL_w$ is 5.75 pCi/g (previous value was 5.73 pCi/g due to earlier decay date of January 15, 2004). The updated value will be reduced by 25% as part of SNEC's requirement to apply an administrative limit as discussed in the License Termination Plan (LTP).

Using the above data selection logic tables the calculated gross activity $DCGL_w$ for surface area is 44,306-dpm/100 cm^2 (previous value of 44,434-dpm/100 cm^2 due to earlier decay date of January 15, 2004). The updated value will be reduced by 25% as part of SNEC's requirement to apply an administrative limit as discussed in the License Termination Plan (LTP).

TABLE 1 - REDUCED LISTING

	SNEC Sample No	LAB No.	Location/Description	H-3	Sr-90	Co-60	Cs-137	Am-241	Pu-238	Pu-239	Pu-241	C-14	Ni-63	Eu-152	Decay Date Analysis Date
1	CV Tunnel	BWXT, 0102059-01	CV Tunnel Sediment Composite, OL1	9.4	9.67	1.26	1250	0.18	0.55	0.22	44.69	9.34	4.02	0.13	February 14, 2001
2	SX9SL99219	111074	Subsuface Sample #29 (0-5'), AY-128, OL1			0.07	0.59								November 17, 1999
3	SXSL1063	Teledyne-80018; L19184-1	North CV Yard Soil BA-127, 812' El, Sample # 5, OL2	4.58	0.0531	0.0192	0.886	0.0961	0.0468	0.0327	3.77	0.21	10.9	0.0525	June 27, 2002
4	SXSL1089	Teledyne-80019; L19184-2	North CV Yard Soil AY-127, 810' El, Sample # 3, OL1	3.03	0.0695	0.0332	1.29	0.0993	0.128	0.05	4.97	0.21	7.54	0.0828	June 28, 2002
5	SXSL1115	Teledyne-80020; L19184-3	North CV Yard Soil AY-128, 804' El, Sample # 2, OL1	4.88	0.0536	0.0243	1.8	0.24	0.138	0.0407	4.21	0.21	7.6	0.0571	June 29, 2002
6	SXSL1122	Teledyne-80021; L19184-4	North CV Yard Soil AY-129, 798' El, Sample # 2, OL1	3.44	0.0529	0.0279	4.77	0.183	0.0894	0.04	3.68	0.206	8.75	0.0862	June 29, 2002
7	SXSL1130	Teledyne-80022; L19184-5	North CV Yard Soil AX-129, 803' El, Sample # 4, OL1	4.99	0.0648	0.0298	22.6	0.149	0.0856	0.0121	3.55	0.231	13.4	0.0989	July 3, 2002
8	SXSL1132	Teledyne-80023; L19184-6	North CV Yard Soil AZ-130, Sample # 5, OL1	2.98	0.0715	0.035	2.59	0.164	0.0746	0.0646	5.27	0.215	12.6	0.0734	July 3, 2002
9	SXSL1270	BWXT, 0108055-02	AX-129, 3-3, Soil, CV SE Side 5' From CV, 800' El., OL1	11.31	0.02	0.01	23.1	0.037	0.007	0.007	2.104	3.93	8.68	0.07	July 26, 2001
10	SXSL1281	BWXT, 0108055-01	AX-128, 3-1, Soil, CV Tunnel East 5' From CV, 800' El, OL1	11.52	0.03	0.01	4.38	0.031	0.016	0.007	1.908	4	7.78	0.04	July 26, 2001
11	SXSL2649	Teledyne-73220; L18077-2	Anulus Well, A-2, 5 to 10' Depth, OL1	2	0.0314	0.1	0.6	0.00978	0.0133	0.011	1.87	0.183	1.75		February 13, 2002
13	SXSL2871	Teledyne-71949; L17838-11	CV Area - East Yard Dirt Pile - Middle, 1/2 Way Up, OL1		0.03	0.07	0.56								March 6, 2002
14	SXSL2872	Teledyne-71948; L17838-10	CV Area - East Yard Dirt Pile - Bottom (also top center), OL1		0.03	0.06	0.1								March 6, 2002
15	SXSL3140	BWXT,1030-003-10-01	East CV Yard, Soil Pile @ 6' on West Side (6" Depth), OL1	1.892	0.012	0.014	0.825	0.007	0.005	0.005	0.369	0.086	3.406	0.03	August 30, 2002
16	SXSL3142	Teledyne; L20326-3	Soil Pile, CV Yard, Three Feet on East Side, SR-37, OL1		0.0295	0.07	0.6								August 13, 2002
17	SXSL3145	BWXT,1030-003-10-01	East CV Yard, Soil Pile @ 3' on East Side (6" Depth), OL1	1.897	0.017	0.013	1.26	0.004	0.005	0.005	0.376	0.083	3.69	0.038	August 30, 2002
18	SXSL3149	Teledyne; L20326-4	Soil Pile, CV Yard, Six Feet on East Side, SR-37, OL1		0.0297	0.08	0.3								August 13, 2002
19	SXSL3153	BWXT,1030-003-10-01	East CV Yard, Soil Pile @ Top (6" Depth), OL1	1.937	0.043	0.023	0.3	0.003	0.005	0.005	0.343	0.087	4.177	0.051	August 30, 2002
21	SXSL4142	Teledyne; L22187-2	CV Yard Soil - West Side, AP1-7, OL1	2.22	0.0325	0.05	0.9	0.0176	0.0671	0.0202					October 2, 2003
22	SXSL4143	Teledyne; L22187-3	CV Yard Soil - West Side, AP1-7, OL1	2.23	0.0316	0.05	0.5	0.0221	0.0631	0.0364					October 2, 2003
23	SXSL4149	Teledyne; L22187-4	CV Yard Soil - West Side, AP1-7, OL1	2.24	0.0277	0.07	3.9	0.0277	0.043	0.0304					October 2, 2003

