ENERGYSOLUTIONS

CS-RS-RP-009-11

Phase II Final Status Survey Report
Mallinckrodt Columbium-Tantalum Plant

St. Louis, Missouri

Chapter 11

Project No. 137131 **Revision 0**

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ABBREVIATIONS AND ACRONYMS

%	percent
σ	sigma; standard deviation
AECOM	AECOM Technical Services
bgs	below grade surface
C-T	columbium-tantalum
CFR	Code of Federal Regulations
DCGL	derived concentration guideline level
DP	decommissioning plan
DQO	data quality objectives
EMC	elevated measurement comparison
F	exposure-weighted fraction of the $DCGL_W$
FSS	Final Status Survey
FSSR	Final Status Survey Report
ft	feet
GWS	gamma walk-over survey
m	meters
m^2	square meters
MARSSIM	Multi-Agency Radiation and Site Investigation Manual (NUREG-1575)
MDC	minimum detectable concentration
NIST	National Institute of Standards and Technology
NRC	U.S. Nuclear Regulatory Commission
pCi/g	picoCuries per gram
Ra	radium
SOF	sum of fractions
Th	thorium
U	uranium
WRS	Wilcoxon Rank Sum

11.0 RESULTS SUMMARY FOR PLANT 5 SUBSURFACE SU05

This chapter of the Final Status Survey Report (FSSR) presents the results of the final status survey (FSS) and data assessment for Plant 5 subsurface survey unit SU05 in accordance with Columbium-Tantalum (C-T) Phase II Decommissioning Plan (DP) Section 14.5. The FSS for this Class 1 survey unit was completed by AECOM Technical Services (AECOM) in September 2011. The SU05 data assessment was performed based on the assumptions, methods, and performance criteria established to satisfy the data quality objectives (DQOs) in accordance with the C-T Phase II DP Section 14.4.3.8. The summary statistics provide numerical values for measures of central tendency (i.e., mean, median), variation (i.e., standard deviation), and spread (i.e., minimum, maximum). Data evaluation and statistical analyses were performed and a separate decision was made for each survey unit of the C-T Plant as to its suitability for release for unrestricted use based upon the industrial use scenario release criterion as established in C-T Phase II DP Chapter 5.

11.1 OVERVIEW

SU05 is a Class 1 survey unit in the western portion of C-T Plant 5. The survey unit is approximately 480 square meters (m^2) in size, which is less than the size limit of 3,000 m^2 for Class 1 survey units for subsurface material (per C-T Phase II DP, Table 14-4). Class 1 was the appropriate classification because the survey unit contained residual radioactivity that exceeded the derived concentration guideline value ($DCGL_W$) prior to remediation. Figure 11-1 shows the location of SU05 within the Plant 5 area.

Figure 11-2 is a photograph of SU05. In Figure 11-2, as viewed from west of the survey unit looking east, shows the east wall of Building 250 in the background. Evident in the figure is the sloped area next to Building 250. The soil adjacent to Building 250 was removed down to the Building 250 grade beam and then along a 1-to-1 slope down to the final remedial depth. Additional excavation threatened to undermine the building foundation and existing water line running along the building and was not performed. Excavated depth ranged from 4 to 13 feet (ft). The sloped area adjacent to Building 250 was addressed as part of the FSS.

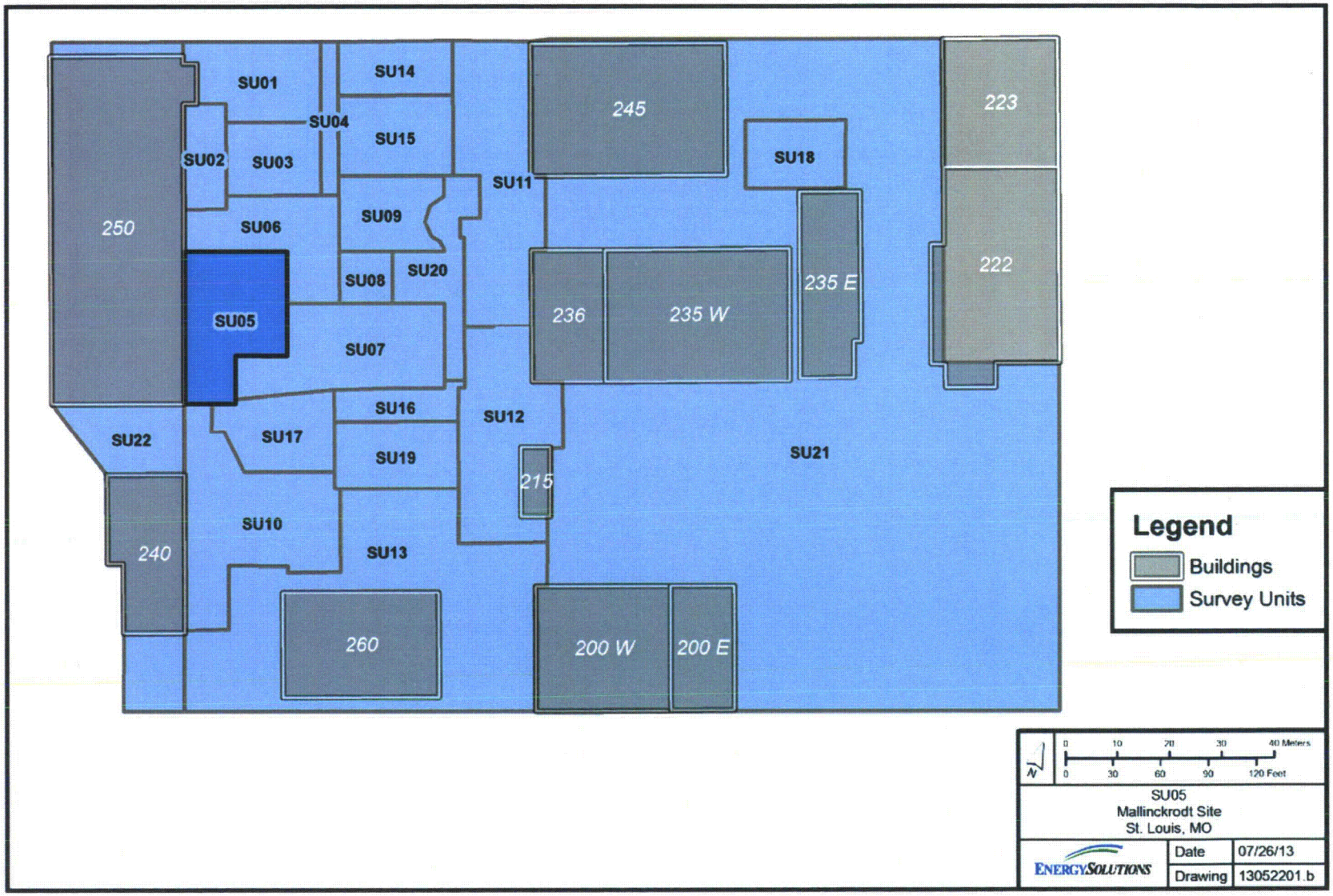


Figure 11-1 Location of SU05 in C-T Plant 5

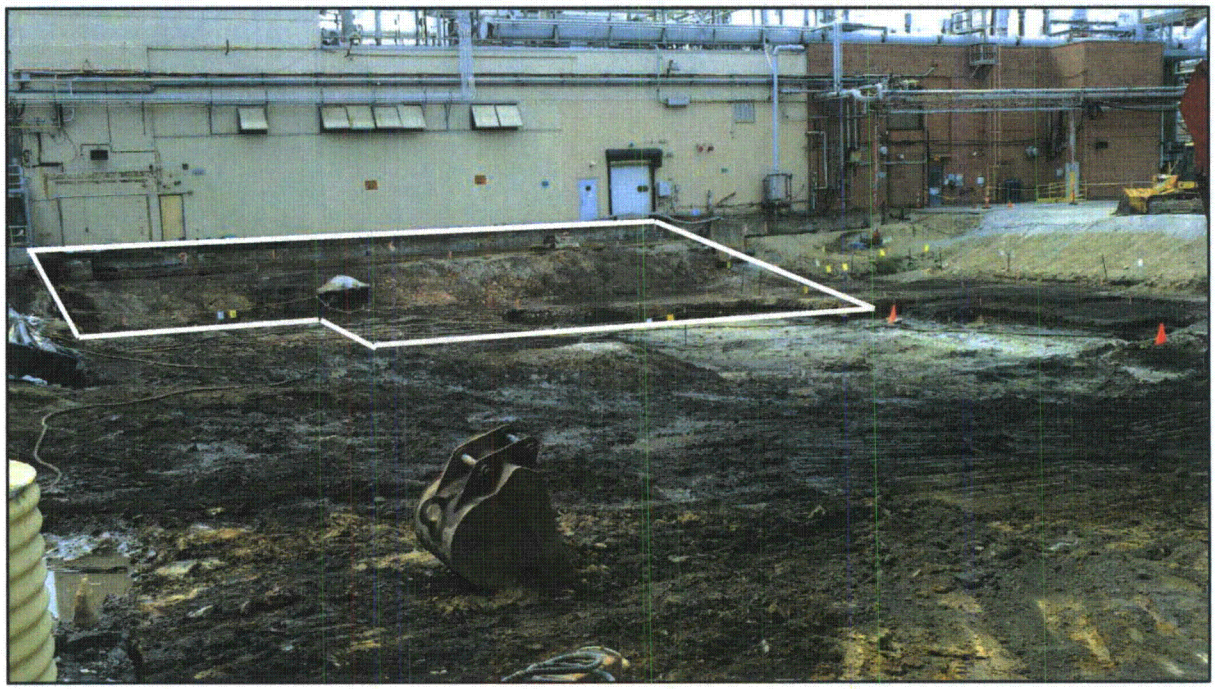


Figure 11-2 Photograph of SU05 Looking West at East Side of Building 250

11.2 REMEDIAL ACTION AND RADIOLOGICAL SAMPLING SUMMARY

Post-remediation soil sampling, shown in Figure 11-3, was performed by AECOM and included: 1) "Grid + Step-Out Sampling", 2) "Sloped Area Characterization" sampling, 3) "At-Depth (Auger) Sampling", and 4) miscellaneous characterization of sludge in a brick pipe. All post-remediation soil samples were analyzed at the on-site laboratory only. Table 11-1 provides the results for the 9 "Grid + Step-Out" samples, 11 "Sloped Area Characterization" samples, 8 "At-Depth (Auger)" samples, and 1 sludge sample.

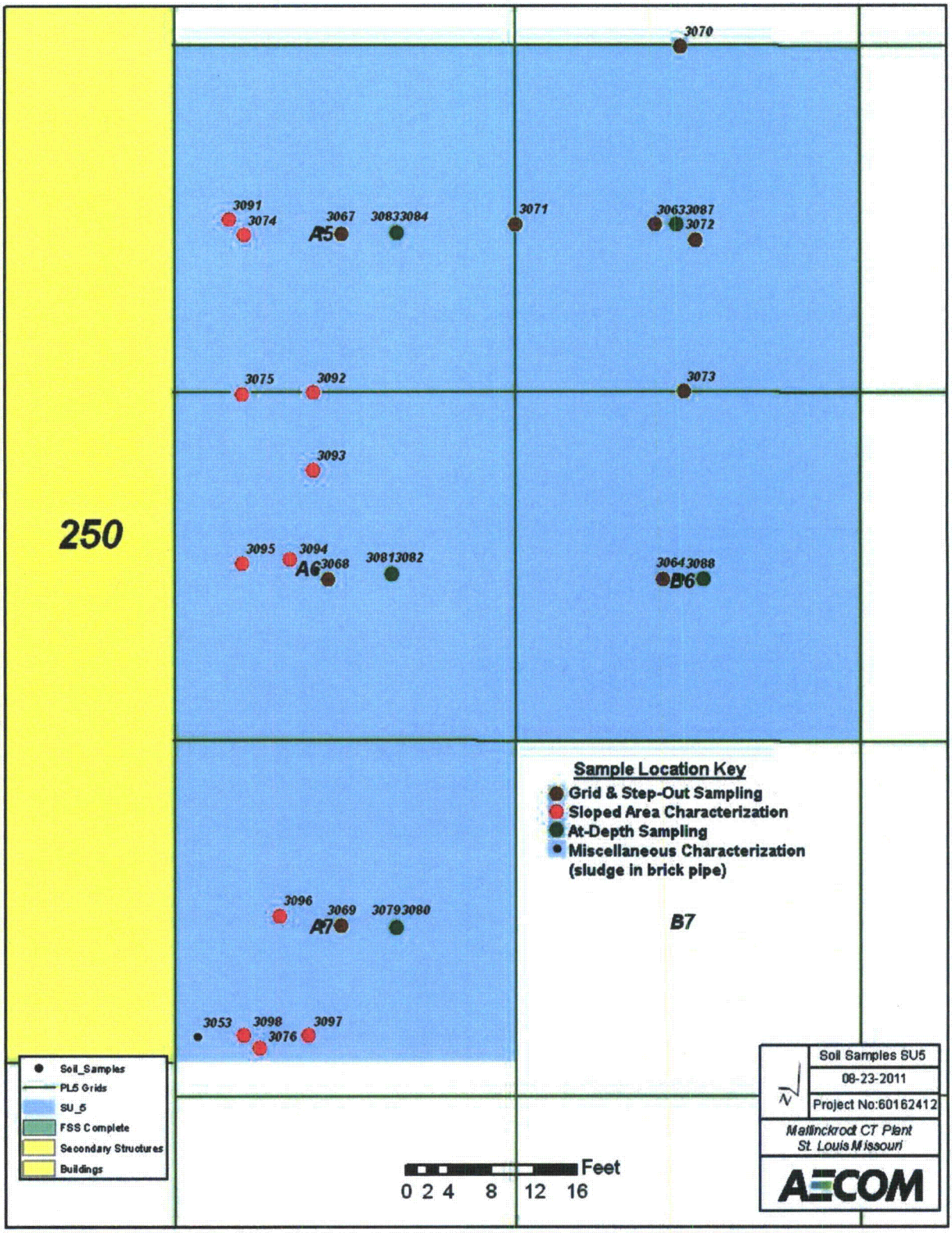


Figure 11-3 Post-Remediation Soil Sampling Locations

Table 11-1 Post-Remediation Sampling Analytical Results

Sample ID	Collection Date	On-Site Results			
		Concentration (pCi/g)			Gross SOF [a]
		^{232}Th	^{226}Ra	^{238}U	
"Grid + Step-Out"					
3063	8/10/2011	4.51	23.90	15.30	**1.03**
3064		2.39	8.49	13.90	0.41
3067		1.59	6.80	5.00	0.31
3068	8/11/2011	3.47	12.20	7.42	**0.57**
3069		2.86	5.40	5.87	0.31
3070		1.14	3.61	37.70	0.23
3071		1.42	1.66	9.07	0.13
3072		2.27	9.83	7.87	0.44
3073		1.23	2.68	12.50	0.16
"Sloped Area Characterization"					
3074	8/12/2011	50.20	81.50	70.80	**4.99**
3075		107.00	28.80	20.50	**5.48**
3076		1.35	4.66	10.40	0.23
3091	8/16/2011	1.12	2.76	5.59	0.15
3092		3.67	3.46	4.91	0.28
3093		22.80	8.00	9.82	**1.24**
3094		2.29	4.73	6.79	0.27
3095		1.88	4.74	7.81	0.25
3096		2.02	2.16	9.98	0.17
3097		36.10	5.49	8.96	**1.71**
3098		0.62	1.21	3.70	0.07
"At-Depth (Auger)"					
3079	8/15/2011	1.23	2.15	2.62	0.13
3080		1.36	2.36	3.24	0.14
3081		1.41	3.30	2.18	0.17
3082		1.52	2.48	2.28	0.15
3083	8/16/2011	0.76	2.51	4.04	0.12
3084		1.20	1.85	2.27	0.12
3087		1.38	1.99	5.45	0.13
3088		1.05	2.01	4.72	0.12
Miscellaneous Characterization (sludge in brick pipe)					
3053	8/4/2011	2.99	12.40	33.80	**0.60**

[a] **Bolded orange** SOF values indicate a result >0.5 but ≤1 and **bolded red** SOF values indicate a result >1.

11.3 DATA COLLECTION

Data collection was performed based on the assumptions, methods, and performance criteria established to satisfy the DQOs in accordance with the C-T Phase II DP, Sections 14.4.1 and 14.4.3. Details regarding FSS design and quality assurance and quality control applicable to all survey units were discussed in Chapters 4 and 5, respectively, of this FSSR.

11.3.1 Gamma Scans

A gamma walk-over survey (GWS) was performed over 100% of the excavated area to locate radiation anomalies that might indicate areas with elevated residual radioactivity where further data collection (i.e., biased soil sampling) was warranted.

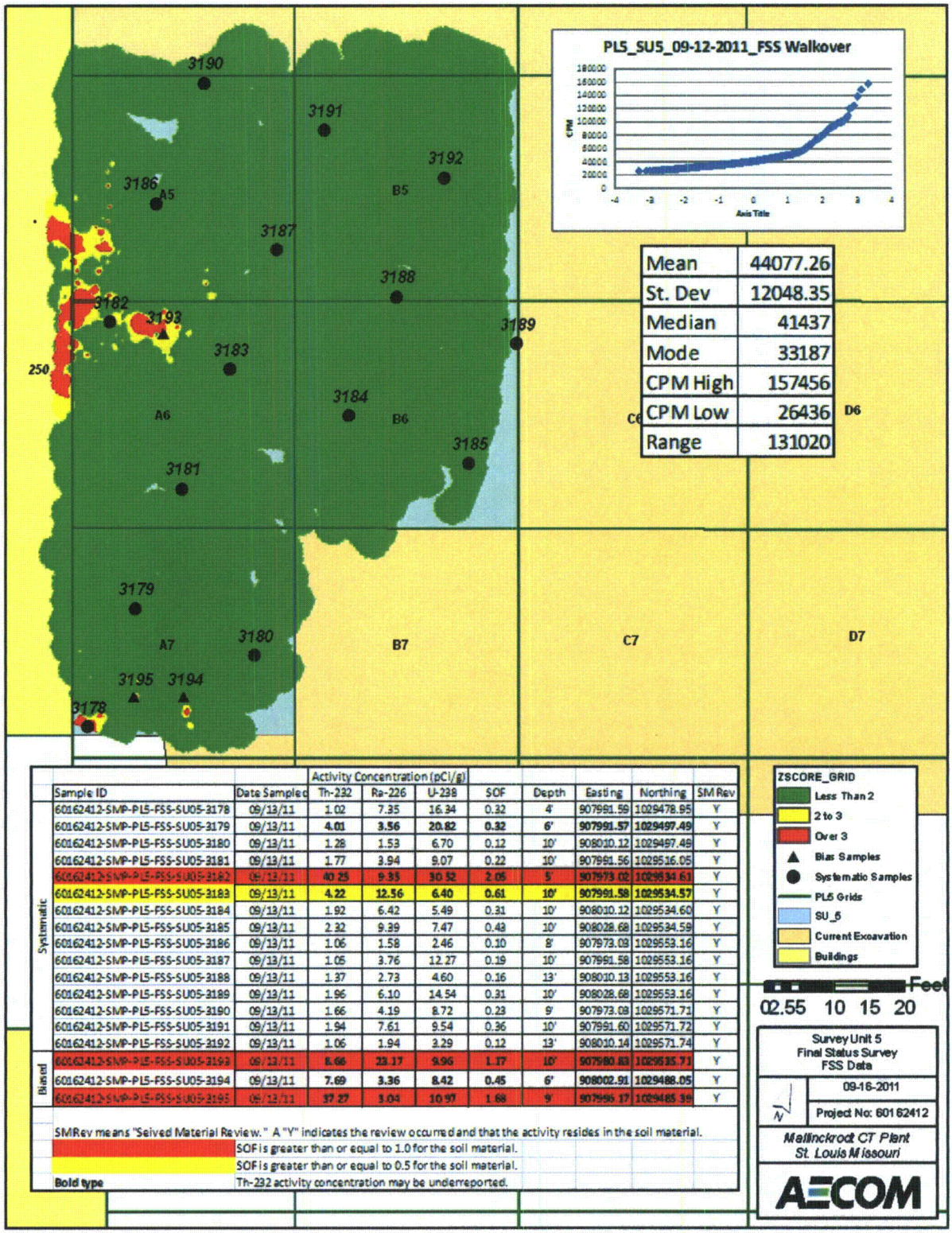
11.3.2 Soil Sampling

Soil samples to be used for the statistical test were collected at a frequency and at representative locations throughout SU05 such that a statistically sound conclusion regarding the radiological condition of the survey unit could be developed. Biased soil samples were collected at locations of elevated residual radioactivity identified by GWS as well as along the sloped excavation along Building 250. Figure 11-4 provides the GWS results and soil sampling locations and Figure 11-5 shows the sloped excavation samples. A total of 35 soil samples were collected throughout SU05, 18 over the areal footprint of SU05 (15 systematic and 3 GWS biased) and 17 biased for elevated area bounding of the sloped excavation along Building 250. Further excavation threatened to undermine the building foundation and therefore additional sampling was performed in order to evaluate the residual contamination.

Figure 11-6 illustrates two elevated areas defined by AECOM using both post-remedial and FSS GWS and soil sampling:

- Elevated Area #1: The larger area in the center of the west edge of the survey unit along Building 250 is no larger than 50 m^2 in size.
- Elevated Area #2: The smaller area in the southeast corner of the survey unit along Building 250 is no larger than 20 m^2.

The combined elevated area was 70 m^2.

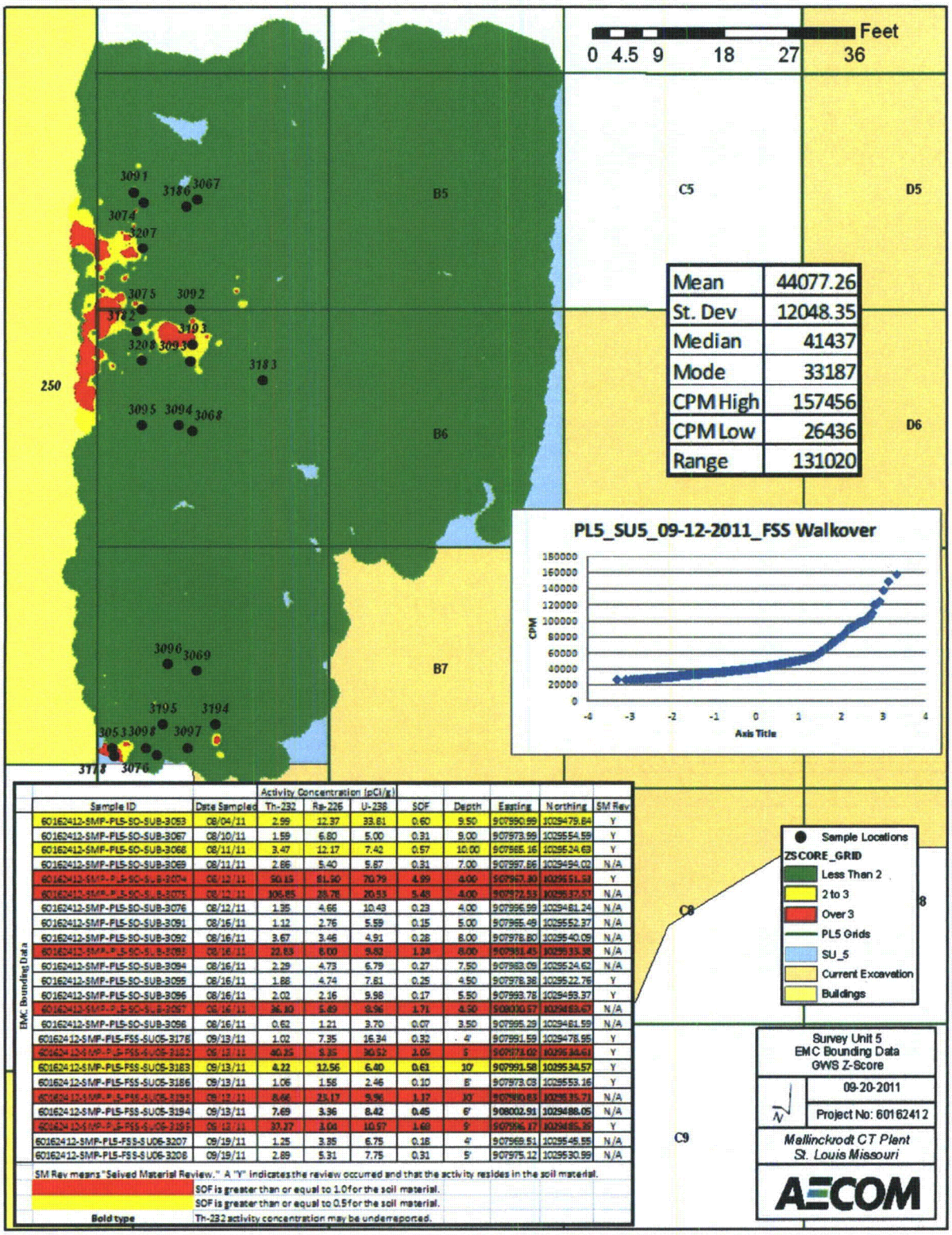


	Sample ID	Date Sampled	Activity Concentration (pCi/g) Th-232	Ra-226	U-238	SOF	Depth	Easting	Northing	SM Rev
Systematic	60162412-SMP-PL5-FSS-SU05-3178	09/13/11	1.02	7.35	16.34	0.32	4'	907991.59	1029478.95	Y
	60162412-SMP-PL5-FSS-SU05-3179	09/13/11	**4.01**	**3.56**	**20.82**	**0.32**	**6'**	**907991.57**	**1029497.49**	Y
	60162412-SMP-PL5-FSS-SU05-3180	09/13/11	1.28	1.53	6.70	0.12	10'	908010.12	1029497.49	Y
	60162412-SMP-PL5-FSS-SU05-3181	09/13/11	1.77	3.94	9.07	0.22	10'	907991.56	1029516.05	Y
	60162412-SMP-PL5-FSS-SU05-3182	09/13/11	40.25	9.35	30.52	2.05	5'	907973.02	1029534.61	Y
	60162412-SMP-PL5-FSS-SU05-3183	09/13/11	**4.22**	**12.56**	**6.40**	**0.61**	**10'**	**907991.58**	**1029534.57**	Y
	60162412-SMP-PL5-FSS-SU05-3184	09/13/11	1.92	6.42	5.49	0.31	10'	908010.12	1029534.60	Y
	60162412-SMP-PL5-FSS-SU05-3185	09/13/11	2.32	9.39	7.47	0.43	10'	908028.68	1029534.59	Y
	60162412-SMP-PL5-FSS-SU05-3186	09/13/11	1.06	1.58	2.46	0.10	8'	907973.03	1029553.16	Y
	60162412-SMP-PL5-FSS-SU05-3187	09/13/11	1.05	3.76	12.27	0.19	10'	907991.58	1029553.16	Y
	60162412-SMP-PL5-FSS-SU05-3188	09/13/11	1.37	2.73	4.60	0.16	13'	908010.13	1029553.16	Y
	60162412-SMP-PL5-FSS-SU05-3189	09/13/11	1.96	6.10	14.54	0.31	10'	908028.68	1029553.16	Y
	60162412-SMP-PL5-FSS-SU05-3190	09/13/11	1.66	4.19	8.72	0.23	9'	907973.03	1029571.71	Y
	60162412-SMP-PL5-FSS-SU05-3191	09/13/11	1.94	7.61	9.54	0.36	10'	907991.60	1029571.72	Y
	60162412-SMP-PL5-FSS-SU05-3192	09/13/11	1.06	1.94	3.29	0.12	13'	908010.14	1029571.74	Y
Biased	60162412-SMP-PL5-FSS-SU05-3193	09/13/11	**8.66**	**23.17**	**9.96**	**1.17**	**10'**	**907980.83**	**1029535.71**	Y
	60162412-SMP-PL5-FSS-SU05-3194	09/13/11	**7.69**	**3.36**	**8.42**	**0.45**	**6'**	**908002.91**	**1029488.05**	Y
	60162412-SMP-PL5-FSS-SU05-3195	09/13/11	**37.27**	**3.04**	**10.97**	**1.68**	**9'**	**907996.17**	**1029485.39**	Y

SMRev means "Seived Material Review." A "Y" indicates the review occurred and that the activity resides in the soil material.

	SOF is greater than or equal to 1.0 for the soil material.
	SOF is greater than or equal to 0.5 for the soil material.
Bold type	Th-232 activity concentration may be underreported.

Figure 11-4 GWS and Soil Sampling Locations



			Activity Concentration (pCi/g)								
	Sample ID	Date Sampled	Th-232	Ra-226	U-238	SOF	Depth	Easting	Northing	SM Rev
EMC Bounding Data	60162412-SMP-PL5-SO-SUB-3053	08/04/11	2.99	12.37	33.81	0.60	9.50	907990.99	1029479.84	Y
	60162412-SMP-PL5-SO-SUB-3067	08/10/11	1.59	6.80	5.00	0.31	9.00	907973.99	1029554.59	Y
	60162412-SMP-PL5-SO-SUB-3068	08/11/11	3.47	12.17	7.42	0.57	10.00	907985.16	1029524.63	Y
	60162412-SMP-PL5-SO-SUB-3069	08/11/11	2.86	5.40	5.87	0.31	7.00	907997.86	1029494.02	N/A
	60162412-SMP-PL5-SO-SUB-3074	08/12/11	50.15	81.50	70.79	4.99	4.00	907967.80	1029551.53	Y
	60162412-SMP-PL5-SO-SUB-3075	08/12/11	106.85	28.78	20.53	5.48	4.00	907972.53	1029532.57	N/A
	60162412-SMP-PL5-SO-SUB-3076	08/12/11	1.35	4.66	10.43	0.23	4.00	907996.99	1029481.24	N/A
	60162412-SMP-PL5-SO-SUB-3091	08/16/11	1.12	2.76	5.59	0.15	5.00	907965.49	1029552.37	N/A
	60162412-SMP-PL5-SO-SUB-3092	08/16/11	3.67	3.46	4.91	0.28	8.00	907978.80	1029540.09	N/A
	60162412-SMP-PL5-SO-SUB-3093	08/16/11	22.83	8.00	9.82	1.28	8.00	907981.45	1029533.38	N/A
	60162412-SMP-PL5-SO-SUB-3094	08/16/11	2.29	4.73	6.79	0.27	7.50	907983.09	1029524.62	N/A
	60162412-SMP-PL5-SO-SUB-3095	08/16/11	1.88	4.74	7.81	0.25	4.50	907978.38	1029522.76	Y
	60162412-SMP-PL5-SO-SUB-3096	08/16/11	2.02	2.16	9.98	0.17	5.50	907993.78	1029493.37	Y
	60162412-SMP-PL5-SO-SUB-3097	08/16/11	36.10	5.69	9.96	1.71	4.50	908000.57	1029483.67	N/A
	60162412-SMP-PL5-SO-SUB-3098	08/16/11	0.62	1.21	3.70	0.07	3.50	907995.29	1029481.59	N/A
	60162412-SMP-PL5-FSS-SU05-3178	09/13/11	1.02	7.35	16.34	0.32	4'	907991.59	1029478.95	Y
	60162412-SMP-PL5-FSS-SU05-3182	09/13/11	40.35	9.35	30.52	2.05	5	907973.02	1029534.61	Y
	60162412-SMP-PL5-FSS-SU05-3183	09/13/11	4.22	12.56	6.40	0.61	10'	907991.58	1029534.57	Y
	60162412-SMP-PL5-FSS-SU05-3186	09/13/11	1.06	1.56	2.46	0.10	8'	907973.03	1029553.16	Y
	60162412-SMP-PL5-FSS-SU05-3193	09/13/11	8.66	23.17	9.96	1.17	10'	907980.83	1029535.71	N/A
	60162412-SMP-PL5-FSS-SU05-3194	09/13/11	7.69	3.36	8.42	0.45	6'	908002.91	1029488.05	N/A
	60162412-SMP-PL5-FSS-SU05-3195	09/13/11	37.27	3.04	10.57	1.68	5'	907996.47	1029485.36	Y
	60162412-SMP-PL5-FSS-SU05-3207	09/19/11	1.25	3.35	6.75	0.18	4'	907969.51	1029545.55	N/A
	60162412-SMP-PL5-FSS-SU05-3208	09/19/11	2.89	5.31	7.75	0.31	5'	907975.12	1029530.99	N/A

SM Rev means "Solved Material Review." A "Y" indicates the review occurred and that the activity resides in the soil material.

SOF is greater than or equal to 1.0 for the soil material.

SOF is greater than or equal to 0.5 for the soil material.

Bold type Th-232 activity concentration may be underreported.

Figure 11-5 Additional Biased Soil Sampling Locations

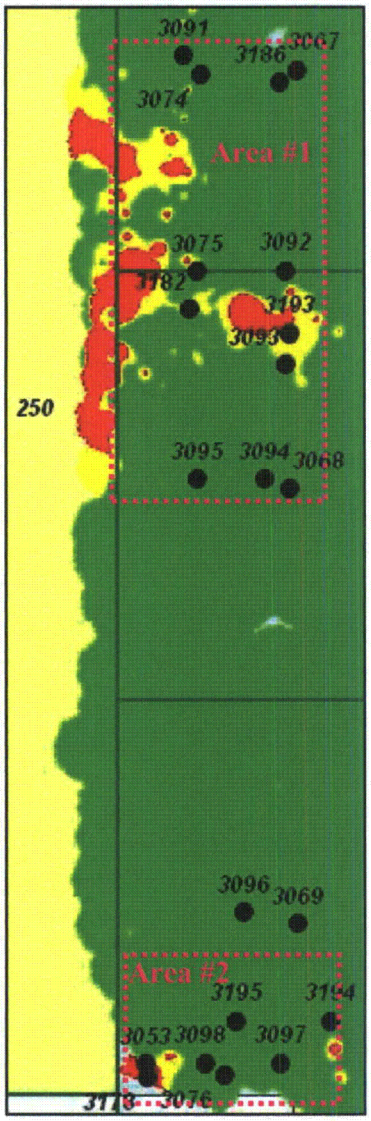


Figure 11-6 Elevated Areas Defined by AECOM

All soil samples were analyzed on site via gamma spectroscopy analysis. Table 11-2 provides the sample results and summary statistics for the 15 systematic samples. Table 11-3 provides the sample results for the 3 GWS biased samples and the 17 biased samples for elevated area bounding of the sloped excavation along Building 250.

Any remaining sieved material from each sample was analyzed separately to verify residual radioactivity was consistent with sample results. The radiological screening process did not identify any significant levels of radioactivity in the sieved materials removed from samples.

The C-T Phase II DP, Table 4-17, provided mean background activity levels of 1.3, 2.5, and 4.4 picoCuries per gram (pCi/g) for thorium-232 (^{232}Th), radium-226 (^{226}Ra), and uranium-238 (^{238}U), respectively. These values were used to calculate net SOF values—note that when measured activity concentration levels were less than the background mean resulting in a negative value, the net activity concentration was set equal to zero for the net SOF calculation.

To mitigate the risk of backfilling, the on-site laboratory analytical results were reviewed to determine the likelihood of the survey unit failing to meet the criteria for radiological release. The on-site laboratory, by design, reported conservative sample results.

Table 11-2 Gamma Spectroscopy Systematic Sample Analytical Results

Sample ID	Depth (ft bgs)	On-Site Results											Off-Site Results [a]											On-Site/ Off-Site Gross SOF Ratio
		Activity Concentration (pCi/g)									SOF [b]		Activity Concentration (pCi/g)									SOF [b]		
		^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U					
		Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [c]	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [c]	
3178	4	1.02	0.25	0.09	7.35	1.99	1.46	16.34	1.66	0.86	0.32	0.18	1.20	0.63	0.46	4.94	0.69	0.12	5.04	0.69	0.15	0.23	0.08	1.40
3179	6	4.01	0.53	0.14	3.56	2.15	1.69	20.82	2.25	1.14	0.32	0.17	4.86	0.87	0.53	1.87	0.32	0.17	2.03	0.33	0.16	0.27	0.15	1.18
3180	10	1.28	0.26	0.05	1.53	1.30	1.02	6.70	1.42	0.77	0.12	0.00	1.35	0.37	0.38	1.72	0.32	0.11	2.00	0.30	0.12	0.12	0.00	0.98
3181	10	1.77	0.30	0.05	3.94	1.51	1.12	9.07	1.49	0.86	0.22	0.08	2.10	0.56	0.44	1.73	0.29	0.12	2.02	0.31	0.12	0.15	0.03	1.48
3182	5	40.25	2.35	0.43	9.35	3.90	3.04	30.52	5.15	3.05	**2.04**	**1.90**	40.00	5.40	1.49	44.00	5.40	0.73	7.30	1.10	0.42	**3.18**	**3.03**	0.64
3183	10	4.22	0.54	0.13	12.56	2.03	1.32	6.40	1.55	1.11	**0.61**	0.47	3.58	0.86	0.68	8.93	1.20	0.16	9.69	1.20	0.20	0.47	0.32	1.31
3184	10	1.92	0.36	0.11	6.42	1.42	0.97	5.49	1.47	0.88	0.31	0.16	2.02	0.58	0.49	5.14	0.73	0.13	5.29	0.68	0.15	0.27	0.12	1.15
3185	10	2.32	0.44	0.14	9.39	1.90	1.27	7.47	1.54	1.04	0.43	0.28	2.88	0.81	0.64	7.49	1.00	0.16	7.91	1.05	0.19	0.39	0.24	1.11
3186	8	1.06	0.29	0.10	1.58	0.98	0.72	2.46	0.88	0.60	0.10	0.00	0.94	0.47	0.36	1.21	0.22	0.12	1.21	0.24	0.11	0.08	0.00	1.24
3187	10	1.05	0.20	0.08	3.76	1.61	1.22	12.27	1.70	0.86	0.19	0.05	0.92	0.38	0.36	2.39	0.37	0.11	2.69	0.37	0.11	0.12	0.00	1.53
3188	13	1.37	0.30	0.08	2.73	1.26	0.93	4.60	1.36	0.77	0.16	0.01	1.56	0.50	0.41	1.93	0.31	0.12	1.86	0.29	0.12	0.13	0.01	1.17
3189	10	1.96	0.33	0.11	6.10	1.89	1.41	14.54	1.58	0.85	0.31	0.16	1.62	0.53	0.50	3.85	0.57	0.13	4.17	0.56	0.14	0.20	0.06	1.51
3190	9	1.66	0.37	0.13	4.19	1.71	1.28	8.72	2.04	1.16	0.22	0.08	2.60	0.61	0.52	5.00	0.72	0.16	5.46	0.74	0.15	0.29	0.14	0.78
3191	10	1.94	0.37	0.13	7.61	1.79	1.27	9.54	1.82	1.07	0.35	0.21	2.26	0.62	0.54	5.96	0.84	0.16	6.52	0.84	0.17	0.31	0.16	1.15
3192	13	1.06	0.23	0.05	1.94	1.04	0.78	3.29	0.89	0.59	0.12	0.00	1.06	0.39	0.39	1.17	0.24	0.11	1.31	0.22	0.11	0.09	0.00	1.34
Summary Statistics																								
Count:		15			15			15			15	15	15			15			15			15	15	15
Average:		4.46			5.47			10.55			0.39	0.25	4.60			6.49			4.30			0.42	0.29	1.20
Median:		1.77			4.19			8.72			0.31	0.16	2.02			3.85			4.17			0.23	0.08	1.18
Standard Dev.:		9.95			3.29			7.48			0.48	0.47	9.85			10.65			2.69			0.77	0.77	0.25
Minimum:		1.02			1.53			2.46			0.10	0.00	0.92			1.17			1.21			0.08	0.00	0.64
Maximum:		40.25			12.56			30.52			**2.04**	**1.90**	40.00			44.00			9.69			**3.18**	**3.03**	1.53
Range:		39.23			11.03			28.06			1.94	1.90	39.08			42.83			8.48			3.10	3.03	0.89

[a] Off-site laboratory results as reported by TestAmerica after sufficient in-growth time to reach ^{226}Ra progeny equilibrium.
[b] **Bolded orange** SOF values indicate a result >0.5 but ≤1 and **bolded red** SOF values indicate a result >1.
[c] Calculated as discussed in Section 11.3.2.

Table 11-3 Gamma Spectroscopy Biased Sample Analytical Results

Sample ID	Depth (ft bgs)	On-Site Results											Off-Site Results [a, b]											On-Site/ Off-Site Gross SOF Ratio
		Activity Concentration (pCi/g)									SOF [c]		Activity Concentration (pCi/g)									SOF [c]		
		^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U					
		Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [d]	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [d]	
GWS Biased Samples																								
3193	10	8.66	0.85	0.26	23.17	2.80	1.73	9.96	2.80	1.85	**1.16**	**1.02**	8.85	1.60	0.94	17.80	2.40	0.26	18.70	2.30	0.30	**1.00**	**0.86**	1.16
3194	6	7.69	0.72	0.09	3.36	1.78	1.38	8.42	2.24	1.37	0.45	0.30	8.44	1.40	0.65	2.79	0.46	0.20	2.71	0.48	0.19	0.45	0.31	0.99
3195	9	37.27	2.02	0.30	3.04	2.59	2.08	10.97	3.56	2.44	**1.68**	**1.53**	39.30	5.20	1.28	2.69	0.56	0.36	2.40	0.50	0.35	**1.74**	**1.60**	0.96
Sloped Excavation Biased Samples																								
3053	9	2.99	0.67	0.18	12.37	4.49	3.30	33.81	3.78	1.66	**0.59**	0.45	9.41	2.98	1.90	25.50	3.80	1.04	114.00	23.10	20.20	**1.42**	**1.27**	0.42
3067	9	1.59	0.29	0.09	6.80	1.48	1.00	5.00	1.11	0.74	0.30	0.16	1.86	0.42	0.31	5.42	0.70	0.21	4.45	1.25	3.39	0.27	0.12	1.14
3068	10	3.47	0.50	0.13	12.17	2.04	1.32	7.42	1.58	1.09	**0.57**	0.42	4.04	0.67	0.45	9.92	1.19	0.33	5.16	1.45	4.32	**0.51**	0.37	1.11
3069	7	2.86	0.40	0.15	5.40	1.61	1.14	5.87	1.50	0.93	0.31	0.17	2.84	0.43	0.29	4.40	0.59	0.18	6.45	2.64	3.17	0.28	0.13	1.12
3074	4	50.15	2.84	0.63	81.50	6.39	3.88	70.79	6.18	3.45	**4.97**	**4.82**	61.50	7.80	1.65	71.30	9.20	0.43	73.80	9.00	0.48	**5.10**	**4.96**	0.97
3075	4	106.85	4.59	0.61	28.78	4.62	3.40	20.53	5.65	3.85	**5.48**	**5.33**	131.00	16.00	1.56	26.40	3.30	0.41	29.20	3.50	0.47	**6.42**	**6.27**	0.85
3076	4	1.35	0.18	0.55	4.66	1.63	1.22	10.43	1.46	0.90	0.23	0.08	5.01	0.78	0.17	1.99	0.45	0.34	16.00	4.94	4.93	0.30	0.17	0.77
3091	5	1.12	0.22	0.02	2.76	1.15	0.86	5.59	1.17	0.67	0.15	0.01	0.91	0.25	0.23	1.38	0.20	0.06	1.51	0.22	0.07	0.09	0.00	1.71
3092	8	3.67	0.48	0.14	3.46	1.26	0.92	4.91	1.18	0.83	0.28	0.13	4.14	0.60	0.27	2.76	0.36	0.07	3.10	0.40	0.08	0.27	0.13	1.02
3093	8	22.83	1.46	0.28	8.00	2.31	1.74	9.82	2.34	1.76	**1.24**	**1.10**	22.60	2.51	0.65	6.25	0.88	0.45	12.10	5.44	6.83	**1.17**	**1.03**	1.06
3094	7.5	2.29	0.36	0.12	4.73	1.31	0.93	6.79	1.13	0.71	0.27	0.12	2.36	0.39	0.30	3.64	0.51	0.21	8.08	3.30	3.66	0.23	0.09	1.14
3095	4.5	1.88	0.29	0.12	4.74	1.60	1.15	7.81	1.82	0.98	0.25	0.11	1.94	0.41	0.31	4.51	0.61	0.20	5.75	1.38	3.07	0.24	0.10	1.03
3096	5.5	2.02	0.34	0.07	2.16	1.45	1.13	9.98	1.27	0.69	0.17	0.04	2.48	0.49	0.36	1.54	0.25	0.11	1.71	0.26	0.10	0.16	0.05	1.08
3097	4.5	36.10	1.81	0.33	5.49	2.43	1.92	8.96	3.20	2.19	**1.71**	**1.56**	37.80	4.20	0.88	3.07	0.94	0.85	16.00	7.27	9.60	**1.71**	**1.56**	1.00
3098	3.5	0.62	0.20	0.07	1.21	0.96	0.75	3.70	1.02	0.57	0.07	0.00	*0.30*	0.14	0.31	0.85	0.19	0.12	2.83	0.78	1.91	0.05	0.00	1.60
3207	6	1.25	0.20	0.08	3.35	1.38	1.04	6.75	1.49	0.85	0.18	0.03	1.84	0.53	0.38	2.43	0.37	0.10	2.45	0.36	0.12	0.16	0.02	1.08
3208	6	2.89	0.43	0.10	5.31	1.64	1.19	7.75	1.39	0.89	0.31	0.17	2.83	0.64	0.52	3.69	0.55	0.14	4.05	0.55	0.14	0.25	0.10	1.25

[a] Off-site laboratory results as reported by TestAmerica after sufficient in-growth time to reach ^{226}Ra progeny equilibrium.
[b] Italicized results indicate < MDC.
[c] **Bolded orange** SOF values indicate a result >0.5 but ≤1 and **bolded red** SOF values indicate a result >1.
[d] Calculated as discussed in Section 11.3.2.

11.3.3 Core Boring

C-T Phase II DP Table 4-7 provided characterization borehole results. Of the locations provided in the table, four were collected within the extent of SU05: BH-010, BH-010A, BH-027, and BH-028. Table 11-4 provides the data for these locations. The results indicate that beyond the excavation extent, additional subsurface contamination is not reasonably expected where FSS results indicate acceptable levels of contamination. Therefore, in accordance with Page 14-22 of the C-T Phase II DP, FSS core sampling or measurements were not performed.

Table 11-4 Characterization Borehole Results

Location ID	Sample Depth (ft)	Activity Concentration (pCi/g) [a]			SOF [b]	
		^{232}Th	^{226}Ra	^{238}U	Gross	Net [c]
BH-010	2 - 3	51.10	239.30	21.50	**10.31**	**10.16**
	4 - 5	2.90	31.80	20.00	**1.23**	**1.09**
	5 - 6	0.45	2.84	15.00	0.14	0.03
BH-010A	6 - 7	10.80	22.50	7.10	**1.23**	**1.08**
	9 - 10	3.10	2.81	*3.98*	0.23	0.09
	13 - 14	1.00	1.30	1.30	0.09	0.00
BH-027	2.5 - 3.5	0.97	2.16	*4.76*	0.12	0.00
	4 - 5	0.99	1.44	*4.77*	0.10	0.00
	5 - 6	2.10	1.50	3.60	0.14	0.03
	8 - 9	2.90	4.60	7.10	0.29	0.14
	11 - 12	1.90	1.40	2.50	0.13	0.03
	22.5 - 23.5	1.30	1.10	1.10	0.09	0.00
BH-028	0.7 - 2	1.42	4.34	27.90	0.25	0.10
	2 - 3	1.10	5.10	23.50	0.25	0.11
	3 - 4	1.35	3.63	13.80	0.20	0.05
	10 - 11	1.00	1.70	3.00	0.10	0.00
	13 - 14	1.70	3.30	4.10	0.19	0.04

[a] Italicized results indicate < MDC.
[b] **Bolded red** SOF values indicate a result >1.
[c] Calculated as discussed in Section 11.3.2.

11.4 DATA ANALYSIS

Data analysis was performed based on the assumptions, methods, and performance criteria established to satisfy the DQOs in accordance with the C-T Phase II DP, Sections 14.4.1 and 14.4.3. Details regarding FSS design and quality assurance and quality control applicable to all survey units were discussed in Chapters 4 and 5, respectively, of this FSSR.

11.4.1 Elevated Area Evaluation

AECOM provided a preliminary evaluation of the elevated areas. For a combined area of 70 m^2, the area factor from C-T Phase II DP Figure 5-3 was 1.4. The combined data set's average measured concentration SOF value was 1.2. AECOM concluded that the "application of the $DCGL_{EMC}$ to the two identified areas in the sloped area along Bldg 250 is warranted based on ALARA considerations" and that further "excavation threatens to undermine Bldg 250 foundation."

Using the elevated area extents defined by AECOM, Table 11-5 presents a summary of the sample results for the two elevated areas. The average gross SOF for Elevated Area #1 and Elevated Area #2 were 1.55 and 0.84, respectively. Because the average gross SOF for Elevated Area #2 was less than one, no further assessment was performed for this elevated area.