TABLE 2 - REDUCED LISTING - DECAYED

				T 1/2	T 1/2	T 1/2	T 1/2	T 1/2	T 1/2	T 1/2	T 1/2	T 1/2	T 1/2	T 1/2	Decay Date	
				4485.27	10446.15	1925.233	11019.59	157861.1	32050.69	8813848	5259.6	2092883	36561.53	4967.4	December 15, 2004	
	SNEC Sample No	LAB No.	Location/Description	H-3	Sr-90	Co-60	Cs-137	Am-241	Pu-238	Pu-239	Pu-241	C-14	Ni-63	Eu-152	Analysis Date	ET (d)
1	CV Tunnel	BWXT, 0102059-01	CV Tunnel Sediment Composite, OL1	7.57E+00	8.81E+00	7.61E-01	1.14E+03	1.79E-01	5.34E-01	2.20E-01	3.72E+01	9.34E+00	3.91E+00	1.07E-01	February 14, 2001	1400
2	SX9SL99219	111074	Subsuface Sample #29 (0-5'), AY-128, OL1			3.59E-02	5.25E-01								November 17, 1999	1855
3	SXSL1063	Teledyne-80018; L19184-1	North CV Yard Soil BA-127, 812' El, Sample # 5, OL2	3.98E+00	5.00E-02	1.39E-02	8.37E-01	9.57E-02	4.59E-02	3.27E-02	3.35E+00	2.10E-01	1.07E+01	4.63E-02	June 27, 2002	902
4	SXSL1089	Teledyne-80019; L19184-2	North CV Yard Soil AY-127, 810' El, Sample # 3, OL1	2.64E+00	6.55E-02	2.40E-02	1.22E+00	9.89E-02	1.26E-01	5.00E-02	4.41E+00	2.10E-01	7.41E+00	7.30E-02	June 28, 2002	901
5	SXSL1115	Teledyne-80020; L19184-3	North CV Yard Soil AY-128, 804' El, Sample # 2, OL1	4.25E+00	5.05E-02	1.76E-02	1.70E+00	2.39E-01	1.35E-01	4.07E-02	3.74E+00	2.10E-01	7.47E+00	5.04E-02	June 29, 2002	900
6	SXSL1122	Teledyne-80021; L19184-4	North CV Yard Soil AY-129, 798' El, Sample # 2, OL1	2.99E+00	4.98E-02	2.02E-02	4.51E+00	1.82E-01	8.77E-02	4.00E-02	3.27E+00	2.06E-01	8.60E+00	7.60E-02	June 29, 2002	900
7	SXSL1130	Teledyne-80022; L19184-5	North CV Yard Soil AX-129, 803' El, Sample # 4, OL1	4.34E+00	6.11E-02	2.16E-02	2.14E+01	1.48E-01	8.40E-02	1.21E-02	3.15E+00	2.31E-01	1.32E+01	8.73E-02	July 3, 2002	896
8	SXSL1132	Teledyne-80023; L19184-6	North CV Yard Soil AZ-130, Sample # 5, OL1	2.59E+00	6.74E-02	2.54E-02	2.45E+00	1.63E-01	7.32E-02	6.46E-02	4.68E+00	2.15E-01	1.24E+01	6.48E-02	July 3, 2002	896
9	SXSL1270	BWXT, 0108055-02	AX-129, 3-3, Soil, CV SE Side 5' From CV, 800' El., OL1	9.34E+00	1.84E-02	6.40E-03	2.14E+01	3.68E-02	6.82E-03	7.00E-03	1.79E+00	3.93E+00	8.48E+00	5.89E-02	July 26, 2001	1238
10	SXSL1281	BWXT, 0108055-01	AX-128, 3-1, Soil, CV Tunnel East 5' From CV, 800' El, OL1	9.51E+00	2.76E-02	6.40E-03	4.05E+00	3.08E-02	1.56E-02	7.00E-03	1.62E+00	4.00E+00	7.60E+00	3.37E-02	July 26, 2001	1238
11	SXSL2649	Teledyne-73220; L18077-2	Anulus Well, A-2, 5 to 10' Depth, OL1	1.70E+00	2.93E-02	6.89E-02	5.62E-01	9.74E-03	1.30E-02	1.10E-02	1.63E+00	1.83E-01	1.72E+00	0.00E+00	February 13, 2002	1036
13	SXSL2871	Teledyne-71949; L17838-11	CV Area - East Yard Dirt Pile - Middle, 1/2 Way Up, OL1		2.80E-02	4.86E-02	5.25E-01								March 6, 2002	1015
14	SXSL2872	Teledyne-71948; L17838-10	CV Area - East Yard Dirt Pile - Bottom (also top center), OL1		2.80E-02	4.16E-02	9.38E-02								March 6, 2002	1015
15	SXSL3140	BWXT,1030-003-10-01	East CV Yard, Soil Pile @ 6' on West Side (6" Depth), OL1	1.66E+00	1.14E-02	1.04E-02	7.83E-01	6.97E-03	4.91E-03	5.00E-03	3.30E-01	8.60E-02	3.35E+00	2.67E-02	August 30, 2002	838
16	SXSL3142	Teledyne; L20326-3	Soil Pile, CV Yard, Three Feet on East Side, SR-37, OL1		2.79E-02	5.15E-02	5.69E-01								August 13, 2002	855
17	SXSL3145	BWXT,1030-003-10-01	East CV Yard, Soil Pile @ 3' on East Side (6" Depth), OL1	1.67E+00	1.61E-02	9.61E-03	1.20E+00	3.99E-03	4.91E-03	5.00E-03	3.37E-01	8.30E-02	3.63E+00	3.38E-02	August 30, 2002	838
18	SXSL3149	Teledyne; L20326-4	Soil Pile, CV Yard, Six Feet on East Side, SR-37, OL1		2.81E-02	5.88E-02	2.84E-01								August 13, 2002	855
19	SXSL3153	BWXT,1030-003-10-01	East CV Yard, Soil Pile @ Top (6" Depth), OL1	1.70E+00	4.07E-02	1.70E-02	2.85E-01	2.99E-03	4.91E-03	5.00E-03	3.07E-01	8.70E-02	4.11E+00	4.54E-02	August 30, 2002	838
21	SXSL4142	Teledyne; L22187-2	CV Yard Soil - West Side, AP1-7, OL1	2.07E+00	3.16E-02	4.27E-02	8.75E-01	1.76E-02	6.65E-02	2.02E-02					October 2, 2003	440
22	SXSL4143	Teledyne; L22187-3	CV Yard Soil - West Side, AP1-7, OL1	2.08E+00	3.07E-02	4.27E-02	4.86E-01	2.21E-02	6.25E-02	3.64E-02					October 2, 2003	440
23	SXSL4149	Teledyne; L22187-4	CV Yard Soil - West Side, AP1-7, OL1	2.09E+00	2.69E-02	5.97E-02	3.79E+00	2.76E-02	4.26E-02	3.04E-02					October 2, 2003	440

KEY

	Yellow Background = Positive Result
	Gray Shaded Background = MDA
XXXX	Red Values = On-Site Analysis