Table 11-5 Elevated Areas Results Summary

Sample ID	Activity Concentration (pCi/g)			SOF [a]	
	^{232}Th	^{226}Ra	^{238}U	Gross	Net [b]
Elevated Area #1					
3067	1.86	5.42	4.45	0.27	0.12
3068	4.04	9.92	5.16	**0.51**	0.37
3074	61.50	71.30	73.80	**5.10**	**4.96**
3075	131.00	26.40	29.20	**6.42**	**6.27**
3091	0.91	1.38	1.51	0.09	0.00
3092	4.14	2.76	3.10	0.27	0.13
3093	22.60	6.25	12.10	**1.17**	**1.03**
3094	2.36	3.64	8.08	0.23	0.09
3095	1.94	4.51	5.75	0.24	0.10
3182	40.00	44.00	7.30	**3.18**	**3.03**
3186	0.94	1.21	1.21	0.08	0.00
3193	8.85	17.80	18.70	**1.00**	**0.86**
Average	23.34	16.22	14.20	**1.55**	**1.40**
Elevated Area #2					
3053	9.41	25.50	114.00	**1.42**	**1.27**
3076	5.01	1.99	16.00	0.30	0.17
3097	37.80	3.07	16.00	**1.71**	**1.56**
3098	0.30	0.85	2.83	0.05	0.00
3178	1.20	4.94	5.04	0.23	0.08
3194	8.44	2.79	2.71	0.45	0.31
3195	39.30	2.69	2.40	**1.74**	**1.60**
Average	14.49	5.98	22.71	**0.84**	**0.70**

[a] **Bolded orange** SOF values indicate a result >0.5 but ≤1 and **bolded red** SOF values indicate a result >1.
[b] Calculated as discussed in Section 11.3.2.

Equation 9 from C-T Phase II DP, Section 5.8.7 provides for the calculation of an *Index* value that represents the fraction or multiple of the $DCGL_{EMC}$. If the *Index* value is greater than one, then the $DCGL_{EMC}$ is exceeded. Using the elevated area extents determined by AECOM, parameters necessary to calculate the *Index* value for Elevated Area #1 were:

- The average elevated area activity levels were 23.34, 16.22, and 14.20 pCi/g for ^{232}Th, ^{226}Ra, and ^{238}U, respectively (from Table 11-5 above);
- Mean background activity levels were 1.3, 2.5, and 4.4 pCi/g for ^{232}Th, ^{226}Ra, and ^{238}U, respectively (from C-T Phase II DP Table 4-17);
- The size of the elevated area was approximately 50 m^2; and,
- The area factors from C-T Phase II DP Figure 5-3 for the elevated area were 1.4, 1.5, and 2.1 for ^{232}Th, ^{226}Ra, and ^{238}U, respectively.

The calculation of the *Index* value for Elevated Area #1 is shown below. Because the *Index* value as calculated in accordance with the DP was less than one, this elevated area is compliant with the C-T Phase II DP for elevated measurements in soil.

$$Index = \frac{(23.34 - 1.3)\,pCi/g}{(1.4 \times 23.9\,pCi/g)_{Th\ series}} + \frac{(16.22 - 2.5)\,pCi/g}{(1.5 \times 29.4\,pCi/g)_{Ra226}} + \frac{(14.20 - 4.4)\,pCi/g}{(2.1 \times 721\,pCi/g)_{U}} = 0.98$$

11.4.2 Data Set Screening Analysis

Table 11-6 summarizes the results of the screening tests performed in accordance with Pages 14-27 through 14-29 of the C-T Phase II DP. All applicable tests demonstrating compliance passed.

Table 11-6 Screening Tests Results

Screening Test	Test Value	Conclusion
Min/Max	3.16	FAIL; conduct DCGL test
Low Level	N/A	Not applicable; Class 1 survey unit
DCGL	0.27	PASS; conduct WRS test
EMC Limit	0.32	PASS

11.4.2.1 Min/Max

In accordance with Page 14-27 of the C-T Phase II DP, the Min/Max screening test value was calculated by subtracting the minimum reference area result from the maximum survey unit systematic result. Sample 3182 with a gross SOF of 3.18 (from Table 11-2) was the maximum survey unit systematic result. Sample BH-Z-08 with a calculated gross SOF of 0.02 (from C-T Phase II DP Table B-1) was the minimum reference area result. The Min/Max screening test value was calculated to be 3.16. Because the test value was greater than one, further computations are required, i.e., $DCGL_W$ screening and Wilcoxon Rank Sum (WRS) tests.

11.4.2.2 Low Level

In accordance with Page 14-27 of the C-T Phase II DP, the Low Level screening test is not applicable to Class 1 survey units.

11.4.2.3 $DCGL_W$

In accordance with Page 14-28 of the C-T Phase II DP and because the Min/Max test value was greater than one, the $DCGL_W$ screening test value was calculated by subtracting the reference area average gross SOF from the survey unit average gross SOF. The survey unit average gross SOF was 0.42 (from Table 11-2). The reference area average gross SOF was calculated to be 0.15 using average activity concentrations from C-T Phase II DP Table 4-17. The $DCGL_W$ screening test value was calculated to be 0.27. Because the test value was less than one, the WRS test is required per C-T Phase II DP Table 14-6.

11.4.2.4 EMC Limit

In accordance with Page 14-28 of the C-T Phase II DP, the EMC limit screening test was applied to the AECOM-defined Elevated Area #1. Parameters necessary to calculate the exposure-weighted fraction of the $DCGL_W$, F, were:

- The size of Elevated Area #1 was determined to be approximately 50 m^2, as discussed in Section 11.3.2;
- The area factor from C-T Phase II DP Figure 5-3 for Elevated Area #1 was conservatively set to 1.4 (based on thorium series only);
- The average elevated area activity level was a gross SOF = 1.55, as discussed in Section 11.4.1; and,
- The survey unit average was a gross SOF = 0.22 (from Table 11-2, excluding sample 3182).

The calculation of the EMC screening test result is shown below, using C-T Phase II DP Equation 14-7.

$$F = \left[\frac{50\ m^2}{480\ m^2} \times \frac{1.55}{1.4 \times 1}\right] + \left[\frac{(480 - 50)\ m^2}{480\ m^2} \times \frac{0.22}{1}\right] = 0.31$$

In accordance with the C-T Phase II DP and because the result was less than one, the total radioactivity concentration in the survey unit is within the release criterion.

11.4.3 WRS Test

In accordance with Page 14-29 of the C-T Phase II DP, because the Min/Max test value was greater than one and the $DCGL_W$ test was less than one, the WRS Test was required to demonstrate compliance. The test was completed in accordance with Pages 14-29 and 14-30 of the C-T Phase II DP. The result was that the survey unit passed, with the calculation details provided in Table 11-7.

Table 11-7 WRS Test Results

Sample ID	Area	On-Site Results				Off-Site Results			
		Data (SOF)	Adjusted Data (SOF)	Ranks	RA Ranks	Data (SOF)	Adjusted Data (SOF)	Ranks	RA Ranks
BH-013	RA	0.11	1.11	22	22	0.11	1.11	22	22
BH-016	RA	0.42	1.42	29	29	0.42	1.42	29	29
BH-028	RA	0.10	1.10	21	21	0.10	1.10	21	21
BH-031	RA	0.09	1.09	18	18	0.09	1.09	18	18
BH-034	RA	0.29	1.29	28	28	0.29	1.29	28	28
BH-037	RA	0.22	1.22	25	25	0.22	1.22	25	25
BH-045	RA	0.10	1.10	20	20	0.10	1.10	20	20
BH-053	RA	0.16	1.16	23	23	0.16	1.16	23	23
BH-065	RA	0.23	1.23	26	26	0.23	1.23	26	26
BH-083	RA	0.07	1.07	17	17	0.07	1.07	17	17
BH-091	RA	0.24	1.24	27	27	0.24	1.24	27	27
BH-093	RA	0.10	1.10	19	19	0.10	1.10	19	19
BH-099	RA	0.22	1.22	24	24	0.22	1.22	24	24
BH-Z-02	RA	0.07	1.07	16	16	0.07	1.07	16	16
BH-Z-09	RA	0.05	1.05	15	15	0.05	1.05	15	15
3178	SU	0.32	0.32	10	0	0.23	0.23	8	0
3179	SU	0.32	0.32	11	0	0.27	0.27	10	0
3180	SU	0.12	0.12	2	0	0.12	0.12	3	0
3181	SU	0.22	0.22	6	0	0.15	0.15	6	0
3182	SU	2.04	2.04	30	0	3.18	3.18	30	0
3183	SU	0.61	0.61	14	0	0.47	0.47	14	0
3184	SU	0.31	0.31	8	0	0.27	0.27	9	0
3185	SU	0.43	0.43	13	0	0.39	0.39	13	0
3186	SU	0.10	0.10	1	0	0.08	0.08	1	0
3187	SU	0.19	0.19	5	0	0.12	0.12	4	0
3188	SU	0.16	0.16	4	0	0.13	0.13	5	0
3189	SU	0.31	0.31	9	0	0.20	0.20	7	0
3190	SU	0.22	0.22	7	0	0.29	0.29	11	0
3191	SU	0.35	0.35	12	0	0.31	0.31	12	0
3192	SU	0.12	0.12	3	0	0.09	0.09	2	0
			Sum:	465	330		Sum:	465	330
			Critical Value:	272			Critical Value:	272	
			Conclusion:	**PASS**			**Conclusion:**	**PASS**	

11.4.4 Retrospective Analysis

A retrospective analysis was performed of the FSS results to determine whether the results met the survey design objectives, in accordance with Page 14-30 of the C-T Phase II DP. Sample 3182 was the maximum systematic result (Table 11-2) with a gross SOF of 3.18. This result was greater than one and systematic sample 3182 was evaluated as part of the elevated area evaluation (Section 11.4.1). Also, the next largest systematic result was sample 3183 (Table 11-2) with a gross SOF of 0.47. Because systematic sample 3182 was over 6½ times greater than the next highest systematic result, it was considered an outlier that would not allow for a meaningful assessment of the survey unit average and was therefore excluded from the

analysis of the survey unit statistics. Table 11-8 provides the results of the retrospective analysis, with systematic sample 3182 excluded. Because the actual sample size exceeded the retrospective value sample size, the conclusion is that the survey design objectives were met.

Table 11-8 Retrospective Analysis

Parameter	*A Priori* Value	Retrospective Value Based on FSS Results (Gross SOF)
Upper Bound of Gray Region	DCGL = 1	1
Lower Bound of Gray Region	0.5 x DCGL = 0.5	0.22
Spatial Variability (standard deviation)	1/6 x DCGL = 0.17	0.12
Type I Error (false positive)	0.05	0.05
Type II Error (false negative)	0.05	0.05
Relative Shift	3	6.5
Calculated N/2 Sample Size	15 [a]	9
Actual N/2 Sample Size	--	14

[a] The *a priori* value of 15 for the N/2 sample size was determined to be a conservative value that would allow application of either the Sign or WRS test. The *a priori* value for N/2 is 10 based on MARSSIM Table 5.3.

11.5 DEVIATIONS

In accordance with the second bullet in Section 14.5 of the C-T Phase II DP, the FSSR is required to list changes made in the FSS from what was proposed in the DP. Two deviations were noted.

1. Page 14-22 of the C-T Phase II DP indicated where "subsoil contamination is reasonably suspected, final status survey design will be expected to include subsoil radioactivity measurement, either by soil core sampling and gamma spectrometry or in-ground, down-hole gamma spectrometry to measure key radionuclides." The elevated areas discussed in Section 11.4.1 were included in the areas that were excavated to a 1-to-1 slope because additional excavation threatened to undermine the building foundation and existing water line running along the building. Therefore additional contamination subsurface to the excavated slope and the 30 cm layer of sampled soil is reasonably suspected and additional sampling should have been performed. However, even if the sampling would have confirmed that the elevated area was thicker than 30 cm, the dose consequence would have not been significant as shown in Figure 5-1 and as discussed in Section 5.7.1.2 of the C-T Phase II DP. Figure 5-1 shows that as the thickness of the contaminated zone increases past 30 cm, the maximum annual dose does not significantly increase, or conversely the DCGL would not significantly decrease. Therefore, this deviation does not have significant dose consequences and does not affect the assessment.
2. Page 14-27 of the C-T Phase II DP indicated that the "data set for the survey unit will be processed within a database using screening software developed and verified for the project." This database was not developed; instead, a combination of Microsoft® Excel® spreadsheets and hand calculations was utilized. This deviation is not significant and does not affect the data collection or assessment.

11.6 NRC INSPECTIONS

A summary of NRC inspections applicable to the FSS are provided in Section 5.8 of this FSSR. The scope of the inspections included, but was not limited to: review of project plans, interviewing of project personnel, evaluation of the on-site laboratory, and independent confirmatory surveys conducted by the NRC after backfilling. Inspection Report 040-06563/11-003 noted that the NRC reviewed the FSS data package for SU05 to ensure the licensee conducted the surveys in accordance with the NRC-approved DP and work plans. No violations were identified. No findings of significance were identified.

11.7 CONCLUSION

FSS data were verified to be reliable, appropriately documented, and technically defensible. Specifically, the following conclusions are made:

- The instruments used to collect the data were capable of detecting the radiation type (i.e., gamma) at or below the release criteria (described in Sections 4.4 and 4.5 of this FSSR).
- The calibration of the instruments used to collect the data was current and radioactive sources used for calibration were National Institute of Standards and Technology (NIST) traceable (described in Section 5.4 of this FSSR). Specific records available upon request.
- Instrument response was checked before instrument use each day, at minimum (described in Section 5.4 of this FSSR). Specific records available upon request.
- The survey methods used to collect the data were appropriate for the media and type of radiation being measured (described in Sections 4.4, 4.5, and 4.6 of this FSSR).
- The custody of samples collected for laboratory analysis was tracked from the point of collection until final results were obtained (described in Section 5.5.2 of this FSSR). Specific records available upon request.
- The survey data consist of qualified measurement results that are representative of the area of interest.
- Areas identified with elevated residual radioactivity (i.e. SOF > 1.0) were appropriately investigated and the $DCGL_{EMC}$ properly applied.

All the applicable screening tests passed and the retrospective analysis found that the survey design objectives were met; however, as discussed in Section 11.5, additional subsurface contamination within the 1-to-1 sloped excavation adjacent to Building 250 was reasonably suspected but AECOM did not perform additional subsoil radioactivity measurements per the requirements of the C-T Phase II DP. Section 11.5 discusses the deviation and it was presented that if the contaminated soil was thicker than 30 cm, the dose consequence would not be significant. SU05 meets the industrial use scenario release criterion as established in the C-T Phase II DP Chapter 5; and therefore, satisfies the unrestricted release provisions of Title 10, Code of Federal Regulations (CFR), Part 20, Subpart E.

11.8 REFERENCES

Mallinckrodt, *Mallinckrodt Columbium-Tantalum Phase II Decommissioning Plan*, Revision 2, August 2008.

ENERGYSOLUTIONS

CS-RS-RP-009-16

Phase II Final Status Survey Report
Mallinckrodt Columbium-Tantalum Plant

St. Louis, Missouri

Chapter 16

Project No. 137131 **Revision 0**

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- [X] Non-Proprietary
- [ ] Proprietary
- [ ] Restricted Information
- [ ] Safeguards Information
- [ ] Sensitive Security Information

- [X] New
- [ ] Title Change
- [ ] Revision
- [ ] Rewrite
- [ ] Cancellation

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ABBREVIATIONS AND ACRONYMS

σ	sigma; standard deviation
AECOM	AECOM Technical Services
bgs	below grade surface
C-T	columbium-tantalum
CFR	Code of Federal Regulations
cm	centimeter
cpm	counts per minute
DCGL	derived concentration guideline level
DP	decommissioning plan
DQO	data quality objectives
EMC	elevated measurement comparison
Energy*Solutions*, LLC	Energy*Solutions*
F	exposure-weighted fraction of the $DCGL_W$
FSS	Final Status Survey
FSSR	Final Status Survey Report
ft	feet
GPS	global positioning system
GWS	gamma walk-over survey
m	meters
m^2	square meters
MARSSIM	Multi-Agency Radiation and Site Investigation Manual (NUREG-1575)
MDC	minimum detectable concentration
NIST	National Institute of Standards and Technology
NRC	U.S. Nuclear Regulatory Commission
pCi/g	picoCuries per gram
Ra	radium
SOF	sum of fractions
Th	thorium
U	uranium
Unc.	uncertainty
WRS	Wilcoxon Rank Sum

16.0 RESULTS SUMMARY FOR PLANT 5 SUBSURFACE SU10

This chapter of the Final Status Survey Report (FSSR) presents the results of the final status survey (FSS) and data assessment for Plant 5 subsurface survey unit SU10 in accordance with Columbium-Tantalum (C-T) Phase II Decommissioning Plan (DP) Section 14.5. The majority of FSS for this Class 1 survey unit was performed by Energy*Solutions*, LLC (Energy*Solutions*) in October of 2012 and completed in December. The SU10 data assessment was performed based on the assumptions, methods, and performance criteria established to satisfy the data quality objectives (DQOs) in accordance with the C-T Phase II DP Section 14.4.3.8. The summary statistics provide numerical values for measures of central tendency (i.e., mean, median), variation (i.e., standard deviation), and spread (i.e., minimum, maximum). Data evaluation and statistical analyses were performed and a separate decision was made for each survey unit of the C-T Plant as to its suitability for release for unrestricted use based upon the industrial use scenario release criterion as established in C-T Phase II DP Chapter 5.

16.1 OVERVIEW

SU10 is a Class 1 survey unit in the southwest portion of C-T Plant 5. The survey unit is approximately 743 square meters (m^2) in size, which is less than the size limit of 3,000 m^2 for Class 1 survey units for subsurface material (per C-T Phase II DP, Table 14-4). Class 1 was the appropriate classification because the survey unit contained residual radioactivity that exceeded the derived concentration guideline value ($DCGL_W$) prior to remediation. Figure 16-1 shows the location of SU10 within the Plant 5 area while Figure 16-2 depicts features within the survey unit, the extent of excavation and the locations and direction of photographs taken as presented in the following subsections to facilitate the text.

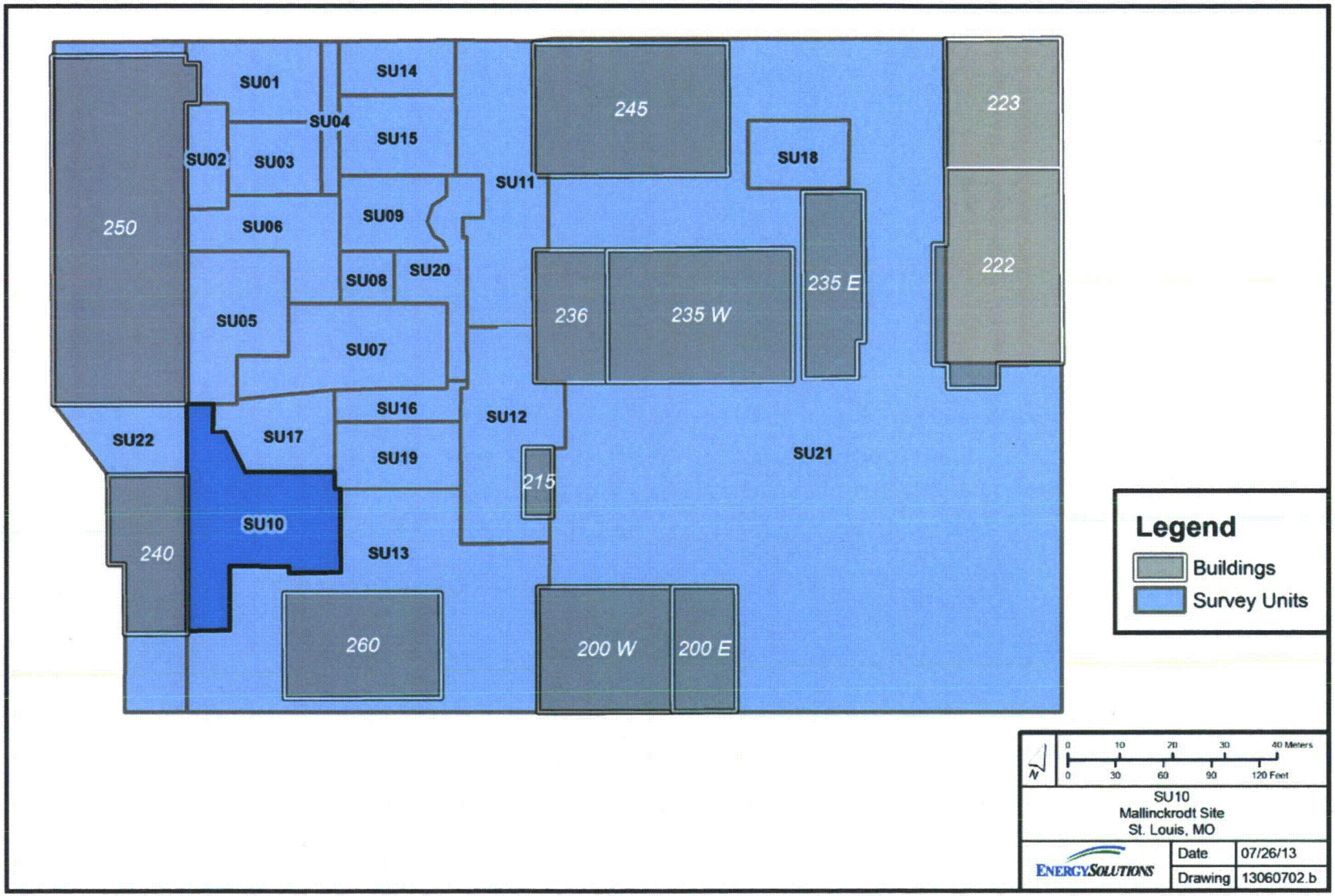

Figure 16-1 Location of SU10 in C-T Plant 5

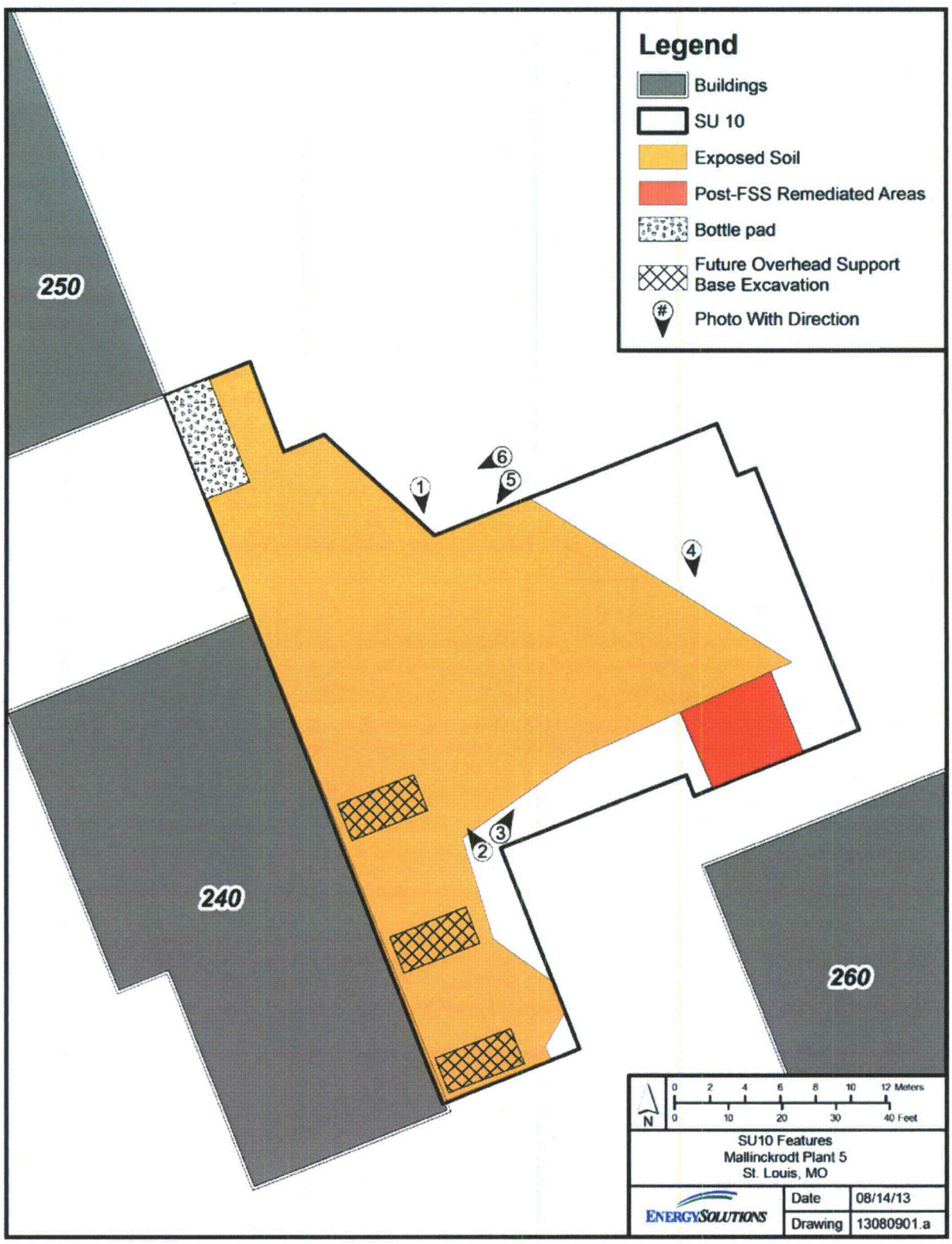

Figure 16-2 SU10 Feature Diagram

16.1.1 General Excavation

Figure 16-3 through Figure 16-5 are photographs of the SU10 general excavation that were taken during FSS following remediation in October of 2012 with the position and orientation of the photographs provided on Figure 16-2. Figure 16-3 (photograph 1), as viewed from the northern edge of the excavation shows the southeast corner of Building 240 to the right. Figure 16-4 (photograph 2), as viewed from the south side of the excavation looking northwest shows the northeast corner of Building 240 to the left as well as the alley between Buildings 240/250 and the Building 250 bottle pad. Figure 16-5 (photograph 3), taken from the same location as Figure 16-4 shows the excavation looking northeast toward Buildings 236/245.

General excavation depths ranged from 1 to approximately 9 feet (ft) below grade surface (bgs). The majority of the excavation ranged between 3 to 6 ft bgs as shown in the figures. The center of the excavation near the north east corner of Building 240 was the deepest at approximately 9 feet bgs within the clay layer as shown in Figure 16-4. Three additional pits were excavated along Building 240 toward the south as provided in Figure 16-2 in support of the construction of new overhead piping supports.

During excavation, two active manholes were removed from in front of the Building 240/250 alley (one sanitary and one storm sewer) as well as a combination sewer line. Upon backfill, new manholes and sewer line were installed.

Figure 16-3 Photograph (1) of SU10 at Time of FSS (South View)

Figure 16-4 Photograph (2) of SU10 at Time of FSS (Northwest View)

Figure 16-5 Photograph (3) of SU10 at Time of FSS (Northeast View)

16.1.2 SU13 Systematic Sample Location 5

During FSS and core boring of SU13 in December of 2012, a small area of subsurface contamination was identified directly adjacent to SU10 near the northwest corner of Building 260 in the general vicinity of the combination sewer. Contamination was identified at systematic sample location 5 within SU13 between 0-2 meters (m) bgs which was bounded by corebores that were collected to the east and west. This small area was subsequently segregated from SU13 due to its proximity to SU10 as shown in Figure 16-6. SU10 was expanded south to capture the area which was then remediated to an approximate depth of 5 ft bgs. Figure 16-2 shows the location of the post FSS remediation performed as part of SU10.

Figure 16-6 Photograph (4) of SU13 Systematic Sample Location 5

16.2 DATA COLLECTION

Data collection was performed based on the assumptions, methods, and performance criteria established to satisfy the DQOs in accordance with the C-T Phase II DP, Sections 14.4.1 and 14.4.3. Details regarding FSS design and quality assurance and quality control applicable to all survey units were discussed in Chapters 4 and 5, respectively, of this FSSR. FSS data as collected for SU10 is summarized as follows:

16.2.1 Gamma Scans

A gamma walk-over survey (GWS) was performed over the entire survey unit to the maximum extent practical in order to locate radiation anomalies that might indicate areas with elevated residual radioactivity where further data collection (i.e., biased soil sampling) was warranted. In general, global positioning system (GPS) coverage was good for SU10 with limited signal near Building 240 toward the Building 240/250 alley. The deepest area of excavation as shown in Figure 16-4 near the northwest corner of Building 240 was not scanned as part of the GWS due to standing water. This area was excavated to the clay layer and was surveyed as much as possible with no elevated readings noted by the surveyor. Additional inaccessible areas included locations where concrete barriers were placed for vehicle traffic safety and clean fill from the prior excavation of SU17.

Figure 16-7 provides the GWS scan results and survey unit coverage. The GWS was performed over both the exposed soil of the general excavation and the remaining asphalt. The recorded survey results ranged from 3,840 to 18,300 counts per minute (cpm) with a mean of 6,700 cpm and a median of 6,300 cpm for asphalt. The elevated readings associated with asphalt were along the edges of the general excavation and were elevated because of the proximity to soil. The recorded survey results within the excavation over soil ranged from 1,740 to 198,000 cpm with a mean of 16,500 cpm and a median of 15,000 cpm. The elevated readings for soil were concentrated along the western edge of the excavation, particularly near the northwest corner of Building 240, the alley between Building 240/250 and the Building 250 bottle pad. Upon further investigation, it was determined that these elevated readings were due to contamination along the face of the vertical wall. The characterization of the west wall is discussed within Section 16.2.4.

16.2.2 Soil Sampling

Soil samples to be used for the statistical testing were collected at a frequency and at representative locations throughout SU10 such that a statistically sound conclusion regarding the radiological condition of the survey unit could be developed. Biased soil samples were also collected at locations of elevated residual radioactivity identified by GWS. Samples within the excavation and exposed soil consisted of 30-centimeter (cm) surface samples. Samples outside the excavation consisted of the top 1-m composite from the core bore samples as footnoted in the data tables and as shown in the figures in red text. The FSS soil sampling locations are provided on Figure 16-7 and Figure 16-8. A total of 34 soil samples were collected throughout SU10, 28 over the areal footprint of SU10 (15 systematic and 13 GWS biased) and 6 within the remediation area of the former survey unit SU13 systematic Location 05 (1 systematic, 2 bounding and 3 biased).

All soil samples were analyzed on site via gamma spectroscopy analysis. Any remaining sieved material from each sample was analyzed separately to verify residual radioactivity was consistent with sample results. The radiological screening process did not identify any significant levels of radioactivity in the sieved materials removed from samples.

The C-T Phase II DP, Table 4-17, provided mean background activity levels of 1.3, 2.5, and 4.4 picoCuries per gram (pCi/g) for thorium-232 (^{232}Th), radium-226 (^{226}Ra), and uranium-238 (^{238}U), respectively. These values were used to calculate net sum of fractions (SOF) values for

the individual sample results—note that when measured activity concentration levels were less than the background mean resulting in a negative value, the net activity concentration was set equal to zero for the net SOF calculation.

To mitigate the risk of backfilling, the on-site laboratory analytical results were reviewed to determine the likelihood of the survey unit failing to meet the criteria for radiological release. The on-site laboratory, by design, reported conservative sample results.

Table 16-1 provides the sample results and summary statistics for the 15 systematic samples as well as the former SU13 systematic sample location 5. Table 16-2 provides the sample results for the 13 GWS biased samples. Table 16-3 provides the sample results for the bounding samples to the east and west of the former SU13 systematic sample location 5. Table 16-4 provides the sample results for the 3 biased samples take following the remediation of the former SU13 systematic sample location 5.

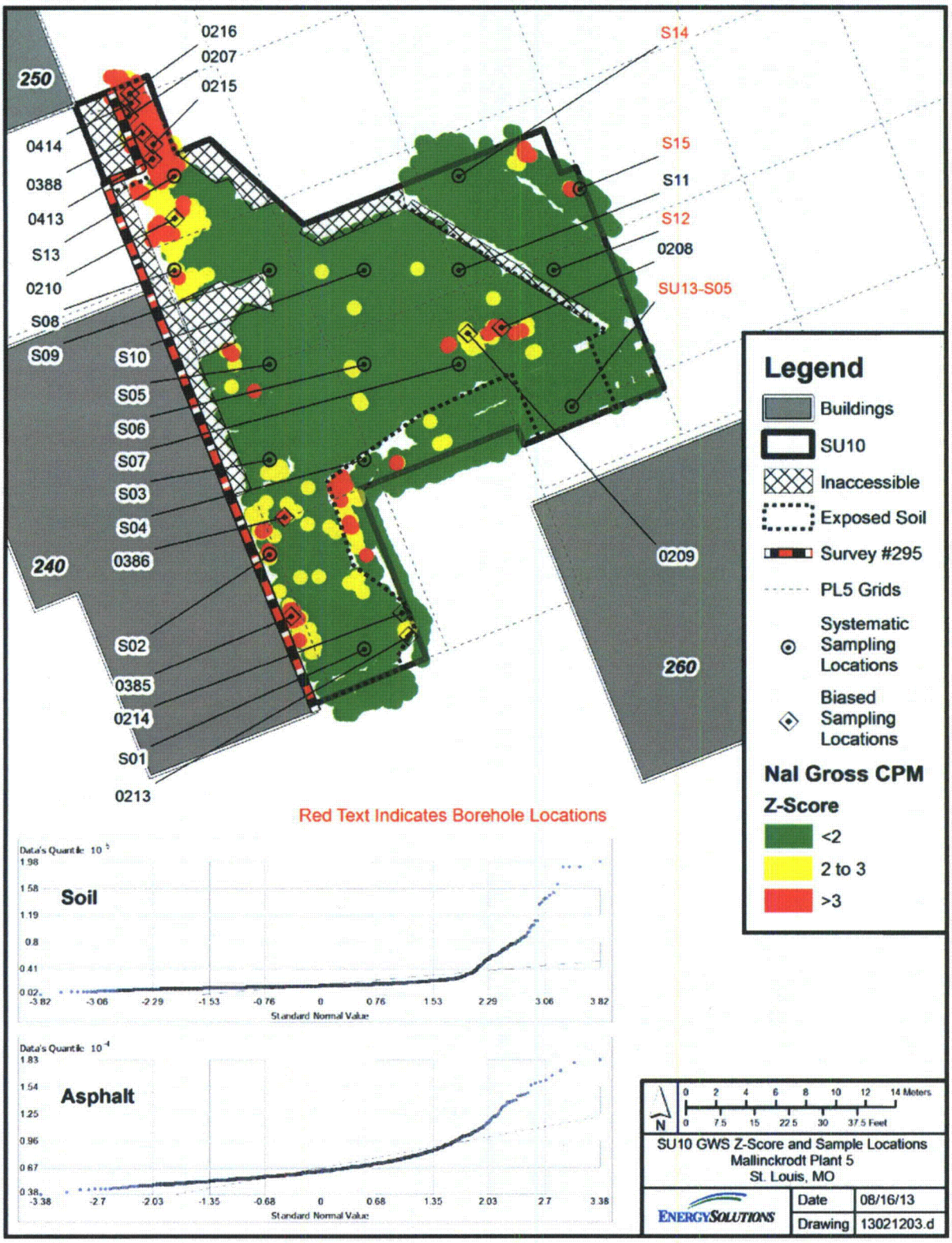

Figure 16-7 GWS and Soil Sampling Locations

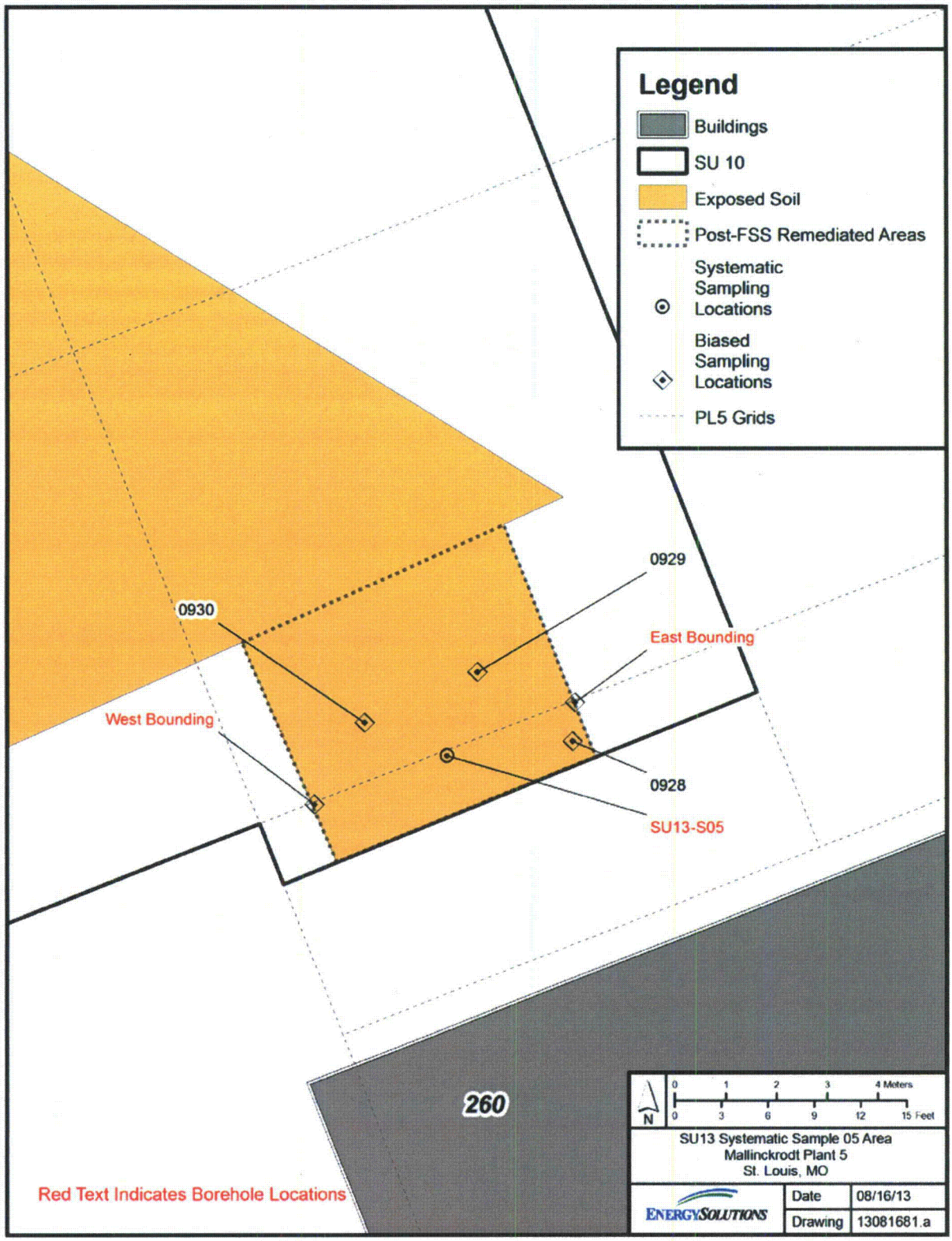

Figure 16-8 Former SU13 Systematic Sample Location 5 Soil Sampling Locations

Table 16-1 Gamma Spectroscopy Systematic Sample Analytical Results

Loc.	Sample ID	Depth (ft bgs)	On-Site Results											Off-Site Results [a]											On-Site/ Off-Site Gross SOF Ratio
			Activity Concentration (pCi/g) [b]									SOF [c]		Activity Concentration (pCi/g) [b]									SOF [c]		
			^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U					
			Result	Unc. (2σ)	MDC	Result	Unc. (2σ)	MDC	Result	Unc. (2σ)	MDC	Gross	Net [d]	Result	Unc. (2σ)	MDC	Result	Unc. (2σ)	MDC	Result	Unc. (2σ)	MDC	Gross	Net [d]	
S01	0195	4	*0.87*	0.20	0.90	6.15	1.51	1.07	10.26	0.98	0.81	0.26	0.13	0.63	0.21	0.33	3.30	0.45	0.16	10.00	1.62	2.95	0.15	0.03	1.71
S02	0196	3	1.47	0.39	0.20	17.52	2.62	1.73	21.87	1.79	1.57	**0.69**	**0.54**	1.33	0.37	0.27	6.51	0.84	0.22	25.00	3.22	3.58	0.31	0.17	2.21
S03	0197	4	0.90	0.19	0.79	2.00	0.84	0.59	1.91	0.63	0.70	0.11	0.00	0.56	0.25	0.32	1.39	0.27	0.14	*1.39*	0.84	2.38	0.07	0.00	1.50
S04	0198	1	1.00	0.28	0.85	2.33	1.01	0.72	2.62	0.69	0.65	0.12	0.00	1.02	0.23	0.10	1.66	0.29	0.15	3.02	1.75	2.28	0.10	0.00	1.21
S05	0199	8	1.12	0.22	0.13	4.21	1.01	0.64	3.02	0.60	0.61	0.19	0.06	0.77	0.25	0.33	2.03	0.36	0.18	5.09	1.29	2.65	0.11	0.00	1.79
S06	0200	5	0.92	0.27	0.12	8.53	1.08	1.15	11.00	1.09	0.98	0.34	0.21	0.96	0.25	0.28	4.41	0.58	0.18	11.50	2.84	3.01	0.21	0.07	1.67
S07	0201	3	2.06	0.45	0.13	15.67	2.87	1.99	29.53	1.94	1.23	**0.66**	**0.51**	2.29	0.56	0.27	4.83	0.79	0.34	32.50	4.66	6.03	0.31	0.16	2.16
S08	0387	7	8.69	0.61	0.21	8.23	1.59	1.10	7.63	2.14	0.96	**0.65**	**0.51**	8.96	1.16	0.28	5.24	0.69	0.34	7.30	3.33	4.06	**0.56**	0.42	1.16
S09	0203	6	1.21	0.26	0.16	6.30	1.46	0.98	7.25	0.94	0.89	0.27	0.13	1.39	0.40	0.29	3.34	0.57	0.29	11.70	3.25	3.44	0.19	0.04	1.46
S10	0204	5	0.94	0.21	0.12	10.80	1.79	1.19	13.10	1.18	1.00	0.42	0.29	1.34	0.36	0.23	3.61	0.49	0.15	14.30	3.23	3.11	0.20	0.05	2.14
S11	0205	5	0.97	0.26	0.86	3.46	1.14	0.82	4.39	0.70	0.74	0.16	0.03	0.62	0.22	0.28	1.75	0.30	0.11	3.58	0.94	1.96	0.09	0.00	1.82
S12	0229	0 [e]	*0.78*	0.25	0.90	3.06	1.20	0.89	4.17	0.89	0.54	0.14	0.02	0.70	0.27	0.41	2.02	0.37	0.21	6.01	1.23	2.38	0.11	0.00	1.34
S13	0206	6	1.61	0.35	0.13	9.74	2.02	1.24	6.63	1.26	1.36	0.41	0.26	1.96	0.52	0.37	6.95	0.93	0.33	5.66	1.64	4.26	0.33	0.18	1.25
S14	0224	0 [e]	0.64	0.17	0.42	2.53	0.85	0.59	1.73	0.38	0.40	0.12	0.00	*0.07*	0.19	0.65	2.26	0.43	0.24	*1.58*	1.12	2.99	0.08	0.00	1.41
S15	0636	0 [e]	1.29	0.28	0.14	2.96	1.29	0.97	3.83	0.65	0.63	0.16	0.02	0.78	0.25	0.28	2.89	0.42	0.18	5.66	2.35	2.45	0.14	0.02	1.15
SU13 S05 (Sample 0564)		5 [f]	1.65	0.31	0.14	3.63	1.57	1.18	9.16	0.96	0.73	0.21	0.06	Sample not sent to off-site laboratory (gross SOF < 0.5)											
Summary Statistics																									
Count:			16			16			16			16	16	15			15			15			15	15	15
Average:			1.63			6.70			8.63			0.31	0.17	1.56			3.48			9.62			0.20	0.08	1.60
Median:			1.06			5.18			6.94			0.23	0.10	0.96			3.30			6.01			0.15	0.03	1.50
Standard Dev.:			1.92			4.77			7.61			0.20	0.20	2.12			1.77			8.75			0.13	0.11	0.37
Minimum:			0.64			2.00			1.73			0.11	0.00	0.07			1.39			1.39			0.07	0.00	1.15
Maximum:			8.69			17.52			29.53			**0.69**	**0.54**	8.96			6.95			32.50			**0.56**	0.42	2.21
Range:			8.05			15.51			27.80			0.58	0.54	8.89			5.56			31.11			0.49	0.42	1.05

[a] Off-site laboratory results as reported by TestAmerica after sufficient in-growth time to reach ^{226}Ra progeny equilibrium.
[b] Italicized results indicate <MDC.
[c] **Bolded orange** SOF values indicate a result >0.5 but ≤1.
[d] Calculated as discussed in Section 16.2.2.
[e] No excavation was performed at this location. Sample is the first 1-meter segment of the borehole collected at the location.
[f] Sample is the 2-3 m segment of the borehole collected at the location prior to remediation.

Table 16-2 Gamma Spectroscopy Biased Sample Analytical Results

Sample ID	Depth (ft bgs)	On-Site Results											Off-Site Results [a]											On-Site/ Off-Site Gross SOF Ratio
		Activity Concentration (pCi/g) [b]									SOF [c]		Activity Concentration (pCi/g) [b]									SOF [c]		
		^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U					
		Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [d]	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [d]	
0207	6	4.31	0.46	0.16	11.06	2.20	1.54	22.35	1.54	1.04	**0.59**	0.44	4.25	0.64	0.22	2.48	0.42	0.21	27.90	4.81	4.17	0.30	0.16	1.95
0208	3	1.98	0.45	0.18	13.09	3.17	2.34	36.93	2.32	1.39	**0.58**	0.43	1.95	0.39	0.28	4.09	0.62	0.25	40.00	5.15	5.31	0.28	0.13	2.10
0209	4	1.74	0.42	0.20	24.23	4.22	3.04	61.87	3.35	1.70	**0.98**	**0.84**	1.49	0.42	0.46	6.64	0.85	0.27	61.80	7.20	5.55	0.37	0.23	2.63
0210	6	1.79	0.45	0.21	10.56	2.35	1.61	10.97	1.34	1.21	0.45	0.30	1.82	0.46	0.35	6.67	0.82	0.21	12.60	3.31	3.59	0.32	0.17	1.40
0385	4	1.11	0.26	0.10	25.53	3.41	2.39	57.25	3.65	1.39	**0.99**	**0.86**	0.84	0.51	0.77	3.83	0.73	0.41	81.70	10.90	6.47	0.28	0.15	3.57
0386	4	1.58	0.28	0.12	21.64	3.52	2.57	61.87	3.61	1.23	**0.89**	**0.74**	1.72	0.39	0.27	4.68	0.70	0.32	85.50	11.00	6.10	0.35	0.20	2.54
0213	3	1.58	0.48	0.21	22.79	4.80	3.61	82.61	4.26	2.10	**0.96**	**0.81**	1.46	0.53	0.93	6.29	1.01	0.50	103.00	14.60	10.20	0.42	0.27	2.29
0214	3	1.47	0.38	0.19	18.38	3.05	2.13	28.60	2.04	1.56	**0.73**	**0.58**	1.95	0.58	0.52	9.18	1.14	0.31	32.20	5.93	5.31	0.44	0.29	1.66
0215	6	1.72	0.30	0.14	7.69	1.81	1.25	11.96	1.20	1.13	0.35	0.20	1.68	0.37	0.23	2.60	0.40	0.17	13.70	3.29	3.11	0.18	0.03	1.97
0216	6	5.71	0.48	0.14	2.34	1.42	1.10	3.41	2.01	0.93	0.32	0.18	5.25	0.74	0.39	2.10	0.45	0.31	4.48	3.29	4.04	0.30	0.17	1.09
0388	6	28.61	1.41	0.27	10.45	2.53	1.92	16.50	4.36	1.79	**1.58**	**1.43**	26.40	2.88	0.71	6.00	0.81	0.41	15.60	4.89	5.87	**1.33**	**1.18**	1.18
0413	6	1.88	0.37	0.08	5.28	1.90	1.36	9.85	1.20	1.02	0.27	0.13	1.78	0.38	0.25	2.53	0.43	0.15	13.50	3.24	3.19	0.18	0.03	1.52
0414	6	6.85	0.56	0.19	6.07	1.93	1.44	11.70	1.25	1.09	**0.51**	0.36	5.79	0.74	0.23	2.57	0.41	0.24	12.10	3.99	4.29	0.35	0.20	1.47

[a] Off-site laboratory results as reported by TestAmerica after sufficient in-growth time to reach ^{226}Ra progeny equilibrium.
[b] Italicized results indicate <MDC.
[c] **Bolded orange** SOF values indicate a result >0.5 but ≤1 and **bolded red** SOF values indicate a result >1.
[d] Calculated as discussed in Section 16.2.2.

Table 16-3 Gamma Spectroscopy Former SU13 Systematic Sample Location 5 Bounding Sample Analytical Results

Sample Location	Sample ID	Sample Depth (m) [a]	On-Site Results											Off-Site Results [b]											Column SOF [d]	
			Activity Concentration (pCi/g) [c]									Sample SOF [c]		Activity Concentration (pCi/g) [c]									Sample SOF [c]			
			^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U						
			Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [e]	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [e]	Gross	Net [e]
SU13 SYS05 West Bounding	0565	0 - 1	2.11	0.37	0.22	19.51	2.26	1.24	7.59	1.05	0.97	**0.76**	**0.62**	Sample not sent to off-site laboratory (sample inadvertently disposed)											**0.76**	**0.62**
	0566	1 - 2	1.33	0.24	0.12	6.45	1.36	0.87	3.73	0.70	0.68	0.28	0.14	Samples not sent to off-site laboratory (gross SOF < 0.5)											**0.52**	0.38
	0567	2 - 3	1.50	0.33	0.12	3.51	1.23	0.86	3.69	0.64	0.60	0.19	0.04												0.41	0.26
SU13 SYS05 East Bounding	0568	0 - 1	1.39	0.46	0.26	21.75	3.20	2.15	29.73	2.31	1.79	**0.84**	**0.69**	0.58	0.31	0.43	7.59	0.95	0.26	35.70	7.09	6.74	0.33	0.22	0.33	0.22
	0569	1 - 2	1.02	0.20	0.12	16.31	2.70	1.90	32.15	2.52	1.04	**0.64**	**0.51**	0.71	0.26	0.22	2.49	0.37	0.17	34.00	3.97	3.35	0.16	0.04	0.25	0.13
	0570	2 - 3	0.66	0.19	0.10	4.96	1.29	0.91	4.44	0.95	0.52	0.20	0.08	Sample not sent to off-site laboratory (gross SOF < 0.5)											0.23	0.11

[a] Sampling was stopped when native clay soil was reached or refusal encountered.
[b] Off-site laboratory results as reported by TestAmerica after sufficient in-growth time to reach ^{226}Ra progeny equilibrium.
[c] **Bolded orange** SOF values indicate a result >0.5 but ≤1.
[d] Calculated per Section 14.4.3.7 of C-T Phase II DP. Calculation of column SOF used on-site results unless off-site results were available.
[e] Calculated as discussed in Section 16.2.2.