C01

TABLE 3 - REDUCED LISTING DECAYED - MDA's REMOVED

	SNEC Sample No	LAB No.	Location/Description	H-3	Sr-90	Co-60	Cs-137	Total pCi/g
1	CV Tunnel	BWXT, 0102059-01	CV Tunnel Sediment Composite, OL1		8.81E+00	7.61E-01	1.14E+03	1154.23
2	SX9SL99219	111074	Subsuface Sample #29 (0-5'), AY-128, OL1				5.25E-01	0.53
3	SXSL1063	Teledyne-80018; L19184-1	North CV Yard Soil BA-127, 812' El, Sample # 5, OL2	3.98E+00			8.37E-01	4.82
4	SXSL1089	Teledyne-80019; L19184-2	North CV Yard Soil AY-127, 810' El, Sample # 3, OL1	2.64E+00			1.22E+00	3.86
5	SXSL1115	Teledyne-80020; L19184-3	North CV Yard Soil AY-128, 804' El, Sample # 2, OL1	4.25E+00			1.70E+00	5.95
6	SXSL1122	Teledyne-80021; L19184-4	North CV Yard Soil AY-129, 798' El, Sample # 2, OL1	2.99E+00			4.51E+00	7.50
7	SXSL1130	Teledyne-80022; L19184-5	North CV Yard Soil AX-129, 803' El, Sample # 4, OL1	4.34E+00		2.16E-02	2.14E+01	25.73
8	SXSL1132	Teledyne-80023; L19184-6	North CV Yard Soil AZ-130, Sample # 5, OL1	2.59E+00			2.45E+00	5.04
9	SXSL1270	BWXT, 0108055-02	AX-129, 3-3, Soil, CV SE Side 5' From CV, 800' El., OL1				2.14E+01	21.37
10	SXSL1281	BWXT, 0108055-01	AX-128, 3-1, Soil, CV Tunnel East 5' From CV, 800' El, OL1				4.05E+00	4.05
11	SXSL2649	Teledyne-73220; L18077-2	Anulus Well, A-2, 5 to 10' Depth, OL1				5.62E-01	0.56
13	SXSL2871	Teledyne-71949; L17838-11	CV Area - East Yard Dirt Pile - Middle, 1/2 Way Up, OL1				5.25E-01	0.53
14	SXSL2872	Teledyne-71948; L17838-10	CV Area - East Yard Dirt Pile - Bottom (also top center), OL1				9.38E-02	0.09
15	SXSL3140	BWXT,1030-003-10-01	East CV Yard, Soil Pile @ 6' on West Side (6" Depth), OL1				7.83E-01	0.78
16	SXSL3142	Teledyne; L20326-3	Soil Pile, CV Yard, Three Feet on East Side, SR-37, OL1				5.69E-01	0.57
17	SXSL3145	BWXT,1030-003-10-01	East CV Yard, Soil Pile @ 3' on East Side (6" Depth), OL1				1.20E+00	1.20
18	SXSL3149	Teledyne; L20326-4	Soil Pile, CV Yard, Six Feet on East Side, SR-37, OL1				2.84E-01	0.28
19	SXSL3153	BWXT,1030-003-10-01	East CV Yard, Soil Pile @ Top (6" Depth), OL1				2.85E-01	0.28
21	SXSL4142	Teledyne; L22187-2	CV Yard Soil - West Side, AP1-7, OL1				8.75E-01	0.88
22	SXSL4143	Teledyne; L22187-3	CV Yard Soil - West Side, AP1-7, OL1				4.86E-01	0.49
23	SXSL4149	Teledyne; L22187-4	CV Yard Soil - West Side, AP1-7, OL1			5.97E-02	3.79E+00	3.85