Table 16-4 Gamma Spectroscopy Former SU13 Systematic Sample Location 5 Biased Sample Analytical Results

Sample ID	Depth (ft bgs)	On-Site Results											Off-Site Results [a]											On-Site/ Off-Site Gross SOF Ratio
		Activity Concentration (pCi/g) [b]									SOF [c]		Activity Concentration (pCi/g) [b]									SOF [c]		
		^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U					
		Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [d]	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [d]	
0928	1	1.19	0.31	0.15	16.17	2.60	1.80	16.22	1.63	1.66	**0.62**	0.48	1.00	0.35	0.43	7.99	0.95	0.22	17.40	4.07	4.75	0.34	0.20	1.84
0929	5	1.07	0.29	0.19	10.89	2.51	1.85	28.33	1.72	1.07	0.45	0.32	1.31	0.34	0.15	3.08	0.48	0.18	37.70	5.88	4.48	0.21	0.07	2.15
0930	3	0.95	0.25	0.08	4.71	1.09	0.76	6.95	0.67	0.53	0.21	0.08	0.88	0.22	0.14	0.92	0.18	0.14	8.91	1.46	2.32	0.08	0.01	2.61

[a] Off-site laboratory results as reported by TestAmerica after sufficient in-growth time to reach ^{226}Ra progeny equilibrium.
[b] Italicized results indicate <MDC.
[c] **Bolded orange** SOF values indicate a result >0.5 but ≤1 and **bolded red** SOF values indicate a result >1.
[d] Calculated as discussed in Section 16.2.2.

16.2.3 Core Boring

C-T Phase II DP Tables 4-7, 4-15, and 4-16 provided characterization borehole results. Of the locations provided in the tables, nine were collected within the extent of SU10. Table 16-5 provides the data for these locations.

Table 16-5 Characterization Borehole Results

Location ID	Sample Depth (ft)	Activity Concentration (pCi/g) [a]			SOF [b]	
		^{232}Th	^{226}Ra	^{238}U	Gross	Net [c]
BH-025	2.5 - 3.5	0.66	4.10	81.80	0.28	0.16
	4 - 5	0.71	2.33	65.10	0.20	0.08
	8 - 9	0.76	1.60	76.00	0.19	0.10
BH-026	3 - 4		13.70	8.15	0.48	0.39
	4 - 5	0.48	21.90	17.80	**0.79**	**0.68**
	5 - 6		1.29	13.30	0.06	0.01
	7 - 8		*0.64*	11.30	0.04	0.01
	9 - 10		1.21	*2.23*	0.04	0.00
	12 - 13	0.96	8.50	8.20	0.34	0.21
	15 - 16	1.10	1.20	1.00	0.09	0.00
BH-085	1 - 1.5	0.69	1.48	2.10	0.08	0.00
	3 - 4.5	0.96	1.60	2.89	0.10	0.00
	6 - 7.5	0.45	0.54	0.63	0.04	0.00
	7.5 - 9	0.93	0.55	0.93	0.06	0.00
JA-02	0 - 1	2.16	13.44	89.96	**0.67**	**0.53**
JA-03	0 - 1	3.07	28.08	28.39	**1.12**	**0.98**
JA-04	0 - 1	8.24	132.80	33.46	**4.91**	**4.76**
JA-05	0 - 1	1.95	4.79	26.87	0.28	0.14
JA-06	0 - 1	5.88	242.70	36.27	**8.55**	**8.41**
JA-07	0 - 1	2.50	2.49	51.91	0.26	0.12

[a] Italicized results indicate <MDC. No value indicates no result was provided.
[b] **Bolded orange** SOF values indicate a result >0.5 but ≤1 and **bolded red** SOF values indicate a result >1.
[c] Calculated as discussed in Section 16.2.2.

AECOM Technical Services (AECOM) also collected numerous supplemental characterization core boring samples within the extent of SU10. Table 16-6 provides these results. During the sampling effort, AECOM noted that the clay layer depth ranged between 7 and 16 ft bgs.

Table 16-6 AECOM Supplemental Characterization Borehole Results

Location ID	Sample ID	Sample Depth (m)	Activity Concentration (pCi/g)			Sample SOF [a]		Column SOF [a, b]	
			^{232}Th	^{226}Ra	^{238}U	Gross	Net [c]	Gross	Net [c]
A11-1	4533	0 - 1	1.49	4.64	6.89	0.23	0.08	0.23	0.08
	4534	1 - 2	1.66	5.04	11.65	0.26	0.11	0.24	0.10
	4535	2 - 3	0.88	4.54	14.12	0.21	0.08	0.23	0.09
	4536	3 - 4	0.76	1.83	11.54	0.11	0.01	0.20	0.06
	4537	4 - 5	1.42	1.81	5.85	0.13	0.01	0.19	0.04
B9-2	4675	0 - 1	0.82	1.44	4.38	0.09	0.00	0.09	0.00
	4676	1 - 2	0.90	3.12	4.42	0.15	0.02	0.12	0.00
	4677	2 - 3	1.02	1.68	3.33	0.10	0.00	0.11	0.00
	4678	3 - 4	0.87	0.94	0.93	0.07	0.00	0.10	0.00
	4679	4 - 5	1.09	1.64	1.40	0.10	0.00	0.10	0.00
	4680	5 - 6	1.17	1.81	0.74	0.11	0.00	0.10	0.00
C9-2	4660	0 - 1	0.96	1.68	5.07	0.10	0.00	0.10	0.00
	4661	1 - 2	0.83	1.02	2.45	0.07	0.00	0.09	0.00
	4662	2 - 3	0.76	3.84	16.80	0.19	0.06	0.12	0.01
	4663	3 - 4	0.85	1.14	4.50	0.08	0.00	0.11	0.00
	4664	4 - 5	1.17	0.93	2.28	0.08	0.00	0.11	0.00
C9-6	4691	0 - 1	1.02	1.85	7.33	0.12	0.00	0.12	0.00
	4692	1 - 2	0.77	1.25	3.16	0.08	0.00	0.10	0.00
	4693	2 - 3	0.65	1.83	4.10	0.10	0.00	0.10	0.00
	4694	3 - 4	0.87	2.86	10.73	0.15	0.02	0.11	0.00
	4695	4 - 5	1.06	1.54	2.74	0.10	0.00	0.11	0.00
C10-1	4570	0 - 1	1.31	4.23	10.31	0.21	0.07	0.21	0.07
	4571	1 - 2	1.16	3.40	7.00	0.17	0.03	0.19	0.05
	4572	2 - 3	0.97	2.42	7.74	0.13	0.00	0.17	0.03
	4573	3 - 4	1.34	3.48	12.69	0.19	0.05	0.18	0.04
	4574	4 - 5	1.54	8.19	12.21	0.36	0.21	0.21	0.07
	4575	5 - 6	1.38	9.87	12.81	0.41	0.27	0.25	0.10
C11-1	4518	0 - 1	0.84	1.97	3.33	0.11	0.00	0.11	0.00
	4519	1 - 2	1.32	3.77	2.66	0.19	0.04	0.15	0.01
	4520	2 - 3	1.31	6.48	19.96	0.30	0.16	0.20	0.06
	4521	3 - 4	1.29	1.72	5.38	0.12	0.00	0.18	0.04
	Clay layer reached at 12.25 ft bgs								
C11-2	4522	0 - 1	0.98	2.43	2.16	0.13	0.00	0.13	0.00
	4523	1 - 2	0.88	1.88	1.96	0.10	0.00	0.12	0.00
	4524	2 - 3	1.03	1.74	2.26	0.11	0.00	0.11	0.00
	4525	3 - 4	0.93	1.17	2.41	0.08	0.00	0.10	0.00
	4526	4 - 5	1.13	1.24	3.23	0.09	0.00	0.10	0.00
D9-3	4632	0 - 1	0.86	4.42	4.73	0.19	0.07	0.19	0.07
	Refusal at 5 ft bgs								
D9-3A	4633	0 - 1	0.99	1.85	3.59	0.11	0.00	0.11	0.00
	4634	1 - 2	0.99	2.79	3.31	0.14	0.01	0.13	0.00
	4635	2 - 3	1.20	5.50	14.37	0.26	0.12	0.17	0.03
	4636	3 - 4	5.34	26.94	31.52	**1.18**	**1.04**	0.42	0.28
	4637	4 - 5	0.83	2.31	3.69	0.12	0.00	0.36	0.22
D10-2	Refusal at 2 ft bgs								

Table 16-6 AECOM Supplemental Characterization Borehole Results (continued)

Location ID	Sample ID	Sample Depth (m)	Activity Concentration (pCi/g)			Sample SOF [a]		Column SOF [a, b]	
			^{232}Th	^{226}Ra	^{238}U	Gross	Net [c]	Gross	Net [c]
SA-240-01	4896	0 - 1	3.61	907.99	22.39	**31.07**	**30.92**	**31.07**	**30.92**
	4897	1 - 2	1.83	192.92	28.43	**6.68**	**6.53**	**18.87**	**18.73**
	4902	2 - 3	1.84	158.07	7.45	**5.46**	**5.32**	**14.40**	**14.26**
	--	3 - 4	No recovery						
	4903	4 - 5	1.31	30.12	2.67	**1.08**	**0.94**	**11.07**	**10.93**
SA-240-02	4898	0 - 1	0.79	6.23	6.49	0.25	0.13	0.25	0.13
	4899	1 - 2	0.60	2.77	8.22	0.13	0.01	0.19	0.07
	4904	2 - 3	1.06	2.81	4.13	0.15	0.01	0.18	0.05
	4905	3 - 4	1.14	1.30	3.05	0.10	0.00	0.16	0.03
	4906	4 - 5	1.00	1.49	1.71	0.09	0.00	0.14	0.01
SA-240-03	4900	0 - 1	0.80	10.60	4.73	0.40	0.28	0.40	0.28
	4901	1 - 2	0.53	1.50	2.05	0.08	0.00	0.24	0.12
	4909	2 - 3	1.11	2.21	2.91	0.13	0.00	0.20	0.08
	--	3 - 4	No recovery						
	4910	4 - 5	1.16	1.43	1.67	0.10	0.00	0.18	0.05
SA-240-04	4907	0 - 1	0.84	2.23	2.41	0.11	0.00	0.11	0.00
	4908	1 - 2	0.78	3.32	3.13	0.15	0.03	0.13	0.01
	4911	2 - 3	1.13	1.71	3.58	0.11	0.00	0.12	0.00
	4912	3 - 4	1.11	1.97	2.60	0.12	0.00	0.12	0.00
	4913	4 - 5	0.93	1.41	1.20	0.09	0.00	0.12	0.00
SA-240-05	4914	0 - 1	Field screening indicated very high activity; sample not analyzed						
	--	1 - 2	No recovery						
		2 - 3							
	4917	3 - 4	3.30	526.49	41.86	**18.10**	**17.96**	**18.10**	**17.96**
	4918	4 - 5	1.74	71.74	8.25	**2.52**	**2.38**	**10.31**	**10.17**
SA-240-06	4915	0 - 1	0.87	44.22	5.67	**1.55**	**1.42**	**1.55**	**1.42**
	4916	1 - 2	0.79	8.22	8.02	0.32	0.20	**0.94**	**0.81**
	4919	2 - 3	1.32	2.94	13.36	0.17	0.03	**0.68**	**0.55**
	4920	3 - 4	1.09	2.93	1.90	0.15	0.01	**0.55**	0.41
	4921	4 - 5	0.94	1.28	1.79	0.09	0.00	0.46	0.32
SB-041	4982	0 - 1	1.17	8.53	17.24	0.36	0.22	0.36	0.22
	4983	1 - 2	1.44	6.63	7.48	0.30	0.15	0.33	0.18
	4984	2 - 3	1.34	1.66	2.00	0.12	0.00	0.26	0.11
	4985	3 - 4	1.09	0.98	2.27	0.08	0.00	0.21	0.07
	4986	4 - 5	1.07	1.54	1.49	0.10	0.00	0.19	0.05
SB-042	4987	0 - 1	4.88	45.31	64.59	**1.84**	**1.69**	**1.84**	**1.69**
	4988	1 - 2	5.11	42.26	34.34	**1.70**	**1.55**	**1.77**	**1.62**
	4989	2 - 3	1.18	2.96	21.30	0.18	0.04	**1.24**	**1.09**
	4990	3 - 4	1.14	2.39	10.66	0.14	0.01	**0.96**	**0.82**
	4991	4 - 5	1.14	3.67	8.00	0.18	0.04	**0.81**	**0.66**
SB-043	4992	0 - 1	4.80	38.42	13.44	**1.53**	**1.38**	**1.53**	**1.38**
	4993	1 - 2	2.04	11.83	4.28	0.49	0.35	**1.01**	**0.86**
	--	2 - 3	No recovery						
	4994	3 - 4	1.33	1.80	2.60	0.12	0.00	**0.71**	**0.57**
	4995	4 - 5	1.32	1.54	1.60	0.11	0.00	**0.56**	0.42

Table 16-6 AECOM Supplemental Characterization Borehole Results (continued)

Location ID	Sample ID	Sample Depth (m)	Activity Concentration (pCi/g)			Sample SOF [a]		Column SOF [a, b]	
			^{232}Th	^{226}Ra	^{238}U	Gross	Net [c]	Gross	Net [c]
SB-044	4996	0 - 1	0.65	2.64	1.01	0.12	0.00	0.12	0.00
	4997	1 - 2	0.85	13.63	5.73	**0.51**	0.38	0.31	0.19
	--	2 - 3	No recovery						
	4998	3 - 4	1.18	1.78	1.43	0.11	0.00	0.25	0.12
	4999	4 - 5	1.29	1.37	2.99	0.10	0.00	0.21	0.08
SB-045	6500	0 - 1	0.77	27.17	81.34	**1.07**	**0.95**	**1.07**	**0.95**
	6501	1 - 2	0.78	4.76	18.02	0.22	0.10	**0.64**	**0.52**
	6502	2 - 3	1.00	2.81	4.67	0.14	0.01	0.48	0.35
	6503	3 - 4	1.18	2.91	7.14	0.16	0.02	0.40	0.27
	6504	4 - 5	1.00	1.25	4.36	0.09	0.00	0.34	0.21
SB-046	6505	0 - 1	1.26	87.44	35.84	**3.08**	**2.93**	**3.08**	**2.93**
	6506	1 - 2	0.78	9.33	15.21	0.37	0.25	**1.72**	**1.59**
	6507	2 - 3	1.17	5.41	8.89	0.25	0.11	**1.23**	**1.10**
	6508	3 - 4	1.05	4.46	5.82	0.20	0.07	**0.97**	**0.84**
	6509	4 - 5	1.20	2.40	3.29	0.14	0.00	**0.81**	**0.67**
SB-047	6510	0 - 1	0.68	14.93	38.69	**0.59**	0.47	**0.59**	0.47
	6511	1 - 2	0.90	10.10	12.79	0.40	0.27	0.49	0.37
	6512	2 - 3	1.23	1.35	2.68	0.10	0.00	0.36	0.23
	6513	3 - 4	1.56	2.97	2.51	0.17	0.03	0.31	0.18
	6514	4 - 5	1.21	1.85	1.77	0.12	0.00	0.28	0.14
SB-048	6515	0 - 1	12.39	1,631.40	42.48	**56.07**	**55.92**	**56.07**	**55.92**
	6516	1 - 2	2.26	383.47	58.32	**13.22**	**13.07**	**34.64**	**34.50**
	6517	2 - 3	1.16	4.52	9.61	0.22	0.08	**23.17**	**23.02**
	6518	3 - 4	1.44	31.80	6.07	**1.15**	**1.00**	**17.66**	**17.52**
	6519	4 - 5	1.34	7.62	2.46	0.32	0.18	**14.19**	**14.05**
SB-068	6610	0 - 1	6.13	63.80	67.33	**2.52**	**2.37**	**2.52**	**2.37**
	6611	1 - 2	10.50	63.27	54.01	**2.67**	**2.52**	**2.59**	**2.45**
	6612	2 - 3	19.36	73.60	73.18	**3.41**	**3.27**	**2.87**	**2.72**
	--	3 - 4	No recovery						
		4 - 5							
SB-069	6613	0 - 1	3.81	205.51	387.18	**7.69**	**7.54**	**7.69**	**7.54**
	6614	1 - 2	10.81	57.44	118.48	**2.57**	**2.42**	**5.13**	**4.98**
	--	2 - 3	No recovery						
	6615	3 - 4	1.12	1.89	2.85	0.12	0.00	**3.46**	**3.31**
	6616	4 - 5	1.15	3.67	8.45	0.18	0.05	**2.64**	**2.49**

[a] **Bolded orange** SOF values indicate a result >0.5 but ≤1 and **bolded red** SOF values indicate a result >1.
[b] Calculated per Section 14.4.3.7 of C-T Phase II DP
[c] Calculated as discussed in Section 16.2.2.

In accordance with Page 14-22 of the C-T Phase II DP, FSS core sampling was performed for two reasons: 1) it was reasonably suspected that subsoil contamination existed below the un-excavated areas and 2) to demonstrate that contaminated soil above the DCGLs did not exist under the excavation extent. Energy*Solutions* collected borehole samples at each systematic sample location throughout SU10 as shown in Figure 16-7 with the exception of systematic sample 2 (S02) which was too close to Building 240 to collect. Table 16-7 provides the results of the borehole samples collected at each FSS systematic location. Boreholes located at locations

within the general excavation were performed following remediation. As a result, the initial sample composites as indicated in Table 16-7 reflect that the soil column had been excavated as part of remediation and that background fill would be used for column averaging.

Six additional biased borehole locations were also sampled including the 2 bounding samples around systematic sample location 5 from SU13 as shown in Figure 16-8 and 4 from the general excavation of SU10 as shown in Figure 16-7. Table 16-3 provides the results of the bounding borehole samples while Table 16-8 provides the results for the additional biased boreholes within the general excavation.

In accordance with Table 14-5 of the C-T Phase II DP, the Class 1 subsurface investigation level is the $DCGL_W$ (1 SOF) plus the mean of background (0.15 SOF) plus six standard deviations of background (6 × 0.09 SOF = 0.54 SOF), using data from Tables 4-17 and B-1. This evaluates to a gross SOF of 1.69. All borehole samples were below this investigation level. Figure 16-9 shows a summary of all sampling locations performed including all characterization and FSS samples.

Table 16-7 Gamma Spectroscopy Systematic Borehole Sample Analytical Results

Sample Location	Sample ID	Sample Depth (m) [a]	On-Site Results											Off-Site Results [b]											Column SOF [e]	
			Activity Concentration (pCi/g) [c]									Sample SOF [d]		Activity Concentration (pCi/g) [c]									Sample SOF [d]			
			^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U						
			Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [f]	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [f]	Gross	Net [f]
S01	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No sample											0.15	0.00
	0265	1 - 2	1.06	0.21	0.10	2.78	1.19	0.88	6.84	0.72	0.59	0.15	0.01	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.15	0.01
	0266	2 - 3	1.23	0.23	0.03	5.11	1.49	1.06	9.09	0.90	0.72	0.24	0.10												0.18	0.04
S03	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No sample											0.15	0.00
	0301	1 - 2	1.01	0.23	0.06	1.73	0.84	0.60	1.56	0.45	0.45	0.10	0.00	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.12	0.00
	0302	2 - 3	1.29	0.23	0.10	1.56	0.84	0.61	2.52	0.56	0.58	0.11	0.00												0.12	0.00
S04	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No sample											0.15	0.00
	0296	1 - 2	0.69	0.26	0.10	2.01	0.89	0.63	2.12	0.51	0.50	0.10	0.00	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.12	0.00
	0297	2 - 3	1.42	0.29	0.06	1.93	0.96	0.70	2.49	0.48	0.48	0.13	0.01												0.12	0.00
S05	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No samples											0.15	0.00
		1 - 2										0.15	0.00												0.15	0.00
	0258	2 - 3	1.22	0.24	0.08	3.00	1.23	0.91	6.01	0.76	0.69	0.16	0.02	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.15	0.01
	0259	3 - 4	1.41	0.25	0.06	2.76	1.33	1.00	5.15	0.74	0.67	0.16	0.01												0.15	0.01
S06	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No sample											0.15	0.00
	0250	1 - 2	0.68	0.17	0.07	2.03	1.26	0.97	6.42	0.61	0.44	0.11	0.00	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.13	0.00
	0251	2 - 3	1.48	0.24	0.09	2.17	0.98	0.71	2.60	0.62	0.61	0.14	0.01												0.13	0.00
S07	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No sample											0.15	0.00
	0254	1 - 2	0.43	0.13	0.03	2.34	0.95	0.71	4.62	0.75	0.38	0.10	0.00	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.12	0.00
	0255	2 - 3	0.96	0.21	0.12	1.37	0.89	0.68	3.06	0.49	0.46	0.09	0.00												0.11	0.00
S08	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No samples											0.15	0.00
		1 - 2										0.15	0.00												0.15	0.00
	0291	2 - 3	1.55	0.26	0.06	2.67	0.94	0.64	1.83	0.58	0.49	0.16	0.02	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.15	0.01
	0292	3 - 4	1.32	0.26	0.09	1.87	0.88	0.63	1.69	0.42	0.44	0.12	0.00												0.14	0.00
S09	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No samples											0.15	0.00
		1 - 2										0.15	0.00												0.15	0.00
	0300	2 - 3	1.14	0.22	0.10	2.10	0.85	0.60	1.79	0.47	0.39	0.12	0.00	Sample not sent to off-site laboratory (gross SOF < 0.5)											0.14	0.00
S10	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No sample											0.15	0.00
	0298	1 - 2	1.07	0.21	0.06	2.21	0.84	0.59	2.32	0.47	0.47	0.12	0.00	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.13	0.00
	0299	2 - 3	1.33	0.25	0.09	1.62	0.85	0.63	2.08	0.53	0.46	0.11	0.00												0.13	0.00
S11	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No sample											0.15	0.00
	0256	1 - 2	0.78	0.18	0.07	3.10	1.09	0.80	4.67	0.72	0.41	0.14	0.02	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.15	0.01
	0257	2 - 3	1.40	0.31	0.09	2.05	1.14	0.86	3.60	0.66	0.64	0.13	0.00												0.14	0.00
S12	0229	0 - 1	*0.78*	0.25	0.90	3.06	1.20	0.89	4.17	0.89	0.54	0.14	0.02												0.14	0.02
	0230	1 - 2	1.34	0.27	0.10	6.92	2.26	1.69	19.09	1.38	0.91	0.32	0.17												0.23	0.09
	0231	2 - 3	1.11	0.25	0.93	3.35	1.45	1.09	7.54	0.80	0.64	0.17	0.03												0.21	0.07
	0232	3 - 4	1.19	0.23	0.13	2.40	1.10	0.82	4.02	0.59	0.57	0.14	0.00												0.19	0.05
	0233	4 - 5	1.32	0.31	0.18	2.03	1.28	0.98	4.18	0.62	0.54	0.13	0.00												0.18	0.04
S13	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No samples											0.15	0.00
		1 - 2										0.15	0.00												0.15	0.00
	0262	2 - 3	1.43	0.30	0.19	10.22	1.63	0.97	5.35	0.91	0.81	0.41	0.27	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.24	0.09
	0263	3 - 4	1.04	0.29	0.16	2.11	1.16	0.88	3.84	0.66	0.63	0.12	0.00												0.21	0.06
	0264	4 - 5	1.56	0.26	0.08	2.55	0.77	0.50	1.85	0.54	0.46	0.15	0.01												0.20	0.05
S14	0224	0 - 1	0.64	0.17	0.42	2.53	0.85	0.59	1.73	0.38	0.40	0.12	0.00												0.12	0.00
	0225	1 - 2	1.51	0.34	0.16	5.27	1.81	1.35	9.99	1.03	0.98	0.26	0.11												0.19	0.05
	0226	2 - 3	1.06	0.23	0.93	3.05	1.14	0.83	3.61	0.52	0.44	0.15	0.02												0.17	0.04
	0227	3 - 4	1.09	0.27	0.65	2.41	1.11	0.81	3.22	0.63	0.63	0.13	0.00												0.16	0.03
	0228	4 - 5	1.12	0.26	0.67	1.41	0.70	0.50	1.47	0.35	0.38	0.10	0.00												0.15	0.01

Table 16-7 Gamma Spectroscopy Systematic Borehole Sample Analytical Results (continued)

Sample Location	Sample ID	Sample Depth (m) [a]	On-Site Results											Off-Site Results [b]											Column SOF [e]	
			Activity Concentration (pCi/g) [c]									Sample SOF [d]		Activity Concentration (pCi/g) [c]									Sample SOF [d]			
			^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U						
			Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [f]	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [e]	Gross	Net [f]
S15	0636	0 - 1	1.29	0.28	0.14	2.96	1.29	0.97	3.83	0.65	0.63	0.16	0.02	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.16	0.02
	0637	1 - 2	1.26	0.22	0.03	1.16	1.05	0.81	2.74	0.58	0.54	0.10	0.00												0.13	0.00
	0638	2 - 3	0.83	0.22	0.07	0.88	1.16	0.92	3.90	0.60	0.51	0.07	0.00												0.11	0.00
	0639	3 - 4	1.26	0.28	0.10	5.72	2.16	1.62	13.65	1.21	0.83	0.27	0.12												0.15	0.01
	0640	4 - 5	7.57	0.76	0.43	36.88	4.69	3.07	29.00	2.80	1.55	**1.61**	**1.47**	6.50	0.90	0.58	28.70	3.13	0.39	29.40	6.26	6.43	**1.29**	**1.14**	0.38	0.23
SU13 S05	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No samples											0.15	0.00
		1 - 2										0.15	0.00												0.15	0.00
	0564	2 - 3	1.65	0.31	0.14	3.63	1.57	1.18	9.16	0.96	0.73	0.21	0.06	Sample not sent to off-site laboratory (gross SOF < 0.5)											0.17	0.02

[a] When borehole samples were collected from remediated areas, for example Location 1 which was remediated down to 5 ft bgs, samples were assigned to the nearest one-meter increment. Sampling was stopped when native clay soil was reached or refusal encountered.
[b] Off-site laboratory results as reported by TestAmerica after sufficient in-growth time to reach ^{226}Ra progeny equilibrium.
[c] Italicized results indicate <MDC.
[d] **Bolded red** SOF values indicate a result >1.
[e] Calculated per Section 14.4.3.7 of C-T Phase II DP. Calculation of column SOF used on-site results unless off-site results were available.
[f] Calculated as discussed in Section 16.2.2.

Table 16-8 Gamma Spectroscopy Biased Borehole Sample Analytical Results

Sample Location	Sample ID	Sample Depth (m) [a]	On-Site Results											Off-Site Results [b]											Column SOF [d]	
			Activity Concentration (pCi/g) [c]									Sample SOF [e]		Activity Concentration (pCi/g) [c]									Sample SOF [e]			
			^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U						
			Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [e]	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [e]	Gross	Net [e]
B02 (0208) [f]	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No sample											0.15	0.00
	0252	1 - 2	1.75	0.40	0.19	8.73	2.41	1.78	21.05	1.54	1.07	0.40	0.25	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.27	0.13
	0253	2 - 3	1.30	0.25	0.14	4.12	1.41	1.03	9.18	0.92	0.78	0.21	0.06												0.25	0.11
B04 (0210) [f]	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No samples											0.15	0.00
		1 - 2										0.15	0.00												0.15	0.00
	0293	2 - 3	1.79	0.34	0.17	9.23	1.92	1.28	9.05	0.94	0.81	0.40	0.26	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.23	0.09
	0294	3 - 4	1.16	0.26	0.09	2.32	1.08	0.79	2.86	0.58	0.54	0.13	0.00												0.21	0.06
	0295	4 - 5	1.53	0.28	0.09	2.09	0.80	0.55	2.02	1.23	0.52	0.14	0.01												0.19	0.05
B05 (0385) [f]	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No sample											0.15	0.00
	0303	1 - 2	0.56	0.15	0.05	8.79	2.01	1.52	15.61	1.51	0.66	0.34	0.23	Sample not sent to off-site laboratory (gross SOF < 0.5)											0.24	0.11
	0304	2 - 3	1.08	0.24	0.13	21.73	3.91	2.88	78.72	3.83	1.50	**0.89**	**0.76**	0.55	0.35	0.45	1.13	0.36	0.32	115.00	14.20	6.64	0.22	0.15	0.24	0.11
B08 (0214) [f]	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No sample											0.15	0.00
	0260	1 - 2	0.86	0.21	0.08	6.09	1.52	1.10	10.56	1.43	0.71	0.26	0.13	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.20	0.07
	0261	2 - 3	1.41	0.25	0.12	5.39	1.73	1.29	15.51	1.21	0.88	0.26	0.12												0.22	0.08

[a] Sampling was stopped when native clay soil was reached or refusal encountered.
[b] Off-site laboratory results as reported by TestAmerica after sufficient in-growth time to reach ^{226}Ra progeny equilibrium.
[c] **Bolded orange** SOF values indicate a result >0.5 but ≤1.
[d] Calculated per Section 14.4.3.7 of C-T Phase II DP. Calculation of column SOF used on-site results unless off-site results were available.
[e] Calculated as discussed in Section 16.2.2.
[f] Corresponding biased sample location as provided in Figure 16-7

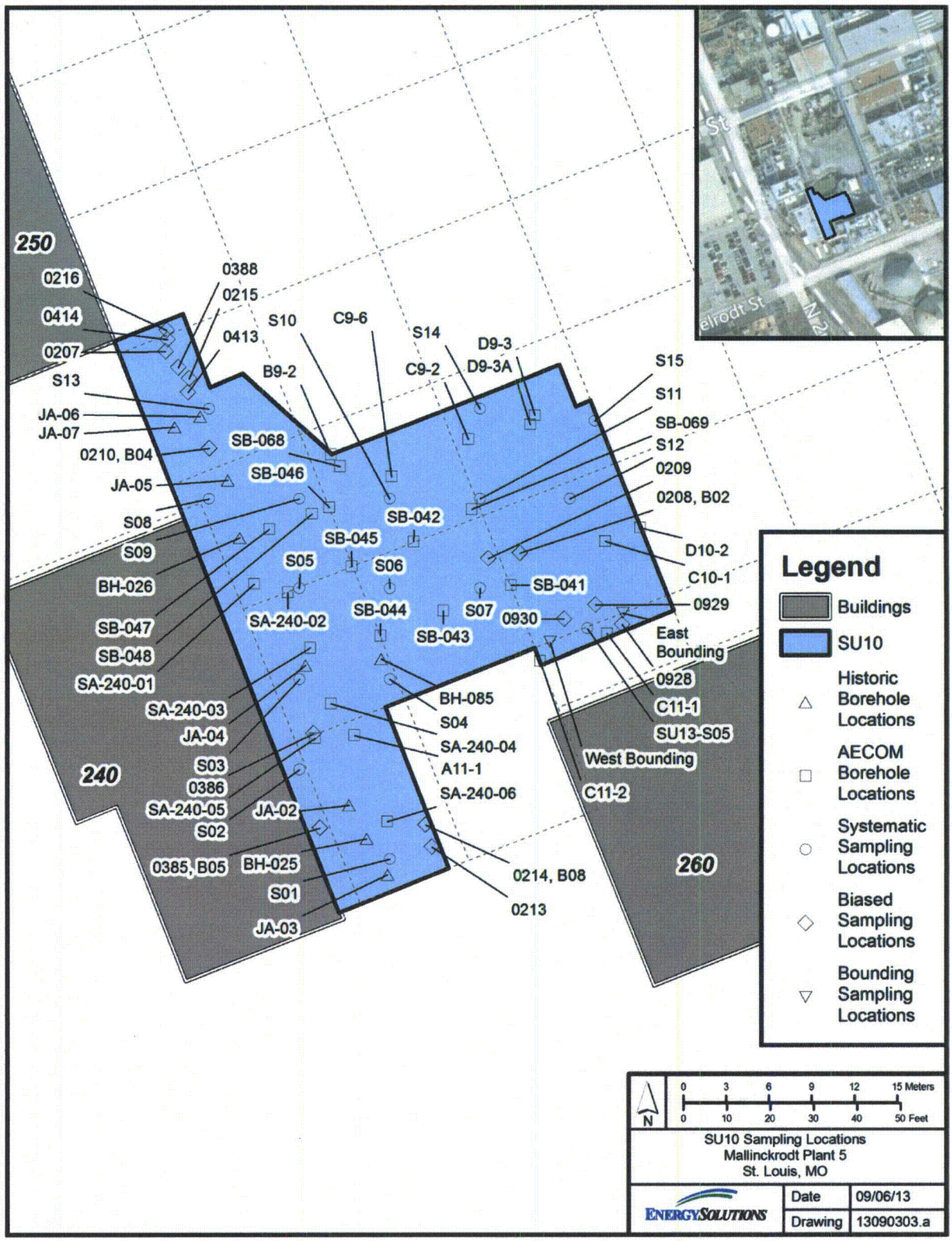

Figure 16-9 Characterization and FSS Sampling Locations

16.2.4 Characterization of West Wall

As shown in the Figure 16-10 and Figure 16-11 (photographs 5 and 6), SU10 was excavated directly along Building 240 and across the alley to the Building 250 bottle pad with a nearly vertical surface. Following excavation and during FSS, elevated measurements were identified along the west edge of the excavation. Contaminated soil remains along the west wall, which is considered part of survey unit SU22 as it extended beyond the SU10 west boundary. The bottom of the excavation was verified free of contamination.

Surveys were performed along the vertical wall of the excavation and samples collected. The wall was gridded using a 1-m grid and a 1 minute scalar count recorded for each grid. Figure 16-12 provides the gamma survey results for the west wall as exposed during the remediation of SU10. Each grid of the gamma survey was color coded to highlight the elevated readings. The darkest blue represents the minimum value and brightest orange represents the maximum value. The actual hue of the color varied based on the recorded value, with green representing the median value in the color scaling. Below the Building 240 footer, gamma levels ranged from 12,901 counts per minute (cpm) to 142,482 cpm. Along the alleyway on the north side of Building 240, gamma levels ranged from 27,657 cpm to 283,112 cpm. Along the east and south sides of the bottle pad (north end of alleyway between Buildings 240 and 250), gamma levels ranged from 26,311 cpm to 198,995 cpm.

A total of nine biased samples were collected from the west wall. Figure 16-13 shows the survey grids from which the samples were collected. Table 16-9 provides the sample results.

Figure 16-10 Photograph (5) of SU10 West Wall – South End

Figure 16-11 Photograph (6) of SU10 West Wall – North End

Building 240 Footer

South End of Building

bgs (m)																		
0 - 1	13,908	13,960	23,624	18,182	12,901	24,135	28,820	22,334	20,945	18,985	14,827	26,124	17,503	24,096	23,103	17,084	Sewer Pipe 19,625	85,892
1 - 2	15,361	X	X	X	X	X	X	X	18,779	20,506	X	X	X	X	X	X	18,859	22,526

Building 240 Footer (continued)

North End of Building

bgs (m)															
0 - 1	27,773	41,430 18,711	15,549	14,229	13,709	13,454	13,619	14,183	16,623	22,796	37,610	142,482	90,371	37,039	28,470
1 - 2	22,284	X	X	X	X	13,872	13,326	X	14,794	14,464	33,957	38,272	38,933	X	X

Alleyway on North Side of Building 240

bgs (m)								
0 - 1	275,598	77,810	89,601	256,547	101,785	139,926	85,000	283,112
1 - 2	63,285	27,657	30,788	Water Pipe 35,363	57,510	X	X	X

Bottle Pad

bgs (m)										
0 - 1	79,588	35,463	110,338	31,585	39,461	111,906	63,431	82,179	198,995	66,982
1 - 2	X	X	26,311	53,919	36,414	136,332	66,716	117,601	184,673	71,249

SOUTH SIDE	EAST SIDE

Represents approximately a 1 m by 1 m grid

X Measurement not collected

(measurements in cpm)

Figure 16-12 Gamma Survey (#0295) of West Wall (SU22)

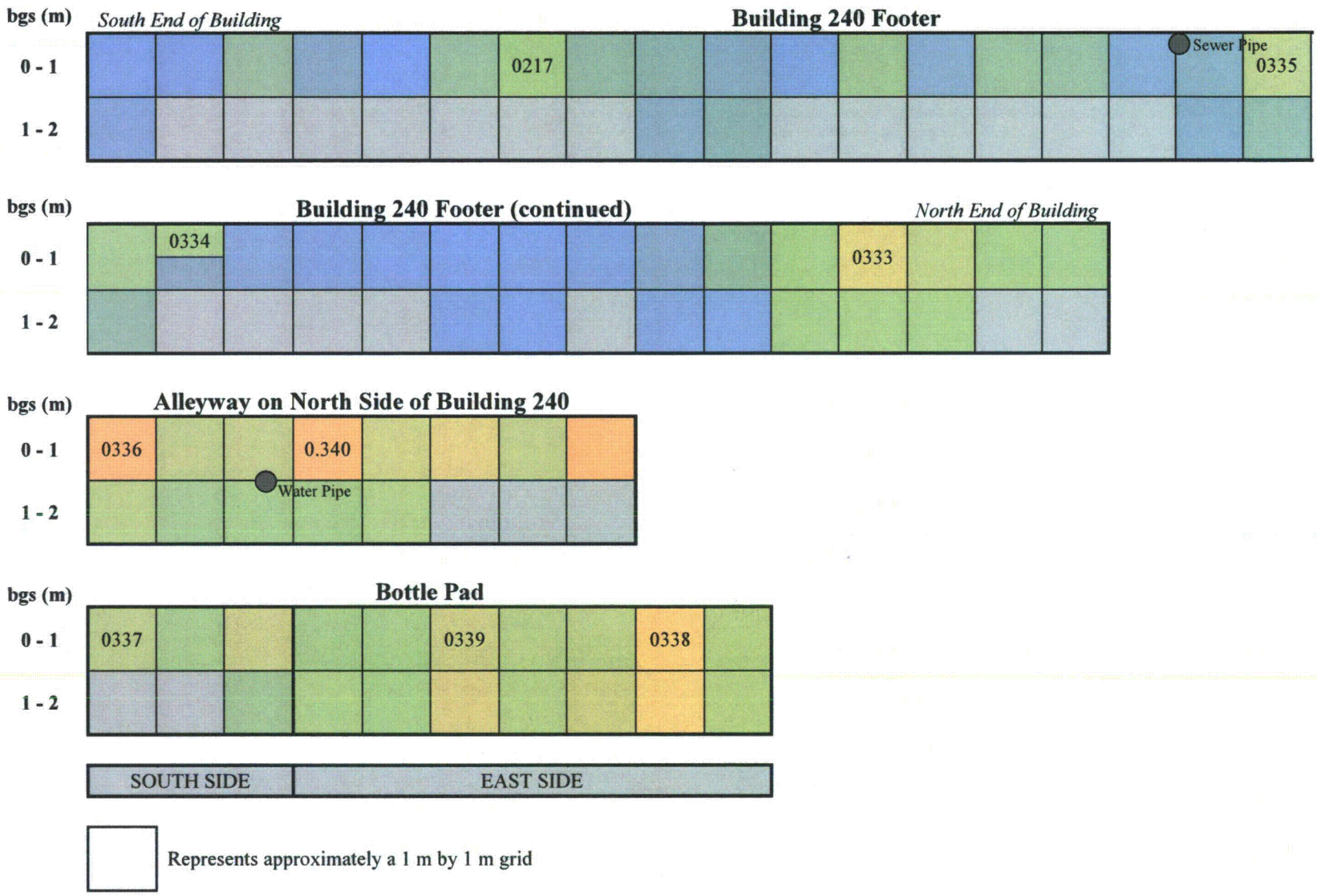

Figure 16-13 Characterization Samples of West Wall (SU22)

Table 16-9 Gamma Spectroscopy West Wall (SU22) Characterization Sample Analytical Results

Sample ID	Depth (ft bgs)	On-Site Results											Off-Site Results [a]											On-Site/ Off-Site Gross SOF Ratio
		Activity Concentration (pCi/g) [b]									SOF [c]		Activity Concentration (pCi/g) [b]									SOF [c]		
		^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U					
		Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [d]	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [d]	
0217	3	1.89	0.77	0.68	148.91	8.92	4.12	47.57	3.62	3.25	**5.21**	**5.06**	*1.48*	1.02	1.68	125.00	13.10	0.96	61.60	11.70	12.20	**4.40**	**4.25**	1.18
0333	2	3.68	2.61	1.59	648.10	29.81	7.71	30.61	7.87	6.25	**22.24**	**22.10**	These characterization samples were not sent for off-site analysis.											
0334	2	1.51	0.55	0.34	77.03	5.42	2.61	23.66	2.08	1.82	**2.72**	**2.57**												
0335	2	1.49	0.45	0.28	44.75	3.70	1.87	23.95	1.86	1.57	**1.62**	**1.47**												
0336	2	9.51	1.57	1.34	1,155.80	51.03	8.43	28.31	4.02	5.09	**39.75**	**39.60**												
0337	2	3.05	1.05	0.47	214.46	11.05	2.48	10.86	1.69	1.75	**7.44**	**7.29**												
0338	2	11.92	0.88	0.32	9.10	2.79	2.07	17.89	1.86	1.76	**0.83**	**0.69**												
0339	2	76.23	3.64	0.53	13.09	4.44	3.49	28.85	7.92	3.38	**3.67**	**3.53**												
0340	2	1.18	0.28	0.14	5.28	1.39	0.93	4.48	0.73	0.72	0.24	0.09												

[a] Off-site laboratory results as reported by TestAmerica after sufficient in-growth time to reach ^{226}Ra progeny equilibrium.
[b] Italicized results indicate <MDC.
[c] **Bolded orange** SOF values indicate a result >0.5 but ≤1 and **bolded red** SOF values indicate a result >1.
[d] Calculated as discussed in Section 16.2.2.

16.3 DATA ANALYSIS – EXCAVATED SURFACE

Data analysis of the excavated surface was performed based on the assumptions, methods, and performance criteria established to satisfy the DQOs in accordance with the C-T Phase II DP, Sections 14.4.1 and 14.4.3. Details regarding FSS design and quality assurance and quality control applicable to all survey units were discussed in Chapters 4 and 5, respectively, of this FSSR. Surface soil (0 to 30 cm) sample results and 1-m composite sample result from boreholes were used in the assessment of excavated and unexcavated locations, respectively as appropriate.

16.3.1 Elevated Area Evaluation

Equation 9 from C-T Phase II DP, Section 5.8.7 provides for the calculation of an *Index* value that represents the fraction or multiple of the $DCGL_{EMC}$. If the *Index* value is greater than one, then the $DCGL_{EMC}$ is exceeded.

Parameters necessary to calculate the *Index* value for the elevated area adjacent to the bottle pad were:

- The elevated area activity levels, represented by the maximum activity observed (sample 0388) were 26.40, 6.00, and 15.60 pCi/g for ^{232}Th, ^{226}Ra, and ^{238}U, respectively (from Table 16-2);
- Mean background activity levels were 1.3, 2.5, and 4.4 pCi/g for ^{232}Th, ^{226}Ra, and ^{238}U, respectively (from C-T Phase II DP Table 4-17);
- The size of the elevated area was determined to be approximately 8 ft by 18 ft, or 15.0 m^2; and,
- The area factors from C-T Phase II DP Figure 5-3 for the elevated area were 1.9, 2.1, and 2.9 for ^{232}Th, ^{226}Ra, and ^{238}U, respectively.

The calculation of the *Index* value is shown below. Because the ^{232}Th elevated area activity concentration was less than the background mean, the thorium series term was set equal to zero. Because the *Index* value as calculated in accordance with the DP was less than one, this elevated area is compliant with the C-T Phase II DP for elevated measurements in soil.

$$Index = \frac{(26.40 - 1.3)\,pCi/g}{(1.9 \times 23.9\,pCi/g)_{Th\,series}} + \frac{(6.00 - 2.5)\,pCi/g}{(2.1 \times 29.4\,pCi/g)_{Ra226}} + \frac{(15.60 - 4.4)\,pCi/g}{(2.9 \times 721\,pCi/g)_{U}} = 0.61$$

16.3.2 Data Set Screening Analysis

Table 16-10 summarizes the results of the screening tests performed on the excavated surface FSS data in accordance with Pages 14-27 through 14-29 of the C-T Phase II DP. All applicable tests demonstrating compliance passed.

Table 16-10 Screening Tests Results – Excavated Surface

Screening Test	Test Value	Conclusion
Min/Max	0.54	PASS
Low Level	N/A	Not applicable; Class 1 survey unit
DCGL	N/A	Not applicable; Min/Max < 1
EMC Limit	0.21	PASS

16.3.2.1 Min/Max

In accordance with Page 14-27 of the C-T Phase II DP, the Min/Max screening test value was calculated by subtracting the minimum reference area result from the maximum survey unit systematic result. Sample 0387 with a gross SOF of 0.56 (from Table 16-1) was the maximum survey unit systematic result. Sample BH-Z-08 with a calculated gross SOF of 0.02 (from C-T Phase II DP Table B-1) was the minimum reference area result. The Min/Max screening test value was calculated to be 0.54. Because the test value was less than one, no further computations are required, i.e., $DCGL_W$ screening and Wilcoxon Rank Sum (WRS) tests.

16.3.2.2 Low Level

In accordance with Page 14-27 of the C-T Phase II DP, the Low Level screening test is not applicable to Class 1 survey units.

16.3.2.3 $DCGL_W$

In accordance with Page 14-28 of the C-T Phase II DP and because the Min/Max test value was less than one, the $DCGL_W$ screening test was not applicable to the excavated surface of this survey unit.

16.3.2.4 EMC Limit

In accordance with Page 14-28 of the C-T Phase II DP, the elevated measurement comparison (EMC) limit screening test was applied due to the elevated area adjacent to the bottle pad (sample 0388). Parameters necessary to calculate the exposure-weighted fraction of the $DCGL_W$, F, were:

- The size of the elevated area was determined to be approximately 15.0 m^2 (8 ft by 18 ft),
- The area factor from C-T Phase II DP Figure 5-3 for the elevated area was conservatively set to 1.9 (based on thorium series only),
- The elevated area activity level was conservatively represented by sample 0388 with a gross SOF = 1.33, and
- The survey unit average was a gross SOF = 0.20 (refer to Table 16-1).

The calculation of the EMC screening test result is shown below, using C-T Phase II DP Equation 14-7.

$$F = \left[\frac{15\ m^2}{743\ m^2} \times \frac{1.33}{1.9 \times 1}\right] + \left[\frac{(743 - 15)\ m^2}{743\ m^2} \times \frac{0.20}{1}\right] = 0.21$$

In accordance with the C-T Phase II DP and because the result was less than one, the total radioactivity concentration in the survey unit is within the release criterion.

16.3.3 WRS Test

In accordance with Page 14-29 of the C-T Phase II DP and because the Min/Max test value was less than one, the WRS Test was not required to demonstrate compliance.

16.3.4 Retrospective Analysis

A retrospective analysis was performed of the FSS results to determine whether the results met the survey design objectives, in accordance with Page 14-30 of the C-T Phase II DP. Table 16-11 provides the results of the retrospective analysis. Because the actual sample size exceeded the retrospective value sample size, the conclusion is that the survey design objectives were met.

Table 16-11 Retrospective Analysis – Excavated Surface

Parameter	*A Priori* Value	Retrospective Value Based on FSS Results (Gross SOF)
Upper Bound of Gray Region	DCGL = 1	1
Lower Bound of Gray Region	0.5 x DCGL = 0.5	0.20 [a]
Spatial Variability (standard deviation)	1/6 x DCGL = 0.17	0.15 [a]
Type I Error (false positive)	0.05	0.05
Type II Error (false negative)	0.05	0.05
Relative Shift	3	5.3
Calculated N/2 Sample Size	15 [b]	9
Actual N/2 Sample Size	--	15 [a]

[a] The result for SU13 S05 was not included and if it was, the average would be the same and the spatial variability would have been 0.13.
[b] The *a priori* value of 15 for the N/2 sample size was determined to be a conservative value that would allow application of either the Sign or WRS test. The *a priori* value for N/2 is 10 based on MARSSIM Table 5.3.

16.4 DATA ANALYSIS – SUBSURFACE MATERIAL

Data analysis of the subsurface material was performed based on the assumptions, methods, and performance criteria established to satisfy the DQOs in accordance with the C-T Phase II DP, Sections 14.4.1 and 14.4.3. Column average gross SOF results were used in the data assessment. Borehole sampling was stopped when native clay soil was reached or refusal encountered. Per Page 14-19 of the C-T Phase II DP, column averages were calculated over 1-meter increments (averaged 0 to 1 m, 0 to 2 m, etc.) for the set of samples collected. Table 16-12 provides the calculated borehole column average gross SOF results. Table 16-13 provides the calculated borehole column average net SOF results.