TABLE 4 - MEAN PERCENT OF TOTAL FOR POSITIVE NUCLIDES

	SNEC Sample No	LAB No.	Location/Description	H-3	Sr-90	Co-60	Cs-137	Total
1	CV Tunnel	BWXT, 0102059-01	CV Tunnel Sediment Composite, OL1		0.76%	0.07%	99.17%	100.0%
2	SX9SL99219	111074	Subsuface Sample #29 (0-5'), AY-128, OL1				100.00%	100.0%
3	SXSL1063	Teledyne-80018; L19184-1	North CV Yard Soil BA-127, 812' El, Sample # 5, OL2	82.64%			17.36%	100.0%
4	SXSL1089	Teledyne-80019; L19184-2	North CV Yard Soil AY-127, 810' El, Sample # 3, OL1	68.38%			31.62%	100.0%
5	SXSL1115	Teledyne-80020; L19184-3	North CV Yard Soil AY-128, 804' El, Sample # 2, OL1	71.40%			28.60%	100.0%
6	SXSL1122	Teledyne-80021; L19184-4	North CV Yard Soil AY-129, 798' El, Sample # 2, OL1	39.91%			60.09%	100.0%
7	SXSL1130	Teledyne-80022; L19184-5	North CV Yard Soil AX-129, 803' El, Sample # 4, OL1	16.89%		0.08%	83.03%	100.0%
8	SXSL1132	Teledyne-80023; L19184-6	North CV Yard Soil AZ-130, Sample # 5, OL1	51.45%			48.55%	100.0%
9	SXSL1270	BWXT, 0108055-02	AX-129, 3-3, Soil, CV SE Side 5' From CV, 800' El., OL1				100.00%	100.0%
10	SXSL1281	BWXT, 0108055-01	AX-128, 3-1, Soil, CV Tunnel East 5' From CV, 800' El, OL1				100.00%	100.0%
11	SXSL2649	Teledyne-73220; L18077-2	Anulus Well, A-2, 5 to 10' Depth, OL1				100.00%	100.0%
13	SXSL2871	Teledyne-71949; L17838-11	CV Area - East Yard Dirt Pile - Middle, 1/2 Way Up, OL1				100.00%	100.0%
14	SXSL2872	Teledyne-71948; L17838-10	CV Area - East Yard Dirt Pile - Bottom (also top center), OL1				100.00%	100.0%
15	SXSL3140	BWXT,1030-003-10-01	East CV Yard, Soil Pile @ 6' on West Side (6" Depth), OL1				100.00%	100.0%
16	SXSL3142	Teledyne; L20326-3	Soil Pile, CV Yard, Three Feet on East Side, SR-37, OL1				100.00%	100.0%
17	SXSL3145	BWXT,1030-003-10-01	East CV Yard, Soil Pile @ 3' on East Side (6" Depth), OL1				100.00%	100.0%
18	SXSL3149	Teledyne; L20326-4	Soil Pile, CV Yard, Six Feet on East Side, SR-37, OL1				100.00%	100.0%
19	SXSL3153	BWXT,1030-003-10-01	East CV Yard, Soil Pile @ Top (6" Depth), OL1				100.00%	100.0%
21	SXSL4142	Teledyne; L22187-2	CV Yard Soil - West Side, AP1-7, OL1				100.00%	100.0%
22	SXSL4143	Teledyne; L22187-3	CV Yard Soil - West Side, AP1-7, OL1				100.00%	100.0%
23	SXSL4149	Teledyne; L22187-4	CV Yard Soil - West Side, AP1-7, OL1			1.55%	98.45%	100.0%
			Mean⇒	0.551113	0.007635	0.005668	0.841366	1.41
			Sigma⇒	0.241		0.009	0.282	
			Mean % of Total⇒	39.20%	0.54%	0.40%	59.85%	100.00%
			2 Sigma + Mean⇒	1.03E+00	7.63E-03	2.27E-02	1.40E+00	2.47
			% of Total⇒	41.86%	0.31%	0.92%	56.91%	100.00%

C02

TABLE 5 - RATIO TO Cs-137 FOR POSITIVE NUCLIDES

	SNEC Sample No	LAB No.	Location/Description	H-3	Sr-90	Co-60	Cs-137	Total
1	CV Tunnel	**BWXT, 0102059-01**	CV Tunnel Sediment Composite, OL1		7.70E-03	6.65E-04	1.00E+00	1.01
2	SX9SL99219	111074	Subsuface Sample #29 (0-5'), AY-128, OL1				1.00E+00	1.00
3	SXSL1063	**Teledyne-80018; L19184-1**	North CV Yard Soil BA-127, 812' El, Sample # 5, OL2	4.76E+00			1.00E+00	5.76
4	SXSL1089	**Teledyne-80019; L19184-2**	North CV Yard Soil AY-127, 810' El, Sample # 3, OL1	2.16E+00			1.00E+00	3.16
5	SXSL1115	**Teledyne-80020; L19184-3**	North CV Yard Soil AY-128, 804' El, Sample # 2, OL1	2.50E+00			1.00E+00	3.50
6	SXSL1122	**Teledyne-80021; L19184-4**	North CV Yard Soil AY-129, 798' El, Sample # 2, OL1	6.64E-01			1.00E+00	1.66
7	SXSL1130	**Teledyne-80022; L19184-5**	North CV Yard Soil AX-129, 803' El, Sample # 4, OL1	2.03E-01		1.01E-03	1.00E+00	1.20
8	SXSL1132	**Teledyne-80023; L19184-6**	North CV Yard Soil AZ-130, Sample # 5, OL1	1.06E+00			1.00E+00	2.06
9	SXSL1270	**BWXT, 0108055-02**	AX-129, 3-3, Soil, CV SE Side 5' From CV, 800' El., OL1				1.00E+00	1.00
10	SXSL1281	**BWXT, 0108055-01**	AX-128, 3-1, Soil, CV Tunnel East 5' From CV, 800' El, OL1				1.00E+00	1.00
11	SXSL2649	**Teledyne-73220; L18077-2**	Anulus Well, A-2, 5 to 10' Depth, OL1				**1.00E+00**	1.00
13	SXSL2871	**Teledyne-71949; L17838-11**	CV Area - East Yard Dirt Pile - Middle, 1/2 Way Up, OL1				**1.00E+00**	1.00
14	SXSL2872	**Teledyne-71948; L17838-10**	CV Area - East Yard Dirt Pile - Bottom (also top center), OL1				**1.00E+00**	1.00
15	SXSL3140	**BWXT,1030-003-10-01**	East CV Yard, Soil Pile @ 6' on West Side (6" Depth), OL1				1.00E+00	1.00
16	SXSL3142	**Teledyne; L20326-3**	Soil Pile, CV Yard, Three Feet on East Side, SR-37, OL1				**1.00E+00**	1.00
17	SXSL3145	**BWXT,1030-003-10-01**	East CV Yard, Soil Pile @ 3' on East Side (6" Depth), OL1				1.00E+00	1.00
18	SXSL3149	**Teledyne; L20326-4**	Soil Pile, CV Yard, Six Feet on East Side, SR-37, OL1				**1.00E+00**	1.00
19	SXSL3153	**BWXT,1030-003-10-01**	East CV Yard, Soil Pile @ Top (6" Depth), OL1				1.00E+00	1.00
21	SXSL4142	**Teledyne; L22187-2**	CV Yard Soil - West Side, AP1-7, OL1				**1.00E+00**	1.00
22	SXSL4143	**Teledyne; L22187-3**	CV Yard Soil - West Side, AP1-7, OL1				**1.00E+00**	1.00
23	SXSL4149	**Teledyne; L22187-4**	CV Yard Soil - West Side, AP1-7, OL1			**1.57E-02**	**1.00E+00**	1.02
			Mean⇒	1.890991	0.007699	0.005808	1	2.90
			Sigma⇒	1.656		0.009	0.000	
			Mean % of Total⇒	65.11%	0.27%	0.20%	34.43%	100.00%
			2 Sigma + Mean⇒	5.20E+00	7.70E-03	2.30E-02	1.00E+00	6.23
			% of Total⇒	83.47%	0.12%	0.37%	16.04%	100.00%