Table 16-12 Systematic Borehole Column Average Gross SOF Results

Sample Location	Core Depth Interval (m)				
	0-1	0-2	0-3	0-4	0-5
	Combined Results for Column Average Gross SOF [a]				
S01	0.15	0.15	0.18	--	--
S02	--	--	--	--	--
S03	0.15	0.12	0.12	--	--
S04	0.15	0.12	0.12	--	--
S05	0.15	0.15	0.15	0.15	--
S06	0.15	0.13	0.13	--	--
S07	0.15	0.12	0.11	--	--
S08	0.15	0.15	0.15	0.14	--
S09	0.15	0.15	0.14	--	--
S10	0.15	0.13	0.13	--	--
S11	0.15	0.15	0.14	--	--
S12	0.14	0.23	0.21	0.19	0.18
S13	0.15	0.15	0.24	0.21	0.20
S14	0.12	0.19	0.17	0.16	0.15
S15	0.16	0.13	0.11	0.15	0.38
SU13 S05	0.15	0.15	0.17	--	--
Summary Statistics					
Count:	15	15	15	6	4
Average:	0.14	0.15	0.15	0.17	0.23
Median:	0.15	0.15	0.14	0.16	0.19
Standard Dev.:	0.01	0.03	0.04	0.03	0.10
Minimum:	0.12	0.12	0.11	0.14	0.15
Maximum:	0.16	0.23	0.24	0.21	0.38
Range:	0.04	0.11	0.13	0.06	0.23

[a] Calculation of column average gross SOF used on-site results unless off-site results were available.

Table 16-13 Systematic Borehole Column Average Net SOF Results

Sample Location	Core Depth Interval (m)				
	0-1	0-2	0-3	0-4	0-5
	Combined Results for Column Average Net SOF[a]				
S01	0.00	0.01	0.04	--	--
S02	--	--	--	--	--
S03	0.00	0.00	0.00	--	--
S04	0.00	0.00	0.00	--	--
S05	0.00	0.00	0.01	0.01	--
S06	0.00	0.00	0.00		--
S07	0.00	0.00	0.00		--
S08	0.00	0.00	0.01	0.00	--
S09	0.00	0.00	0.00	--	--
S10	0.00	0.00	0.00	--	--
S11	0.00	0.01	0.00	--	--
S12	0.02	0.09	0.07	0.05	0.04
S13	0.00	0.00	0.09	0.06	0.05
S14	0.00	0.05	0.04	0.03	0.01
S15	0.02	0.00	0.00	0.01	0.23
SU13 S05	0.00	0.00	0.02	--	--
Summary Statistics					
Count:	15	15	15	6	4
Average:	0.00	0.01	0.02	0.03	0.08
Median:	0.00	0.00	0.00	0.02	0.05
Standard Dev.:	0.01	0.03	0.03	0.03	0.10
Minimum:	0.00	0.00	0.00	0.00	0.01
Maximum:	0.02	0.09	0.09	0.06	0.23
Range:	0.02	0.09	0.09	0.06	0.22

[a] Calculation of column average net SOF used on-site results unless off-site results were available.

16.4.1 Data Set Screening Analysis

Table 16-10 summarizes the results of the screening tests performed on the borehole subsurface FSS data in accordance with Pages 14-27 through 14-29 of the C-T Phase II DP. All applicable tests demonstrating compliance passed.

Table 16-14 Screening Tests Results – Subsurface Material

Screening Test	Test Value	Conclusion
0 – 1 m		
Min/Max	0.14	PASS
Low Level	N/A	Not applicable; Class 1 survey unit
DCGL	N/A	Not applicable; Min / Max < 1
EMC Limit	N/A	Not applicable; subsurface material
0 – 2 m		
Min/Max	0.21	PASS
Low Level	N/A	Not applicable; Class 1 survey unit
DCGL	N/A	Not applicable; Min / Max < 1
EMC Limit	N/A	Not applicable; subsurface material
0 – 3 m		
Min/Max	0.22	PASS
Low Level	N/A	Not applicable; Class 1 survey unit
DCGL	N/A	Not applicable; Min / Max < 1
EMC Limit	N/A	Not applicable; subsurface material
0 – 4 m		
Min/Max	0.19	PASS
Low Level	N/A	Not applicable; Class 1 survey unit
DCGL	N/A	Not applicable; Min / Max < 1
EMC Limit	N/A	Not applicable; subsurface material
0 – 5 m		
Min/Max	0.36	PASS
Low Level	N/A	Not applicable; Class 1 survey unit
DCGL	N/A	Not applicable; Min / Max < 1
EMC Limit	N/A	Not applicable; subsurface material

16.4.1.1 Min/Max

In accordance with Page 14-27 of the C-T Phase II DP, the Min/Max screening test value was calculated by subtracting the minimum reference area result from the maximum survey unit systematic result. Location 15 had the maximum survey unit systematic column average gross SOF of 0.16 for 0-1 m (from Table 16-12). Location 12 had the maximum survey unit systematic column average gross SOF of 0.23 for 0-2 m (from Table 16-12). Location 13 had the maximum survey unit systematic column average gross SOF of 0.24 and 0.21 for 0-3 m and 0-4 m, respectively (from Table 16-12). Location 15 had the maximum survey unit systematic column average gross SOF of 0.38 for 0-5 m (from Table 16-12).Sample BH-Z-08 with a calculated gross SOF of 0.02 (from C-T Phase II DP Table B-1) was the minimum reference area result. The Min/Max screening test value was calculated to be 0.14, 0.21, 0.22, 0.19, and 0.36 for 0-1 m, 0-2 m, 0-3 m, 0-4 m, and 0-5 m, respectively. Because the test value was less than one for 0-1 m, 0-2 m, 0-3 m, 0-4 m, and 0-5 m, further computations are not required, i.e., $DCGL_W$ screening and Wilcoxon Rank Sum (WRS) tests.

16.4.1.2 Low Level

In accordance with Page 14-27 of the C-T Phase II DP, the Low Level screening test is not applicable to Class 1 survey units.

16.4.1.3 $DCGL_W$

In accordance with Page 14-28 of the C-T Phase II DP and because the Min/Max test value was less than one, the $DCGL_W$ screening test was not applicable to subsurface material for this survey unit.

16.4.1.4 EMC Limit

In accordance with Page 14-26 of the C-T Phase II DP, the $DCGL_{EMC}$ is not applicable to subsurface survey units, in this case the assessment of the subsurface material in the survey unit. Thus, the EMC limit is not applicable.

16.4.2 WRS Test

In accordance with Page 14-29 of the C-T Phase II DP and because the Min/Max test values were less than one, the WRS Test was not required to demonstrate compliance.

16.4.3 Retrospective Analysis

A retrospective analysis was performed of the FSS results to determine whether the results met the survey design objectives, in accordance with Page 14-30 of the C-T Phase II DP.

Table 16-15, Table 16-16, and Table 16-17 provide the results of the retrospective analysis for 0-1 m, 0-2 m, and 0-3 m. Because the actual sample size exceeded the retrospective value sample size, the conclusion is that the survey design objectives were met.

Table 16-18 and Table 16-19 provide the results of the retrospective analysis for 0-4 m and 0-5 m. In both cases, the actual sample size was less than the retrospective value sample size. This is the result of a limited sample size due to either reaching the clay layer or encountering refusal in the soil column, not because elevated contamination caused a large calculated relative shift. Based on this result and the core boring results provided in Section 16.2.3, it was reasonable to not re-perform the systematic FSS borehole sampling at new locations for two reasons: 1) characterization data guided the excavation extent and FSS data results were consistent with characterization data results and 2) if the systematic FSS boring sampling was re-performed, it was anticipated that a large fraction of the new locations would have a reduced number of samples from 0-4 m and 0-5 m because of either reaching the clay layer or encountering refusal in the soil column, as with the original locations. Therefore, the FSS for 0-4 m and 0-5 m was considered adequate for demonstrating compliance in this situation.

Table 16-15 Retrospective Analysis – 0-1 m

Parameter	*A Priori* Value	Retrospective Value Based on FSS Results (Gross SOF)
Upper Bound of Gray Region	DCGL = 1	1
Lower Bound of Gray Region	0.5 x DCGL = 0.5	0.14
Spatial Variability (standard deviation)	1/6 x DCGL = 0.17	0.01
Type I Error (false positive)	0.05	0.05
Type II Error (false negative)	0.05	0.05
Relative Shift	3	86
Calculated N/2 Sample Size	15 [a]	9
Actual N/2 Sample Size	--	14

[a] The *a priori* value of 15 for the N/2 sample size was determined to be a conservative value that would allow application of either the Sign or WRS test. The *a priori* value for N/2 is 10 based on MARSSIM Table 5.3.

Table 16-16 Retrospective Analysis – 0-2 m

Parameter	*A Priori* Value	Retrospective Value Based on FSS Results (Gross SOF)
Upper Bound of Gray Region	DCGL = 1	1
Lower Bound of Gray Region	0.5 x DCGL = 0.5	0.15
Spatial Variability (standard deviation)	1/6 x DCGL = 0.17	0.03
Type I Error (false positive)	0.05	0.05
Type II Error (false negative)	0.05	0.05
Relative Shift	3	28
Calculated N/2 Sample Size	15 [a]	9
Actual N/2 Sample Size	--	14

[a] The *a priori* value of 15 for the N/2 sample size was determined to be a conservative value that would allow application of either the Sign or WRS test. The *a priori* value for N/2 is 10 based on MARSSIM Table 5.3.

Table 16-17 Retrospective Analysis – 0-3 m

Parameter	*A Priori* Value	Retrospective Value Based on FSS Results (Gross SOF)
Upper Bound of Gray Region	DCGL = 1	1
Lower Bound of Gray Region	0.5 x DCGL = 0.5	0.15
Spatial Variability (standard deviation)	1/6 x DCGL = 0.17	0.04
Type I Error (false positive)	0.05	0.05
Type II Error (false negative)	0.05	0.05
Relative Shift	3	21
Calculated N/2 Sample Size	15 [a]	9
Actual N/2 Sample Size	--	14

[a] The *a priori* value of 15 for the N/2 sample size was determined to be a conservative value that would allow application of either the Sign or WRS test. The *a priori* value for N/2 is 10 based on MARSSIM Table 5.3.

Table 16-18 Retrospective Analysis – 0-4 m

Parameter	*A Priori* Value	Retrospective Value Based on FSS Results (Gross SOF)
Upper Bound of Gray Region	DCGL = 1	1
Lower Bound of Gray Region	0.5 x DCGL = 0.5	0.17
Spatial Variability (standard deviation)	1/6 x DCGL = 0.17	0.03
Type I Error (false positive)	0.05	0.05
Type II Error (false negative)	0.05	0.05
Relative Shift	3	27
Calculated N/2 Sample Size	15 [a]	9
Actual N/2 Sample Size	--	6

[a] The *a priori* value of 15 for the N/2 sample size was determined to be a conservative value that would allow application of either the Sign or WRS test. The *a priori* value for N/2 is 10 based on MARSSIM Table 5.3.

Table 16-19 Retrospective Analysis – 0-5 m

Parameter	*A Priori* Value	Retrospective Value Based on FSS Results (Gross SOF)
Upper Bound of Gray Region	DCGL = 1	1
Lower Bound of Gray Region	0.5 x DCGL = 0.5	0.23
Spatial Variability (standard deviation)	1/6 x DCGL = 0.17	0.10
Type I Error (false positive)	0.05	0.05
Type II Error (false negative)	0.05	0.05
Relative Shift	3	7
Calculated N/2 Sample Size	15 [a]	9
Actual N/2 Sample Size	--	4

[a] The *a priori* value of 15 for the N/2 sample size was determined to be a conservative value that would allow application of either the Sign or WRS test. The *a priori* value for N/2 is 10 based on MARSSIM Table 5.3.

16.5 DEVIATIONS

In accordance with the second bullet in Section 14.5 of the C-T Phase II DP, the FSSR is required to list changes made in the FSS from what was proposed in the DP. Only one deviation was noted. Page 14-27 of the C-T Phase II DP indicated that the "data set for the survey unit will be processed within a database using screening software developed and verified for the project." This database was not developed; instead, a combination of Microsoft® Excel® spreadsheets and hand calculations was utilized. This deviation is not significant and does not affect the data collection or assessment.

16.6 NRC INSPECTIONS

A summary of U.S. Nuclear Regulatory Commission (NRC) inspections applicable to the FSS are provided in Section 5.8 of this FSSR. The scope of the inspections included, but was not limited to: review of project plans, interviewing of project personnel, evaluation of the on-site laboratory, and independent confirmatory surveys conducted by the NRC after backfilling.

Inspection Report 04006563/12001 noted that the NRC reviewed the FSS data package for SU10 to ensure the licensee conducted the survey in accordance with the requirements as stated in the DP. No violations were identified. No findings of significance were identified.

16.7 CONCLUSION

FSS data were verified to be reliable, appropriately documented, and technically defensible. Specifically, the following conclusions are made:

- The instruments used to collect the data were capable of detecting the radiation type (i.e., gamma) at or below the release criteria (described in Sections 4.4 and 4.5 of this FSSR).
- The calibration of the instruments used to collect the data was current and radioactive sources used for calibration were National Institute of Standards and Technology (NIST) traceable (described in Section 5.4 of this FSSR). Specific records available upon request.
- Instrument response was checked before instrument use each day, at minimum (described in Section 5.4 of this FSSR). Specific records available upon request.
- The survey methods used to collect the data were appropriate for the media and type of radiation being measured (described in Section 4.4, 4.5, and 4.6 of this FSSR).
- The custody of samples collected for laboratory analysis was tracked from the point of collection until final results were obtained (described in Section 5.5.2 of this FSSR). Specific records available upon request.
- The survey data consist of qualified measurement results that are representative of the area of interest.
- Areas identified with elevated residual radioactivity (i.e. SOF > 1.0) were appropriately investigated and the $DCGL_{EMC}$ properly applied.

All the applicable screening tests passed, the retrospective analysis found that the survey design objectives were met, and additional subsurface contamination was not reasonably suspected. SU10 meets the industrial use scenario release criterion as established in the C-T Phase II DP Chapter 5; and therefore, satisfies the unrestricted release provisions of Title 10, Code of Federal Regulations (CFR), Part 20, Subpart E.

16.8 REFERENCES

Mallinckrodt, *Mallinckrodt Columbium-Tantalum Phase II Decommissioning Plan*, Revision 2, August 2008.

ENERGYSOLUTIONS

CS-RS-RP-009-17

Phase II Final Status Survey Report
Mallinckrodt Columbium-Tantalum Plant

St. Louis, Missouri

Chapter 17

Project No. 137131 **Revision 0**

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- [X] Non-Proprietary
- [ ] Proprietary
- [ ] Restricted Information
- [ ] Safeguards Information
- [ ] Sensitive Security Information

- [X] New
- [ ] Title Change
- [ ] Revision
- [ ] Rewrite
- [ ] Cancellation

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ABBREVIATIONS AND ACRONYMS

%	percent
σ	sigma; standard deviation
Ac	actinium
AECOM	AECOM Technical Services
bgs	below grade surface
C-T	columbium-tantalum
CFR	Code of Federal Regulations
cm	centimeter
cpm	counts per minute
DCGL	derived concentration guideline level
DP	decommissioning plan
DQO	data quality objectives
EMC	elevated measurement comparison
Energy*Solutions*, LLC	Energy*Solutions*
F	exposure-weighted fraction of the $DCGL_W$
FSS	Final Status Survey
FSSR	Final Status Survey Report
ft	feet
GWS	gamma walk-over survey
Loc.	location
m	meter
m^2	square meters
MARSSIM	Multi-Agency Radiation and Site Investigation Manual (NUREG-1575)
MDC	minimum detectable concentration
mrem/yr	millirem per year
NIST	National Institute of Standards and Technology
NRC	U.S. Nuclear Regulatory Commission
Pa	protactinium
Pb	lead
pCi/g	picoCuries per gram
Ra	radium
SOF	sum of fractions
Th	thorium
U	uranium
Unc.	uncertainty
WRS	Wilcoxon Rank Sum

17.0 RESULTS SUMMARY FOR PLANT 5 SUBSURFACE SU11

This chapter of the Final Status Survey Report (FSSR) presents the results of the final status survey (FSS) and data assessment for Plant 5 subsurface survey unit SU11 in accordance with Columbium-Tantalum (C-T) Phase II Decommissioning Plan (DP) Section 14.5. The FSS for this Class 1 survey unit was performed by Energy*Solutions*, LLC (Energy*Solutions*) between November and December of 2012 with final excavation of a deep lens of contamination below several plant utilities in January 2013 following backfill of the remaining survey unit. The SU11 data assessment was performed based on the assumptions, methods, and performance criteria established to satisfy the data quality objectives (DQOs) in accordance with the C-T Phase II DP Section 14.4.3.8. The summary statistics provide numerical values for measures of central tendency (i.e., mean, median), variation (i.e., standard deviation), and spread (i.e., minimum, maximum). Data evaluation and statistical analyses were performed and a separate decision was made for each survey unit of the C-T Plant as to its suitability for release for unrestricted use based upon the industrial use scenario release criterion as established in C-T Phase II DP Chapter 5.

17.1 OVERVIEW

SU11 is a Class 1 survey unit in the north central portion of C-T Plant 5. The survey unit is approximately 767 square meters (m^2) in size, which is less than the size limit of 3,000 m^2 for Class 1 survey units for subsurface material (per C-T Phase II DP, Table 14-4). Class 1 was the appropriate classification because the survey unit contained residual radioactivity that exceeded the derived concentration guideline values ($DCGL_W$) prior to remediation. Figure 17-1 shows the location of SU11 within the Plant 5 area while Figure 17-2 depicts features within the survey unit, the extent of the excavation and the locations and directions of photographs taken as presented in the following subsections to facilitate the text.

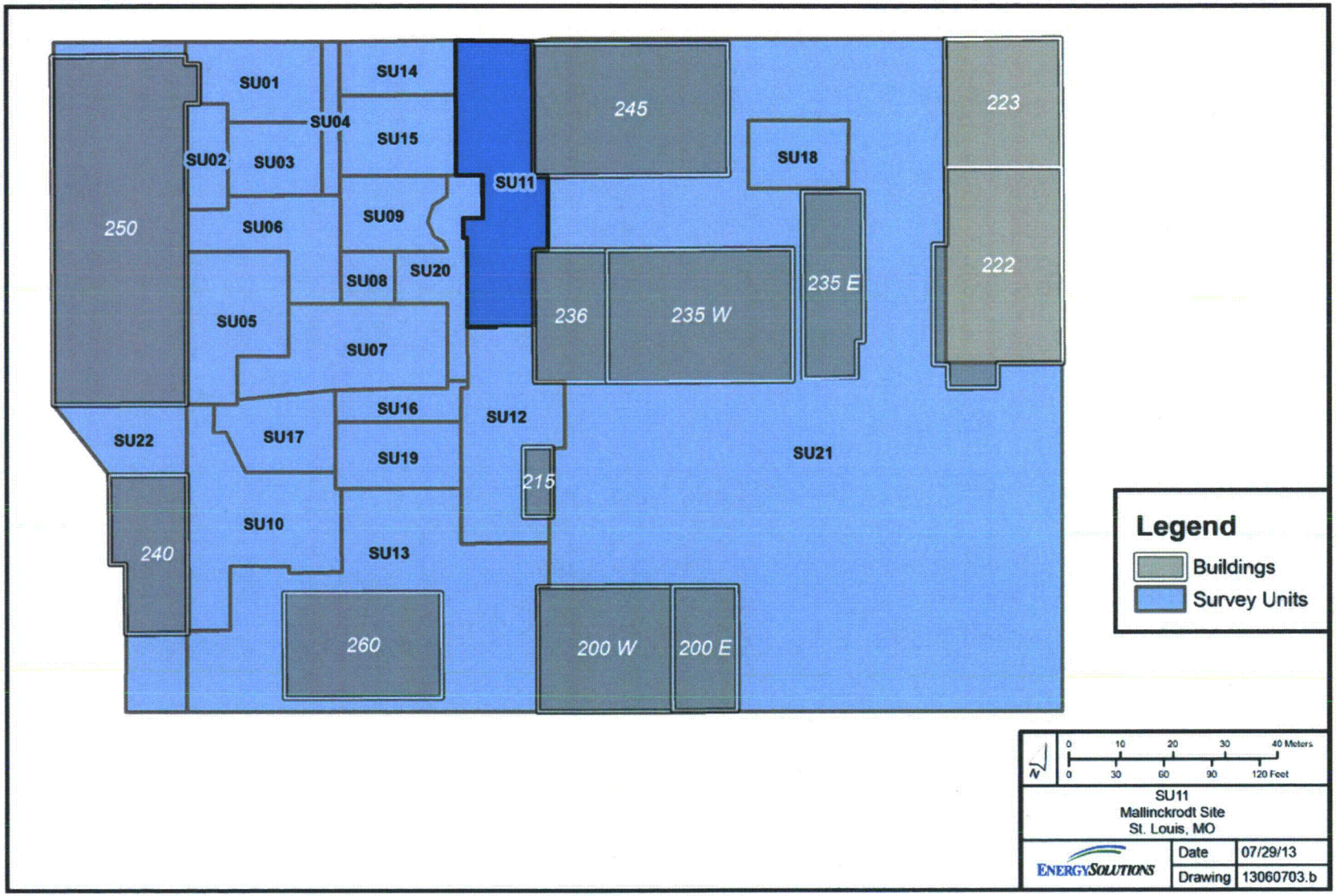

Figure 17-1 Location of SU11 in C-T Plant 5

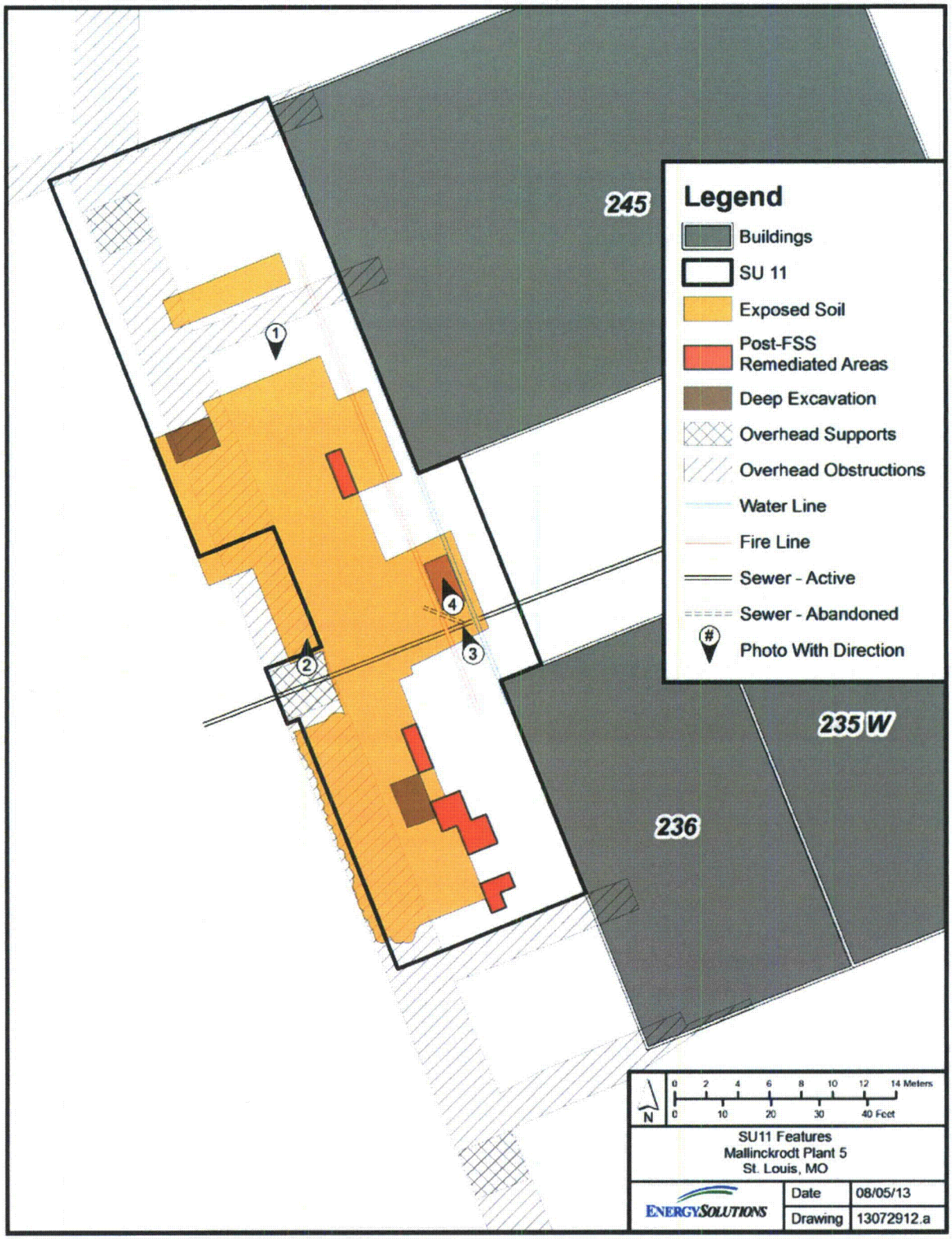

Figure 17-2 SU11 Feature Diagram

17.1.1 General Excavation

Figure 17-3 and Figure 17-4 are photographs of SU11 that were taken during the FSS following remediation in November of 2012 with the position and orientation of the photographs provided on Figure 17-2. In Figure 17-3 (photograph 1), as viewed from the northern edge of the excavation within the survey unit looking south, shows the west wall of Building 236 to the left and Building 260 in the background. Figure 17-4 (photograph 2), as viewed from the vertical pipe stand for the overhead piping looking north, shows the west wall of Building 245 to the right.

Excavation depths ranged from 1 to 10 feet (ft) below grade surface (bgs). The majority of the excavation ranged between 3 to 6 ft bgs with the deepest parts of the excavation including:

1) A pit in the southern end of the survey unit shown in Figure 17-3;
2) An area at the northern edge of the general excavation shown in Figure 17-4; and
3) A trench between the water lines running north-south in the alley between Buildings 236 and 245 where a deep lens of activity was identified as discussed in Section 17.1.3.

The southern edge of the survey unit sloped downward into the SU12 excavation.

Following the initial FSS, additional remediation was performed based upon the survey and sampling results. These limited areas of post-FSS remediation performed in December of 2012 are shown in Figure 17-2 and included:

1) Surface cracks along the perimeter of the general excavation that were not removed until the general area was backfilled and the security fence relocated, and
2) An area that was not excavated completely during the initial general excavation.

Figure 17-3 Photograph (1) of SU11 at Time of FSS (South View)

Figure 17-4 Photograph (2) of SU11 at Time of FSS (North View)

17.1.2 Abandoned Sewer

As part of the excavation of SU11, an abandoned manhole and associated clay piping was discovered and removed. These were part of the sewer system and had been previously abandoned and grouted. Once the general excavation had been complete and the area backfilled, Energy*Solutions* chased the remaining clay sewer pipe to remove as much as possible leading to the active sewer. The pavement was removed to facilitate the removal of the grouted sewer and to prepare for the excavation of the deep contamination identified during the sampling of systematic sample location 7 (S07) as discussed in Section 17.1.3 in January of 2013.

During removal of the pavement, the water main was ruptured. The water line was isolated and repaired prior to additional remediation. The grouted sewer pipe was then removed to the maximum extent practical. An approximate 8-10 ft length of sewer could not be removed and is addressed separately as part of the elevated measurement evaluation for SU11 in Section 17.3.1.1. This length of sewer was encased in poured concrete and lay directly on top of the fire main where it dropped downward between the fire main and plant water line to connect to the active sewer. Figure 17-5 (photograph 3) as identified in Figure 17-2, shows the concrete encased sewer line atop of the site's fire line. Any further attempt to remove the abandoned sewer risked compromising both the fire main and water line. The fire main and water lines were then covered with clean fill back to grade in order to prevent the lines from freezing and for preparation of excavating contaminated soils from systematic sample location 7 (S07) between the two plant systems.

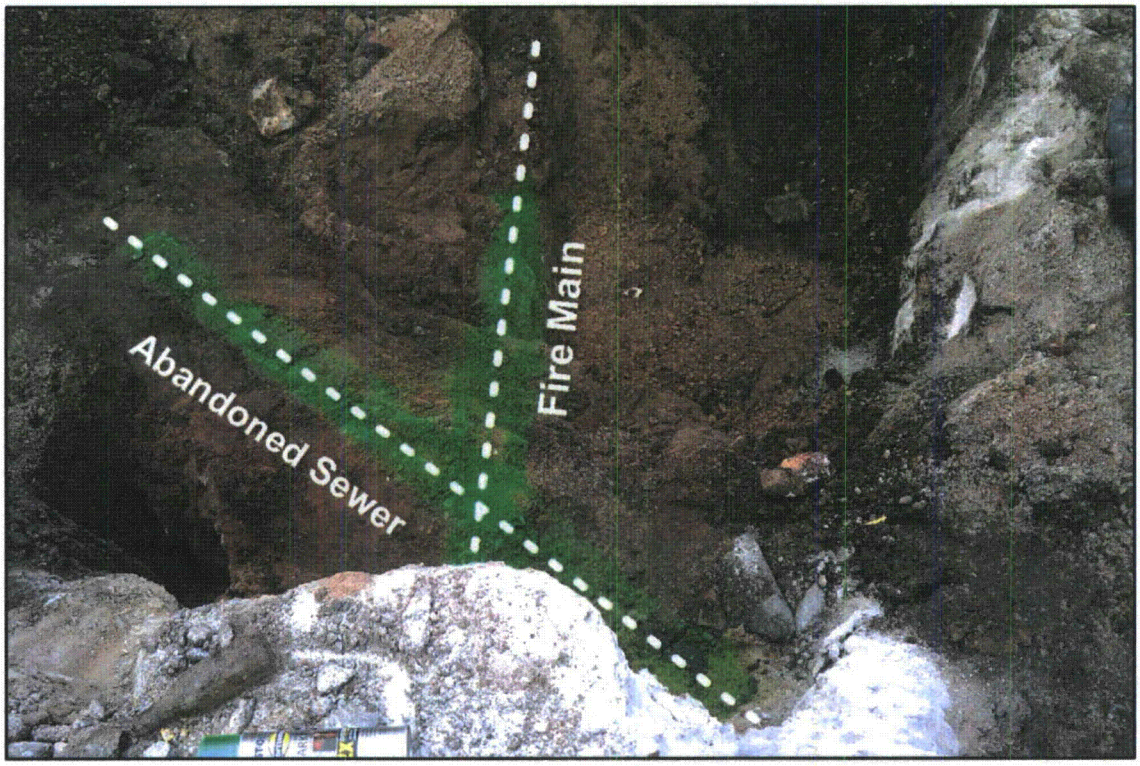

Figure 17-5 Photograph (3) of Abandoned Concrete Encased Sewer

17.1.3 Systematic Sample Location 7

During core boring of the systematic sample locations within SU11, contamination at depth was identified at systematic sample location 7 (S07) between the 2 and 4 meter (m) depths. The subsurface contamination was determined to be a localized area based upon additional core bore sampling offset to the north, east, south and west of systematic sample location 7 (S07).

Once the general remediation and removal of the abandoned sewer had been complete, the subsurface contamination identified was removed to the maximum extent practical due to the proximity of the fire main and water line. A mini excavator was used to excavate between the two water lines to remove as much contaminated material as possible (9 to 10 ft bgs) without undermining the water lines. Figure 17-6 (photograph 4) shows the excavation as performed. Remaining contamination is addressed separately as part of the dose assessment in Section 17.5.

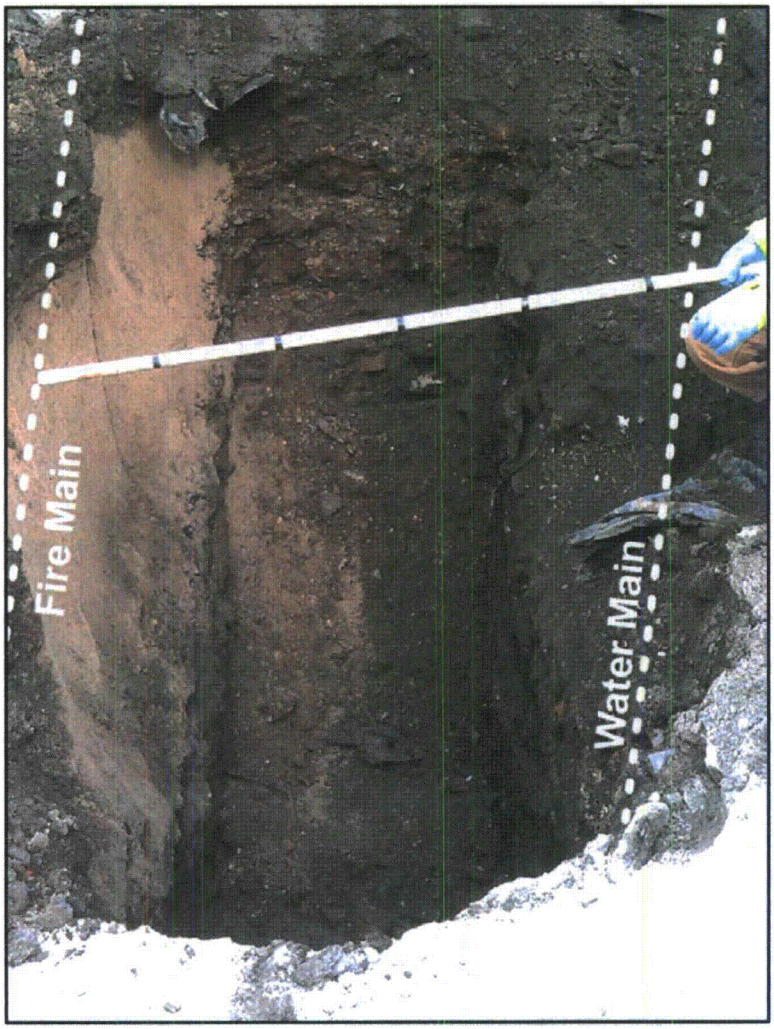

Figure 17-6 Photograph (4) of the Deep Excavation for Systematic Sample Location 7

17.2 DATA COLLECTION

Data collection was performed based on the assumptions, methods, and performance criteria established to satisfy the DQOs in accordance with the C-T Phase II DP, Sections 14.4.1 and 14.4.3. Details regarding FSS design and quality assurance and quality control applicable to all survey units were discussed in Chapters 4 and 5, respectively, of this FSSR. FSS data as collected for SU11 is summarized as follows:

17.2.1 Gamma Scans

A gamma walkover survey (GWS) was performed over 100% of the survey unit to locate radiation anomalies that might indicate areas with elevated residual radioactivity where further data collection (i.e., biased soil sampling) was warranted. Due to overhead obstructions, the GPS signal was inadequate for most of the survey due to poor satellite reception. As a result, a 1-m grid survey was performed over the majority of the survey unit and a 1-minute scalar count collected over the center of each grid.

Figure 17-7 provides the GWS scan results and survey unit coverage. The GWS was performed over both the exposed soil of the general excavation and the remaining asphalt. The recorded survey results ranged from 4,580 to 13,500 counts per minute (cpm) with a mean of 7,080 cpm and a median of 6,960 cpm for asphalt. The recorded survey results within the excavation over soil ranged from 4,740 to 41,900 cpm with a mean of 12,000 cpm and a median of 12,100 cpm. Several areas as noted in the Figure 17-7 received further remediation as discussed in Section 17.1.1. The figure includes GWS data prior to this additional remediation; however, these areas were subsequently scanned to verify all elevated materials were removed.

17.2.2 Soil Sampling

Soil samples to be used for the statistical testing were collected at a frequency and at representative locations throughout SU11 such that a statistically sound conclusion regarding the radiological condition of the survey unit could be developed. Biased soil samples were also collected at locations of elevated residual radioactivity identified by the gamma surveys and from areas which received additional remediation. Samples within the excavation and exposed soil consisted of 30-centimeter (cm) surface samples. Samples outside the excavation consisted of the top 1-m composite from the core bore samples as footnoted in the data tables and as shown in the figures in red text.

All soil samples were analyzed on site via gamma spectroscopy analysis. Any remaining sieved material from each sample was analyzed separately to verify residual radioactivity was consistent with sample results. The radiological screening process did not identify any significant levels of radioactivity in the sieved materials removed from samples.

The C-T Phase II DP, Table 4-17, provided mean background activity levels of 1.3, 2.5, and 4.4 picoCuries per gram (pCi/g) for thorium-232 (^{232}Th), radium-226 (^{226}Ra), and uranium-238 (^{238}U), respectively. These values were used to calculate net sum of fractions (SOF) values for the individual sample results—note that when measured activity concentration levels were less

than the background mean resulting in a negative value, the net activity concentration was set equal to zero for the net SOF calculation.

To mitigate the risk of backfilling, the on-site laboratory analytical results were reviewed to determine the likelihood of the survey unit failing to meet the criteria for radiological release. The on-site laboratory, by design, reported conservative sample results.

17.2.2.1 General Excavation

Figure 17-7 provides the soil sampling locations for the general excavation excluding the abandoned sewer and the biased samples from the excavation of systematic sample location 7 (S07) which are addressed in Sections 17.2.2.2 and 17.2.2.3, respectively. A total of 31 soil samples were collected throughout the general excavation including 15 systematic and 16 biased samples. Due to the excavation of the systematic sample location 7 (S07), the 1-m composite between 3 and 4 m was used to represent the sample location since the area was excavated to approximately 9 to 10 ft bgs. Table 17-1 provides the sample results and summary statistics for the 15 systematic samples while Table 17-2 provides the sample results for the 16 GWS biased samples.

17.2.2.2 Abandoned Sewer

In addition to the systematic and biased sampling of the general excavation, samples were collected from inside and around the abandoned clay sewer that was left in place. A total of 7 biased samples were collected in and around the abandoned sewer as shown in Figure 17-9. Samples were taken from the soil around and under the sewer pipe and concrete encasement as well as samples of the sediment inside the sewer, the grout filling the sewer and the clay pipe itself. Table 17-3 provides the sample results of these samples.

17.2.2.3 Systematic Sample Location 7

Bounding samples were collected from boreholes to the north, east, south and west to determine the extent of subsurface contamination identified at systematic sample location 7 (S07) as shown in Figure 17-9. Based upon the bounding samples, the extent of contamination was determined to be limited to a small area local to systematic sample location 7 (S07). Table 17-4 provides the sample results for the bounding samples.

Once the subsurface contamination was excavated to the maximum extent practical as discussed in Section 17.1.3, a total of 7 biased samples were collected from the excavated pit as shown in Figure 17-9. Samples were taken from the north wall as well as the southern, middle and northern sections along the bottom of the excavation and the east wall. No samples were taken from the west wall as this was backfill sand from the installation of the fire main. Table 17-5 provides the sample results for the biased samples taken within the excavation.

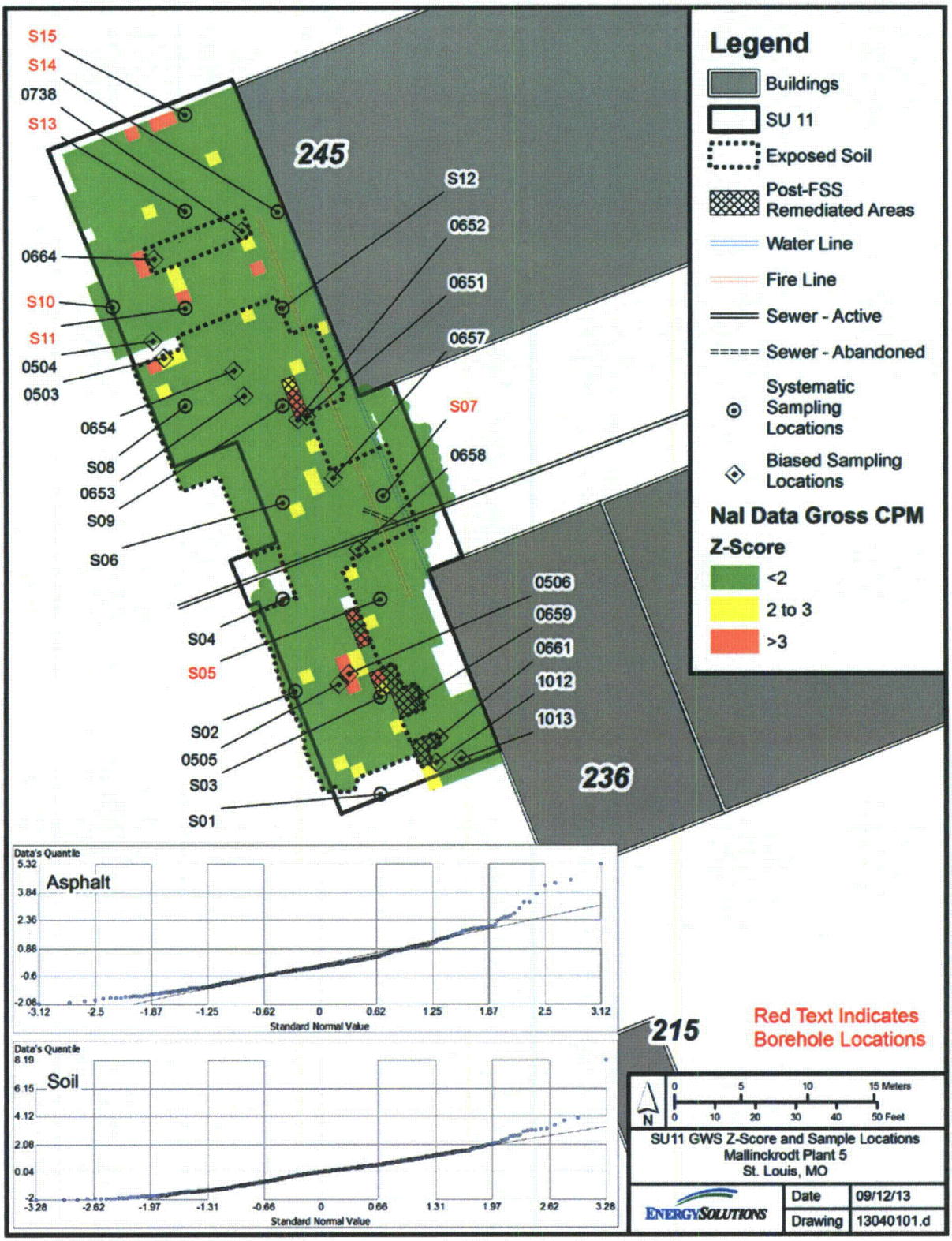

Figure 17-7 GWS and Soil Sampling Locations

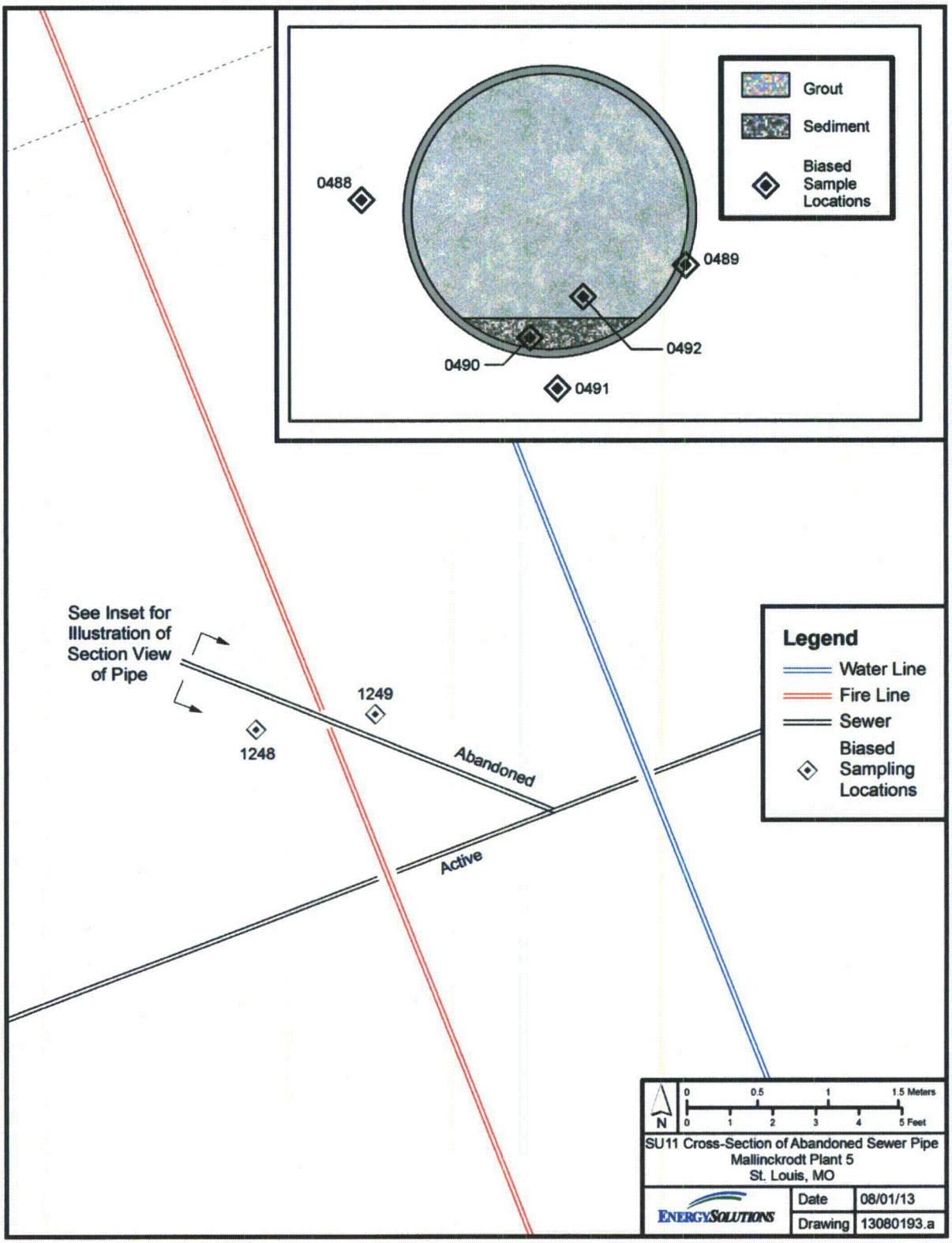

Figure 17-8 Abandoned Sewer Soil Sampling Locations

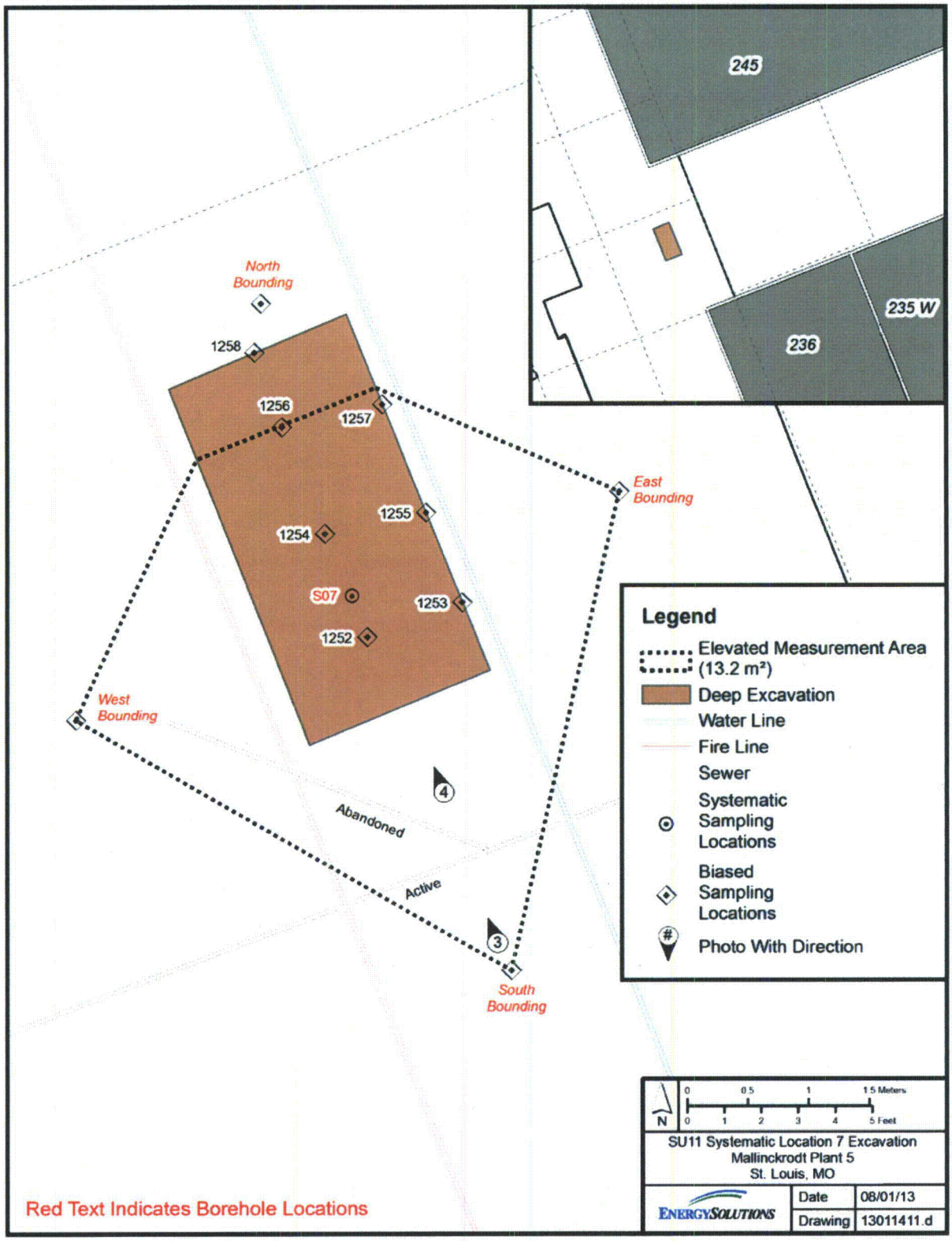

Figure 17-9 Systematic Sample Location 7 Excavation Soil Sampling Locations

Table 17-1 Gamma Spectroscopy Systematic Sample Analytical Results

Loc.	Sample ID	Depth (ft bgs)	On-Site Results											Off-Site Results [a]											On-Site/ Off-Site Gross SOF Ratio
			Activity Concentration (pCi/g) [b]									SOF [c]		Activity Concentration (pCi/g) [b]									SOF [c]		
			^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U					
			Result	Unc. (2σ)	MDC	Result	Unc. (2σ)	MDC	Result	Unc. (2σ)	MDC	Gross	Net [d]	Result	Unc. (2σ)	MDC	Result	Unc. (2σ)	MDC	Result	Unc. (2σ)	MDC	Gross	Net [d]	
S01	0495	5	0.85	0.19	0.11	2.29	0.86	0.60	2.36	0.43	0.44	0.12	0.00	0.88	0.18	0.15	1.09	0.21	0.12	*1.59*	0.68	1.87	0.08	0.00	1.54
S02	0496	5	0.20	0.09	0.11	1.19	0.59	0.41	1.27	0.35	0.27	0.05	0.00	*0.12*	0.11	0.23	0.64	0.14	0.09	*1.20*	0.56	1.53	0.03	0.00	1.78
S03	0497	5	1.56	0.33	0.17	20.26	3.52	2.47	40.82	3.48	1.46	**0.81**	**0.67**	1.75	0.46	0.42	10.10	1.25	0.27	60.90	9.23	6.45	**0.50**	0.36	1.62
S04	0498	5	1.32	0.29	0.07	2.60	1.05	0.77	3.68	0.69	0.57	0.15	0.00	0.93	0.23	0.20	1.77	0.29	0.15	5.59	2.03	2.26	0.11	0.00	1.39
S05	0240	0 [e]	1.30	0.36	0.17	3.53	1.85	1.42	8.53	0.95	0.82	0.19	0.04	1.88	0.50	0.30	3.34	0.50	0.21	14.40	3.54	3.33	0.21	0.07	0.88
S06	0499	5	1.38	0.36	0.16	3.93	1.77	1.34	11.44	1.06	0.75	0.21	0.06	1.33	0.31	0.20	1.78	0.31	0.17	13.50	2.78	2.66	0.13	0.01	1.54
S07	0624	10 [f]	43.72	2.53	0.63	176.66	10.61	4.04	85.50	7.20	3.47	**7.96**	**7.81**	Sample not sent to off-site laboratory											
S08	0500	5	3.71	0.55	0.21	4.57	2.01	1.50	6.53	1.12	1.03	0.32	0.17	3.01	0.63	0.63	4.75	0.77	0.27	9.25	3.76	4.79	0.30	0.15	1.06
S09	0501	2	1.07	0.27	0.10	1.52	1.17	0.91	3.81	0.60	0.53	0.10	0.00	0.99	0.31	0.30	2.11	0.34	0.11	5.37	1.62	1.94	0.12	0.00	0.85
S10	0235	0 [e]	0.59	0.23	0.22	4.38	1.28	0.88	4.09	1.07	0.64	0.18	0.06	0.89	0.24	0.16	3.14	0.44	0.16	3.98	1.91	2.37	0.15	0.02	1.20
S11	0514	0 [e]	0.84	0.23	0.07	2.03	0.90	0.65	2.02	0.49	0.44	0.11	0.00	0.42	0.16	0.24	1.49	0.26	0.14	*1.50*	0.54	1.61	0.07	0.00	1.53
S12	0502	2	0.58	0.18	0.10	5.51	1.12	0.68	1.88	0.49	0.51	0.21	0.10	0.45	0.18	0.32	3.85	0.51	0.17	*1.81*	0.70	2.00	0.15	0.05	1.41
S13	0318	0 [e]	0.56	0.16	0.11	3.17	0.84	0.52	2.39	0.53	0.53	0.13	0.02	0.48	0.18	0.22	1.16	0.23	0.16	3.16	0.82	1.98	0.06	0.00	2.10
S14	0313	0 [e]	0.99	0.21	0.11	3.16	1.32	0.98	5.33	0.64	0.61	0.16	0.02	1.09	0.25	0.18	1.92	0.33	0.18	6.65	2.03	2.32	0.12	0.00	1.30
S15	0323	0 [e]	1.50	--	--	3.04	1.21	0.86	3.14	0.64	0.68	0.17	0.03	1.53	0.32	0.20	1.75	0.29	0.11	2.35	0.78	1.93	0.13	0.01	1.34
Summary Statistics																									
Count:			15			15			15			15	15	14			14			14			14	14	14
Average:			4.01			15.86			12.19			**0.72**	**0.60**	1.12			2.78			9.38			0.15	0.05	1.40
Median:			1.07			3.17			3.81			0.17	0.03	0.96			1.85			4.68			0.12	0.01	1.40
Standard Dev.:			11.01			44.72			22.52			2.01	2.00	0.75			2.40			15.44			0.12	0.10	0.34
Minimum:			0.20			1.19			1.27			0.05	0.00	0.12			0.64			1.20			0.03	0.00	0.85
Maximum:			43.72			176.66			85.50			**7.96**	**7.81**	3.01			10.10			60.90			**0.50**	0.36	2.10
Range:			43.52			175.47			84.23			7.91	7.81	2.89			9.46			59.70			0.47	0.36	1.26

[a] Off-site laboratory results as reported by TestAmerica after sufficient in-growth time to reach ^{226}Ra progeny equilibrium.
[b] Italicized results indicate <MDC.
[c] **Bolded orange** SOF values indicate a result >0.5 but ≤1 and **bolded red** SOF values indicate a result >1.
[d] Calculated as discussed in Section 17.2.2.
[e] No excavation was performed at this location. Sample results provided are from the first 1-m segment of the borehole collected at the location.
[f] Sample is the 3-4-m segment of the borehole collected at the location prior to remediation.