C03

Table 6

Effective DCGL Calculator for Cs-137 (dpm/100 cm^2)

Gross Activity DCGLw		Gross Activity Administrative Limit	
44306	dpm/100 cm^2	33229	dpm/100 cm^2

25.0 mrem/y TEDE Limit

SAMPLE NO(s)⇒ CV Yard Soil & Boulder Samples - Deacy 12-15-04

Cs-137 Limit		Cs-137 Administrative Limit	
26517	dpm/100 cm^2	19888	dpm/100 cm^2

SNEC AL	75%

	Isotope	Sample Input (pCi/g, uCi, etc.)	% of Total	Individual Limits (dpm/100 cm^2)	Allowed dpm/100 cm^2	mrem/y TEDE	Beta dpm/100 cm^2	Alpha dpm/100 cm^2	
1	Am-241		0.000%	27	0.00	0.00	N/A	0.00	Am-241
2	C-14		0.000%	3,700,000	0.00	0.00	0.00	N/A	C-14
3	Co-60	5.67E-03	0.403%	7,100	178.64	0.63	178.64	N/A	Co-60
4	Cs-137	8.41E-01	59.850%	28,000	26517.03	23.68	26517.0	N/A	Cs-137
5	Eu-152		0.000%	13,000	0.00	0.00	0.00	N/A	Eu-152
6	H-3	5.51E-01	39.203%	120,000,000	17369.23	0.00	Not Detectable	N/A	H-3
7	Ni-63		0.000%	1,800,000	0.00	0.00	Not Detectable	N/A	Ni-63
8	Pu-238		0.000%	30	0.00	0.00	N/A	0.00	Pu-238
9	Pu-239		0.000%	28	0.00	0.00	N/A	0.00	Pu-239
10	Pu-241		0.000%	880	0.00	0.00	Not Detectable	N/A	Pu-241
11	Sr-90	7.64E-03	0.543%	8,700	240.63	0.69	240.63	N/A	Sr-90
			100.000%		44306	25.0	26936	0	
					Maximum Permissible dpm/100 cm^2				

C04

Table 7

Effective DCGL Calculator for Cs-137 (in pCi/g)

SNEC AL	75%	Total Activity Limit DCGLw		Administrative Limit	
		16.70	pCi/g	12.53	pCi/g

SAMPLE NUMBER(s)⇒ CV YARD SOIL & BOULDER SAMPLES - Decayed to 12-15-04

Cs-137 Limit		Cs-137 Administrative Limit	
5.75	pCi/g	4.31	pCi/g

17.39%	25.0	mrem/y TEDE Limit
7.60%	4.0	mrem/y Drinking Water (DW) Limit

☑ Check for 25 mrem/y

	Isotope	Sample Input (pCi/g, uCi, etc.)	% of Total	25 mrem/y TEDE Limits (pCi/g)	4 mrem/y DW Limits (pCi/g)	A - Allowed pCi/g for 25 mrem/y TEDE	B - Allowed pCi/g for 4 mrem/y DW	Value Checked from Column A or B	This Sample mrem/y TEDE	This Sample mrem/y DW	
1	Am-241		0.000%	9.9	2.3	0.00	0.00	0.00	0.00	0.00	Am-241
2	C-14		0.000%	2.0	5.4	0.00	0.00	0.00	0.00	0.00	C-14
3	Co-60	0.006	0.200%	3.5	67.0	0.03	0.08	0.03	0.04	0.00	Co-60
4	Cs-137	1.00	34.429%	6.6	397	5.75	13.15	5.75	3.79	0.01	Cs-137
5	Eu-152		0.000%	10.1	1440	0.00	0.00	0.00	0.00	0.00	Eu-152
6	H-3	1.89	65.106%	132	31.1	10.87	24.87	10.87	0.36	0.24	H-3
7	Ni-63		0.000%	747	19000	0.00	0.00	0.00	0.00	0.00	Ni-63
8	Pu-238		0.000%	1.8	0.41	0.00	0.00	0.00	0.00	0.00	Pu-238
9	Pu-239		0.000%	1.6	0.37	0.00	0.00	0.00	0.00	0.00	Pu-239
10	Pu-241		0.000%	86	19.8	0.00	0.00	0.00	0.00	0.00	Pu-241
11	Sr-90	0.008	0.265%	1.2	0.61	0.04	0.10	0.04	0.16	0.05	Sr-90
		2.90E+00	100.000%			16.70	38.20	16.70	4.348	0.304	
						Maximum Permissible pCi/g (25 mrem/y)	Maximum Permissible pCi/g (4 mrem/y)		To Use This Information, Sample Input Units Must Be In pCi/g		

C05

SURVEY REQUEST CONTINUATION SHEET			
SR NUMBER	SR-0186	AREA/LOCATION	SNEC Site
SPECIFIC SAMPLING / SURVEY INSTRUCTIONS OR COMMENTS			

RESULTS SUMMARY FOR SR-0186

SR-0186 was issued to survey and sample material removed from several locations across the SNEC Facility site. The material will be scanned with NaI detectors by Shonka Research Associates, Inc. sampled by SNEC Rad Con personnel, and transferred to the adjacent PRI area.

The SR required the following radiological measurements:

- Surface Scan Measurements Using Sodium Iodide Detectors (5" X 2") (set to identify Cs-137) – 100% scan of Material at a rate not exceeding 4 inches/sec at a distance within 13 inches. The action level is 2.91 pCi/g, Cs-137.

- Surface Scan Measurements Using a Sodium Iodide Detector – 100% scan of suspect material is required. Scan rate shall not exceed 0.5 meters/sec at a distance not exceeding 2 inches. The action level is 300 gross cpm.

- Soil Samples – obtain approximately 500 cc of material from each 30 minutes of run time. A minimum of two samples is required of each batch.

- QC Repeat Measurements – A minimum of 5% of all surface scan/static measurements and sampling will be re-performed using identical methodology.

- Additional sampling/surveys may be performed at the request of the SR Coordinator.

1. Summary of Results

A. Surface Scan Measurements Using a 5" x 2" Sodium Iodide Detectors (set to identify Cs-137)

100% scan is required.

Results: Scan results indicate activity below the action level with one exception. A point source alarm was declared. The material was removed from the conveyor belt and the associated monitoring data was expunged to not improperly bias the results reported fore the remaining material.

B. Surface Scan Measurements Using a NaI Detector of Suspect Material

100% surface scan is required of material identified by SRA as exceeding the alarm point (2.91 pCi/g).

Results: One alarm was indicated during SRA scanning. (Batch Number SRA-05-044-2). Scanning was performed indicating a maximum of 2430 gross cpm on a 1-minute static measurement. The material was removed the conveyor belt.

SURVEY REQUEST CONTINUATION SHEET			
SR NUMBER	SR-0186	AREA/LOCATION	SNEC Site
SPECIFIC SAMPLING / SURVEY INSTRUCTIONS OR COMMENTS			

C. Soil Samples

One hundred thirty-one samples were obtained covering 56 batches.

Results: The highest activity was indicated on sample SX-SL-9469 with 0.84 ± 0.14 pCi/g, Cs-137, <0.1 pCi/g, Co-60. Positive Cs-137 results ranged from 0.13 to 0.84 pCi/g. No Co-60 was identified (typical achieved MDA was 0.1 pCi/g).