Table 17-2 Gamma Spectroscopy Biased Sample Analytical Results

Sample ID	Depth (ft bgs)	On-Site Results											Off-Site Results [a]											On-Site/ Off-Site Gross SOF Ratio
		Activity Concentration (pCi/g)									SOF [b]		Activity Concentration (pCi/g)									SOF [b]		
		^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U					
		Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [c]	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [c]	
GWS Biased Samples																								
0503	6	2.54	0.48	0.08	7.29	1.95	1.35	6.36	1.09	1.06	0.36	0.22	Samples not sent to off-site laboratory (gross SOF < 0.5).											
0504	10	3.35	0.49	0.22	3.99	1.73	1.29	5.32	1.02	0.99	0.28	0.14												
0505	6	3.49	0.61	0.14	7.95	2.36	1.69	12.88	1.46	1.16	0.43	0.29												
0506 [d]	9	1.81	0.45	0.22	25.34	2.75	1.44	8.63	1.25	1.23	**0.95**	**0.80**	2.12	0.56	0.49	21.10	2.34	0.32	11.10	4.21	5.17	**0.82**	**0.68**	1.16
0651	2	1.64	0.28	0.14	4.28	1.82	1.36	6.94	0.94	0.83	0.22	0.08	Samples not sent to off-site laboratory (gross SOF < 0.5).											
0652	2	1.48	0.37	0.19	9.24	1.96	1.30	6.36	1.01	0.92	0.38	0.24												
0653	9	2.37	0.34	0.10	1.44	1.22	0.95	4.03	0.77	0.74	0.15	0.04												
0654	9	0.96	0.20	0.09	1.08	0.89	0.68	2.32	0.48	0.47	0.08	0.00												
0657	1	2.01	0.42	0.20	11.78	5.30	4.23	88.78	5.75	2.00	**0.61**	0.46	Sample inadvertently disposed of rather than being sent to off-site laboratory											
0658	1	2.10	0.50	0.17	3.37	2.00	1.53	7.85	1.14	0.99	0.21	0.07	Samples not sent to off-site laboratory (gross SOF < 0.5).											
0659	1	1.82	0.40	0.17	6.23	2.67	2.04	17.41	1.39	0.90	0.31	0.17												
0661	1	1.64	0.34	0.18	6.57	2.31	1.71	11.96	1.63	0.83	0.31	0.16												
0664	1	2.86	0.49	0.14	9.09	1.92	1.32	7.88	1.04	0.95	0.44	0.29												
0738	1	2.05	0.38	0.24	25.49	2.80	1.52	9.99	1.21	1.14	**0.97**	**0.82**	2.03	0.59	0.52	18.20	2.07	0.43	12.10	4.28	5.17	**0.72**	**0.58**	1.34
1012	3	0.62	0.21	0.08	4.98	1.26	0.88	7.77	0.81	0.69	0.21	0.09	Sample not sent to off-site laboratory (gross SOF < 0.5).											
1013	3	1.79	0.44	0.22	19.76	3.65	2.53	41.97	2.66	1.56	**0.81**	**0.66**	1.99	0.45	0.45	4.03	0.59	0.16	52.10	7.43	4.82	0.29	0.15	2.75

[a] Off-site laboratory results as reported by TestAmerica after sufficient in-growth time to reach ^{226}Ra progeny equilibrium.
[b] **Bolded orange** SOF values indicate a result >0.5 but ≤1.
[c] Calculated as discussed in Section 17.2.2.
[d] 30-cm sample collected at biased borehole location B02.

Table 17-3 Gamma Spectroscopy *In Situ* Sewer Drain (Grouted) Sample Analytical Results

Sample ID	Depth (ft bgs)	On-Site Results											Off-Site Results [a]											On-Site/ Off-Site Gross SOF Ratio
		Activity Concentration (pCi/g)									SOF [b]		Activity Concentration (pCi/g)									SOF [b]		
		^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U					
		Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [c]	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [c]	
0488	4	9.19	0.78	0.37	18.84	3.10	2.10	12.78	2.39	1.49	**1.04**	**0.90**	9.76	1.25	0.40	12.50	1.48	0.39	18.30	4.87	5.57	**0.86**	**0.71**	1.21
0489	4	41.04	2.29	0.74	117.80	7.98	3.72	29.07	3.79	2.66	**5.76**	**5.62**	Sample not sent to off-site laboratory [d]											
0490	4	133.69	6.77	1.45	226.49	14.53	6.61	48.84	6.59	4.76	**13.37**	**13.22**	104.00	10.80	1.91	146.00	15.30	1.21	33.80	7.80	11.00	**9.36**	**9.22**	1.43
0491	4	3.93	0.46	0.17	5.68	1.67	1.19	5.06	0.93	0.94	0.36	0.22	Sample not sent to off-site laboratory [d]											
0492	4	8.05	1.28	0.48	45.39	4.93	2.73	13.72	1.91	0.20	**1.90**	**1.75**												
1248	4	1.15	0.25	0.14	2.08	1.18	0.88	3.19	0.64	0.57	0.12	0.00												
1249	4	1.25	0.36	0.12	5.56	1.61	1.14	7.10	0.92	0.78	0.25	0.11												

[a] Off-site laboratory results as reported by TestAmerica after sufficient in-growth time to reach ^{226}Ra progeny equilibrium.
[b] **Bolded orange** SOF values indicate a result >0.5 but ≤1 and **bolded red** SOF values indicate a result >1.
[c] Calculated as discussed in Section 17.2.2.
[d] Samples 0489 (clay pipe) and 0492 (grout) were not sent off-site. Sample 0490 (sediment between the pipe and grout) was determined to best represent the remaining activity within the abandoned sewer. Other samples not sent off-site because gross SOF < 0.5.

Table 17-4 Gamma Spectroscopy Systematic Sample Location 7 Bounding Borehole Sample Analytical Results

Sample Location	Sample ID	Sample Depth (m) [a]	On-Site Results											Off-Site Results [b]											Column SOF [c, d]	
			Activity Concentration (pCi/g)									Sample SOF [c]		Activity Concentration (pCi/g)									Sample SOF [c]			
			^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U						
			Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [e]	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [e]	Gross	Net [e]
West	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No samples											0.15	0.00
		1 - 2										0.15	0.00												0.15	0.00
	0881	2 - 3	0.79	0.21	0.07	3.36	1.55	1.17	7.36	0.76	0.58	0.16	0.03	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.15	0.01
	0882	3 - 4	2.79	0.47	0.09	6.55	2.09	1.56	11.89	1.48	0.77	0.36	0.21												0.20	0.06
	0883	4 - 5	1.31	0.26	0.09	6.83	2.38	1.83	29.77	1.72	0.98	0.33	0.18												0.23	0.08
North	0884	0 - 1	1.36	0.30	0.12	9.02	2.41	1.76	20.21	1.47	1.00	0.39	0.25												0.39	0.25
	0885	1 - 2	1.25	0.29	0.06	2.67	1.20	0.89	3.61	0.61	0.56	0.15	0.01												0.27	0.12
	0886	2 - 3	2.23	0.39	0.17	9.34	1.93	1.32	8.09	0.86	0.73	0.42	0.28												0.32	0.18
	0887	3 - 4	6.50	0.72	0.27	23.56	3.46	2.35	28.35	1.82	1.25	**1.11**	**0.97**	5.34	0.82	0.64	13.80	1.62	0.35	34.40	6.95	6.62	**0.74**	0.43	0.43	0.28
	0888	4 - 5	5.24	0.68	0.20	13.76	2.51	1.77	16.81	1.43	1.16	**0.71**	**0.56**	5.04	0.78	0.38	9.91	1.18	0.31	19.00	4.84	5.09	**0.57**	0.27	0.46	0.31
East	0889	0 - 1	1.21	0.26	0.10	4.85	1.60	1.16	8.60	0.92	0.74	0.23	0.09	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.23	0.09
	0890	1 - 2	0.77	0.22	0.10	2.98	1.04	0.70	2.49	0.52	0.50	0.14	0.02												0.18	0.05
	0891	2 - 3	1.57	0.36	0.09	4.28	1.38	0.95	4.94	0.71	0.64	0.22	0.07												0.19	0.05
	0892	3 - 4	1.22	0.31	0.14	7.17	1.67	1.16	10.24	0.86	0.63	0.31	0.17												0.22	0.08
	0893	4 - 5	1.22	0.25	0.13	4.78	1.79	1.34	9.06	0.94	0.75	0.23	0.08												0.22	0.08
South	0894	0 - 1	1.40	0.37	0.14	8.92	2.38	1.74	18.63	1.45	1.05	0.39	0.24												0.39	0.24
	0895	1 - 2	1.22	0.38	0.22	12.34	2.76	2.00	22.81	1.64	1.19	**0.50**	0.36	1.41	0.42	0.35	7.94	0.98	0.25	26.10	4.82	4.57	0.37	0.22	0.38	0.23
	0896	2 - 3	2.16	0.36	0.14	8.26	1.65	1.07	7.31	0.89	0.75	0.38	0.24	Sample not sent to off-site laboratory (gross SOF < 0.5)											0.38	0.23
	0897	3 - 4	7.63	0.87	0.29	28.82	3.15	1.87	20.86	1.77	1.44	**1.33**	**1.18**	6.43	1.08	0.65	16.70	2.06	0.53	18.10	3.38	6.75	**0.86**	**0.50**	0.50	0.35
	0898	4 - 5	1.45	0.44	0.34	10.79	2.17	1.50	14.71	1.22	0.94	0.45	0.30	Sample not sent to off-site laboratory (gross SOF < 0.5)											0.49	0.34

[a] Sampling was stopped when native clay soil was reached or refusal encountered.
[b] Off-site laboratory results as reported by TestAmerica after sufficient in-growth time to reach 226Ra progeny equilibrium.
[c] **Bolded orange** SOF values indicate a result >0.5 but ≤1 and **bolded red** SOF values indicate a result >1.
[d] Calculated per Section 14.4.3.7 of C-T Phase II DP. Calculation of column SOF used on-site results unless off-site results were available.
[e] Calculated as discussed in Section 17.2.2.

Table 17-5 Gamma Spectroscopy Systematic Sample Location 7 Trench Post-Remediation Sample Analytical Results

Sample ID	Depth [a] (ft bgs)	On-Site Results											Off-Site Results [b]											On-Site/ Off-Site Gross SOF Ratio
		Activity Concentration (pCi/g) [c]									SOF [d]		Activity Concentration (pCi/g) [c]									SOF [d]		
		^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U					
		Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [e]	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [e]	
1252	10	9.26	1.10	0.35	28.40	3.42	2.14	19.85	1.92	1.68	**1.38**	**1.24**	7.44	1.08	0.61	21.80	2.39	0.38	20.00	5.28	5.65	**1.08**	**0.94**	1.28
1253	8	*0.00*	0.00	0.03	3.56	1.12	0.78	4.50	0.70	0.63	0.13	0.04	Sample not sent to off-site laboratory (gross SOF < 0.5)											
1254	10	54.27	2.93	0.96	187.94	11.34	4.80	69.02	5.43	3.13	**8.76**	**8.61**	49.70	5.36	1.67	153.00	16.00	1.10	64.60	8.43	13.20	**7.37**	**7.23**	1.19
1255	8	1.71	0.31	0.12	6.75	1.50	1.02	5.95	0.79	0.70	0.31	0.16	Samples not sent to off-site laboratory (gross SOF < 0.5)											
1256	10	1.14	0.27	0.13	3.64	1.42	1.04	6.20	0.80	0.65	0.18	0.04												
1257	8	1.65	0.38	0.15	6.65	1.99	1.45	11.16	1.88	1.00	0.31	0.17												
1258	8	1.69	0.32	0.15	5.21	2.02	1.51	10.39	1.51	0.78	0.26	0.12												

[a] Sample depth of 8 feet indicates wall samples while sample depth of 10 feet indicates the trench bottom.
[b] Off-site laboratory results as reported by TestAmerica after sufficient in-growth time to reach ^{226}Ra progeny equilibrium.
[c] Italicized results indicate <MDC.
[d] **Bolded orange** SOF values indicate a result >0.5 but ≤1 and **bolded red** SOF values indicate a result >1.
[e] Calculated as discussed in Section 17.2.2.

17.2.3 Core Boring

C-T Phase II DP Table 4-7 provided characterization borehole results. Six were collected within the extent of SU11: BH-032, BH-040, BH-042, BH-044, BH-089, and JA-31. Table 17-6 provides the sample data for these locations.

Table 17-6 Characterization Borehole Results

Location ID	Sample Depth (ft)	Activity Concentration (pCi/g) [a]			SOF [b]	
		^{232}Th	^{226}Ra	^{238}U	Gross	Net [c]
BH-032	1 - 3	0.82	6.30	12.60	0.27	0.14
	3 - 5	0.88	2.18	9.96	0.12	0.01
	5 - 7	0.66	1.03	*4.93*	0.07	0.00
	13 - 15	1.50	1.60	16.80	0.14	0.03
	17 - 19	2.40	1.40	7.00	0.16	0.05
	27 - 29	1.10	0.98	1.30	0.08	0.00
BH-040	0.5 - 2	0.28	0.87	*3.97*	0.05	0.00
	2 - 3	1.36	2.28	*5.91*	0.14	0.00
	3 - 4	1.30	2.80	3.30	0.15	0.01
	11 - 12	2.30	1.70	8.00	0.17	0.05
	17 - 18	1.30	1.10	1.10	0.09	0.00
BH-042	0.6 - 2	1.50	5.00	11.10	0.25	0.10
	2 - 3	1.12	1.12	*4.98*	0.09	0.00
	4.5 - 5.5	1.31	2.38	*4.57*	0.14	0.00
	7 - 8	0.99	2.23	6.11	0.13	0.00
	9 - 10	0.77	2.09	20.90	0.13	0.02
	10.5 - 11.5	3.00	5.30	19.00	0.33	0.19
	16 - 17	1.30	1.90	2.20	0.12	0.00
BH-044	0.6 - 1	1.40	16.70	5.40	**0.63**	0.49
	1 - 2	0.48	1.10	*6.01*	0.07	0.00
	2 - 3		7.92	6.71	0.28	0.19
	8 - 9	0.90	1.74	7.00	0.11	0.00
	10.5 - 11.5	3.10	3.00	4.80	0.24	0.09
	17 - 18	1.20	1.30	2.40	0.10	0.00
BH-089	1 - 1.5	0.79	21.40	4.36	**0.77**	**0.64**
	3 - 4.5	0.96	9.10	3.13	0.35	0.22
	6 - 7.5	1.10	15.70	4.15	**0.59**	0.45
	9 - 10.5	1.45	5.25	6.20	0.25	0.10
	15 - 16.5	4.05	1.04	9.00	0.22	0.12
	18 - 19.5	1.33	1.40	1.23	0.10	0.00
JA-31	0 - 6	0.59	1.49	13.80	0.09	0.01

[a] Italicized results indicate <MDC. No value indicates no result was provided.
[b] **Bolded orange** SOF values indicate a result >0.5 but ≤1.
[c] Calculated as discussed in Section 17.2.2.

AECOM Technical Services (AECOM) also collected numerous supplemental characterization core boring samples within SU11. Table 17-7 provides these sample results. During the sampling effort, AECOM noted that the clay layer depth ranged between 11 and 15 ft bgs.

Table 17-7 AECOM Supplemental Characterization Borehole Results

Location ID	Sample ID	Sample Depth (m)	Activity Concentration (pCi/g) [a]			Sample SOF [b]		Column SOF [b]	
			^{232}Th	^{226}Ra	^{238}U	Gross	Net [c]	Gross	Net [c]
F1-2	4784	0 - 1	0.73	2.56	3.64	0.12	0.00	0.12	0.00
	4785	1 - 2	1.39	3.48	5.53	0.18	0.04	0.15	0.02
	Refusal at 6.5 ft bgs								
F1-3	4776	0 - 1	0.96	3.19	8.79	0.16	0.03	0.16	0.03
	4777	1 - 2	1.23	2.18	4.97	0.13	0.00	0.15	0.01
	Refusal at 6.5 ft bgs								
F1-4	4786	0 - 1	0.88	4.87	11.98	0.22	0.09	0.22	0.09
	Refusal at 3.5 ft bgs								
F2-1	4780	0 - 1	1.13	8.51	10.62	0.35	0.21	0.35	0.21
	4781	1 - 2	1.33	8.21	9.31	0.35	0.20	0.35	0.21
	Refusal at 5 ft bgs								
F2-2	4737	0 - 1	0.72	7.17	2.86	0.28	0.16	0.28	0.16
	4738	1 - 2	0.92	2.22	2.42	0.12	0.00	0.20	0.07
	End of borehole at 6.5 bgs; Reason not indicated								
F2-3	4787	0 - 1	0.92	1.94	5.75	0.11	0.00	0.11	0.00
	Refusal at 3.75 ft bgs								
F2-4	4772	0 - 1	0.63	2.05	1.09	0.10	0.00	0.10	0.00
	Refusal at 4 ft bgs								
F2-5	4775	0 - 1	0.96	6.51	1.98	0.26	0.14	0.26	0.14
	Refusal at 3.5 ft bgs								
F3-1	4733	0 - 1	0.70	2.59	5.65	0.13	0.00	0.13	0.00
	4734	1 - 2	0.79	1.89	3.06	0.10	0.00	0.11	0.00
	End of borehole at 6.5 bgs; Reason not indicated								
F3-2	4735	0 - 1	0.91	4.01	4.07	0.18	0.05	0.18	0.05
	4736	1 - 2	0.88	2.12	2.54	0.11	0.00	0.15	0.02
	End of borehole at 6.5 bgs; Reason not indicated								
F3-3	4731	0 - 1	0.59	2.44	5.05	0.11	0.00	0.11	0.00
	4732	1 - 2	0.60	2.57	6.06	0.12	0.00	0.12	0.00
	End of borehole at 6.5 bgs; Reason not indicated								
F5-1	4727	0 - 1	2.03	74.25	5.34	**2.62**	**2.47**	**2.62**	**2.47**
	4728	1 - 2	1.14	15.21	4.03	**0.57**	0.43	**1.59**	**1.45**
	Refusal at 5.5 ft bgs								
F5-2	4729	0 - 1	3.04	38.42	6.28	**1.44**	**1.30**	**1.44**	**1.30**
	4730	1 - 2	1.18	8.19	5.69	0.34	0.20	**0.89**	**0.74**
	End of borehole at 6.5 bgs; Reason not indicated								
F5-3	4768	0 - 1	1.02	5.56	6.83	0.24	0.11	0.24	0.11
	4769	1 - 2	0.84	2.05	4.29	0.11	0.00	0.18	0.05
	Refusal at 6 ft bgs								
F6-1	4770	0 - 1	1.04	5.67	5.98	0.24	0.11	0.24	0.11
	4771	1 - 2	0.99	2.76	4.16	0.14	0.01	0.19	0.06
	Refusal at 5.5 ft bgs								
G1-1	4773	0 - 1	0.66	1.74	1.77	0.09	0.00	0.09	0.00
	4774	1 - 2	1.57	3.52	8.81	0.20	0.05	0.14	0.01
	Refusal at 6.5 ft bgs								

Table 17-7 AECOM Supplemental Characterization Borehole Results (continued)

Location ID	Sample ID	Sample Depth (m)	Activity Concentration (pCi/g) [a]			Sample SOF [b]		Column SOF [b]	
			^{232}Th	^{226}Ra	^{238}U	Gross	Net [c]	Gross	Net [c]
G1-2	4778	0 - 1	0.62	2.02	3.49	0.10	0.00	0.10	0.00
	4779	1 - 2	0.87	1.33	2.54	0.09	0.00	0.09	0.00
	Refusal at 6.5 ft bgs								
G1-3	4758	0 - 1	0.90	5.33	2.94	0.22	0.10	0.22	0.10
	Refusal at 3.5 ft bgs								
G2-1	4752	0 - 1	0.68	1.50	2.35	0.08	0.00	0.08	0.00
	4753	1 - 2	0.81	1.71	1.58	0.09	0.00	0.09	0.00
	Refusal at 5 ft bgs								
G2-2	4759	0 - 1	0.67	1.57	2.21	0.08	0.00	0.08	0.00
	Refusal at 3.5 ft bgs								
G3-1	4740	0 - 1	0.52	2.52	9.27	0.12	0.01	0.12	0.01
	4741	1 - 2	0.84	2.45	4.81	0.13	0.00	0.12	0.00
	Refusal at 5 ft bgs								
G3-2	4754	0 - 1	0.62	8.12	4.01	0.31	0.19	0.31	0.19
	4755	1 - 2	0.50	6.43	2.90	0.24	0.13	0.28	0.16
	Refusal at 5.5 ft bgs								
G3-3	4742	0 - 1	0.94	4.23	18.74	0.21	0.08	0.21	0.08
	4743	1 - 2	0.82	2.86	3.94	0.14	0.01	0.17	0.05
	Refusal at 5.5 ft bgs								
G3-4	4756	0 - 1	4.23	176.87	43.12	**6.25**	**6.11**	**6.25**	**6.11**
	4757	1 - 2	1.35	33.71	13.00	**1.22**	**1.08**	**3.74**	**3.59**
	End of borehole at 6.5 bgs; Reason not indicated								
G4-1	4750	0 - 1	0.91	2.47	4.28	0.13	0.00	0.13	0.00
	4751	1 - 2	0.71	2.69	2.61	0.12	0.01	0.13	0.00
	Refusal at 5.5 ft bgs								
G4-2	4739	0 - 1	4.64	29.74	16.52	**1.23**	**1.08**	**1.23**	**1.08**
	Refusal at 4 ft bgs								
G5-1	4766	0 - 1	1.22	10.19	18.13	0.42	0.28	0.42	0.28
	4767	1 - 2	1.01	2.54	4.89	0.14	0.00	0.28	0.14
	Refusal at 5.5 ft bgs								
G5-2	4748	0 - 1	0.66	3.80	10.79	0.17	0.05	0.17	0.05
	4749	1 - 2	0.85	2.88	4.90	0.14	0.01	0.16	0.03
	End of borehole at 6.5 bgs; Reason not indicated								
G5-3	4746	0 - 1	0.99	3.72	16.43	0.19	0.06	0.19	0.06
	4747	1 - 2	0.96	4.83	11.37	0.22	0.09	0.21	0.07
	Refusal at 5.5 ft bgs								
G6-2	4744	0 - 1	0.81	4.82	0.24	0.20	0.08	0.20	0.08
	4745	1 - 2	1.13	7.18	13.80	0.31	0.17	0.25	0.12
	End of borehole at 6.5 bgs; Reason not indicated								
G6-3	4725	0 - 1	1.73	48.83	8.48	**1.75**	**1.60**	**1.75**	**1.60**
	4726	1 - 2	0.94	2.54	2.52	0.13	0.00	**0.94**	**0.80**
	Refusal at 6.5 ft bgs								

Table 17-7 AECOM Supplemental Characterization Borehole Results (continued)

Location ID	Sample ID	Sample Depth (m)	Activity Concentration (pCi/g) [a]			Sample SOF [b]		Column SOF [b]	
			^{232}Th	^{226}Ra	^{238}U	Gross	Net [c]	Gross	Net [c]
SB-001	4788	0 - 1	0.93	37.23	5.36	**1.31**	**1.18**	**1.31**	**1.18**
	4789	1 - 2	0.77	36.09	4.72	**1.27**	**1.14**	**1.29**	**1.16**
	4795	2 - 3	1.08	13.71	8.14	**0.52**	0.39	**1.03**	**0.90**
	4797	3 - 4	1.26	3.89	6.54	0.19	0.05	**0.82**	**0.69**
	Clay layer reached at 11 ft bgs								
SB-002	4790	0 - 1	0.69	1.75	3.75	0.09	0.00	0.09	0.00
	4791	1 - 2	0.78	1.30	4.21	0.08	0.00	0.09	0.00
	4798	2 - 3	1.01	2.11	5.17	0.12	0.00	0.10	0.00
	4799	3 - 4	1.61	3.30	14.49	0.20	0.05	0.12	0.00
	4802	4 - 5	1.48	3.34	12.83	0.19	0.05	0.14	0.01
SB-003	4792	0 - 1	0.28	1.07	0.75	0.05	0.00	0.05	0.00
	4793	1 - 2	0.32	0.80	0.51	0.04	0.00	0.05	0.00
	4805	2 - 3	0.82	3.87	7.24	0.18	0.05	0.09	0.00
	4807	3 - 4	2.08	4.45	6.78	0.25	0.10	0.13	0.00
	4808	4 - 5	1.77	1.36	1.70	0.12	0.02	0.13	0.00
SB-004	4794	0 - 1	1.14	4.32	16.76	0.22	0.08	0.22	0.08
	4796	1 - 2	0.51	1.87	5.58	0.09	0.00	0.16	0.03
	4800	2 - 3	1.11	2.28	4.25	0.13	0.00	0.15	0.02
	4819	3 - 4	1.60	3.82	6.59	0.21	0.06	0.16	0.02
	4820	4 - 5	2.40	4.88	5.13	0.27	0.13	0.18	0.04
SB-005	4801	0 - 1	0.99	4.08	7.31	0.19	0.06	0.19	0.06
	4803	1 - 2	0.89	1.14	2.62	0.08	0.00	0.13	0.00
	--	2 - 3	No recovery						
	4823	3 - 4	1.11	1.65	2.36	0.11	0.00	0.13	0.00
	4824	4 - 5	4.24	2.64	4.73	0.27	0.13	0.16	0.02
SB-006	4804	0 - 1	0.96	4.82	10.98	0.22	0.09	0.22	0.09
	4806	1 - 2	0.58	2.21	3.32	0.10	0.00	0.16	0.04
	4825	2 - 3	1.58	2.24	12.45	0.16	0.02	0.16	0.03
	4826	3 - 4	13.98	46.71	12.86	**2.19**	**2.05**	**0.67**	**0.52**
	4827	4 - 5	25.96	83.24	49.38	**3.99**	**3.84**	**1.33**	**1.19**
SB-007	4809	0 - 1	0.84	4.09	3.13	0.18	0.05	0.18	0.05
	4810	1 - 2	1.22	2.79	3.14	0.15	0.01	0.16	0.03
	4828	2 - 3	1.01	2.00	6.08	0.12	0.00	0.15	0.02
	4829	3 - 4	2.10	5.07	7.51	0.27	0.13	0.18	0.03
	4830	4 - 5	1.46	7.20	8.51	0.32	0.17	0.21	0.06
SB-008	4811	0 - 1	1.00	3.05	6.08	0.15	0.02	0.15	0.02
	4812	1 - 2	1.16	2.75	3.92	0.15	0.01	0.15	0.01
	4831	2 - 3	1.00	3.61	5.58	0.17	0.04	0.16	0.02
	4832	3 - 4	1.85	9.52	5.40	0.41	0.26	0.22	0.08
	4833	4 - 5	1.40	2.61	2.26	0.15	0.01	0.21	0.06
SB-018	4867	0 - 1	0.77	6.58	4.60	0.26	0.14	0.26	0.14
	4868	1 - 2	7.75	4.57	3.40	0.48	0.34	0.37	0.23
	4869	2 - 3	1.18	4.64	13.62	0.23	0.09	0.32	0.18
	4870	3 - 4	1.78	6.04	18.21	0.31	0.16	0.32	0.17
	4871	4 - 5	1.43	4.95	17.64	0.25	0.11	0.31	0.16

Table 17-7 AECOM Supplemental Characterization Borehole Results (continued)

Location ID	Sample ID	Sample Depth (m)	Activity Concentration (pCi/g) [a]			Sample SOF [b]		Column SOF [b]	
			^{232}Th	^{226}Ra	^{238}U	Gross	Net [c]	Gross	Net [c]
SB-019	--	0 - 1	No recovery						
	4872	1 - 2	1.89	40.25	10.25	**1.46**	**1.32**	**1.46**	**1.32**
	4873	2 - 3	1.71	37.33	14.49	**1.36**	**1.22**	**1.41**	**1.27**
	4874	3 - 4	2.27	31.38	26.98	**1.20**	**1.05**	**1.34**	**1.20**
	4875	4 - 5	1.61	18.75	10.13	**0.72**	**0.57**	**1.19**	**1.04**
SB-020	4876	0 - 1	0.84	2.75	1.82	0.13	0.01	0.13	0.01
	4877	1 - 2	1.15	1.91	3.36	0.12	0.00	0.12	0.00
	4878	2 - 3	0.94	3.88	3.41	0.18	0.05	0.14	0.01
	4879	3 - 4	3.02	11.71	9.81	**0.54**	0.39	0.24	0.10
	4880	4 - 5	4.40	17.17	14.13	**0.79**	**0.64**	0.35	0.20
SB-021	4881	0 - 1	4.12	131.55	35.51	**4.70**	**4.55**	**4.70**	**4.55**
	4882	1 - 2	1.15	21.47	9.07	**0.79**	**0.65**	**2.74**	**2.60**
	4885	2 - 3	0.72	7.10	6.63	0.28	0.16	**1.92**	**1.78**
	4886	3 - 4	2.92	4.76	18.76	0.31	0.16	**1.52**	**1.37**
	4887	4 - 5	1.53	8.59	25.15	0.39	0.25	**1.29**	**1.15**
SB-022	4883	0 - 1	0.97	10.87	12.37	0.43	0.30	0.43	0.30
	4884	1 - 2	1.03	2.21	10.60	0.13	0.01	0.28	0.15
	4890	2 - 3	1.06	2.78	15.35	0.16	0.02	0.24	0.11
	4891	3 - 4	0.89	2.15	9.94	0.12	0.01	0.21	0.08
	4892	4 - 5	2.39	7.10	13.54	0.36	0.21	0.24	0.10
SB-023	4888	0 - 1	0.89	8.12	31.25	0.36	0.23	0.36	0.23
	4889	1 - 2	0.94	5.00	12.61	0.23	0.10	0.29	0.16
	4893	2 - 3	0.55	1.31	3.07	0.07	0.00	0.22	0.09
	4894	3 - 4	0.74	2.08	2.58	0.11	0.00	0.19	0.07
	4895	4 - 5	1.49	2.62	6.85	0.16	0.02	0.18	0.05
SB-039	4972	0 - 1	0.98	22.25	27.96	**0.84**	**0.70**	**0.84**	**0.70**
	4973	1 - 2	1.00	14.62	12.04	**0.56**	0.42	**0.70**	**0.56**
	4974	2 - 3	0.90	4.85	7.63	0.21	0.08	**0.54**	0.40
	4975	3 - 4	0.24	8.27	10.93	0.31	0.21	0.48	0.35
	4976	4 - 5	0.54	9.31	10.46	0.35	0.24	0.45	0.33
SB-040	4977	0 - 1	1.26	12.85	6.54	0.50	0.36	0.50	0.36
	4978	1 - 2	0.50	14.58	3.03	**0.52**	0.41	**0.51**	0.38
	4979	2 - 3	1.90	8.36	10.92	0.38	0.23	0.47	0.32
	4980	3 - 4	*0.00*	25.79	15.68	**0.90**	**0.81**	**0.57**	0.45
	4981	4 - 5	3.61	13.88	12.40	**0.64**	0.49	**0.59**	0.44

[a] Italicized results indicate <MDC.
[b] **Bolded orange** SOF values indicate a result >0.5 but ≤1 and **bolded red** SOF values indicate a result >1.
[c] Calculated as discussed in Section 17.2.2.

In accordance with Page 14-22 of the C-T Phase II DP, FSS core sampling was performed for two reasons: 1) it was reasonably suspected that subsoil contamination existed below the un-excavated areas and 2) to demonstrate that contaminated soil above the DCGLs did not exist under the excavation extent. Energy*Solutions* collected borehole samples at each systematic sample location throughout SU11 as shown in Figure 17-7. Table 17-8 provides these borehole sample results. Boreholes located at systematic locations within the general excavation were performed following remediation. As a result, the initial sample composites as indicated in

Table 17-8 reflect that the soil column had been excavated as part of remediation and that background fill would be used for column averaging.

Six additional biased borehole locations were also sampled including the 4 bounding samples around systematic sample location 7 (S07) as shown in Figure 17-9 and 2 from the pit located at the south end of SU11. One of the two boreholes for the south pit was located directly adjacent to the pit (west) and the second in the middle of the pit after it was filled with clean fill. Table 17-4 provides the sample results for the systematic sample location 7 (S07) bounding samples and Table 17-9 provides the results of borehole samples collected from the south pit.

During characterization surveys of the excavation wall in AECOM grid F5 (SU20, Section 26.2.4), elevated readings were noted during gamma scans and grab samples from the wall indicated elevated radionuclide concentrations. The gamma survey is shown on Figure 26-18 while the grab sample results are provided in Table 26-4. Systematic location 2 (S02) of SU11 was collected within the area of elevated gamma radiation and radionuclide concentrations. As shown in Table 17-8, column gross SOFs ranged from 0.13 to 0.20. The elevated gamma readings and radionuclide concentrations are considered to be adequately investigated through the measurement of the radionuclide concentrations following the DQOs of the C-T Phase II DP.

In addition to the borehole samples, Energy*Solutions* investigated AECOM borehole location SB-019 to ensure all surface contamination had been remediated. Following general excavation, SB-019 was located using the southwest corner of Building 246 as a reference and the area re-scanned. The general area was excavated to a depth of about 9 ft. Both the pit and spoils were sampled, see samples 0653 and 0654 from Figure 17-7.

In accordance with Table 14-5 of the C-T Phase II DP, the Class 1 subsurface investigation level is the $DCGL_W$ (1 SOF) plus the mean of background (0.15 SOF) plus six standard deviations of background (6 × 0.09 SOF = 0.54 SOF), using data from Tables 4-17 and B-1. This evaluates to a gross SOF of 1.69. All borehole samples, except for systematic sample location 7 (S07), were below this investigation level. Figure 17-10 shows a summary of all sampling locations performed including all characterization and FSS samples.

Table 17-8 Gamma Spectroscopy Systematic Borehole Sample Analytical Results

Sample Location	Sample ID	Sample Depth (m) [a]	On-Site Results											Off-Site Results [b]											Column SOF [d, e]	
			Activity Concentration (pCi/g) [c]									Sample SOF [d]		Activity Concentration (pCi/g) [c]									Sample SOF [d]			
			^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U						
			Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [f]	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [e]	Gross	Net [f]
S01	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No sample											0.15	0.00
	0356	1 - 2	0.56	0.14	0.08	2.11	0.93	0.67	2.29	0.45	0.40	0.10	0.00	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.12	0.00
	0357	2 - 3	0.63	0.15	0.08	2.39	0.88	0.61	2.37	0.48	0.44	0.11	0.00												0.12	0.00
	0358	3 - 4	1.32	0.30	0.14	4.06	1.42	1.00	3.70	0.76	0.78	0.20	0.05												0.14	0.01
	0359	4 - 5	1.11	0.26	0.13	1.92	0.83	0.58	1.31	0.57	0.51	0.11	0.00												0.13	0.00
S02	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No sample											0.15	0.00
	0360	1 - 2	1.12	0.28	0.09	3.54	1.34	0.99	5.74	0.72	0.65	0.18	0.04	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.16	0.02
	0361	2 - 3	0.18	0.09	0.05	1.38	0.84	0.64	2.16	0.52	0.28	0.06	0.00												0.13	0.00
	0362	3 - 4	1.99	0.32	0.15	4.12	1.66	1.24	5.91	0.89	0.81	0.23	0.09												0.15	0.01
	0363	4 - 5	5.93	0.61	0.25	5.12	1.99	1.48	6.89	1.24	0.99	0.43	0.29												0.21	0.06
	0364	5 - 6	1.53	0.29	0.11	1.95	0.91	0.65	1.71	0.46	0.50	0.13	0.01												0.20	0.05
S03	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No sample											0.15	0.00
	0365	1 - 2	1.33	0.25	0.17	2.94	1.58	1.22	7.83	0.80	0.66	0.17	0.02	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.16	0.01
	0366	2 - 3	0.81	0.19	0.08	2.38	1.25	0.95	5.61	0.70	0.58	0.12	0.00												0.14	0.01
	0367	3 - 4	4.82	0.62	0.37	22.02	2.71	1.17	7.25	1.11	1.26	0.96	0.82	4.86	0.74	0.52	17.10	1.94	0.37	6.54	1.90	5.06	0.79	0.50	0.31	0.16
	0368	4 - 5	2.02	0.38	0.14	4.50	1.36	0.94	3.27	0.70	0.71	0.24	0.10												0.29	0.15
S04	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.15	0.00
	0469	1 - 2	1.73	0.33	0.23	5.20	1.87	1.35	9.11	1.09	0.94	0.26	0.12												0.20	0.06
	0470	2 - 3	2.19	0.40	0.17	8.68	1.91	1.22	6.35	1.04	0.96	0.40	0.25												0.27	0.12
	0471	3 - 4	1.83	0.38	0.15	2.63	1.49	1.11	3.53	0.73	0.76	0.17	0.03												0.24	0.10
S05	0240	0 - 1	1.30	0.36	0.17	3.53	1.85	1.42	8.53	0.95	0.82	0.19	0.04												0.19	0.04
	0241	1 - 2	1.19	0.28	0.11	3.30	1.43	1.05	5.40	0.68	0.55	0.17	0.03												0.18	0.03
	0242	2 - 3	0.54	0.15	0.36	1.11	0.94	0.72	2.58	0.46	0.38	0.06	0.00												0.14	0.01
	0243	3 - 4	6.14	0.71	0.23	18.59	2.59	1.68	14.28	1.40	1.24	0.91	0.76	5.33	0.72	0.40	14.70	1.64	0.30	11.60	2.02	3.56	0.74	0.42	0.29	0.14
	0244	4 - 5	3.24	0.46	0.22	9.79	2.01	1.40	12.95	1.27	1.08	0.49	0.34	Sample not sent to off-site laboratory (gross SOF < 0.5)											0.33	0.18
S06	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No sample											0.15	0.00
	0550	1 - 2	1.29	0.27	0.09	3.66	1.51	1.14	10.08	0.93	0.67	0.19	0.05	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.17	0.02
	0551	2 - 3	2.46	0.45	0.12	8.24	2.04	1.46	15.57	1.30	0.89	0.40	0.26												0.25	0.10
	0552	3 - 4	2.53	0.32	0.15	3.37	1.43	1.07	8.29	0.94	0.77	0.23	0.09												0.24	0.10
S07	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No samples											0.15	0.00
		1 - 2										0.15	0.00												0.15	0.00
		2 - 3										0.15	0.00												0.15	0.00
	0624	3 - 4	43.72	2.53	0.63	176.66	10.61	4.04	85.50	7.20	3.47	7.96	7.81	Samples not sent to off-site laboratory											2.10	1.95
	0625	4 - 5	1.54	0.25	0.13	5.68	1.28	0.81	4.50	0.73	0.69	0.26	0.12												1.73	1.59
S08	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No sample											0.15	0.00
	0553	1 - 2	2.01	0.29	0.09	2.54	1.17	0.88	4.45	0.69	0.63	0.18	0.03	Sample not sent to off-site laboratory (gross SOF < 0.5)											0.16	0.02
	0554	2 - 3	Sample lost																							
	0555	3 - 4	2.27	0.44	0.13	3.94	1.48	1.10	9.78	0.93	0.71	0.24	0.10	Sample not sent to off-site laboratory (gross SOF < 0.5)											0.19	0.04
S09	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	No sample											0.15	0.00
	0547	1 - 2	1.23	0.28	0.12	2.87	1.34	1.00	5.06	0.66	0.57	0.16	0.01	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.15	0.01
	0548	2 - 3	1.89	0.32	0.14	6.27	1.57	1.11	8.96	1.01	0.86	0.30	0.16												0.20	0.06
	0549	3 - 4	1.93	0.32	0.11	2.99	1.43	1.10	11.26	0.97	0.70	0.20	0.05												0.20	0.06
S10	0235	0 - 1	0.59	0.23	0.22	4.38	1.28	0.88	4.09	1.07	0.64	0.18	0.06												0.18	0.06
	0236	1 - 2	1.73	0.43	0.15	4.68	1.53	1.08	5.21	0.88	0.86	0.24	0.09												0.21	0.07
	0237	2 - 3	3.38	0.57	0.97	7.11	2.03	1.41	6.00	1.12	1.14	0.39	0.25												0.27	0.12
	0238	3 - 4	1.09	0.22	0.13	2.02	0.77	0.55	1.68	0.42	0.42	0.12	0.00												0.23	0.09
	0239	4 - 5	1.16	0.28	0.12	*0.65*	0.87	0.68	1.77	0.46	0.44	0.07	0.00												0.20	0.06
S11	0514	0 - 1	0.84	0.23	0.07	2.03	0.90	0.65	2.02	0.49	0.44	0.11	0.00												0.11	0.00
	0515	1 - 2	2.14	0.35	0.08	5.25	1.88	1.41	13.50	1.27	0.91	0.29	0.14												0.20	0.05
	0516	2 - 3	0.80	0.22	0.09	*0.48*	0.94	0.76	2.49	0.54	0.52	0.05	0.00												0.15	0.01
	0517	3 - 4	1.10	0.27	0.11	1.39	0.67	0.46	1.64	0.90	0.40	0.10	0.00												0.14	0.00

Table 17-8 Gamma Spectroscopy Systematic Borehole Sample Analytical Results (continued)

Sample Location	Sample ID	Sample Depth (m) [a]	On-Site Results											Off-Site Results [b]											Column SOF [d, e]	
			Activity Concentration (pCi/g) [c]									Sample SOF [d]		Activity Concentration (pCi/g) [c]									Sample SOF [d]			
			^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U						
			Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [f]	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [e]	Gross	Net [f]
S12	0245	0 - 1	0.46	0.15	0.27	4.04	1.57	1.11	5.21	0.87	0.81	0.16	0.05	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.16	0.05
	0246	1 - 2	1.36	0.33	0.16	3.57	1.25	0.86	3.96	0.74	0.77	0.18	0.04												0.17	0.04
	0247	2 - 3	0.84	0.23	0.79	1.30	0.86	0.64	1.49	0.40	0.38	0.08	0.00												0.14	0.02
	0248	3 - 4	3.71	0.53	0.16	11.38	2.11	1.42	9.78	1.47	0.93	**0.56**	0.41	3.02	0.52	0.18	6.07	0.77	0.25	10.30	1.91	3.92	0.35	0.13	0.19	0.05
	0249	4 - 5	4.31	0.53	0.20	11.29	2.73	2.01	25.87	1.90	1.39	**0.60**	0.45	4.15	0.57	0.25	4.69	0.64	0.24	25.20	4.73	4.34	0.37	0.10	0.23	0.08
S13	0318	0 - 1	0.56	0.16	0.11	3.17	0.84	0.52	2.39	0.53	0.53	0.13	0.02	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.13	0.02
	0319	1 - 2	1.30	0.25	0.10	3.13	1.08	0.76	3.78	0.61	0.58	0.17	0.02												0.15	0.02
	0320	2 - 3	2.34	0.37	0.08	4.59	1.35	0.95	4.45	0.79	0.77	0.26	0.11												0.19	0.04
	0321	3 - 4	1.09	0.26	0.11	1.48	0.89	0.66	1.07	0.94	0.47	0.10	0.00												0.16	0.02
	0322	4 - 5	1.30	0.28	0.12	1.39	0.90	0.67	1.78	0.62	0.54	0.10	0.00												0.15	0.01
S14	0313	0 - 1	0.99	0.21	0.11	3.16	1.32	0.98	5.33	0.64	0.61	0.16	0.02												0.16	0.02
	0314	1 - 2	1.02	0.22	0.08	2.21	0.93	0.66	1.88	0.47	0.43	0.12	0.00												0.14	0.01
	0315	2 - 3	2.86	0.38	0.14	7.40	1.78	1.21	8.89	1.13	1.02	0.38	0.24												0.22	0.07
	0316	3 - 4	2.44	0.37	0.14	6.11	1.74	1.24	9.89	1.06	0.91	0.32	0.18												0.25	0.10
	0317	4 - 5	1.34	0.29	0.04	2.59	0.99	0.67	1.95	0.55	0.60	0.15	0.00												0.23	0.08
S15	0323	0 - 1	1.50	--	--	3.04	1.21	0.86	3.14	0.64	0.68	0.17	0.03												0.17	0.03
	0324	1 - 2	2.40	0.34	0.17	2.14	1.27	0.97	3.99	0.71	0.71	0.18	0.05												0.17	0.03
	0325	2 - 3	2.22	0.37	0.13	5.61	1.98	1.47	11.99	1.14	0.92	0.30	0.15												0.22	0.07
	0326	3 - 4	0.81	0.21	0.10	1.62	0.84	0.60	1.02	0.41	0.71	0.09	0.00												0.19	0.04

[a] When borehole samples were collected from remediated areas, for example Location 1 which was remediated down to 5 ft bgs, samples were assigned to the nearest one-meter increment. Sampling was stopped when native clay soil was reached or refusal encountered.
[b] Off-site laboratory results as reported by TestAmerica after sufficient in-growth time to reach ^{226}Ra progeny equilibrium.
[c] Italicized results indicate <MDC.
[d] **Bolded orange** SOF values indicate a result >0.5 but ≤1 and **bolded red** SOF values indicate a result >1.
[e] Calculated per Section 14.4.3.7 of C-T Phase II DP. Calculation of column SOF used on-site results unless off-site results were available.
[f] Calculated as discussed in Section 17.2.2.