Two additional samples (unprocessed) were obtained of material on the conveyor belt during the alarm of batch SRA-05-044-2). These samples indicated 0.6 ± 0.17 and 0.19 ± 0.08 pCi/g, Cs-137. No Co-60 activity was indicated (MDA was 0.09 and 0.18 pCi/g).

2. Quality Control (QC) Measurements and Comparisons

Repeat Scan measurements and Soil samples were performed and met the applicable acceptance criteria established in Section 4.6 of E900-IMP-4520.04. A repeat static measurement was not performed in response to the alarm in batch SRA-05-044-2. This was due to an oversight of the technician. The QAO was notified.

3. Special Notes:

R. Shepherd performed two quality checking inspections. Inspection performed on 12/04/04 primarily checked SRA technician's qualifications and observed pre-op checking of detectors. One discrepancy was identified. The technician did not have a copy of the SRA-SXTN-106 Rev. 0 procedure, "Operation of the SMCM /Conveyor System". A copy was obtained. An inspection performed on 1/18/05 observed a point source alarm/response by SRA technician and site Rad Con technician to ensure compliance with SR requirements. No discrepancies were identified.

4. Exceptions and Discrepancies: none

David Sarge (GRCS) _____ **Date** _____

SURVEY REQUEST CONTINUATION SHEET			
SR NUMBER	SR-0190	AREA/LOCATION	SNEC Site
SPECIFIC SAMPLING / SURVEY INSTRUCTIONS OR COMMENTS			

RESULTS SUMMARY FOR SR-0190

SR-0190 was issued to survey and sample material removed from 5 inter-modals and approximately 40 B-25 boxes. The material will be scanned with NaI detectors by Shonka Research Associates, Inc. (SRA), sampled by SNEC Rad Con personnel, and transferred to the adjacent PRI area.

The SR required the following radiological measurements:

- Surface Scan Measurements Using Sodium Iodide Detectors (5" X 2") (set to identify Cs-137) – 100% scan of Material at a rate not exceeding 4 inches/sec at a distance within 13 inches. The action level is 2.91 pCi/g, Cs-137.

- Surface Scan Measurements Using a Sodium Iodide Detector – 100% scan of suspect material is required. Scan rate shall not exceed 0.5 meters/sec at a distance not exceeding 2 inches. The action level is 300 gross cpm.

- Soil Samples – obtain approximately 500 cc of material from each 30 minutes of run time. A minimum of two samples is required of each batch.

- QC Repeat Measurements – A minimum of 5% of all surface scan/static measurements and sampling will be re-performed using identical methodology.

- Additional sampling/surveys may be performed at the request of the SR Coordinator.

1. Summary of Results

A. Surface Scan Measurements Using a 5" x 2" Sodium Iodide Detectors (set to identify Cs-137)

100% scan is required.

Results: Scan results indicate activity below the action level with two exceptions. A point source and small volume alarm was declared. The material was removed from the conveyor belt and the associated monitoring data was expunged to not improperly bias the results reported fore the remaining material.

B. Surface Scan Measurements Using a NaI Detector of Suspect Material

100% surface scan is required of material identified by SRA as exceeding the alarm point (2.91 pCi/g).

Results: Two alarms were indicated during SRA scanning. (Batch Number SRA-05-054-1). Scanning was performed indicating a maximum of 2274 gross cpm on a 1-minute static measurement. The material was removed the conveyor belt.

C. Soil Samples

Five samples were obtained covering batch SRA-05-054.

Results: The highest activity indicated was 1.0 ± 0.18 pCi/g, Cs-137, <0.15 pCi/g, Co-60. All samples indicted positive Cs-137 ranging from 0.7 to 1.0 pCi/g. No Co-60 was identified (typical achieved MDA was 0.13 pCi/g).

Four additional samples (unprocessed) were obtained of material on the conveyor belt during the alarms of batch SRA-05-054). These samples indicated positive Cs-137 ranging from 0.52 to 0.62 pCi/g. No Co-60 activity was indicated (typical achieved MDA was 0.12 pCi/g).

2. Quality Control (QC) Measurements and Comparisons

Repeat Scan and soil samples were performed and met the applicable acceptance criteria established in Section 4.6 of E900-IMP-4520.04. A repeat static measurement was not obtained during the response of the point source alarm. This was due to an oversight of the technician. The QAO was notified.

3. Special Notes: none

4. Exceptions and Discrepancies: see section 2.

David Sarge (GRCS) _____ **Date** _____