Table 17-9 Gamma Spectroscopy Biased Borehole Sample Analytical Results

Sample Location	Sample ID	Sample Depth (m) [a]	On-Site Results											Off-Site Results [b]											Column SOF [c]	
			Activity Concentration (pCi/g)									Sample SOF		Activity Concentration (pCi/g)									Sample SOF			
			^{232}Th			^{226}Ra			^{238}U					^{232}Th			^{226}Ra			^{238}U						
			Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [d]	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Result	Uncert. (2σ)	MDC	Gross	Net [e]	Gross	Net [d]
B01	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00	Samples not sent to off-site laboratory (gross SOF < 0.5)											0.15	0.00
	0556	1 - 2	3.11	0.74	0.17	9.08	2.57	1.69	11.74	1.52	1.16	0.46	0.31												0.30	0.15
	0557	2 - 3	2.39	0.48	0.17	10.42	2.09	1.38	11.22	1.08	0.84	0.47	0.32												0.36	0.21
	0558	3 - 4	1.46	0.32	0.18	6.92	1.63	1.09	5.91	0.93	0.83	0.30	0.16												0.34	0.20
	0559	4 - 5	4.12	0.47	0.15	6.55	1.84	1.30	7.67	0.98	0.83	0.41	0.26												0.36	0.21
B02	--	0 - 1	Soil excavated; reference area background used for column average calculations									0.15	0.00												0.15	0.00
	--	1 - 2										0.15	0.00												0.15	0.00
	0560	2 - 3	1.49	0.31	0.12	7.30	1.81	1.24	8.50	1.06	0.86	0.32	0.18												0.20	0.06
	0561	3 - 4	2.50	0.43	0.15	7.07	1.97	1.41	10.16	1.68	0.91	0.36	0.21												0.24	0.10

[a] Sampling was stopped when native clay soil was reached or refusal encountered.
[b] Off-site laboratory results as reported by TestAmerica after sufficient in-growth time to reach ^{226}Ra progeny equilibrium.
[c] Calculated per Section 14.4.3.7 of C-T Phase II DP. Calculation of column SOF used on-site results unless off-site results were available.
[d] Calculated as discussed in Section 17.2.2.

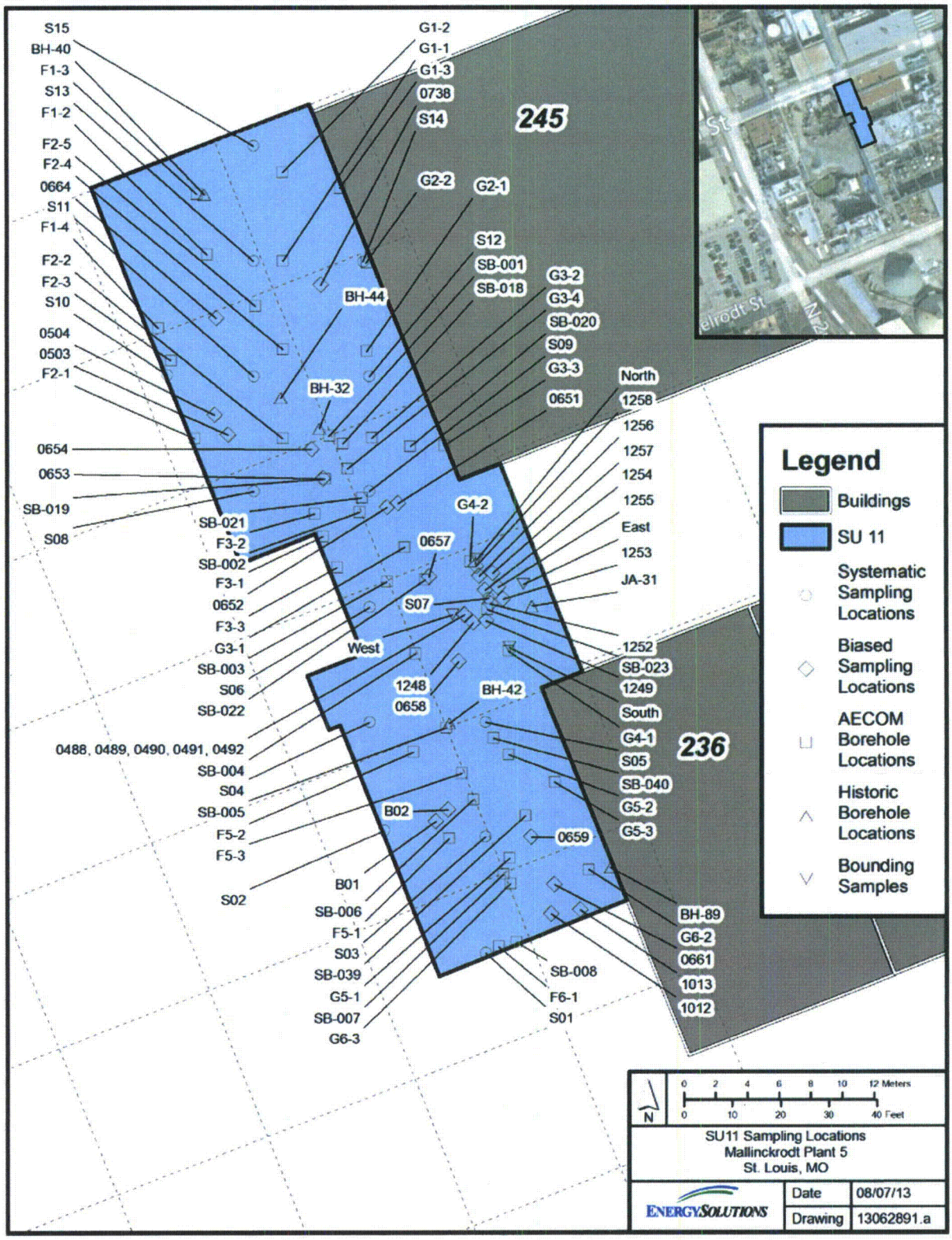

Figure 17-10 Characterization and FSS Sampling Locations

17.3 DATA ANALYSIS – EXCAVATED SURFACE

Data analysis of the excavated surface was performed based on the assumptions, methods, and performance criteria established to satisfy the DQOs in accordance with the C-T Phase II DP, Sections 14.4.1 and 14.4.3. Details regarding FSS design and quality assurance and quality control applicable to all survey units were discussed in Chapters 4 and 5, respectively, of this FSSR. Surface soil (0 to 30 cm) sample results and the first 1-m composite sample result from boreholes were used in the assessment of excavated and unexcavated locations, respectively as appropriate.

17.3.1 Elevated Area Evaluation

Equation 9 from C-T Phase II DP, Section 5.8.7 provides for the calculation of an *Index* value that represents the fraction or multiple of the $DCGL_{EMC}$. If the *Index* value is greater than one, then the $DCGL_{EMC}$ is exceeded.

17.3.1.1 Abandoned Sewer

Parameters necessary to calculate the *Index* value for the area of the *in situ* inactive sewer drain, noted as Elevated Area #1:

- The elevated area activity levels, represented by the weighted average of samples 0490 (5%) and 0492 (95%), were 12.85, 50.72, and 14.73 pCi/g for ^{232}Th, ^{226}Ra, and ^{238}U, respectively (from Table 17-3);
- Mean background activity levels were 1.3, 2.5, and 4.4 pCi/g for ^{232}Th, ^{226}Ra, and ^{238}U, respectively (from C-T Phase II DP Table 4-17);
- The size of the elevated area was determined to be less than 0.8 m^2 (10-inch diameter clay pipe with a length of 10 ft); and,
- The area factors from C-T Phase II DP Figure 5-3 for the elevated area were 2.2, 2.4, and 3.3 for ^{232}Th, ^{226}Ra, and ^{238}U, respectively.

The calculation of the *Index* value is shown below. Because the *Index* value as calculated in accordance with the DP was less than one, this elevated area is compliant with the C-T Phase II DP for elevated measurements in soil.

$$Index = \frac{(12.85 - 1.3)\,pCi/g}{(2.2 \times 23.9\,pCi/g)_{Th\,series}} + \frac{(50.72 - 2.5)\,pCi/g}{(2.4 \times 29.4\,pCi/g)_{Ra226}} + \frac{(14.73 - 4.4)\,pCi/g}{(3.3 \times 721\,pCi/g)_{U}} = 0.91$$

17.3.1.2 Systematic Sample Location 7

Parameters necessary to calculate the *Index* value for the area at systematic sample location 7 (S07), noted as Elevated Area #2:

- The elevated area activity levels, represented by the average of samples 1252 and 1254, were 28.57, 87.40, and 42.30 pCi/g for ^{232}Th, ^{226}Ra, and ^{238}U, respectively (from Table 17-5);

- Mean background activity levels were 1.3, 2.5, and 4.4 pCi/g for ^{232}Th, ^{226}Ra, and ^{238}U, respectively (from C-T Phase II DP Table 4-17);
- The size of the elevated area was determined to be approximately 13.2 m^2 as shown on Figure 17-9; and,
- The area factors from C-T Phase II DP Figure 5-3 for the elevated area were 2.1, 2.3, and 3.1 for ^{232}Th, ^{226}Ra, and ^{238}U, respectively.

The calculation of the *Index* value is shown below. Because the *Index* value as calculated in accordance with the DP was greater than one, this elevated area is not compliant with the C-T Phase II DP for elevated measurements in soil. Section 17.5 discusses a dose assessment performed to evaluate the impact of this area that is not compliant with the DCGLs.

$$Index = \frac{(28.57 - 1.3)\,pCi/g}{(2.1 \times 23.9\,pCi/g)_{Th\,series}} + \frac{(87.40 - 2.5)\,pCi/g}{(2.3 \times 29.4\,pCi/g)_{Ra226}} + \frac{(42.30 - 4.4)\,pCi/g}{(3.1 \times 721\,pCi/g)_{U}} = 1.82$$

17.3.1.3 Elevated Area South of the AECOM Grid F4 Vertical Pipe Stand

Parameters necessary to calculate the *Index* value for the elevated area south of the vertical pipe stand in AECOM grid F4 as shown on Figure 26-18, noted as Elevated Area #3:

- The elevated area activity levels, represented by AECOM sample 3335, were 82.98, 94.59, and 20.17 pCi/g for ^{232}Th, ^{226}Ra, and ^{238}U, respectively (from Table 26-4);
- Mean background activity levels were 1.3, 2.5, and 4.4 pCi/g for ^{232}Th, ^{226}Ra, and ^{238}U, respectively (from C-T Phase II DP Table 4-17);
- The size of the elevated area was determined to be approximately 25 m^2 as shown on Figure 17-11; and,
- The area factors from C-T Phase II DP Figure 5-3 for the elevated area were 1.7, 1.8, and 2.5 for ^{232}Th, ^{226}Ra, and ^{238}U, respectively.

The calculation of the *Index* value is shown below. Because the *Index* value as calculated in accordance with the DP was greater than one, this elevated area is not compliant with the C-T Phase II DP for elevated measurements in soil. Section 17.5 discusses a dose assessment performed to evaluate the impact of this area that is not compliant with the DCGLs.

$$Index = \frac{(82.98 - 1.3)\,pCi/g}{(1.7 \times 23.9\,pCi/g)_{Th\,series}} + \frac{(94.59 - 2.5)\,pCi/g}{(1.8 \times 29.4\,pCi/g)_{Ra226}} + \frac{(20.17 - 4.4)\,pCi/g}{(2.5 \times 721\,pCi/g)_{U}} = 3.76$$

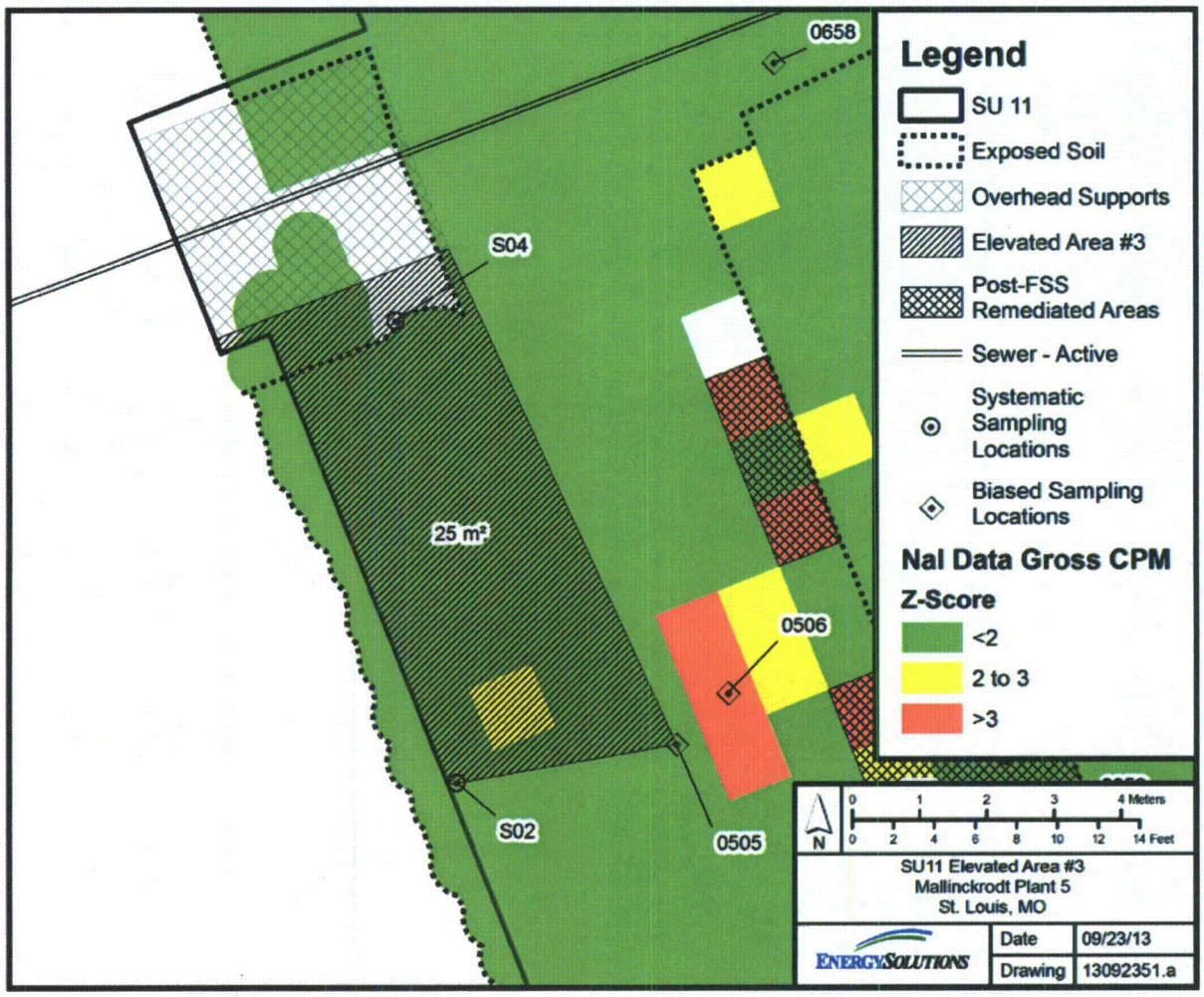

Figure 17-11 Elevated Area #3

17.3.2 Data Set Screening Analysis

Table 17-10 summarizes the results of the screening tests performed on the excavated surface FSS data in accordance with Pages 14-27 through 14-29 of the C-T Phase II DP. All applicable tests demonstrating compliance passed.

Table 17-10 Screening Tests Results – Excavated Surface

Screening Test	Test Value	Conclusion
Min/Max	7.94	FAIL; conduct DCGL test
Low Level	N/A	Not applicable; Class 1 survey unit
DCGL	0.52	PASS; conduct WRS test
EMC Limit	0.18	PASS

17.3.2.1 Min/Max

In accordance with Page 14-27 of the C-T Phase II DP, the Min/Max screening test value was calculated by subtracting the minimum reference area result from the maximum survey unit systematic result. Sample 0624 with a gross SOF of 7.96 (from Table 17-1) was the maximum survey unit systematic result. Sample BH-Z-08 with a calculated gross SOF of 0.02 (from C-T Phase II DP Table B-1) was the minimum reference area result. The Min/Max screening test value was calculated to be 7.94. Because the test value was greater than one, further computations are required, i.e., $DCGL_W$ screening and Wilcoxon Rank Sum (WRS) tests.

17.3.2.2 Low Level

In accordance with Page 14-27 of the C-T Phase II DP, the Low Level screening test is not applicable to Class 1 survey units.

17.3.2.3 $DCGL_W$

In accordance with Page 14-28 of the C-T Phase II DP and because the Min/Max test value was greater than one, the $DCGL_W$ screening test value was calculated by subtracting the reference area average gross SOF from the survey unit average gross SOF. The survey unit average gross SOF was 0.72 using on-site results and 0.15 using off-site results (from Table 17-1). It should be noted that sample 0624 was not sent for off-site analysis and was not included in the off-site results average. When including the on-site results for sample 0624 with the off-site results, the average gross SOF was 0.67. The reference area average gross SOF was calculated to be 0.15 using average activity concentrations from C-T Phase II DP Table 4-17. The $DCGL_W$ screening test value was calculated to be 0.52 using the combined survey unit average. Because the test value was less than one, the WRS test is required per C-T Phase II DP Table 14-6.

17.3.2.4 EMC Limit

In accordance with Page 14-26 of the C-T Phase II DP, the $DCGL_{EMC}$ is not applicable to subsurface survey units/areas which would include elevated area #3, the subsurface material south of the vertical pipe stand. Thus, the EMC limit is not applicable to this area.

In accordance with Page 14-28 of the C-T Phase II DP, the elevated measurement comparison (EMC) limit screening test was applied to the remaining two elevated areas: #1 at systematic sample location 7 (S07) and #2 at the *in situ* inactive sewer line. Parameters necessary to calculate the exposure-weighted fraction of the $DCGL_W$, F, were:

- The size of the elevated areas were determined to be approximately 13.2 m^2 for area #1 and less than 0.8 m^2 for area #2;
- The area factor from C-T Phase II DP Figure 5-3 for elevated area was conservatively set to 2.1, 2.2, and 1.7 for areas #1 and #2 (based on thorium series only);
- The elevated area activity level was a gross SOF = 4.23 and a gross SOF = 2.27 for areas #1 and #2, respectively; and,

- The survey unit average was a gross SOF = 0.15 (off-site results from Table 17-1, excluding on-site sample 0624 results).

The calculation of the EMC screening test result is shown below, using C-T Phase II DP Equation 14-7. A separate term was included for each elevated area.

$$F = \left[\frac{13.2\,m^2}{767\,m^2} \times \frac{4.23}{2.1 \times 1}\right] + \left[\frac{0.8\,m^2}{767\,m^2} \times \frac{2.27}{2.2 \times 1}\right] + \left[\frac{(767 - 13.2 - 0.8)\,m^2}{767\,m^2} \times \frac{0.15}{1}\right] = 0.18$$

In accordance with the C-T Phase II DP and because the result was less than one, the total radioactivity concentration in the survey unit is within the release criterion. However, elevated areas #2 and #3 failed the elevated area evaluation and are evaluated using a dose assessment in Section 17.5.

17.3.3 WRS Test

In accordance with Page 14-29 of the C-T Phase II DP, because the Min/Max test value was greater than one and the $DCGL_W$ test was less than one, the WRS Test was required to demonstrate compliance. The test was completed in accordance with Pages 14-29 and 14-30 of the C-T Phase II DP. The result was that the survey unit passed, with the calculation details provided in Table 17-11.

Table 17-11 WRS Test Results – Excavated Surface

Sample ID	Area	On-Site Results				Off-Site Results			
		Data (SOF)	Adjusted Data (SOF)	Ranks	RA Ranks	Data (SOF)	Adjusted Data (SOF)	Ranks	RA Ranks
BH-013	RA	0.11	1.11	22	22	0.11	1.11	22	22
BH-016	RA	0.42	1.42	29	29	0.42	1.42	29	29
BH-028	RA	0.10	1.10	21	21	0.10	1.10	21	21
BH-031	RA	0.09	1.09	18	18	0.09	1.09	18	18
BH-034	RA	0.29	1.29	28	28	0.29	1.29	28	28
BH-037	RA	0.22	1.22	25	25	0.22	1.22	25	25
BH-045	RA	0.10	1.10	20	20	0.10	1.10	20	20
BH-053	RA	0.16	1.16	23	23	0.16	1.16	23	23
BH-065	RA	0.23	1.23	26	26	0.23	1.23	26	26
BH-083	RA	0.07	1.07	17	17	0.07	1.07	17	17
BH-091	RA	0.24	1.24	27	27	0.24	1.24	27	27
BH-093	RA	0.10	1.10	19	19	0.10	1.10	19	19
BH-099	RA	0.22	1.22	24	24	0.22	1.22	24	24
BH-Z-02	RA	0.07	1.07	16	16	0.07	1.07	16	16
BH-Z-09	RA	0.05	1.05	15	15	0.05	1.05	15	15
0495	SU	0.12	0.12	4	0	0.08	0.08	4	0
0496	SU	0.05	0.05	1	0	0.03	0.03	1	0
0497	SU	0.81	0.81	14	0	0.50	0.50	14	0
0498	SU	0.15	0.15	6	0	0.11	0.11	5	0
0240	SU	0.19	0.19	10	0	0.21	0.21	12	0
0499	SU	0.21	0.21	11	0	0.13	0.13	9	0

Table 17-11 WRS Test Results – Excavated Surface (continued)

Sample ID	Area	On-Site Results				Off-Site Results			
		Data (SOF)	Adjusted Data (SOF)	Ranks	RA Ranks	Data (SOF)	Adjusted Data (SOF)	Ranks	RA Ranks
0624	SU	7.96	7.96	30	0	--			
0500	SU	0.32	0.32	13	0	0.30	0.30	13	0
0501	SU	0.10	0.10	2	0	0.12	0.12	7	0
0235	SU	0.18	0.18	9	0	0.15	0.15	10	0
0514	SU	0.11	0.11	3	0	0.07	0.07	3	0
0502	SU	0.21	0.21	12	0	0.15	0.15	11	0
0318	SU	0.13	0.13	5	0	0.06	0.06	2	0
0313	SU	0.16	0.16	7	0	0.12	0.12	6	0
0323	SU	0.17	0.17	8	0	0.13	0.13	8	0
			Sum:	465	330		Sum:	435	330
			Critical Value:	272			Critical Value:	263	
			Conclusion:	**PASS**			**Conclusion:**	**PASS**	

17.3.4 Retrospective Analysis

A retrospective analysis was performed of the FSS results to determine whether the results met the survey design objectives, in accordance with Page 14-30 of the C-T Phase II DP. Sample 0624 was the maximum systematic result (Table 17-1) with a gross SOF of 7.96. This result was greater than one and systematic sample 0624 was evaluated as part of the elevated area evaluation (Section 17.3.1) and dose assessment (Section 17.5). Also, the next largest systematic (on-site) result was sample 0497 (Table 17-1) with a gross SOF of 0.50. Because systematic sample 0624 was over 15½ times greater than the next highest systematic result, it was considered an outlier that would not allow for a meaningful assessment of the survey unit average and was therefore excluded from the analysis of the survey unit statistics. Table 17-12 provides the results of the retrospective analysis. Because the actual sample size exceeded the retrospective value sample size, the conclusion is that the survey design objectives were met.

Table 17-12 Retrospective Analysis – Excavated Surface

Parameter	*A Priori* Value	Retrospective Value Based on FSS Results (Gross SOF)
Upper Bound of Gray Region	DCGL = 1	1
Lower Bound of Gray Region	0.5 x DCGL = 0.5	0.15
Spatial Variability (standard deviation)	1/6 x DCGL = 0.17	0.12
Type I Error (false positive)	0.05	0.05
Type II Error (false negative)	0.05	0.05
Relative Shift	3	7
Calculated N/2 Sample Size	15 [a]	9
Actual N/2 Sample Size	--	14

[a] The *a priori* value of 15 for the N/2 sample size was determined to be a conservative value that would allow application of either the Sign or WRS test. The *a priori* value for N/2 is 10 based on MARSSIM Table 5.3.

17.4 Data Analysis – Subsurface Material

Data analysis of the subsurface material was performed based on the assumptions, methods, and performance criteria established to satisfy the DQOs in accordance with the C-T Phase II DP, Sections 14.4.1 and 14.4.3. Column average gross SOF results were used in the data assessment. Borehole sampling was stopped when native clay soil was reached or refusal encountered. Per Page 14-19 of the C-T Phase II DP, column averages were calculated over 1-m increments (averaged 0 to 1 m, 0 to 2 m, etc.) for the set of samples collected. Table 17-13 provides the calculated borehole column average gross SOF results. Table 17-14 provides the calculated borehole column average net SOF results.

Table 17-13 Systematic Borehole Column Average Gross SOF Results

Sample Location	Core Depth Interval (m)				
	0-1	0-2	0-3	0-4	0-5
	Combined Results for Column Average Gross SOF [a, b]				
S01	0.15	0.12	0.12	0.14	0.13
S02	0.15	0.16	0.13	0.15	0.21
S03	0.15	0.16	0.14	0.31	0.29
S04	0.15	0.20	0.27	0.24	--
S05	0.19	0.18	0.14	0.29	0.33
S06	0.15	0.17	0.25	0.24	--
S07	0.15	0.15	0.15	**2.10**	**1.73**
S08	0.15	0.16	--	0.19	--
S09	0.15	0.15	0.20	0.20	--
S10	0.18	0.21	0.27	0.23	0.20
S11	0.11	0.20	0.15	0.14	--
S12	0.16	0.17	0.14	0.19	0.23
S13	0.13	0.15	0.19	0.16	0.15
S14	0.16	0.14	0.22	0.25	0.23
S15	0.17	0.17	0.22	0.19	--
Summary Statistics					
Count:	15	15	14	15	9
Average:	0.15	0.17	0.18	0.33	0.39
Median:	0.15	0.16	0.17	0.20	0.23
Standard Dev.:	0.02	0.02	0.05	0.49	0.51
Minimum:	0.11	0.12	0.12	0.14	0.13
Maximum:	0.19	0.21	0.27	**2.10**	**1.73**
Range:	0.08	0.08	0.15	1.96	1.60

[a] **Bolded red** SOF values indicate a result >1.
[b] Calculation of column average gross SOF used on-site results unless off-site results were available.

Table 17-14 Systematic Borehole Column Average Net SOF Results

Sample Location	Core Depth Interval (m)				
	0-1	0-2	0-3	0-4	0-5
	Combined Results for Column Average Net SOF [a, b]				
S01	0.00	0.00	0.00	0.01	0.00
S02	0.00	0.02	0.00	0.01	0.06
S03	0.00	0.01	0.01	0.16	0.15
S04	0.00	0.06	0.12	0.10	--
S05	0.04	0.03	0.01	0.14	0.18
S06	0.00	0.02	0.10	0.10	--
S07	0.00	0.00	0.00	**1.95**	**1.59**
S08	0.00	0.02	--	0.04	--
S09	0.00	0.01	0.06	0.06	--
S10	0.06	0.07	0.12	0.09	0.06
S11	0.00	0.05	0.01	0.00	--
S12	0.05	0.04	0.02	0.05	0.08
S13	0.02	0.02	0.04	0.02	0.01
S14	0.02	0.01	0.07	0.10	0.08
S15	0.03	0.03	0.07	0.04	--
Summary Statistics					
Count:	15	15	14	15	9
Average:	0.02	0.03	0.04	0.19	0.25
Median:	0.00	0.02	0.03	0.06	0.08
Standard Dev.:	0.02	0.02	0.05	0.49	0.51
Minimum:	0.00	0.00	0.00	0.00	0.00
Maximum:	0.06	0.07	0.12	**1.95**	**1.59**
Range:	0.06	0.07	0.12	1.95	1.58

[a] **Bolded red** SOF values indicate a result >1.
[b] Calculation of column average net SOF used on-site results unless off-site results were available.

17.4.1 Data Set Screening Analysis

Table 17-10 summarizes the results of the screening tests performed on the borehole subsurface FSS data in accordance with Pages 14-27 through 14-29 of the C-T Phase II DP. All applicable tests demonstrating compliance passed.

Table 17-15 Screening Tests Results – Subsurface Material

Screening Test	Test Value	Conclusion
0 – 1 m		
Min/Max	0.17	PASS
Low Level	N/A	Not applicable; Class 1 survey unit
DCGL	N/A	Not applicable; Min / Max < 1
EMC Limit	N/A	Not applicable; subsurface material
0 – 2 m		
Min/Max	0.19	PASS
Low Level	N/A	Not applicable; Class 1 survey unit
DCGL	N/A	Not applicable; Min / Max < 1
EMC Limit	N/A	Not applicable; subsurface material
0 – 3 m		
Min/Max	0.25	PASS
Low Level	N/A	Not applicable; Class 1 survey unit
DCGL	N/A	Not applicable; Min / Max < 1
EMC Limit	N/A	Not applicable; subsurface material
0 – 4 m		
Min/Max	2.08	FAIL; conduct DCGL test
Low Level	N/A	Not applicable; Class 1 survey unit
DCGL	0.18	PASS; conduct WRS test
EMC Limit	N/A	Not applicable; subsurface material
0 – 5 m		
Min/Max	1.71	FAIL; conduct DCGL test
Low Level	N/A	Not applicable; Class 1 survey unit
DCGL	0.24	PASS; conduct WRS test
EMC Limit	N/A	Not applicable; subsurface material

17.4.1.1 Min/Max

In accordance with Page 14-27 of the C-T Phase II DP, the Min/Max screening test value was calculated by subtracting the minimum reference area result from the maximum survey unit systematic result. Systematic sample location 5 had the maximum survey unit systematic column average gross SOF of 0.19 for 0-1 m (from Table 17-13). Systematic sample locations 4 and 10 had the maximum survey unit systematic column average gross SOF of 0.21 and 0.27 for 0-2 m and 0-3 m, respectively (from Table 17-13). Systematic sample location 7 (S07) had the maximum survey unit systematic column average gross SOF of 2.10 and 1.73 for 0-4 m and 0-5 m, respectively (from Table 17-13). Sample BH-Z-08 with a calculated gross SOF of 0.02 (from C-T Phase II DP Table B-1) was the minimum reference area result. The Min/Max screening test value was calculated to be 0.17, 0.19, 0.25, 2.08, and 1.71 for 0-1 m, 0-2 m, 0-3 m, 0-4 m, and 0-5 m, respectively. Because the test value was less than one for 0-1 m, 0-2 m, and 0-3 m, further computations are not required, i.e., $DCGL_W$ screening and WRS tests. Because the test value was greater than one for 0-4 m and 0-5 m, further computations are required.

17.4.1.2 Low Level

In accordance with Page 14-27 of the C-T Phase II DP, the Low Level screening test is not applicable to Class 1 survey units.

17.4.1.3 $DCGL_W$

In accordance with Page 14-28 of the C-T Phase II DP and because the Min/Max test value was greater than one for 0-4 m and 0-5 m, the $DCGL_W$ screening test value was calculated by subtracting the reference area average gross SOF from the survey unit column average gross SOF. The survey unit column average gross SOF was 0.33 and 0.39 for 0-4 m and 0-5 m, respectively (from Table 17-13). The reference area average gross SOF was calculated to be 0.15 using average activity concentrations from C-T Phase II DP Table 4-17. The $DCGL_W$ screening test value was calculated to be 0.18 and 0.24 for 0-4 m and 0-5 m, respectively. Because the tests values were less than one, the WRS test is required per C-T Phase II DP Table 14-6.

17.4.1.4 EMC Limit

In accordance with Page 14-26 of the C-T Phase II DP, the $DCGL_{EMC}$ is not applicable to subsurface survey units, in this case the assessment of the subsurface material in the survey unit. Thus, the EMC limit is not applicable.

17.4.2 WRS Test

In accordance with Page 14-29 of the C-T Phase II DP, because the Min/Max test value was greater than one and the $DCGL_W$ test was less than one for 0-4 m and 0-5 m, the WRS Test was required to demonstrate compliance. The test was completed in accordance with Pages 14-29 and 14-30 of the C-T Phase II DP. The result was that the survey unit passed, with the calculation details provided in Table 17-16 and Table 17-17 for 0-4 m and 0-5 m, respectively.

Table 17-16 WRS Test Results – 0-4 m

Sample ID / Location	Area	Combined On-Site and Off-Site Results			
		Data (SOF)	Adjusted Data (SOF)	Ranks	RA Ranks
BH-013	RA	0.11	1.11	22	22
BH-016	RA	0.42	1.42	29	29
BH-028	RA	0.10	1.10	21	21
BH-031	RA	0.09	1.09	18	18
BH-034	RA	0.29	1.29	28	28
BH-037	RA	0.22	1.22	25	25
BH-045	RA	0.10	1.10	20	20
BH-053	RA	0.16	1.16	23	23
BH-065	RA	0.23	1.23	26	26
BH-083	RA	0.07	1.07	17	17
BH-091	RA	0.24	1.24	27	27
BH-093	RA	0.10	1.10	19	19
BH-099	RA	0.22	1.22	24	24
BH-Z-02	RA	0.07	1.07	16	16
BH-Z-09	RA	0.05	1.05	15	15
S01	SU	0.14	0.14	2	0
S02	SU	0.15	0.15	3	0
S03	SU	0.31	0.31	14	0
S04	SU	0.24	0.24	10	0
S05	SU	0.29	0.29	13	0
S06	SU	0.24	0.24	11	0
S07	SU	2.10	2.10	30	0
S08	SU	0.19	0.19	6	0
S09	SU	0.20	0.20	8	0
S10	SU	0.23	0.23	9	0
S11	SU	0.14	0.14	1	0
S12	SU	0.19	0.19	7	0
S13	SU	0.16	0.16	4	0
S14	SU	0.25	0.25	12	0
S15	SU	0.19	0.19	5	0
			Sum:	465	330
			Critical Value:	272	
			Conclusion:	**PASS**	

Table 17-17 WRS Test Results – 0-5 m

Sample ID / Location	Area	Combined On-Site and Off-Site Results			
		Data (SOF)	Adjusted Data (SOF)	Ranks	RA Ranks
BH-013	RA	0.11	1.11	16	16
BH-016	RA	0.42	1.42	23	23
BH-028	RA	0.10	1.10	15	15
BH-031	RA	0.09	1.09	12	12
BH-034	RA	0.29	1.29	22	22
BH-037	RA	0.22	1.22	19	19
BH-045	RA	0.10	1.10	14	14
BH-053	RA	0.16	1.16	17	17
BH-065	RA	0.23	1.23	20	20
BH-083	RA	0.07	1.07	11	11
BH-091	RA	0.24	1.24	21	21
BH-093	RA	0.10	1.10	13	13
BH-099	RA	0.22	1.22	18	18
BH-Z-02	RA	0.07	1.07	10	10
BH-Z-09	RA	0.05	1.05	9	9
S01	SU	0.13	0.13	1	0
S02	SU	0.21	0.21	4	0
S03	SU	0.29	0.29	7	0
S05	SU	0.33	0.33	8	0
S07	SU	1.73	1.73	24	0
S10	SU	0.20	0.20	3	0
S12	SU	0.23	0.23	6	0
S13	SU	0.15	0.15	2	0
S14	SU	0.23	0.23	5	0
			Sum:	300	240
			Critical Value:	215	
			Conclusion:	**PASS**	

17.4.3 Retrospective Analysis

A retrospective analysis was performed of the FSS results to determine whether the results met the survey design objectives, in accordance with Page 14-30 of the C-T Phase II DP.

Table 17-18, Table 17-19, and Table 17-20 provide the results of the retrospective analysis for 0-1 m, 0-2 m, and 0-3 m. Because the actual sample size exceeded the retrospective value sample size, the conclusion is that the survey design objectives were met.

Systematic sample location 7 (S07) was the maximum systematic result (Table 17-13) with a column average gross SOF of 2.10 for 0-4 m. This result was greater than one and the location was evaluated as part of the elevated area evaluation (Section 17.3.1) and dose assessment (Section 17.5). Also, the next largest systematic result was Location 5 (Table 17-13) with a column average gross SOF of 0.33. Because systematic sample location 7 (S07) was over 6-times greater than the next highest systematic result, it was considered an outlier that would not allow for a meaningful assessment of the survey unit average and was therefore excluded from the analysis of the survey unit statistics. Table 17-21 provides the results of the

retrospective analysis for 0-4 m. Because the actual sample size exceeded the retrospective value sample size, the conclusion is that the survey design objectives were met.

Systematic sample location 7 (S07) was the maximum systematic result (Table 17-13) with a column average gross SOF of 1.73 for 0-5 m. This result was greater than one and the location was evaluated as part of the elevated area evaluation (Section 17.3.1) and dose assessment (Section 17.5). Also, the next largest systematic result was Location 5 (Table 17-13) with a column average gross SOF of 0.33. Because systematic sample location 7 (S07) was over 5 times greater than the next highest systematic result, it was considered an outlier that would not allow for a meaningful assessment of the survey unit average and was therefore excluded from the analysis of the survey unit statistics. Table 17-22 provides the results of the retrospective analysis for 0-5 m. Because the actual sample size matched the retrospective value sample size, the conclusion is that the survey design objectives were met.

Table 17-18 Retrospective Analysis – 0-1 m

Parameter	*A Priori* Value	Retrospective Value Based on FSS Results (Gross SOF)
Upper Bound of Gray Region	DCGL = 1	1
Lower Bound of Gray Region	0.5 x DCGL = 0.5	0.15
Spatial Variability (standard deviation)	1/6 x DCGL = 0.17	0.02
Type I Error (false positive)	0.05	0.05
Type II Error (false negative)	0.05	0.05
Relative Shift	3	42
Calculated N/2 Sample Size	15 [a]	9
Actual N/2 Sample Size	--	15

[a] The *a priori* value of 15 for the N/2 sample size was determined to be a conservative value that would allow application of either the Sign or WRS test. The *a priori* value for N/2 is 10 based on MARSSIM Table 5.3.

Table 17-19 Retrospective Analysis – 0-2 m

Parameter	*A Priori* Value	Retrospective Value Based on FSS Results (Gross SOF)
Upper Bound of Gray Region	DCGL = 1	1
Lower Bound of Gray Region	0.5 x DCGL = 0.5	0.17
Spatial Variability (standard deviation)	1/6 x DCGL = 0.17	0.02
Type I Error (false positive)	0.05	0.05
Type II Error (false negative)	0.05	0.05
Relative Shift	3	42
Calculated N/2 Sample Size	15 [a]	9
Actual N/2 Sample Size	--	15

[a] The *a priori* value of 15 for the N/2 sample size was determined to be a conservative value that would allow application of either the Sign or WRS test. The *a priori* value for N/2 is 10 based on MARSSIM Table 5.3.

Table 17-20 Retrospective Analysis – 0-3 m

Parameter	*A Priori* Value	Retrospective Value Based on FSS Results (Gross SOF)
Upper Bound of Gray Region	DCGL = 1	1
Lower Bound of Gray Region	0.5 x DCGL = 0.5	0.18
Spatial Variability (standard deviation)	1/6 x DCGL = 0.17	0.05
Type I Error (false positive)	0.05	0.05
Type II Error (false negative)	0.05	0.05
Relative Shift	3	16
Calculated N/2 Sample Size	15 [a]	9
Actual N/2 Sample Size	--	14

[a] The *a priori* value of 15 for the N/2 sample size was determined to be a conservative value that would allow application of either the Sign or WRS test. The *a priori* value for N/2 is 10 based on MARSSIM Table 5.3.

Table 17-21 Retrospective Analysis – 0-4 m

Parameter	*A Priori* Value	Retrospective Value Based on FSS Results (Gross SOF)
Upper Bound of Gray Region	DCGL = 1	1
Lower Bound of Gray Region	0.5 x DCGL = 0.5	0.21
Spatial Variability (standard deviation)	1/6 x DCGL = 0.17	0.05
Type I Error (false positive)	0.05	0.05
Type II Error (false negative)	0.05	0.05
Relative Shift	3	15
Calculated N/2 Sample Size	15 [a]	9
Actual N/2 Sample Size	--	15

[a] The *a priori* value of 15 for the N/2 sample size was determined to be a conservative value that would allow application of either the Sign or WRS test. The *a priori* value for N/2 is 10 based on MARSSIM Table 5.3.

Table 17-22 Retrospective Analysis – 0-5 m

Parameter	*A Priori* Value	Retrospective Value Based on FSS Results (Gross SOF)
Upper Bound of Gray Region	DCGL = 1	1
Lower Bound of Gray Region	0.5 x DCGL = 0.5	0.22
Spatial Variability (standard deviation)	1/6 x DCGL = 0.17	0.07
Type I Error (false positive)	0.05	0.05
Type II Error (false negative)	0.05	0.05
Relative Shift	3	11
Calculated N/2 Sample Size	15 [a]	9
Actual N/2 Sample Size	--	9

[a] The *a priori* value of 15 for the N/2 sample size was determined to be a conservative value that would allow application of either the Sign or WRS test. The *a priori* value for N/2 is 10 based on MARSSIM Table 5.3.

17.5 Dose Assessment of Elevated Areas #2 and #3

The evaluation of Elevated Area #2 (Section 17.3.1) calculated an *Index* value of 1.82 for the area at systematic sample location 7 (S07). The evaluation of Elevated Area #3 (Section 17.3.1) calculated an *Index* value of 3.76 for the area south of the vertical pipe stand in AECOM grid F4 shown on Figure 17-11. Because these values were greater than one, the elevated areas failed to demonstrate compliance using the DCGLs developed in C-T Phase II DP Chapter 5. As an alternative, this section presents the results of a dose assessment to evaluate Elevated Areas #2 and #3.

17.5.1 Verification of RESRAD v6.5

C-T Phase II DP Chapter 5 presented three dose models (cases) in the development of the DCGLs. 408guti, 407guti, and 399guti were the RESRAD v6.4 cases for the thorium series, natural uranium, and "6 ^{230}Th + ^{226}Ra + ^{210}Pb," respectively. Energy*Solutions* was currently using RESRAD v6.5; therefore, to ensure comparable results, the three cases mentioned were run in the later version. Section 12.5.1 of this FSSR documents the results of the comparison. In conclusion, RESRAD v6.5 provided identical or comparable results to RESRAD v6.4 and therefore RESRAD v6.5 was used to perform the dose assessments of Elevated Areas #2 and #3.

17.5.2 Elevated Area Characterization

17.5.2.1 Elevated Area Size

Elevated Area #2 identified at systematic sample location 7 (S07) was between and beneath active water and fire lines. Pre-remediation bounding borehole sampling was performed to the (plant) north, south, east, and west of systematic sample location 7 (S07) (Table 17-4). Trench post-remediation samples were also collected (Table 17-5). The area bounded was 13.2 m^2, as shown in Figure 17-9. The results in Table 17-8 demonstrated that the elevated area was limited to the 3-4 m bgs strata after remediation.

Elevated Area #3 south of the vertical pipe stand in AECOM grid F4 shown on Figure 17-11 was bounded by systematic borehole location 2, extending up to and along the southern edge of the F4 vertical pipe stand, and back down to the biased borehole location 2 (corresponds to surface sample 0505). The area bounded was 25 m^2, as shown in Figure 17-11. AECOM noted that contamination was at 18 ft bgs. Energy*Solutions* excavated the first 5 ft of soil in this area and during sampling encountered the clay layer at 16 ft; however, the more conservative depth of 18 ft bgs will be used. The thickness of the contaminated zone is therefore 13 ft or 4 m.

17.5.2.2 Radionuclide Concentrations

The 3-4 m bgs borehole sample 0624 (Table 17-8) with an on-site net SOF result of 7.81 represents the radionuclide concentrations averaged 1-m. This sample was collected prior to remediation activities, with post-remediation surface sample results (30 cm) within the trench at systematic sample location 7 (S07) provided in Table 17-5. Post-remediation samples 1252 and 1254 were used in the elevated area evaluation (Section 17.3.1), with a off-site net SOF results of 0.94 and 7.23, respectively. Other samples in the table demonstrate that the elevated area is

considerably smaller than 13.2 m^2; however to ensure a conservative evaluation, the elevated area size was not reduced. Elevated Area #2 gross activity levels using the average of samples 1252 and 1254 were 28.57, 87.40, and 42.30 pCi/g for ^{232}Th, ^{226}Ra, and ^{238}U, respectively (from Table 17-23). The elevated area net activity levels were 27.27, 84.90, and 37.90 pCi/g for ^{232}Th, ^{226}Ra, and ^{238}U, respectively.

Table 17-23 Elevated Area #2 Radionuclide Concentrations

Sample ID	Gross				Net			
	Concentration (pCi/g)			SOF [a]	Concentration (pCi/g)			SOF [a]
	^{232}Th	^{226}Ra	^{238}U		^{232}Th	^{226}Ra	^{238}U	
1252	7.44	21.80	20.00	**1.08**	6.14	19.30	15.60	**0.94**
1254	49.70	153.00	64.60	**7.37**	48.40	150.50	60.20	**7.23**
Avg.	28.57	87.40	42.30	**4.23**	27.27	84.90	37.90	**4.08**

[a] **Bolded orange** SOF values indicate a result >0.5 but ≤1 and **bolded red** SOF values indicate a result >1.

Table 17-24 provides the west wall characterization samples in AECOM grids F4 and F5. These samples were collected as part of the east wall characterization relative to SU20—see Table 26-4. Elevated Area #3 gross activity levels, conservatively represented by sample 3335, were 82.98, 94.59, and 20.17 pCi/g for ^{232}Th, ^{226}Ra, and ^{238}U, respectively (from Table 17-24). The elevated area net activity levels were 81.68, 92.09, and 15.77 pCi/g for ^{232}Th, ^{226}Ra, and ^{238}U, respectively.

Table 17-24 Elevated Area #3 Radionuclide Concentrations

Sample ID	Gross				Net			
	Concentration (pCi/g)			SOF [a]	Concentration (pCi/g)			SOF [a]
	^{232}Th	^{226}Ra	^{238}U		^{232}Th	^{226}Ra	^{238}U	
3332	3.01	12.17	12.03	**0.56**	1.71	9.67	7.63	0.41
3334	48.20	63.21	20.10	**4.19**	46.9	60.71	15.7	**4.05**
3335	82.98	94.59	20.17	**6.72**	81.68	92.09	15.77	**6.57**

[a] **Bolded orange** SOF values indicate a result >0.5 but ≤1 and **bolded red** SOF values indicate a result >1.

17.5.3 *In Situ* Model and Results

17.5.3.1 RESRAD Model

The C-T Phase II DP Chapter 5 RESRAD models 408guti, 407guti, and 399guti were identical except for the entered radionuclide concentrations. Three models were run in order to develop independent DCGLs. For these elevated areas, the actual radionuclide concentrations were established based on sampling and therefore independent models were not required. Table 17-25 provides the RESRAD *in situ* model parameters that were changed from the C-T Phase II DP Chapter 5 RESRAD models and the justification for each change.

Table 17-25 RESRAD *In Situ* Model Parameter Values for Elevated Area #2

Parameter	Value	Justification
Soil Concentrations		
^{228}Ra, ^{228}Th, and ^{232}Th	27.27 pCi/g	Thorium series in secular equilibrium per C-T Phase II DP Section 5.8.2. Average net ^{232}Th concentration from Table 17-23.
^{226}Ra and ^{210}Pb	84.90 pCi/g	^{226}Ra and progeny in secular equilibrium per C-T Phase II DP Section 5.8.4. Average net ^{226}Ra concentration from Table 17-23.
^{230}Th	509.4 pCi/g	^{230}Th was not measured in FSS samples. The ^{230}Th / ^{226}Ra ratio of 6 was assumed per C-T Phase II DP Section 5.8.4.
^{238}U and ^{234}U	37.90 pCi/g	For natural uranium, the concentrations of ^{238}U and ^{234}U are equal per C-T Phase II DP Section 5.8.3. Average net ^{238}U concentration from Table 17-23.
^{235}U, ^{231}Pa, and ^{227}Ac	1.72 pCi/g	^{235}U and progeny in naturally-occurring proportion (^{235}U / ^{238}U = 0.0455) per C-T Phase II DP Section 5.8.3.
Contaminated Zone		
Area	13.2 m^2	Bounding area as discussed in Section 17.5.2.1.
Thickness	1 m	Thickness for the 3-4 m contaminated strata as discussed in Section 17.5.2.1.
Cover/Hydrol.		
Cover depth	3 m	The first 3 m of soil was excavated and replaced with non-contaminated off-site backfill.

Table 17-26 RESRAD *In Situ* Model Parameter Values for Elevated Area #3

Parameter	Value	Justification
Soil Concentrations		
^{228}Ra, ^{228}Th, and ^{232}Th	81.68 pCi/g	Thorium series in secular equilibrium per C-T Phase II DP Section 5.8.2. Average net ^{232}Th concentration from Section 17.5.2.2.
^{226}Ra and ^{210}Pb	92.09 pCi/g	^{226}Ra and progeny in secular equilibrium per C-T Phase II DP Section 5.8.4. Average net ^{226}Ra concentration from Section 17.5.2.2.
^{230}Th	552.54 pCi/g	^{230}Th was not measured in FSS samples. The ^{230}Th / ^{226}Ra ratio of 6 was assumed per C-T Phase II DP Section 5.8.4.
^{238}U and ^{234}U	15.77 pCi/g	For natural uranium, the concentrations of ^{238}U and ^{234}U are equal per C-T Phase II DP Section 5.8.3. Average net ^{238}U concentration from Section 17.5.2.2.
^{235}U, ^{231}Pa, and ^{227}Ac	0.72 pCi/g	^{235}U and progeny in naturally-occurring proportion (^{235}U / ^{238}U = 0.0455) per C-T Phase II DP Section 5.8.3.
Contaminated Zone		
Area	25 m^2	Area as discussed in Section 17.5.2.1.
Thickness	4 m	Thickness of elevated area as discussed in Section 17.5.2.1.
Cover/Hydrol.		
Cover depth	1.5 m	The excavation was approximately 5 ft at this location.

Table 17-26 RESRAD *In Situ* Model Parameter Values for Elevated Area #3 (continued)

Parameter	Value	Justification
Cover erosion rate	3E-06 m/yr	Maximum range value for natural succession vegetation on a 2% slope from RESRAD User's Manual Page A-9. Permanent pasture and row-crop agriculture ranges not applicable for industrial worker scenario. NOTE: The calculated maximum dose was not sensitive to this parameter (or similarly the contaminated zone erosion rate) for the DCGL calculations presented in the C-T Phase II DP. However, for this model, the maximum dose was sensitive to this parameter. The default value of 0.001 m/yr was re-evaluated and based on published literature, was too conservative for the industrial worker scenario.

17.5.3.2 Result

The maximum dose for Elevated Area #2 was 9.215E-08 millirem per year (mrem/yr) at year 1,000. Appendix A provides the RESRAD summary report.

The maximum dose for Elevated Area #3 was 3.811E-05 mrem/yr at year 1,000. Appendix B provides the RESRAD summary report.

17.5.4 Excavation Scenario Model and Results

In addition to evaluating the dose from the elevated areas *in situ*, an excavation scenario was developed to evaluate the dose if the contaminated material was exposed. It is unlikely, based on the future use scenario described in C-T Phase II DP Chapter 5, that large areas of contaminated material would be exposed during future site activities. No building foundations or basements are expected to be installed at the site, so excavation to expose the entire elevated area is unlikely. Utility systems are likely to be installed and most systems are installed in the 6 ft bgs depth range; however, the specific depth of the elevated area is not evaluated in this scenario.

For Elevated Area #2, the scenario assumes that a 3-ft (0.9-m) wide trench is excavated to the shallowest depth of the elevated area. The length of the trench, assumed to be equivalent to the diameter of a circle with the area equal to the elevated area size of 13.2 m^2, is 4.1 m. The area of the trench (excavation) would be 3.7 m^2 (4.1 m by 0.9 m) and represents the size of the elevated area for which the critical receptor will be exposed. The critical receptor is an industrial worker, but not the same individual as that evaluated using the DCGLs, e.g. a contractor is performing the work.

It is assumed that the industrial worker will spend a total of 0.5 hours per meter of trench. Examples of activities being performed include trench bottom preparation, such as leveling aggregate, and pipe joining, such as welding. Total time in this trench would be 2.1 hours (0.5 hours per meter of trench × 4.1 m length). RESRAD evaluates dose on an annual basis.

Therefore, 2.1 hours out of a year's time would be an outdoor time fraction of 0.00024 hours (2.1 hours / 8,766 hours). Indoor time fraction is zero since this is not an indoor scenario.

For Elevated Area #3, the scenario is identical to the scenario for Elevated Area #2. The length of the trench, assumed to be equivalent to the diameter of a circle with the area equal to the elevated area size of 25 m^2, is 5.6 m. The area of the trench (excavation) would be 5 m^2 (5.6 m by 0.9 m). Total time in this trench would be 2.8 hours (0.5 hours per meter of trench × 5.6 m length). RESRAD evaluates dose on an annual basis. Therefore, 2.8 hours out of a year's time would be an outdoor time fraction of 0.00032 hours (2.8 hours / 8,766 hours). Indoor time fraction is zero since this is not an indoor scenario.

17.5.4.1 RESRAD Model

Similar to the *in situ* model discussed in Section 17.5.3.1, one RESRAD model was developed for the excavation scenario for each elevated area. Table 17-27 provides the RESRAD excavation scenario model parameters that were changed from the C-T Phase II DP Chapter 5 RESRAD models and the justification for each change.

Table 17-27 RESRAD Excavation Scenario Model Parameter Values for Elevated Area #2

Parameter	Value	Justification
Soil Concentrations		
^{228}Ra, ^{228}Th, and ^{232}Th	27.27 pCi/g	Thorium series in secular equilibrium per C-T Phase II DP Section 5.8.2. Average net ^{232}Th concentration from Table 17-23.
^{226}Ra and ^{210}Pb	84.90 pCi/g	^{226}Ra and progeny in secular equilibrium per C-T Phase II DP Section 5.8.4. Average net ^{226}Ra concentration from Table 17-23.
^{230}Th	509.4 pCi/g	^{230}Th was not measured in FSS samples. The ^{230}Th / ^{226}Ra ratio of 6 was assumed per C-T Phase II DP Section 5.8.4.
^{238}U and ^{234}U	37.90 pCi/g	For natural uranium, the concentrations of ^{238}U and ^{234}U are equal per C-T Phase II DP Section 5.8.3. Average net ^{238}U concentration from Table 17-23.
^{235}U, ^{231}Pa, and ^{227}Ac	1.72 pCi/g	^{235}U and progeny in naturally-occurring proportion (^{235}U / ^{238}U = 0.0455) per C-T Phase II DP Section 5.8.3.
Contaminated Zone		
Area	3.7 m^2	Trench area of 3.7 m^2 assuming 3-ft (0.9-m) wide trench and 4.1 m long trench.
Thickness	0.30 m	C-T Phase II DP Appendix D, Page D-17, documents that for the radionuclide mixture used to develop the DCGLs that the maximum dose rate by direct radiation is reached asymptotically when the contaminated zone thickness reaches about 30 cm. Additional contaminated zone thickness does not result in additional dose.
Occupancy, Inhalation, and External Gamma Data		
Indoor time fraction	0	No internal exposure applicable for the critical receptor within a trench.

Table 17-27 RESRAD Excavation Scenario Model Parameter Values for Elevated Area #2 (continued)

Parameter	Value	Justification
Outdoor time fraction	0.00024 hours	2.1 hours for this length of trench within any given modeled year.

Table 17-28 RESRAD Excavation Scenario Model Parameter Values for Elevated Area #3

Parameter	Value	Justification
Soil Concentrations		
^{228}Ra, ^{228}Th, and ^{232}Th	81.68 pCi/g	Thorium series in secular equilibrium per C-T Phase II DP Section 5.8.2. Average net ^{232}Th concentration from Section 17.5.2.2.
^{226}Ra and ^{210}Pb	92.09 pCi/g	^{226}Ra and progeny in secular equilibrium per C-T Phase II DP Section 5.8.4. Average net ^{226}Ra concentration from Section 17.5.2.2.
^{230}Th	552.54 pCi/g	^{230}Th was not measured in FSS samples. The ^{230}Th / ^{226}Ra ratio of 6 was assumed per C-T Phase II DP Section 5.8.4.
^{238}U and ^{234}U	15.77 pCi/g	For natural uranium, the concentrations of ^{238}U and ^{234}U are equal per C-T Phase II DP Section 5.8.3. Average net ^{238}U concentration from Section 17.5.2.2.
^{235}U, ^{231}Pa, and ^{227}Ac	0.72 pCi/g	^{235}U and progeny in naturally-occurring proportion (^{235}U / ^{238}U = 0.0455) per C-T Phase II DP Section 5.8.3.
Contaminated Zone		
Area	5 m^2	Trench area of 5 m^2 assuming 3-ft (0.9-m) wide trench and 5.6 m long trench.
Thickness	0.30 m	C-T Phase II DP Appendix D, Page D-17, documents that for the radionuclide mixture used to develop the DCGLs that the maximum dose rate by direct radiation is reached asymptotically when the contaminated zone thickness reaches about 30 cm. Additional contaminated zone thickness does not result in additional dose.
Occupancy, Inhalation, and External Gamma Data		
Indoor time fraction	0	No internal exposure applicable for the critical receptor within a trench.
Outdoor time fraction	0.00032 hours	2.8 hours for this length of trench within any given modeled year.

17.5.4.2 Result

The maximum dose for Elevated Area #2 was 7.757E-02 mrem/yr at year 0. Appendix C provides the RESRAD summary report.

The maximum dose for Elevated Area #3 was 2.087E-01 mrem/yr at year 0. Appendix D provides the RESRAD summary report.

17.5.5 Dose Using Survey Unit Average

17.5.5.1 Excavated Surface

Table 17-1 provided the systematic sample results for the excavated surface. Because the on-site results for systematic sample location 7 (S07; sample 0624) was addressed as part of the dose assessment, it was not included as part of the survey unit average. The average net SOF for the off-site summary statistics was 0.05. This corresponds to a dose of 1.25 mrem/yr.

17.5.5.2 Subsurface Material

Table 17-14 provided the systematic borehole results. Excluding systematic sample location 7 as justified above, the average net SOF results ranged from 0.02 to 0.08. This corresponds to a dose range of 0.5 to 2 mrem/yr.

17.5.6 Conclusion

Adding together the *in situ* doses of 9.215E-08 mrem/yr and 3.811E-05 mrem/yr for Elevated Areas #2 and #3, respectively, and the maximum dose from the survey unit average of 2 mrem/yr, the as-left total dose from the survey unit is 2 mrem/yr for the critical receptor.

The independently-evaluated excavation scenario doses were 0.0776 mrem/yr and 0.2087 mrem/yr for Elevated Areas #2 and #3, respectively. The total excavation scenario dose is 0.29 mrem/yr.

17.6 DEVIATIONS

In accordance with the second bullet in Section 14.5 of the C-T Phase II DP, the FSSR is required to list changes made in the FSS from what was proposed in the DP. Only one deviation was noted. Page 14-27 of the C-T Phase II DP indicated that the "data set for the survey unit will be processed within a database using screening software developed and verified for the project." This database was not developed; instead, a combination of Microsoft® Excel® spreadsheets and hand calculations was utilized. This deviation is not significant and does not affect the data collection or assessment.

17.7 NRC INSPECTIONS

A summary of U.S. Nuclear Regulatory Commission (NRC) inspections applicable to the FSS are provided in Section 5.8 of this FSSR. The scope of the inspections included, but was not limited to: review of project plans, interviewing of project personnel, evaluation of the on-site laboratory, and independent confirmatory surveys conducted by the NRC prior to and after backfilling. Inspection Report 04006563/12001 noted that the NRC reviewed the FSS data package for SU11 to ensure the licensee conducted the survey in accordance with the requirements as stated in the DP. No violations were identified. No findings of significance were identified.

17.8 CONCLUSION

FSS data were verified to be reliable, appropriately documented, and technically defensible. Specifically, the following conclusions are made:

- The instruments used to collect the data were capable of detecting the radiation type (i.e., gamma) at or below the release criteria (described in Sections 4.4 and 4.5 of this FSSR).
- The calibration of the instruments used to collect the data was current and radioactive sources used for calibration were National Institute of Standards and Technology (NIST) traceable (described in Section 5.4 of this FSSR). Specific records available upon request.
- Instrument response was checked before instrument use each day, at minimum (described in Section 5.4 of this FSSR). Specific records available upon request.
- The survey methods used to collect the data were appropriate for the media and type of radiation being measured (described in Section 4.4, 4.5, and 4.6 of this FSSR).
- The custody of samples collected for laboratory analysis was tracked from the point of collection until final results were obtained (described in Section 5.5.2 of this FSSR). Specific records available upon request.
- The survey data consist of qualified measurement results that are representative of the area of interest.
- Areas identified with elevated residual radioactivity (i.e. SOF > 1.0) were appropriately investigated and the $DCGL_{EMC}$ properly applied or dose assessments performed.

All the applicable screening tests passed or a dose assessment was performed, the retrospective analysis found that the survey design objectives were met, and additional subsurface contamination was not reasonably suspected. SU11 meets the industrial use scenario release criterion as established in the C-T Phase II DP Chapter 5; and therefore, satisfies the unrestricted release provisions of Title 10, Code of Federal Regulations (CFR), Part 20, Subpart E.

17.9 REFERENCES

Mallinckrodt, *Mallinckrodt Columbium-Tantalum Phase II Decommissioning Plan*, Revision 2, August 2008.

APPENDIX A

RESRAD v6.5 Summary Report for Elevated Area #2 *In Situ* Model

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Summary : SU11 Elevated Area #2 In Situ
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Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-227 (Source: FGR 12)	4.951E-04	4.951E-04	DCF1(1)
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(2)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(3)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(4)
A-1	Bi-211 (Source: FGR 12)	2.559E-01	2.559E-01	DCF1(5)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(6)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(7)
A-1	Fr-223 (Source: FGR 12)	1.980E-01	1.980E-01	DCF1(8)
A-1	Pa-231 (Source: FGR 12)	1.906E-01	1.906E-01	DCF1(9)
A-1	Pa-234 (Source: FGR 12)	1.155E+01	1.155E+01	DCF1(10)
A-1	Pa-234m (Source: FGR 12)	8.967E-02	8.967E-02	DCF1(11)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(12)
A-1	Pb-211 (Source: FGR 12)	3.064E-01	3.064E-01	DCF1(13)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(14)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(15)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(16)
A-1	Po-211 (Source: FGR 12)	4.764E-02	4.764E-02	DCF1(17)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(18)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(19)
A-1	Po-215 (Source: FGR 12)	1.016E-03	1.016E-03	DCF1(20)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(21)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(22)
A-1	Ra-223 (Source: FGR 12)	6.034E-01	6.034E-01	DCF1(23)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(24)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(25)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(26)
A-1	Rn-219 (Source: FGR 12)	3.083E-01	3.083E-01	DCF1(27)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(28)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(29)
A-1	Th-227 (Source: FGR 12)	5.212E-01	5.212E-01	DCF1(30)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(31)
A-1	Th-230 (Source: FGR 12)	1.209E-03	1.209E-03	DCF1(32)
A-1	Th-231 (Source: FGR 12)	3.643E-02	3.643E-02	DCF1(33)
A-1	Th-232 (Source: FGR 12)	5.212E-04	5.212E-04	DCF1(34)
A-1	Th-234 (Source: FGR 12)	2.410E-02	2.410E-02	DCF1(35)
A-1	Tl-207 (Source: FGR 12)	1.980E-02	1.980E-02	DCF1(36)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(37)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(38)
A-1	U-234 (Source: FGR 12)	4.017E-04	4.017E-04	DCF1(39)
A-1	U-235 (Source: FGR 12)	7.211E-01	7.211E-01	DCF1(40)
A-1	U-238 (Source: FGR 12)	1.031E-04	1.031E-04	DCF1(41)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.724E+00	6.700E+00	DCF2(1)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(2)
B-1	Pb-210+D	1.380E-02	1.360E-02	DCF2(3)
B-1	Po-210	9.400E-03	9.400E-03	DCF2(4)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(5)
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(6)

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Summary : SU11 Elevated Area #2 In Situ
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Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case+	Parameter Name
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(7)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(8)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(9)
B-1	U-234	1.320E-01	1.320E-01	DCF2(10)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(11)
B-1	U-238	1.180E-01	1.180E-01	DCF2(12)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(13)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.410E-02	DCF3(1)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(2)
D-1	Pb-210+D	5.376E-03	5.370E-03	DCF3(3)
D-1	Po-210	1.900E-03	1.900E-03	DCF3(4)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(5)
D-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(6)
D-1	Th-228+D	8.086E-04	3.960E-04	DCF3(7)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(8)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(9)
D-1	U-234	2.830E-04	2.830E-04	DCF3(10)
D-1	U-235+D	2.673E-04	2.660E-04	DCF3(11)
D-1	U-238	2.550E-04	2.550E-04	DCF3(12)
D-1	U-238+D	2.687E-04	2.550E-04	DCF3(13)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(3,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(3,3)
D-34				
D-34	Po-210 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Po-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(4,2)
D-34	Po-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.400E-04	3.400E-04	RTF(4,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(5,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(6,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(6,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(6,3)
D-34				

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Summary : SU11 Elevated Area #2 In Situ
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Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(8,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(8,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(9,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(9,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(9,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(10,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(10,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(10,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(11,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(11,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(11,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(12,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(12,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(12,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(13,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(13,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(13,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(2,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2,2)
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
D-5				
D-5	Po-210 , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Po-210 , crustacea and mollusks	2.000E+04	2.000E+04	BIOFAC(4,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(5,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(5,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(6,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(6,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(7,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7,2)
D-5				

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Summary : SU11 Elevated Area #2 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 IN SITU.RAD

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(8,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(8,2)
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(9,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(9,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(10,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(10,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(11,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(11,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(12,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(12,2)
D-5				
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(13,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(13,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

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Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.320E+01	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.000E+00	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ac-227	1.720E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Pa-231	1.720E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Pb-210	8.490E+01	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ra-226	8.490E+01	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Ra-228	2.727E+01	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Th-228	2.727E+01	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): Th-230	5.094E+02	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): Th-232	2.727E+01	0.000E+00	---	S1(9)
R012	Initial principal radionuclide (pCi/g): U-234	3.790E+01	0.000E+00	---	S1(10)
R012	Initial principal radionuclide (pCi/g): U-235	1.720E+00	0.000E+00	---	S1(11)
R012	Initial principal radionuclide (pCi/g): U-238	3.790E+01	0.000E+00	---	S1(12)
R012	Concentration in groundwater (pCi/L): Ac-227	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Pa-231	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Th-228	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): Th-232	not used	0.000E+00	---	W1(9)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(10)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1(11)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(12)
R013	Cover depth (m)	3.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.500E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID

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Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	0.000E+00	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ac-227				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	2.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.319E-02	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Pa-231				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.311E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.661E-03	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.798E-03	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.798E-03	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.444E-06	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.444E-06	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for Th-232				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.444E-06	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(10)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(10,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.311E-03	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)
R016	Distribution coefficients for U-235				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(11)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(11,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.311E-03	ALEACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(12)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(12,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(12)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.311E-03	ALEACH(12)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(12)
R016	Distribution coefficients for daughter Po-210				
R016	Contaminated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.612E-02	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R017	Inhalation rate (m**3/yr)	1.227E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	3.500E-05	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	6.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	1.700E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	1.825E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	4.563E-02	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)

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Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	not used	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL

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Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

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Summary : SU11 Elevated Area #2 In Situ
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Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

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Summary : SU11 Elevated Area #2 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 IN SITU.RAD

Contaminated Zone Dimensions	
Area:	13.20 square meters
Thickness:	1.00 meters
Cover Depth:	3.00 meters

Initial Soil Concentrations, pCi/g	
Ac-227	1.720E+00
Pa-231	1.720E+00
Pb-210	8.490E+01
Ra-226	8.490E+01
Ra-228	2.727E+01
Th-228	2.727E+01
Th-230	5.094E+02
Th-232	2.727E+01
U-234	3.790E+01
U-235	1.720E+00
U-238	3.790E+01

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	7.152E-12	7.212E-12	7.323E-12	7.721E-12	9.223E-12	1.786E-11	1.185E-10	9.215E-08
M(t):	2.861E-13	2.885E-13	2.929E-13	3.088E-13	3.689E-13	7.143E-13	4.741E-12	3.686E-09

Maximum TDOSE(t): 9.215E-08 mrem/yr at t = 1.000E+03 years

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Summary : SU11 Elevated Area #2 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 IN SITU.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	6.537E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	1.054E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	4.250E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.213E-13	0.0170	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	1.088E-12	0.1522	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	5.896E-12	0.8245	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	1.581E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	4.556E-14	0.0064	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	3.529E-23	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	8.439E-28	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	1.012E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	7.152E-12	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.537E-21	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.054E-22	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.250E-22	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.213E-13	0.0170
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.088E-12	0.1522
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.896E-12	0.8245
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.581E-16	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.556E-14	0.0064
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.529E-23	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.439E-28	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.012E-18	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.152E-12	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #2 In Situ
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	6.340E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	3.122E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	7.157E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.222E-13	0.0169	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	2.665E-12	0.3695	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	4.143E-12	0.5745	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	4.781E-16	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	2.813E-13	0.0390	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	2.488E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	5.295E-27	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	1.021E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	7.212E-12	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.340E-21	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.122E-22	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.157E-22	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.222E-13	0.0169
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.665E-12	0.3695
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.143E-12	0.5745
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.781E-16	0.0001
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.813E-13	0.0390
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.488E-22	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.295E-27	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.021E-18	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.212E-12	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #2 In Situ
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	5.963E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	7.131E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	7.413E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.239E-13	0.0169	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	4.016E-12	0.5484	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	2.046E-12	0.2793	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	1.136E-15	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	1.136E-12	0.1551	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	1.336E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	2.732E-26	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	1.037E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	7.323E-12	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.963E-21	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.131E-22	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.413E-22	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.239E-13	0.0169
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.016E-12	0.5484
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.046E-12	0.2793
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.136E-15	0.0002
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.136E-12	0.1551
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.336E-21	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.732E-26	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.037E-18	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.323E-12	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #2 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 IN SITU.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	4.812E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	1.996E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	6.446E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.301E-13	0.0169	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	2.927E-12	0.3791	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	1.730E-13	0.0224	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	3.632E-15	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	4.487E-12	0.5812	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	1.264E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	2.375E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	1.097E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	7.721E-12	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.812E-21	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.996E-21	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.446E-22	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.301E-13	0.0169
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.927E-12	0.3791
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.730E-13	0.0224
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.632E-15	0.0005
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.487E-12	0.5812
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.264E-20	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.375E-25	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.097E-18	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.721E-12	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #2 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 IN SITU.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	2.608E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	4.929E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	4.300E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.498E-13	0.0162	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	3.203E-13	0.0347	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	1.490E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	1.267E-14	0.0014	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	8.740E-12	0.9476	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	1.253E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	1.905E-24	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	1.289E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	9.223E-12	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.608E-21	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.929E-21	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.300E-22	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.498E-13	0.0162
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.203E-13	0.0347
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.490E-16	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.267E-14	0.0014
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.740E-12	0.9476
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.253E-19	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.905E-24	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.289E-18	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.223E-12	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #2 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 IN SITU.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	3.057E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	1.300E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	1.042E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	2.448E-13	0.0137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	1.030E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	2.790E-27	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	7.963E-14	0.0045	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	1.753E-11	0.9818	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	2.407E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	2.126E-23	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	2.268E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.786E-11	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.057E-22	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.300E-20	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.042E-22	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.448E-13	0.0137
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.030E-16	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.790E-27	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.963E-14	0.0045
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.753E-11	0.9818
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.407E-18	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.126E-23	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.268E-18	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.786E-11	1.0000

*Sum of all water independent and dependent pathways.

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File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 IN SITU.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	6.693E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	8.139E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	1.818E-24	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	9.963E-13	0.0084	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	1.080E-26	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	1.567E-12	0.0132	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	1.160E-10	0.9784	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	1.140E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	4.755E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	1.141E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.185E-10	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.693E-25	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.139E-20	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.818E-24	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.963E-13	0.0084
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.080E-26	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.567E-12	0.0132
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.160E-10	0.9784
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.140E-16	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.755E-22	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.141E-17	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.185E-10	1.0000

*Sum of all water independent and dependent pathways.

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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	4.733E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.356E-10	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	5.600E-09	0.0608	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	8.642E-08	0.9378	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	6.804E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	9.873E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	3.615E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	9.215E-08	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.733E-17	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.356E-10	0.0015
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.600E-09	0.0608
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.642E-08	0.9378
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.804E-13	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.873E-19	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.615E-15	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.215E-08	1.0000

*Sum of all water independent and dependent pathways.

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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	3.800E-21	3.686E-21	3.467E-21	2.798E-21	1.516E-21	1.778E-22	3.891E-25	1.930E-34
Pa-231	Pa-231	1.000E+00	2.920E-25	2.955E-25	3.027E-25	3.294E-25	4.193E-25	9.759E-25	1.090E-23	5.085E-20
Pa-231	Ac-227+D	1.000E+00	6.099E-23	1.812E-22	4.143E-22	1.160E-21	2.865E-21	7.560E-21	4.731E-20	2.747E-17
Pa-231	∑DSR(j)		6.128E-23	1.815E-22	4.146E-22	1.161E-21	2.866E-21	7.561E-21	4.732E-20	2.752E-17
Pb-210+D	Pb-210+D	1.000E+00	2.423E-30	2.389E-30	2.324E-30	2.110E-30	1.602E-30	6.099E-31	3.865E-32	2.476E-36
Pb-210+D	Po-210	1.000E+00	5.006E-24	8.430E-24	8.731E-24	7.592E-24	5.064E-24	1.228E-24	2.142E-26	1.501E-32
Pb-210+D	∑DSR(j)		5.006E-24	8.430E-24	8.731E-24	7.592E-24	5.064E-24	1.228E-24	2.142E-26	1.502E-32
Ra-226+D	Ra-226+D	1.000E+00	1.429E-15	1.439E-15	1.459E-15	1.533E-15	1.764E-15	2.883E-15	1.174E-14	1.597E-12
Ra-226+D	Pb-210+D	1.000E+00	3.794E-32	1.139E-31	2.664E-31	8.075E-31	2.463E-30	1.183E-29	2.891E-28	1.737E-23
Ra-226+D	Po-210	1.000E+00	5.904E-26	2.857E-25	8.399E-25	2.731E-24	7.578E-24	2.341E-23	1.577E-22	1.036E-19
Ra-226+D	∑DSR(j)		1.429E-15	1.439E-15	1.459E-15	1.533E-15	1.764E-15	2.883E-15	1.174E-14	1.597E-12
Ra-228+D	Ra-228+D	1.000E+00	2.295E-17	2.052E-17	1.640E-17	7.496E-18	7.996E-19	3.171E-22	6.055E-32	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	3.988E-14	9.770E-14	1.473E-13	1.073E-13	1.175E-14	3.778E-18	3.959E-28	0.000E+00
Ra-228+D	∑DSR(j)		3.991E-14	9.772E-14	1.473E-13	1.073E-13	1.175E-14	3.778E-18	3.960E-28	0.000E+00
Th-228+D	Th-228+D	1.000E+00	2.162E-13	1.519E-13	7.502E-14	6.345E-15	5.463E-18	1.023E-28	0.000E+00	0.000E+00
Th-230	Th-230	1.000E+00	2.308E-41	2.374E-41	2.510E-41	3.055E-41	5.352E-41	3.809E-40	1.038E-37	3.462E-29
Th-230	Ra-226+D	1.000E+00	3.103E-19	9.386E-19	2.230E-18	7.130E-18	2.487E-17	1.563E-16	3.076E-15	1.099E-11
Th-230	Pb-210+D	1.000E+00	5.505E-36	3.878E-35	2.079E-34	1.962E-33	1.957E-32	4.397E-31	6.260E-29	1.044E-22
Th-230	Po-210	1.000E+00	6.920E-30	7.835E-29	5.720E-28	6.293E-27	5.898E-26	8.636E-25	3.403E-23	6.216E-19
Th-230	∑DSR(j)		3.103E-19	9.386E-19	2.230E-18	7.130E-18	2.487E-17	1.563E-16	3.076E-15	1.099E-11
Th-232	Th-232	1.000E+00	1.401E-45	1.401E-45	1.401E-45	1.401E-45	1.401E-45	1.682E-44	8.590E-42	2.616E-32
Th-232	Ra-228+D	1.000E+00	1.415E-18	4.067E-18	8.659E-18	1.953E-17	3.360E-17	8.214E-17	9.899E-16	6.014E-12
Th-232	Th-228+D	1.000E+00	1.669E-15	1.031E-14	4.165E-14	1.645E-13	3.205E-13	6.428E-13	4.251E-12	3.163E-09
Th-232	∑DSR(j)		1.671E-15	1.032E-14	4.166E-14	1.645E-13	3.205E-13	6.429E-13	4.252E-12	3.169E-09
U-234	U-234	1.000E+00	2.747E-43	2.817E-43	2.943E-43	3.489E-43	5.605E-43	2.965E-42	3.451E-40	5.876E-33
U-234	Th-230	1.000E+00	0.000E+00	0.000E+00	1.401E-45	2.803E-45	1.401E-44	2.662E-43	1.404E-40	5.850E-32
U-234	Ra-226+D	1.000E+00	9.312E-25	6.564E-24	3.524E-23	3.335E-22	3.306E-21	6.350E-20	3.009E-18	1.795E-14
U-234	Pb-210+D	1.000E+00	1.241E-41	1.876E-40	2.228E-39	6.307E-38	1.877E-36	1.459E-34	5.715E-32	1.697E-25
U-234	Po-210	1.000E+00	1.313E-35	3.225E-34	5.470E-33	1.927E-31	5.557E-30	2.849E-28	3.102E-26	1.010E-21
U-234	∑DSR(j)		9.312E-25	6.564E-24	3.524E-23	3.335E-22	3.306E-21	6.350E-20	3.009E-18	1.795E-14
U-235+D	U-235+D	1.000E+00	5.569E-29	5.656E-29	5.832E-29	6.496E-29	8.837E-29	2.595E-28	5.634E-27	2.686E-22
U-235+D	Pa-231	1.000E+00	3.095E-30	9.385E-30	2.243E-29	7.320E-29	2.707E-28	2.077E-27	6.956E-26	1.088E-21
U-235+D	Ac-227+D	1.000E+00	4.319E-28	3.013E-27	1.580E-26	1.379E-25	1.107E-24	1.236E-23	2.764E-22	5.727E-19
U-235+D	∑DSR(j)		4.907E-28	3.079E-27	1.588E-26	1.381E-25	1.107E-24	1.236E-23	2.765E-22	5.740E-19
U-238	U-238	5.400E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-238+D	U-238+D	9.999E-01	2.671E-20	2.693E-20	2.737E-20	2.896E-20	3.402E-20	5.982E-20	3.004E-19	8.662E-17
U-238+D	U-234	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.401E-45	2.943E-43	1.669E-35
U-238+D	Th-230	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.484E-44	3.047E-35
U-238+D	Ra-226+D	9.999E-01	6.599E-31	9.963E-30	1.179E-28	3.296E-27	9.374E-26	5.706E-24	7.171E-22	8.768E-18
U-238+D	Pb-210+D	9.999E-01	0.000E+00	0.000E+00	5.605E-45	4.750E-43	4.177E-41	1.108E-38	1.264E-35	8.208E-29
U-238+D	Po-210	9.999E-01	6.446E-42	3.321E-40	1.258E-38	1.389E-36	1.215E-34	2.152E-32	6.852E-30	4.886E-25
U-238+D	ΣDSR(j)		2.671E-20	2.693E-20	2.737E-20	2.896E-20	3.402E-20	5.983E-20	3.012E-19	9.538E-17

The DSR includes contributions from associated (half-life ≤ 30 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	*7.232E+13	*7.232E+13	*7.232E+13	*7.232E+13	*7.232E+13	*7.232E+13	*7.232E+13	*7.232E+13
Pa-231	*4.723E+10	*4.723E+10	*4.723E+10	*4.723E+10	*4.723E+10	*4.723E+10	*4.723E+10	*4.723E+10
Pb-210	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13
Ra-226	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11
Ra-228	*2.726E+14	2.558E+14	1.697E+14	2.329E+14	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14
Th-228	1.156E+14	1.645E+14	3.333E+14	*8.195E+14	*8.195E+14	*8.195E+14	*8.195E+14	*8.195E+14
Th-230	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10
Th-232	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05
U-234	*6.247E+09	*6.247E+09	*6.247E+09	*6.247E+09	*6.247E+09	*6.247E+09	*6.247E+09	*6.247E+09
U-235	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06
U-238	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05

*At specific activity limit

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 08:21 Page 24
Summary : SU11 Elevated Area #2 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 IN SITU.RAD

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 1.000E+03 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ac-227	1.720E+00	0.000E+00	3.800E-21	*7.232E+13	0.000E+00	*7.232E+13
Pa-231	1.720E+00	1.000E+03	2.752E-17	*4.723E+10	2.752E-17	*4.723E+10
Pb-210	8.490E+01	2.051 ± 0.004	8.820E-24	*7.634E+13	0.000E+00	*7.634E+13
Ra-226	8.490E+01	1.000E+03	1.597E-12	*9.885E+11	1.597E-12	*9.885E+11
Ra-228	2.727E+01	4.233 ± 0.008	1.530E-13	1.634E+14	0.000E+00	*2.726E+14
Th-228	2.727E+01	0.000E+00	2.162E-13	1.156E+14	0.000E+00	*8.195E+14
Th-230	5.094E+02	1.000E+03	1.099E-11	*2.018E+10	1.099E-11	*2.018E+10
Th-232	2.727E+01	1.000E+03	3.169E-09	*1.097E+05	3.169E-09	*1.097E+05
U-234	3.790E+01	1.000E+03	1.795E-14	*6.247E+09	1.795E-14	*6.247E+09
U-235	1.720E+00	1.000E+03	5.740E-19	*2.161E+06	5.740E-19	*2.161E+06
U-238	3.790E+01	1.000E+03	9.538E-17	*3.361E+05	9.538E-17	*3.361E+05

*At specific activity limit

RESRAD, Version 6.5 Th Limit = 30 days 09/24/2013 08:21 Page 25
Summary : SU11 Elevated Area #2 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 IN SITU.RAD

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	Ac-227	1.000E+00	6.537E-21	6.340E-21	5.963E-21	4.812E-21	2.608E-21	3.057E-22	6.693E-25	0.000E+00
Ac-227	Pa-231	1.000E+00	1.049E-22	3.117E-22	7.126E-22	1.996E-21	4.928E-21	1.300E-20	8.137E-20	4.724E-17
Ac-227	U-235	1.000E+00	7.428E-28	5.182E-27	2.718E-26	2.372E-25	1.904E-24	2.126E-23	4.754E-22	9.850E-19
Ac-227	∑DOSE(j)		6.642E-21	6.651E-21	6.676E-21	6.808E-21	7.538E-21	1.333E-20	8.185E-20	4.823E-17
Pa-231	Pa-231	1.000E+00	5.022E-25	5.083E-25	5.207E-25	5.666E-25	7.212E-25	1.679E-24	1.876E-23	8.747E-20
Pa-231	U-235	1.000E+00	5.323E-30	1.614E-29	3.857E-29	1.259E-28	4.656E-28	3.573E-27	1.196E-25	1.871E-21
Pa-231	∑DOSE(j)		5.022E-25	5.083E-25	5.207E-25	5.667E-25	7.217E-25	1.682E-24	1.888E-23	8.934E-20
Pb-210	Pb-210	1.000E+00	2.057E-28	2.029E-28	1.973E-28	1.792E-28	1.360E-28	0.000E+00	0.000E+00	0.000E+00
Pb-210	Ra-226	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.091E-28	1.004E-27	2.455E-26	1.475E-21
Pb-210	Th-230	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.189E-26	5.318E-20
Pb-210	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.430E-24
Pb-210	U-238	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.111E-27
Pb-210	∑DOSE(j)		2.057E-28	2.029E-28	1.973E-28	1.792E-28	3.451E-28	1.004E-27	5.644E-26	5.466E-20
Po-210	Pb-210	1.000E+00	4.250E-22	7.157E-22	7.413E-22	6.446E-22	4.300E-22	1.042E-22	1.818E-24	0.000E+00
Po-210	Ra-226	1.000E+00	5.013E-24	2.426E-23	7.131E-23	2.318E-22	6.434E-22	1.988E-21	1.339E-20	8.800E-18
Po-210	Th-230	1.000E+00	3.525E-27	3.991E-26	2.914E-25	3.206E-24	3.004E-23	4.399E-22	1.733E-20	3.166E-16
Po-210	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.106E-28	1.080E-26	1.176E-24	3.828E-20
Po-210	U-238	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.597E-28	1.852E-23
Po-210	∑DOSE(j)		4.300E-22	7.400E-22	8.129E-22	8.796E-22	1.103E-21	2.532E-21	3.072E-20	3.255E-16
Ra-226	Ra-226	1.000E+00	1.213E-13	1.222E-13	1.239E-13	1.301E-13	1.498E-13	2.448E-13	9.963E-13	1.356E-10
Ra-226	Th-230	1.000E+00	1.581E-16	4.781E-16	1.136E-15	3.632E-15	1.267E-14	7.963E-14	1.567E-12	5.600E-09
Ra-226	U-234	1.000E+00	3.529E-23	2.488E-22	1.336E-21	1.264E-20	1.253E-19	2.407E-18	1.140E-16	6.804E-13
Ra-226	U-238	9.999E-01	0.000E+00	3.776E-28	4.469E-27	1.249E-25	3.553E-24	2.163E-22	2.718E-20	3.323E-16
Ra-226	∑DOSE(j)		1.215E-13	1.227E-13	1.250E-13	1.338E-13	1.624E-13	3.244E-13	2.563E-12	5.736E-09
Ra-228	Ra-228	1.000E+00	6.258E-16	5.596E-16	4.474E-16	2.044E-16	2.181E-17	8.647E-21	0.000E+00	0.000E+00
Ra-228	Th-232	1.000E+00	3.858E-17	1.109E-16	2.361E-16	5.327E-16	9.162E-16	2.240E-15	2.699E-14	1.640E-10
Ra-228	∑DOSE(j)		6.644E-16	6.705E-16	6.835E-16	7.371E-16	9.380E-16	2.240E-15	2.699E-14	1.640E-10
Th-228	Ra-228	1.000E+00	1.088E-12	2.664E-12	4.016E-12	2.927E-12	3.203E-13	1.030E-16	1.080E-26	0.000E+00
Th-228	Th-228	1.000E+00	5.896E-12	4.143E-12	2.046E-12	1.730E-13	1.490E-16	2.790E-27	0.000E+00	0.000E+00
Th-228	Th-232	1.000E+00	4.552E-14	2.812E-13	1.136E-12	4.486E-12	8.739E-12	1.753E-11	1.159E-10	8.625E-08
Th-228	∑DOSE(j)		7.029E-12	7.089E-12	7.197E-12	7.586E-12	9.059E-12	1.753E-11	1.159E-10	8.625E-08
Th-230	Th-230	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.764E-26
Th-230	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	U-238	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.764E-26
Th-232	Th-232	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	U-238	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-235	U-235	1.000E+00	9.579E-29	9.728E-29	1.003E-28	1.117E-28	1.520E-28	4.463E-28	9.690E-27	4.621E-22

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Summary : SU11 Elevated Area #2 In Situ
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-238	U-238	5.400E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238	U-238	9.999E-01	1.012E-18	1.021E-18	1.037E-18	1.097E-18	1.289E-18	2.267E-18	1.139E-17	3.283E-15
U-238	∑DOSE(j)		1.012E-18	1.021E-18	1.037E-18	1.097E-18	1.289E-18	2.267E-18	1.139E-17	3.283E-15

THF(i) is the thread fraction of the parent nuclide.

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 08:21 Page 27
Summary : SU11 Elevated Area #2 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 IN SITU.RAD

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	Ac-227	1.000E+00	1.720E+00	1.644E+00	1.503E+00	1.096E+00	4.455E-01	1.905E-02	2.337E-06	4.780E-20
Ac-227	Pa-231	1.000E+00	0.000E+00	5.340E-02	1.524E-01	4.285E-01	8.182E-01	7.940E-01	2.786E-01	6.667E-03
Ac-227	U-235	1.000E+00	0.000E+00	5.687E-07	4.933E-06	4.832E-05	3.101E-04	1.290E-03	1.625E-03	1.389E-04
Ac-227	∑S(j):		1.720E+00	1.698E+00	1.655E+00	1.525E+00	1.264E+00	8.143E-01	2.802E-01	6.806E-03
Pa-231	Pa-231	1.000E+00	1.720E+00	1.711E+00	1.693E+00	1.631E+00	1.466E+00	1.009E+00	3.474E-01	8.314E-03
Pa-231	U-235	1.000E+00	0.000E+00	3.620E-05	1.074E-04	3.451E-04	9.307E-04	2.137E-03	2.212E-03	1.778E-04
Pa-231	∑S(j):		1.720E+00	1.711E+00	1.693E+00	1.631E+00	1.467E+00	1.011E+00	3.496E-01	8.492E-03
Pb-210	Pb-210	1.000E+00	8.490E+01	8.208E+01	7.673E+01	6.058E+01	3.085E+01	2.907E+00	3.408E-03	1.880E-13
Pb-210	Ra-226	1.000E+00	0.000E+00	2.589E+00	7.481E+00	2.190E+01	4.627E+01	5.551E+01	2.512E+01	1.300E+00
Pb-210	Th-230	1.000E+00	0.000E+00	3.387E-03	2.972E-02	3.030E-01	2.163E+00	1.229E+01	3.254E+01	4.677E+01
Pb-210	U-234	1.000E+00	0.000E+00	7.575E-10	2.002E-08	6.883E-07	1.517E-05	3.019E-04	2.207E-03	5.654E-03
Pb-210	U-238	9.999E-01	0.000E+00	5.374E-16	4.270E-14	4.930E-12	3.318E-10	2.280E-08	4.876E-07	2.735E-06
Pb-210	∑S(j):		8.490E+01	8.468E+01	8.424E+01	8.279E+01	7.928E+01	7.071E+01	5.766E+01	4.807E+01
Po-210	Pb-210	1.000E+00	0.000E+00	6.910E+01	7.672E+01	6.084E+01	3.098E+01	2.919E+00	3.422E-03	1.888E-13
Po-210	Ra-226	1.000E+00	0.000E+00	1.399E+00	6.104E+00	2.062E+01	4.520E+01	5.480E+01	2.483E+01	1.284E+00
Po-210	Th-230	1.000E+00	0.000E+00	1.380E-03	2.076E-02	2.699E-01	2.069E+00	1.204E+01	3.204E+01	4.611E+01
Po-210	U-234	1.000E+00	0.000E+00	2.495E-10	1.228E-08	5.829E-07	1.425E-05	2.941E-04	2.171E-03	5.574E-03
Po-210	U-238	9.999E-01	0.000E+00	1.490E-16	2.340E-14	3.981E-12	3.063E-10	2.209E-08	4.788E-07	2.696E-06
Po-210	∑S(j):		0.000E+00	7.050E+01	8.285E+01	8.173E+01	7.825E+01	6.976E+01	5.687E+01	4.740E+01
Ra-226	Ra-226	1.000E+00	8.490E+01	8.454E+01	8.383E+01	8.138E+01	7.478E+01	5.561E+01	2.386E+01	1.234E+00
Ra-226	Th-230	1.000E+00	0.000E+00	2.202E-01	6.578E-01	2.161E+00	6.216E+00	1.798E+01	3.741E+01	5.086E+01
Ra-226	U-234	1.000E+00	0.000E+00	7.367E-08	6.588E-07	7.159E-06	6.048E-05	5.410E-04	2.720E-03	6.179E-03
Ra-226	U-238	9.999E-01	0.000E+00	6.957E-14	1.865E-12	6.729E-11	1.687E-09	4.839E-08	6.473E-07	3.017E-06
Ra-226	∑S(j):		8.490E+01	8.476E+01	8.449E+01	8.354E+01	8.100E+01	7.359E+01	6.127E+01	5.210E+01
Ra-228	Ra-228	1.000E+00	2.727E+01	2.408E+01	1.878E+01	7.864E+00	6.540E-01	1.085E-04	1.718E-15	0.000E+00
Ra-228	Th-232	1.000E+00	0.000E+00	3.091E+00	8.231E+00	1.881E+01	2.580E+01	2.643E+01	2.640E+01	2.632E+01
Ra-228	∑S(j):		2.727E+01	2.717E+01	2.701E+01	2.668E+01	2.645E+01	2.643E+01	2.640E+01	2.632E+01
Th-228	Ra-228	1.000E+00	0.000E+00	7.765E+00	1.459E+01	1.086E+01	9.950E-01	1.652E-04	2.615E-15	0.000E+00
Th-228	Th-228	1.000E+00	2.727E+01	1.898E+01	9.197E+00	7.280E-01	5.189E-04	5.015E-15	0.000E+00	0.000E+00
Th-228	Th-232	1.000E+00	0.000E+00	5.078E-01	3.377E+00	1.520E+01	2.547E+01	2.643E+01	2.640E+01	2.632E+01
Th-228	∑S(j):		2.727E+01	2.725E+01	2.716E+01	2.679E+01	2.646E+01	2.643E+01	2.640E+01	2.632E+01
Th-230	Th-230	1.000E+00	5.094E+02	5.094E+02	5.094E+02	5.093E+02	5.092E+02	5.087E+02	5.073E+02	5.026E+02
Th-230	U-234	1.000E+00	0.000E+00	3.403E-04	1.015E-03	3.322E-03	9.459E-03	2.645E-02	5.104E-02	6.319E-02
Th-230	U-238	9.999E-01	0.000E+00	4.819E-10	4.306E-09	4.668E-08	3.916E-07	3.419E-06	1.618E-05	3.291E-05
Th-230	∑S(j):		5.094E+02	5.094E+02	5.094E+02	5.093E+02	5.092E+02	5.087E+02	5.074E+02	5.027E+02
Th-232	Th-232	1.000E+00	2.727E+01	2.727E+01	2.727E+01	2.727E+01	2.727E+01	2.726E+01	2.723E+01	2.715E+01
U-234	U-234	1.000E+00	3.790E+01	3.770E+01	3.730E+01	3.594E+01	3.232E+01	2.228E+01	7.697E+00	1.866E-01
U-234	U-238	9.999E-01	0.000E+00	1.069E-04	3.172E-04	1.019E-03	2.748E-03	6.316E-03	6.548E-03	5.297E-04
U-234	∑S(j):		3.790E+01	3.770E+01	3.730E+01	3.594E+01	3.232E+01	2.228E+01	7.703E+00	1.871E-01
U-235	U-235	1.000E+00	1.720E+00	1.711E+00	1.693E+00	1.631E+00	1.467E+00	1.011E+00	3.496E-01	8.492E-03

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Summary : SU11 Elevated Area #2 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 IN SITU.RAD

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-238	U-238	5.400E-05	2.047E-03	2.036E-03	2.014E-03	1.941E-03	1.745E-03	1.203E-03	4.160E-04	1.010E-05
U-238	U-238	9.999E-01	3.790E+01	3.770E+01	3.730E+01	3.594E+01	3.232E+01	2.228E+01	7.703E+00	1.871E-01
U-238	∑S(j):		3.790E+01	3.770E+01	3.730E+01	3.594E+01	3.232E+01	2.228E+01	7.703E+00	1.871E-01

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 2.01 seconds

APPENDIX B

RESRAD v6.5 Summary Report for Elevated Area #3 *In Situ* Model

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 09:38 Page 1
Summary : SU11 Elevated Area #3 In Situ
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Summary : SU11 Elevated Area #3 In Situ
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Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-227 (Source: FGR 12)	4.951E-04	4.951E-04	DCF1(1)
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(2)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(3)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(4)
A-1	Bi-211 (Source: FGR 12)	2.559E-01	2.559E-01	DCF1(5)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(6)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(7)
A-1	Fr-223 (Source: FGR 12)	1.980E-01	1.980E-01	DCF1(8)
A-1	Pa-231 (Source: FGR 12)	1.906E-01	1.906E-01	DCF1(9)
A-1	Pa-234 (Source: FGR 12)	1.155E+01	1.155E+01	DCF1(10)
A-1	Pa-234m (Source: FGR 12)	8.967E-02	8.967E-02	DCF1(11)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(12)
A-1	Pb-211 (Source: FGR 12)	3.064E-01	3.064E-01	DCF1(13)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(14)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(15)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(16)
A-1	Po-211 (Source: FGR 12)	4.764E-02	4.764E-02	DCF1(17)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(18)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(19)
A-1	Po-215 (Source: FGR 12)	1.016E-03	1.016E-03	DCF1(20)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(21)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(22)
A-1	Ra-223 (Source: FGR 12)	6.034E-01	6.034E-01	DCF1(23)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(24)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(25)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(26)
A-1	Rn-219 (Source: FGR 12)	3.083E-01	3.083E-01	DCF1(27)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(28)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(29)
A-1	Th-227 (Source: FGR 12)	5.212E-01	5.212E-01	DCF1(30)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(31)
A-1	Th-230 (Source: FGR 12)	1.209E-03	1.209E-03	DCF1(32)
A-1	Th-231 (Source: FGR 12)	3.643E-02	3.643E-02	DCF1(33)
A-1	Th-232 (Source: FGR 12)	5.212E-04	5.212E-04	DCF1(34)
A-1	Th-234 (Source: FGR 12)	2.410E-02	2.410E-02	DCF1(35)
A-1	Tl-207 (Source: FGR 12)	1.980E-02	1.980E-02	DCF1(36)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(37)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(38)
A-1	U-234 (Source: FGR 12)	4.017E-04	4.017E-04	DCF1(39)
A-1	U-235 (Source: FGR 12)	7.211E-01	7.211E-01	DCF1(40)
A-1	U-238 (Source: FGR 12)	1.031E-04	1.031E-04	DCF1(41)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.724E+00	6.700E+00	DCF2(1)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(2)
B-1	Pb-210+D	1.380E-02	1.360E-02	DCF2(3)
B-1	Po-210	9.400E-03	9.400E-03	DCF2(4)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(5)
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(6)

RESRAD, Version 6.5 Th Limit = 30 days 09/24/2013 09:38 Page 3
Summary : SU11 Elevated Area #3 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 IN SITU.RAD

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(7)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(8)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(9)
B-1	U-234	1.320E-01	1.320E-01	DCF2(10)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(11)
B-1	U-238	1.180E-01	1.180E-01	DCF2(12)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(13)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.410E-02	DCF3(1)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(2)
D-1	Pb-210+D	5.376E-03	5.370E-03	DCF3(3)
D-1	Po-210	1.900E-03	1.900E-03	DCF3(4)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(5)
D-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(6)
D-1	Th-228+D	8.086E-04	3.960E-04	DCF3(7)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(8)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(9)
D-1	U-234	2.830E-04	2.830E-04	DCF3(10)
D-1	U-235+D	2.673E-04	2.660E-04	DCF3(11)
D-1	U-238	2.550E-04	2.550E-04	DCF3(12)
D-1	U-238+D	2.687E-04	2.550E-04	DCF3(13)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(3,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(3,3)
D-34				
D-34	Po-210 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Po-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(4,2)
D-34	Po-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.400E-04	3.400E-04	RTF(4,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(5,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(6,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(6,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(6,3)
D-34				

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 09:38 Page 4
Summary : SU11 Elevated Area #3 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 IN SITU.RAD

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(8,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(8,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(9,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(9,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(9,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(10,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(10,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(10,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(11,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(11,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(11,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(12,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(12,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(12,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(13,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(13,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(13,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(2,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2,2)
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
D-5				
D-5	Po-210 , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Po-210 , crustacea and mollusks	2.000E+04	2.000E+04	BIOFAC(4,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(5,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(5,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(6,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(6,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(7,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7,2)
D-5				

RESRAD, Version 6.5 Th Limit = 30 days 09/24/2013 09:38 Page 5
Summary : SU11 Elevated Area #3 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 IN SITU.RAD

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(8,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(8,2)
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(9,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(9,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(10,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(10,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(11,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(11,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(12,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(12,2)
D-5				
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(13,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(13,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

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Summary : SU11 Elevated Area #3 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 IN SITU.RAD

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	2.500E+01	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	4.000E+00	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ac-227	7.200E-01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Pa-231	7.200E-01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Pb-210	9.209E+01	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ra-226	9.209E+01	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Ra-228	8.168E+01	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Th-228	8.168E+01	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): Th-230	5.525E+02	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): Th-232	8.168E+01	0.000E+00	---	S1(9)
R012	Initial principal radionuclide (pCi/g): U-234	1.577E+01	0.000E+00	---	S1(10)
R012	Initial principal radionuclide (pCi/g): U-235	7.200E-01	0.000E+00	---	S1(11)
R012	Initial principal radionuclide (pCi/g): U-238	1.577E+01	0.000E+00	---	S1(12)
R012	Concentration in groundwater (pCi/L): Ac-227	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Pa-231	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Th-228	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): Th-232	not used	0.000E+00	---	W1(9)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(10)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1(11)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(12)
R013	Cover depth (m)	1.500E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.500E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	3.000E-06	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	0.000E+00	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ac-227				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	2.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.299E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Pa-231				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.328E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.653E-04	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

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Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.495E-04	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.495E-04	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.111E-06	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.111E-06	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for Th-232				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.111E-06	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(10)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(10,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.328E-03	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)
R016	Distribution coefficients for U-235				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(11)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(11,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.328E-03	ALEACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(12)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(12,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(12)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.328E-03	ALEACH(12)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(12)
R016	Distribution coefficients for daughter Po-210				
R016	Contaminated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.529E-03	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R017	Inhalation rate (m**3/yr)	1.227E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	3.500E-05	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	6.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	1.700E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	1.825E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	4.563E-02	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	not used	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

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Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

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Summary : SU11 Elevated Area #3 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 IN SITU.RAD

Contaminated Zone Dimensions	
Area:	25.00 square meters
Thickness:	4.00 meters
Cover Depth:	1.50 meters

Initial Soil Concentrations, pCi/g	
Ac-227	7.200E-01
Pa-231	7.200E-01
Pb-210	9.209E+01
Ra-226	9.209E+01
Ra-228	8.168E+01
Th-228	8.168E+01
Th-230	5.525E+02
Th-232	8.168E+01
U-234	1.577E+01
U-235	7.200E-01
U-238	1.577E+01

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	3.539E-05	3.539E-05	3.537E-05	3.529E-05	3.528E-05	3.557E-05	3.632E-05	3.811E-05
M(t):	1.416E-06	1.416E-06	1.415E-06	1.412E-06	1.411E-06	1.423E-06	1.453E-06	1.525E-06

Maximum TDOSE(t): 3.811E-05 mrem/yr at t = 1.000E+03 years

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Summary : SU11 Elevated Area #3 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 IN SITU.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	7.127E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	1.593E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	2.955E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	2.945E-06	0.0832	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	5.224E-06	0.1476	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	2.700E-05	0.7628	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	3.828E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	2.233E-07	0.0063	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	3.278E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	1.216E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	2.329E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	3.539E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.127E-12	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.593E-13	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.955E-13	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.945E-06	0.0832
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.224E-06	0.1476
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.700E-05	0.7628
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.828E-09	0.0001
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.233E-07	0.0063
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.278E-16	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.216E-15	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.329E-10	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.539E-05	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #3 In Situ
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	6.881E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	3.819E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	4.927E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	2.941E-06	0.0831	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	1.232E-05	0.3483	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	1.879E-05	0.5310	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	1.148E-08	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	1.320E-06	0.0373	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	2.293E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	1.221E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	2.326E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	3.539E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.881E-12	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.819E-13	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.927E-13	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.941E-06	0.0831
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.232E-05	0.3483
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.879E-05	0.5310
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.148E-08	0.0003
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.320E-06	0.0373
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.293E-15	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.221E-15	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.326E-10	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.539E-05	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #3 In Situ
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	6.415E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	8.034E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	4.996E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	2.933E-06	0.0829	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	1.814E-05	0.5130	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	9.105E-06	0.2574	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	2.674E-08	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	5.160E-06	0.1459	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	1.210E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	1.243E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	2.320E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	3.537E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.415E-12	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.034E-13	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.996E-13	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.933E-06	0.0829
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.814E-05	0.5130
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.105E-06	0.2574
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.674E-08	0.0008
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.160E-06	0.1459
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.210E-14	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.243E-15	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.320E-10	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.537E-05	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #3 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 IN SITU.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	5.018E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	2.058E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	4.010E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	2.905E-06	0.0823	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	1.252E-05	0.3548	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	7.209E-07	0.0204	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	7.986E-08	0.0023	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	1.906E-05	0.5402	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	1.076E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	1.447E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	2.299E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	3.529E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.018E-12	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.058E-12	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.010E-13	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.905E-06	0.0823
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.252E-05	0.3548
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.209E-07	0.0204
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.986E-08	0.0023
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.906E-05	0.5402
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.076E-13	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.447E-15	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.299E-10	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.529E-05	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #3 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 IN SITU.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	2.487E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	4.267E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	2.127E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	2.828E-06	0.0801	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	1.198E-06	0.0339	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	5.142E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	2.289E-07	0.0065	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	3.103E-05	0.8794	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	8.913E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	2.791E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	2.241E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	3.528E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.487E-12	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.267E-12	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.127E-13	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.828E-06	0.0801
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.198E-06	0.0339
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.142E-10	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.289E-07	0.0065
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.103E-05	0.8794
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.913E-13	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.791E-15	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.241E-10	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.528E-05	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #3 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 IN SITU.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	2.133E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	5.833E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	2.311E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	2.573E-06	0.0723	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	2.432E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	4.981E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	7.207E-07	0.0203	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	3.228E-05	0.9074	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	9.107E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	1.028E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	2.048E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	3.557E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.133E-13	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.833E-12	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.311E-14	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.573E-06	0.0723
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.432E-10	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.981E-21	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.207E-07	0.0203
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.228E-05	0.9074
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.107E-12	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.028E-14	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.048E-10	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.557E-05	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #3 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 IN SITU.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	1.910E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	4.647E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	4.071E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.965E-06	0.0541	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	6.844E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	1.899E-06	0.0523	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	3.246E-05	0.8936	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	6.864E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	2.757E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	1.583E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	3.632E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.910E-16	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.647E-12	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.071E-17	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.965E-06	0.0541
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.844E-21	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.899E-06	0.0523
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.246E-05	0.8936
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.864E-11	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.757E-14	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.583E-10	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.632E-05	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #3 In Situ
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	4.106E-27	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	1.864E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	9.304E-27	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	7.641E-07	0.0200	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	4.266E-06	0.1119	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	3.308E-05	0.8680	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	4.332E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	3.904E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	6.464E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	3.811E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.106E-27	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.864E-12	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.304E-27	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.641E-07	0.0200
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.266E-06	0.1119
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.308E-05	0.8680
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.332E-10	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.904E-14	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.464E-11	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.811E-05	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #3 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 IN SITU.RAD

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	9.899E-12	9.557E-12	8.910E-12	6.969E-12	3.455E-12	2.962E-13	2.653E-16	5.703E-27
Pa-231	Pa-231	1.000E+00	6.277E-14	6.269E-14	6.253E-14	6.197E-14	6.038E-14	5.514E-14	4.254E-14	1.716E-14
Pa-231	Ac-227+D	1.000E+00	1.584E-13	4.677E-13	1.053E-12	2.796E-12	5.866E-12	8.046E-12	6.412E-12	2.572E-12
Pa-231	∑DSR(j)		2.212E-13	5.304E-13	1.116E-12	2.858E-12	5.927E-12	8.101E-12	6.455E-12	2.589E-12
Pb-210+D	Pb-210+D	1.000E+00	2.382E-17	2.308E-17	2.166E-17	1.735E-17	9.207E-18	1.002E-18	1.772E-21	4.120E-31
Pb-210+D	Po-210	1.000E+00	3.185E-15	5.328E-15	5.404E-15	4.337E-15	2.300E-15	2.500E-16	4.403E-19	1.010E-28
Pb-210+D	∑DSR(j)		3.209E-15	5.351E-15	5.425E-15	4.354E-15	2.310E-15	2.510E-16	4.421E-19	1.014E-28
Ra-226+D	Ra-226+D	1.000E+00	3.198E-08	3.193E-08	3.185E-08	3.155E-08	3.071E-08	2.794E-08	2.133E-08	8.298E-09
Ra-226+D	Pb-210+D	1.000E+00	3.720E-19	1.100E-18	2.485E-18	6.669E-18	1.437E-17	2.066E-17	1.664E-17	6.594E-18
Ra-226+D	Po-210	1.000E+00	3.750E-17	1.801E-16	5.194E-16	1.566E-15	3.492E-15	5.066E-15	4.069E-15	1.590E-15
Ra-226+D	∑DSR(j)		3.198E-08	3.193E-08	3.185E-08	3.155E-08	3.071E-08	2.794E-08	2.133E-08	8.298E-09
Ra-228+D	Ra-228+D	1.000E+00	3.045E-09	2.697E-09	2.115E-09	9.038E-10	7.964E-11	1.617E-14	4.558E-25	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	6.092E-08	1.482E-07	2.200E-07	1.524E-07	1.458E-08	2.961E-12	8.334E-23	0.000E+00
Ra-228+D	∑DSR(j)		6.396E-08	1.509E-07	2.221E-07	1.533E-07	1.466E-08	2.977E-12	8.379E-23	0.000E+00
Th-228+D	Th-228+D	1.000E+00	3.305E-07	2.301E-07	1.115E-07	8.826E-09	6.295E-12	6.098E-23	0.000E+00	0.000E+00
Th-230	Th-230	1.000E+00	4.266E-23	4.267E-23	4.267E-23	4.269E-23	4.276E-23	4.298E-23	4.362E-23	4.594E-23
Th-230	Ra-226+D	1.000E+00	6.928E-12	2.077E-11	4.840E-11	1.445E-10	4.144E-10	1.304E-09	3.438E-09	7.722E-09
Th-230	Pb-210+D	1.000E+00	5.387E-23	3.736E-22	1.933E-21	1.606E-20	1.110E-19	6.867E-19	2.339E-18	5.781E-18
Th-230	Po-210	1.000E+00	4.387E-21	4.927E-20	3.524E-19	3.576E-18	2.644E-17	1.672E-16	5.704E-16	1.393E-15
Th-230	∑DSR(j)		6.928E-12	2.077E-11	4.840E-11	1.445E-10	4.144E-10	1.304E-09	3.438E-09	7.722E-09
Th-232	Th-232	1.000E+00	1.541E-25	1.541E-25	1.541E-25	1.542E-25	1.545E-25	1.555E-25	1.584E-25	1.690E-25
Th-232	Ra-228+D	1.000E+00	1.872E-10	5.329E-10	1.110E-09	2.313E-09	3.133E-09	3.220E-09	3.244E-09	3.327E-09
Th-232	Th-228+D	1.000E+00	2.547E-09	1.562E-08	6.206E-08	2.311E-07	3.768E-07	3.920E-07	3.941E-07	4.017E-07
Th-232	∑DSR(j)		2.734E-09	1.615E-08	6.317E-08	2.334E-07	3.799E-07	3.952E-07	3.974E-07	4.050E-07
U-234	U-234	1.000E+00	2.457E-24	2.454E-24	2.448E-24	2.426E-24	2.367E-24	2.170E-24	1.692E-24	7.086E-25
U-234	Th-230	1.000E+00	1.919E-28	5.755E-28	1.341E-27	4.008E-27	1.151E-26	3.641E-26	9.740E-26	2.296E-25
U-234	Ra-226+D	1.000E+00	2.078E-17	1.454E-16	7.671E-16	6.821E-15	5.652E-14	5.775E-13	4.353E-12	2.747E-11
U-234	Pb-210+D	1.000E+00	1.214E-28	1.808E-27	2.075E-26	5.194E-25	1.086E-23	2.443E-22	2.698E-21	2.008E-20
U-234	Po-210	1.000E+00	8.321E-27	2.027E-25	3.372E-24	1.101E-22	2.538E-21	5.912E-20	6.568E-19	4.836E-18
U-234	∑DSR(j)		2.078E-17	1.454E-16	7.671E-16	6.821E-15	5.652E-14	5.775E-13	4.353E-12	2.747E-11
U-235+D	U-235+D	1.000E+00	1.688E-15	1.686E-15	1.681E-15	1.666E-15	1.625E-15	1.487E-15	1.155E-15	4.760E-16
U-235+D	Pa-231	1.000E+00	6.640E-19	1.990E-18	4.631E-18	1.377E-17	3.898E-17	1.174E-16	2.714E-16	3.672E-16
U-235+D	Ac-227+D	1.000E+00	1.120E-18	7.759E-18	4.003E-17	3.291E-16	2.213E-15	1.267E-14	3.686E-14	5.337E-14
U-235+D	∑DSR(j)		1.690E-15	1.695E-15	1.726E-15	2.009E-15	3.877E-15	1.428E-14	3.829E-14	5.422E-14
U-238	U-238	5.400E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-238+D	U-238+D	9.999E-01	1.477E-11	1.475E-11	1.471E-11	1.458E-11	1.421E-11	1.298E-11	1.004E-11	4.076E-12
U-238+D	U-234	9.999E-01	3.481E-30	1.043E-29	2.428E-29	7.222E-29	2.046E-28	6.182E-28	1.442E-27	2.013E-27
U-238+D	Th-230	9.999E-01	1.813E-34	1.268E-33	6.694E-33	5.955E-32	4.941E-31	5.073E-30	3.876E-29	2.561E-28
U-238+D	Ra-226+D	9.999E-01	1.473E-23	2.207E-22	2.570E-21	6.770E-20	1.624E-18	5.426E-17	1.196E-15	2.298E-14
U-238+D	Pb-210+D	9.999E-01	6.890E-35	2.123E-33	5.277E-32	3.931E-30	2.443E-28	1.928E-26	6.799E-25	1.636E-23
U-238+D	Po-210	9.999E-01	4.083E-33	2.087E-31	7.762E-30	7.962E-28	5.610E-26	4.639E-24	1.652E-22	3.938E-21
U-238+D	∑DSR(j)		1.477E-11	1.475E-11	1.471E-11	1.458E-11	1.421E-11	1.298E-11	1.004E-11	4.099E-12

The DSR includes contributions from associated (half-life ≤ 30 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	2.526E+12	2.616E+12	2.806E+12	3.587E+12	7.237E+12	*7.232E+13	*7.232E+13	*7.232E+13
Pa-231	*4.723E+10	*4.723E+10	*4.723E+10	*4.723E+10	*4.723E+10	*4.723E+10	*4.723E+10	*4.723E+10
Pb-210	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13
Ra-226	7.818E+08	7.829E+08	7.850E+08	7.925E+08	8.141E+08	8.948E+08	1.172E+09	3.013E+09
Ra-228	3.909E+08	1.657E+08	1.126E+08	1.631E+08	1.705E+09	8.397E+12	*2.726E+14	*2.726E+14
Th-228	7.564E+07	1.087E+08	2.243E+08	2.832E+09	3.972E+12	*8.195E+14	*8.195E+14	*8.195E+14
Th-230	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	1.917E+10	7.272E+09	3.238E+09
Th-232	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05
U-234	*6.247E+09	*6.247E+09	*6.247E+09	*6.247E+09	*6.247E+09	*6.247E+09	*6.247E+09	*6.247E+09
U-235	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06
U-238	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05

*At specific activity limit

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Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 1.000E+03 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ac-227	7.200E-01	0.000E+00	9.899E-12	2.526E+12	5.703E-27	*7.232E+13
Pa-231	7.200E-01	96.7 ± 0.2	8.103E-12	*4.723E+10	2.589E-12	*4.723E+10
Pb-210	9.209E+01	1.825 ± 0.004	5.546E-15	*7.634E+13	1.010E-28	*7.634E+13
Ra-226	9.209E+01	0.000E+00	3.198E-08	7.818E+08	8.298E-09	3.013E+09
Ra-228	8.168E+01	4.036 ± 0.008	2.285E-07	1.094E+08	0.000E+00	*2.726E+14
Th-228	8.168E+01	0.000E+00	3.305E-07	7.564E+07	0.000E+00	*8.195E+14
Th-230	5.525E+02	1.000E+03	7.722E-09	3.238E+09	7.722E-09	3.238E+09
Th-232	8.168E+01	1.000E+03	4.050E-07	*1.097E+05	4.050E-07	*1.097E+05
U-234	1.577E+01	1.000E+03	2.747E-11	*6.247E+09	2.747E-11	*6.247E+09
U-235	7.200E-01	793 ± 2	5.590E-14	*2.161E+06	5.422E-14	*2.161E+06
U-238	1.577E+01	0.000E+00	1.477E-11	*3.361E+05	4.099E-12	*3.361E+05

*At specific activity limit

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Summary : SU11 Elevated Area #3 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 IN SITU.RAD

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	Ac-227	1.000E+00	7.127E-12	6.881E-12	6.415E-12	5.018E-12	2.487E-12	2.133E-13	1.910E-16	4.106E-27
Ac-227	Pa-231	1.000E+00	1.141E-13	3.367E-13	7.584E-13	2.013E-12	4.224E-12	5.793E-12	4.617E-12	1.852E-12
Ac-227	U-235	1.000E+00	8.066E-19	5.586E-18	2.883E-17	2.370E-16	1.593E-15	9.126E-15	2.654E-14	3.843E-14
Ac-227	∑DOSE(j)		7.241E-12	7.218E-12	7.173E-12	7.031E-12	6.713E-12	6.015E-12	4.643E-12	1.890E-12
Pa-231	Pa-231	1.000E+00	4.520E-14	4.514E-14	4.502E-14	4.461E-14	4.347E-14	3.970E-14	3.063E-14	1.236E-14
Pa-231	U-235	1.000E+00	4.780E-19	1.433E-18	3.334E-18	9.913E-18	2.806E-17	8.451E-17	1.954E-16	2.644E-16
Pa-231	∑DOSE(j)		4.520E-14	4.514E-14	4.503E-14	4.462E-14	4.350E-14	3.979E-14	3.083E-14	1.262E-14
Pb-210	Pb-210	1.000E+00	2.194E-15	2.125E-15	1.995E-15	1.598E-15	8.478E-16	9.225E-17	1.631E-19	0.000E+00
Pb-210	Ra-226	1.000E+00	3.426E-17	1.013E-16	2.289E-16	6.141E-16	1.323E-15	1.903E-15	1.533E-15	6.072E-16
Pb-210	Th-230	1.000E+00	2.976E-20	2.064E-19	1.068E-18	8.875E-18	6.135E-17	3.794E-16	1.292E-15	3.194E-15
Pb-210	U-234	1.000E+00	1.914E-27	2.851E-26	3.272E-25	8.191E-24	1.712E-22	3.852E-21	4.255E-20	3.167E-19
Pb-210	U-238	9.999E-01	0.000E+00	0.000E+00	0.000E+00	6.200E-29	3.852E-27	3.040E-25	1.072E-23	2.580E-22
Pb-210	∑DOSE(j)		2.228E-15	2.227E-15	2.225E-15	2.221E-15	2.232E-15	2.375E-15	2.825E-15	3.802E-15
Po-210	Pb-210	1.000E+00	2.933E-13	4.906E-13	4.976E-13	3.994E-13	2.118E-13	2.302E-14	4.055E-17	9.304E-27
Po-210	Ra-226	1.000E+00	3.453E-15	1.659E-14	4.784E-14	1.442E-13	3.215E-13	4.665E-13	3.747E-13	1.464E-13
Po-210	Th-230	1.000E+00	2.424E-18	2.722E-17	1.947E-16	1.976E-15	1.461E-14	9.237E-14	3.152E-13	7.695E-13
Po-210	U-234	1.000E+00	1.312E-25	3.197E-24	5.318E-23	1.737E-21	4.002E-20	9.323E-19	1.036E-17	7.626E-17
Po-210	U-238	9.999E-01	0.000E+00	0.000E+00	1.224E-28	1.256E-26	8.847E-25	7.315E-23	2.605E-21	6.210E-20
Po-210	∑DOSE(j)		2.968E-13	5.072E-13	5.457E-13	5.456E-13	5.480E-13	5.819E-13	6.899E-13	9.160E-13
Ra-226	Ra-226	1.000E+00	2.945E-06	2.941E-06	2.933E-06	2.905E-06	2.828E-06	2.573E-06	1.965E-06	7.641E-07
Ra-226	Th-230	1.000E+00	3.828E-09	1.148E-08	2.674E-08	7.986E-08	2.289E-07	7.207E-07	1.899E-06	4.266E-06
Ra-226	U-234	1.000E+00	3.278E-16	2.293E-15	1.210E-14	1.076E-13	8.913E-13	9.107E-12	6.864E-11	4.332E-10
Ra-226	U-238	9.999E-01	2.323E-22	3.481E-21	4.053E-20	1.068E-18	2.561E-17	8.556E-16	1.886E-14	3.625E-13
Ra-226	∑DOSE(j)		2.948E-06	2.952E-06	2.960E-06	2.985E-06	3.057E-06	3.294E-06	3.864E-06	5.031E-06
Ra-228	Ra-228	1.000E+00	2.487E-07	2.203E-07	1.728E-07	7.383E-08	6.505E-09	1.321E-12	3.723E-23	0.000E+00
Ra-228	Th-232	1.000E+00	1.529E-08	4.353E-08	9.068E-08	1.889E-07	2.559E-07	2.630E-07	2.649E-07	2.717E-07
Ra-228	∑DOSE(j)		2.640E-07	2.638E-07	2.634E-07	2.627E-07	2.624E-07	2.630E-07	2.649E-07	2.717E-07
Th-228	Ra-228	1.000E+00	4.976E-06	1.210E-05	1.797E-05	1.245E-05	1.191E-06	2.419E-10	6.807E-21	0.000E+00
Th-228	Th-228	1.000E+00	2.700E-05	1.879E-05	9.105E-06	7.209E-07	5.142E-10	4.981E-21	0.000E+00	0.000E+00
Th-228	Th-232	1.000E+00	2.080E-07	1.276E-06	5.069E-06	1.887E-05	3.077E-05	3.202E-05	3.219E-05	3.281E-05
Th-228	∑DOSE(j)		3.218E-05	3.217E-05	3.214E-05	3.204E-05	3.197E-05	3.202E-05	3.219E-05	3.281E-05
Th-230	Th-230	1.000E+00	2.357E-20	2.357E-20	2.358E-20	2.359E-20	2.363E-20	2.375E-20	2.410E-20	2.538E-20
Th-230	U-234	1.000E+00	3.027E-27	9.076E-27	2.115E-26	6.320E-26	1.815E-25	5.743E-25	1.536E-24	3.621E-24
Th-230	U-238	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.000E-29	6.112E-28	4.039E-27
Th-230	∑DOSE(j)		2.357E-20	2.357E-20	2.358E-20	2.359E-20	2.363E-20	2.375E-20	2.410E-20	2.539E-20
Th-232	Th-232	1.000E+00	1.259E-23	1.259E-23	1.259E-23	1.260E-23	1.262E-23	1.270E-23	1.294E-23	1.380E-23
U-234	U-234	1.000E+00	3.874E-23	3.869E-23	3.860E-23	3.826E-23	3.732E-23	3.421E-23	2.668E-23	1.117E-23
U-234	U-238	9.999E-01	5.490E-29	1.645E-28	3.830E-28	1.139E-27	3.227E-27	9.749E-27	2.274E-26	3.174E-26
U-234	∑DOSE(j)		3.874E-23	3.869E-23	3.860E-23	3.826E-23	3.733E-23	3.422E-23	2.670E-23	1.121E-23
U-235	U-235	1.000E+00	1.215E-15	1.214E-15	1.211E-15	1.200E-15	1.170E-15	1.071E-15	8.313E-16	3.427E-16

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 09:38 Page 26
Summary : SU11 Elevated Area #3 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 IN SITU.RAD

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-238	U-238	5.400E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238	U-238	9.999E-01	2.329E-10	2.326E-10	2.320E-10	2.299E-10	2.241E-10	2.048E-10	1.583E-10	6.428E-11
U-238	∑DOSE(j)		2.329E-10	2.326E-10	2.320E-10	2.299E-10	2.241E-10	2.048E-10	1.583E-10	6.428E-11

THF(i) is the thread fraction of the parent nuclide.

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 09:38 Page 27
Summary : SU11 Elevated Area #3 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 IN SITU.RAD

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	Ac-227	1.000E+00	7.200E-01	6.951E-01	6.480E-01	5.067E-01	2.509E-01	2.145E-02	1.905E-05	3.971E-16
Ac-227	Pa-231	1.000E+00	0.000E+00	2.251E-02	6.513E-02	1.919E-01	4.151E-01	5.726E-01	4.526E-01	1.761E-01
Ac-227	U-235	1.000E+00	0.000E+00	2.395E-07	2.102E-06	2.144E-05	1.537E-04	8.965E-04	2.597E-03	3.653E-03
Ac-227	∑S(j):		7.200E-01	7.177E-01	7.131E-01	6.986E-01	6.662E-01	5.950E-01	4.553E-01	1.797E-01
Pa-231	Pa-231	1.000E+00	7.200E-01	7.190E-01	7.171E-01	7.104E-01	6.914E-01	6.291E-01	4.804E-01	1.869E-01
Pa-231	U-235	1.000E+00	0.000E+00	1.521E-05	4.552E-05	1.503E-04	4.390E-04	1.333E-03	3.059E-03	3.996E-03
Pa-231	∑S(j):		7.200E-01	7.190E-01	7.171E-01	7.105E-01	6.919E-01	6.305E-01	4.834E-01	1.909E-01
Pb-210	Pb-210	1.000E+00	9.209E+01	8.921E+01	8.372E+01	6.704E+01	3.553E+01	3.850E+00	6.727E-03	1.500E-12
Pb-210	Ra-226	1.000E+00	0.000E+00	2.815E+00	8.174E+00	2.435E+01	5.407E+01	7.815E+01	6.225E+01	2.365E+01
Pb-210	Th-230	1.000E+00	0.000E+00	3.679E-03	3.240E-02	3.340E-01	2.460E+00	1.548E+01	5.237E+01	1.243E+02
Pb-210	U-234	1.000E+00	0.000E+00	3.159E-10	8.384E-09	2.928E-07	6.745E-06	1.563E-04	1.721E-03	1.232E-02
Pb-210	U-238	9.999E-01	0.000E+00	2.242E-16	1.790E-14	2.104E-12	1.491E-10	1.227E-08	4.330E-07	1.003E-05
Pb-210	∑S(j):		9.209E+01	9.203E+01	9.193E+01	9.172E+01	9.206E+01	9.748E+01	1.146E+02	1.479E+02
Po-210	Pb-210	1.000E+00	0.000E+00	7.557E+01	8.452E+01	6.798E+01	3.602E+01	3.903E+00	6.821E-03	1.521E-12
Po-210	Ra-226	1.000E+00	0.000E+00	1.527E+00	6.719E+00	2.313E+01	5.331E+01	7.787E+01	6.208E+01	2.358E+01
Po-210	Th-230	1.000E+00	0.000E+00	1.504E-03	2.277E-02	3.001E-01	2.376E+00	1.532E+01	5.210E+01	1.238E+02
Po-210	U-234	1.000E+00	0.000E+00	1.043E-10	5.172E-09	2.500E-07	6.393E-06	1.537E-04	1.709E-03	1.227E-02
Po-210	U-238	9.999E-01	0.000E+00	6.232E-17	9.861E-15	1.712E-12	1.388E-10	1.200E-08	4.291E-07	9.984E-06
Po-210	∑S(j):		0.000E+00	7.710E+01	9.126E+01	9.140E+01	9.171E+01	9.709E+01	1.142E+02	1.474E+02
Ra-226	Ra-226	1.000E+00	9.209E+01	9.196E+01	9.171E+01	9.083E+01	8.835E+01	8.020E+01	6.082E+01	2.310E+01
Ra-226	Th-230	1.000E+00	0.000E+00	2.392E-01	7.166E-01	2.377E+00	7.033E+00	2.234E+01	5.868E+01	1.289E+02
Ra-226	U-234	1.000E+00	0.000E+00	3.072E-08	2.760E-07	3.047E-06	2.693E-05	2.810E-04	2.117E-03	1.308E-02
Ra-226	U-238	9.999E-01	0.000E+00	2.903E-14	7.821E-13	2.876E-11	7.611E-10	2.627E-08	5.808E-07	1.094E-05
Ra-226	∑S(j):		9.209E+01	9.220E+01	9.243E+01	9.320E+01	9.538E+01	1.025E+02	1.195E+02	1.520E+02
Ra-228	Ra-228	1.000E+00	8.168E+01	7.234E+01	5.673E+01	2.424E+01	2.134E+00	4.321E-04	1.209E-14	0.000E+00
Ra-228	Th-232	1.000E+00	0.000E+00	9.272E+00	2.475E+01	5.699E+01	7.892E+01	8.103E+01	8.102E+01	8.095E+01
Ra-228	∑S(j):		8.168E+01	8.161E+01	8.148E+01	8.123E+01	8.106E+01	8.103E+01	8.102E+01	8.095E+01
Th-228	Ra-228	1.000E+00	0.000E+00	2.329E+01	4.391E+01	3.318E+01	3.208E+00	6.501E-04	1.819E-14	0.000E+00
Th-228	Th-228	1.000E+00	8.168E+01	5.685E+01	2.755E+01	2.181E+00	1.554E-03	1.503E-14	0.000E+00	0.000E+00
Th-228	Th-232	1.000E+00	0.000E+00	1.522E+00	1.015E+01	4.595E+01	7.786E+01	8.103E+01	8.102E+01	8.095E+01
Th-228	∑S(j):		8.168E+01	8.167E+01	8.160E+01	8.132E+01	8.106E+01	8.103E+01	8.102E+01	8.095E+01
Th-230	Th-230	1.000E+00	5.525E+02	5.525E+02	5.525E+02	5.525E+02	5.524E+02	5.520E+02	5.509E+02	5.470E+02
Th-230	U-234	1.000E+00	0.000E+00	1.419E-04	4.250E-04	1.410E-03	4.174E-03	1.329E-02	3.506E-02	7.801E-02
Th-230	U-238	9.999E-01	0.000E+00	2.010E-10	1.806E-09	1.994E-08	1.763E-07	1.842E-06	1.393E-05	8.699E-05
Th-230	∑S(j):		5.525E+02	5.525E+02	5.525E+02	5.525E+02	5.524E+02	5.520E+02	5.509E+02	5.471E+02
Th-232	Th-232	1.000E+00	8.168E+01	8.168E+01	8.168E+01	8.168E+01	8.168E+01	8.167E+01	8.165E+01	8.159E+01
U-234	U-234	1.000E+00	1.577E+01	1.575E+01	1.571E+01	1.556E+01	1.515E+01	1.381E+01	1.058E+01	4.168E+00
U-234	U-238	9.999E-01	0.000E+00	4.465E-05	1.336E-04	4.411E-04	1.289E-03	3.914E-03	9.001E-03	1.183E-02
U-234	∑S(j):		1.577E+01	1.575E+01	1.571E+01	1.556E+01	1.515E+01	1.381E+01	1.059E+01	4.180E+00
U-235	U-235	1.000E+00	7.200E-01	7.190E-01	7.171E-01	7.105E-01	6.919E-01	6.305E-01	4.834E-01	1.909E-01

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 09:38 Page 28
Summary : SU11 Elevated Area #3 In Situ
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 IN SITU.RAD

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-238	U-238	5.400E-05	8.516E-04	8.505E-04	8.482E-04	8.403E-04	8.183E-04	7.457E-04	5.718E-04	2.257E-04
U-238	U-238	9.999E-01	1.577E+01	1.575E+01	1.571E+01	1.556E+01	1.515E+01	1.381E+01	1.059E+01	4.180E+00
U-238	∑S(j):		1.577E+01	1.575E+01	1.571E+01	1.556E+01	1.515E+01	1.381E+01	1.059E+01	4.180E+00

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 1.46 seconds

APPENDIX C

RESRAD v6.5 Summary Report for Elevated Area #2 Excavation Scenario Model

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 08:27 Page 1
Summary : SU11 Elevated Area #2 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 EXCAVATION.RAD

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Summary : SU11 Elevated Area #2 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 EXCAVATION.RAD

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-227 (Source: FGR 12)	4.951E-04	4.951E-04	DCF1(1)
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(2)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(3)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(4)
A-1	Bi-211 (Source: FGR 12)	2.559E-01	2.559E-01	DCF1(5)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(6)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(7)
A-1	Fr-223 (Source: FGR 12)	1.980E-01	1.980E-01	DCF1(8)
A-1	Pa-231 (Source: FGR 12)	1.906E-01	1.906E-01	DCF1(9)
A-1	Pa-234 (Source: FGR 12)	1.155E+01	1.155E+01	DCF1(10)
A-1	Pa-234m (Source: FGR 12)	8.967E-02	8.967E-02	DCF1(11)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(12)
A-1	Pb-211 (Source: FGR 12)	3.064E-01	3.064E-01	DCF1(13)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(14)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(15)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(16)
A-1	Po-211 (Source: FGR 12)	4.764E-02	4.764E-02	DCF1(17)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(18)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(19)
A-1	Po-215 (Source: FGR 12)	1.016E-03	1.016E-03	DCF1(20)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(21)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(22)
A-1	Ra-223 (Source: FGR 12)	6.034E-01	6.034E-01	DCF1(23)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(24)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(25)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(26)
A-1	Rn-219 (Source: FGR 12)	3.083E-01	3.083E-01	DCF1(27)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(28)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(29)
A-1	Th-227 (Source: FGR 12)	5.212E-01	5.212E-01	DCF1(30)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(31)
A-1	Th-230 (Source: FGR 12)	1.209E-03	1.209E-03	DCF1(32)
A-1	Th-231 (Source: FGR 12)	3.643E-02	3.643E-02	DCF1(33)
A-1	Th-232 (Source: FGR 12)	5.212E-04	5.212E-04	DCF1(34)
A-1	Th-234 (Source: FGR 12)	2.410E-02	2.410E-02	DCF1(35)
A-1	Tl-207 (Source: FGR 12)	1.980E-02	1.980E-02	DCF1(36)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(37)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(38)
A-1	U-234 (Source: FGR 12)	4.017E-04	4.017E-04	DCF1(39)
A-1	U-235 (Source: FGR 12)	7.211E-01	7.211E-01	DCF1(40)
A-1	U-238 (Source: FGR 12)	1.031E-04	1.031E-04	DCF1(41)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.724E+00	6.700E+00	DCF2(1)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(2)
B-1	Pb-210+D	1.380E-02	1.360E-02	DCF2(3)
B-1	Po-210	9.400E-03	9.400E-03	DCF2(4)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(5)
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(6)

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Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(7)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(8)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(9)
B-1	U-234	1.320E-01	1.320E-01	DCF2(10)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(11)
B-1	U-238	1.180E-01	1.180E-01	DCF2(12)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(13)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.410E-02	DCF3(1)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(2)
D-1	Pb-210+D	5.376E-03	5.370E-03	DCF3(3)
D-1	Po-210	1.900E-03	1.900E-03	DCF3(4)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(5)
D-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(6)
D-1	Th-228+D	8.086E-04	3.960E-04	DCF3(7)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(8)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(9)
D-1	U-234	2.830E-04	2.830E-04	DCF3(10)
D-1	U-235+D	2.673E-04	2.660E-04	DCF3(11)
D-1	U-238	2.550E-04	2.550E-04	DCF3(12)
D-1	U-238+D	2.687E-04	2.550E-04	DCF3(13)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(3,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(3,3)
D-34				
D-34	Po-210 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Po-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(4,2)
D-34	Po-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.400E-04	3.400E-04	RTF(4,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(5,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(6,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(6,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(6,3)
D-34				

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Summary : SU11 Elevated Area #2 Excavation
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Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(8,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(8,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(9,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(9,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(9,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(10,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(10,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(10,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(11,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(11,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(11,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(12,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(12,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(12,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(13,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(13,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(13,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(2,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2,2)
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
D-5				
D-5	Po-210 , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Po-210 , crustacea and mollusks	2.000E+04	2.000E+04	BIOFAC(4,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(5,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(5,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(6,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(6,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(7,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7,2)
D-5				

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Summary : SU11 Elevated Area #2 Excavation
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Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(8,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(8,2)
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(9,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(9,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(10,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(10,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(11,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(11,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(12,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(12,2)
D-5				
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(13,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(13,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

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Summary : SU11 Elevated Area #2 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 EXCAVATION.RAD

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	3.700E+00	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	3.000E-01	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ac-227	1.720E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Pa-231	1.720E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Pb-210	8.490E+01	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ra-226	8.490E+01	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Ra-228	2.727E+01	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Th-228	2.727E+01	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): Th-230	5.094E+02	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): Th-232	2.727E+01	0.000E+00	---	S1(9)
R012	Initial principal radionuclide (pCi/g): U-234	3.790E+01	0.000E+00	---	S1(10)
R012	Initial principal radionuclide (pCi/g): U-235	1.720E+00	0.000E+00	---	S1(11)
R012	Initial principal radionuclide (pCi/g): U-238	3.790E+01	0.000E+00	---	S1(12)
R012	Concentration in groundwater (pCi/L): Ac-227	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Pa-231	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Th-228	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): Th-232	not used	0.000E+00	---	W1(9)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(10)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1(11)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(12)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID

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Summary : SU11 Elevated Area #2 Excavation
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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	0.000E+00	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ac-227				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	2.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.398E-02	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Pa-231				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.770E-02	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.870E-03	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

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Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.266E-02	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.266E-02	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for Th-232				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(10)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(10,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.770E-02	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)
R016	Distribution coefficients for U-235				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(11)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(11,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.770E-02	ALEACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)

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R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(12)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(12,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(12)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.770E-02	ALEACH(12)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(12)
R016	Distribution coefficients for daughter Po-210				
R016	Contaminated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.706E-02	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R017	Inhalation rate (m**3/yr)	1.227E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	3.500E-05	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	6.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	1.700E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.400E-04	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)

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Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	not used	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL

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Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

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Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

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Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	3.70 square meters	Ac-227	1.720E+00
Thickness:	0.30 meters	Pa-231	1.720E+00
Cover Depth:	0.00 meters	Pb-210	8.490E+01
		Ra-226	8.490E+01
		Ra-228	2.727E+01
		Th-228	2.727E+01
		Th-230	5.094E+02
		Th-232	2.727E+01
		U-234	3.790E+01
		U-235	1.720E+00
		U-238	3.790E+01

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	7.757E-02	7.680E-02	7.525E-02	7.033E-02	6.012E-02	4.000E-02	0.000E+00	0.000E+00
M(t):	3.103E-03	3.072E-03	3.010E-03	2.813E-03	2.405E-03	1.600E-03	0.000E+00	0.000E+00

Maximum TDOSE(t): 7.757E-02 mrem/yr at t = 0.000E+00 years

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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	2.040E-04	0.0026	4.469E-05	0.0006	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.944E-07	0.0000
Pa-231	2.301E-05	0.0003	9.472E-06	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.985E-07	0.0000
Pb-210	3.292E-05	0.0004	6.278E-06	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.723E-05	0.0002
Ra-226	5.192E-02	0.6693	3.000E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.869E-06	0.0000
Ra-228	1.082E-02	0.1395	6.340E-06	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.303E-06	0.0000
Th-228	1.239E-02	0.1598	3.170E-05	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.995E-07	0.0000
Th-230	1.087E-04	0.0014	6.663E-04	0.0086	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.053E-06	0.0001
Th-232	6.229E-04	0.0080	1.797E-04	0.0023	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.491E-06	0.0000
U-234	1.048E-06	0.0000	1.990E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.446E-07	0.0000
U-235	8.209E-05	0.0011	8.415E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.478E-08	0.0000
U-238	3.337E-04	0.0043	1.779E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.272E-07	0.0000
Total	7.654E-02	0.9868	9.861E-04	0.0127	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.663E-05	0.0005

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.495E-04	0.0032
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.308E-05	0.0004
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.643E-05	0.0007
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.193E-02	0.6694
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.083E-02	0.1396
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.243E-02	0.1602
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.841E-04	0.0101
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.051E-04	0.0104
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.129E-05	0.0003
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.294E-05	0.0011
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.518E-04	0.0045
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.757E-02	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #2 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 EXCAVATION.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	1.890E-04	0.0025	4.143E-05	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.364E-07	0.0000
Pa-231	2.879E-05	0.0004	1.066E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.121E-07	0.0000
Pb-210	3.172E-05	0.0004	7.163E-06	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.840E-05	0.0002
Ra-226	5.121E-02	0.6668	3.174E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.378E-06	0.0001
Ra-228	1.298E-02	0.1690	1.453E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.311E-06	0.0000
Th-228	8.619E-03	0.1122	2.206E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.173E-07	0.0000
Th-230	2.427E-04	0.0032	6.663E-04	0.0087	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.063E-06	0.0001
Th-232	2.073E-03	0.0270	1.810E-04	0.0024	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.649E-06	0.0000
U-234	1.029E-06	0.0000	1.955E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.385E-07	0.0000
U-235	8.063E-05	0.0010	8.270E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.453E-08	0.0000
U-238	3.277E-04	0.0043	1.748E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.214E-07	0.0000
Total	7.578E-02	0.9867	9.842E-04	0.0128	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.824E-05	0.0005

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.312E-04	0.0030
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.007E-05	0.0005
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.728E-05	0.0007
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.122E-02	0.6669
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.299E-02	0.1692
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.642E-03	0.1125
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.180E-04	0.0120
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.257E-03	0.0294
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.092E-05	0.0003
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.147E-05	0.0011
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.455E-04	0.0045
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.680E-02	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #2 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 EXCAVATION.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	1.623E-04	0.0022	3.560E-05	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.328E-07	0.0000
Pa-231	3.873E-05	0.0005	1.270E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.335E-07	0.0000
Pb-210	2.929E-05	0.0004	6.797E-06	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.729E-05	0.0002
Ra-226	4.982E-02	0.6620	3.523E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.364E-06	0.0001
Ra-228	1.376E-02	0.1829	2.096E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.190E-06	0.0000
Th-228	4.169E-03	0.0554	1.069E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.022E-07	0.0000
Th-230	5.048E-04	0.0067	6.663E-04	0.0089	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.088E-06	0.0001
Th-232	5.359E-03	0.0712	1.855E-04	0.0025	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.953E-06	0.0000
U-234	9.938E-07	0.0000	1.887E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.268E-07	0.0000
U-235	7.779E-05	0.0010	7.987E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.405E-08	0.0000
U-238	3.160E-04	0.0042	1.687E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.103E-07	0.0000
Total	7.424E-02	0.9865	9.786E-04	0.0130	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.801E-05	0.0005

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.986E-04	0.0026
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.206E-05	0.0007
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.337E-05	0.0007
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.983E-02	0.6621
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.378E-02	0.1832
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.180E-03	0.0555
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.180E-03	0.0157
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.548E-03	0.0737
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.019E-05	0.0003
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.861E-05	0.0010
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.332E-04	0.0044
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.525E-02	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #2 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 EXCAVATION.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	9.526E-05	0.0014	2.094E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.722E-07	0.0000
Pa-231	6.033E-05	0.0009	1.697E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.619E-07	0.0000
Pb-210	2.211E-05	0.0003	5.142E-06	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.308E-05	0.0002
Ra-226	4.523E-02	0.6432	4.446E-06	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.025E-06	0.0001
Ra-228	7.447E-03	0.1059	1.356E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.689E-07	0.0000
Th-228	3.280E-04	0.0047	8.462E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.600E-08	0.0000
Th-230	1.364E-03	0.0194	6.663E-04	0.0095	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.210E-06	0.0001
Th-232	1.443E-02	0.2052	2.011E-04	0.0029	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.683E-06	0.0001
U-234	8.817E-07	0.0000	1.667E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.887E-07	0.0000
U-235	6.862E-05	0.0010	7.077E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.251E-08	0.0000
U-238	2.783E-04	0.0040	1.491E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.741E-07	0.0000
Total	6.933E-02	0.9858	9.615E-04	0.0137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.619E-05	0.0005

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.166E-04	0.0017
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.796E-05	0.0011
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.033E-05	0.0006
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.525E-02	0.6434
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.461E-03	0.1061
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.289E-04	0.0047
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.040E-03	0.0290
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.463E-02	0.2081
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.784E-05	0.0003
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.934E-05	0.0010
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.935E-04	0.0042
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.033E-02	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 08:27 Page 18
Summary : SU11 Elevated Area #2 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 EXCAVATION.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	2.076E-05	0.0003	4.596E-06	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.171E-08	0.0000
Pa-231	6.700E-05	0.0011	1.744E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.627E-07	0.0000
Pb-210	9.910E-06	0.0002	2.313E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.881E-06	0.0001
Ra-226	3.428E-02	0.5702	5.325E-06	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.102E-05	0.0002
Ra-228	5.450E-04	0.0091	1.037E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.138E-08	0.0000
Th-228	2.294E-07	0.0000	6.030E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.140E-11	0.0000
Th-230	3.379E-03	0.0562	6.662E-04	0.0111	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.723E-06	0.0002
Th-232	2.061E-02	0.3428	2.131E-04	0.0035	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.174E-06	0.0001
U-234	6.456E-07	0.0000	1.171E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.027E-07	0.0000
U-235	4.795E-05	0.0008	5.031E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.999E-09	0.0000
U-238	1.933E-04	0.0032	1.046E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.924E-07	0.0000
Total	5.915E-02	0.9840	9.327E-04	0.0155	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.189E-05	0.0005

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.544E-05	0.0004
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.500E-05	0.0014
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.810E-05	0.0003
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.430E-02	0.5705
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.461E-04	0.0091
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.300E-07	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.055E-03	0.0675
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.083E-02	0.3464
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.256E-05	0.0002
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.847E-05	0.0008
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.040E-04	0.0034
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.012E-02	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #2 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 EXCAVATION.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	9.920E-08	0.0000	2.278E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.049E-10	0.0000
Pa-231	2.179E-05	0.0005	5.758E-06	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.754E-07	0.0000
Pb-210	5.944E-07	0.0000	1.411E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.588E-07	0.0000
Ra-226	1.269E-02	0.3173	3.036E-06	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.712E-06	0.0002
Ra-228	4.467E-08	0.0000	9.261E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.693E-12	0.0000
Th-228	2.023E-18	0.0000	5.824E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.101E-22	0.0000
Th-230	6.902E-03	0.1725	6.659E-04	0.0166	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.141E-05	0.0003
Th-232	1.940E-02	0.4850	2.138E-04	0.0053	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.207E-06	0.0001
U-234	3.375E-07	0.0000	3.408E-06	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.899E-08	0.0000
U-235	1.359E-05	0.0003	1.540E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.862E-09	0.0000
U-238	5.318E-05	0.0013	3.031E-06	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.573E-08	0.0000
Total	3.908E-02	0.9770	8.953E-04	0.0224	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.298E-05	0.0006

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.224E-07	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.773E-05	0.0007
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.094E-06	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.270E-02	0.3175
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.477E-08	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.029E-18	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.579E-03	0.1895
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.962E-02	0.4904
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.804E-06	0.0001
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.374E-05	0.0003
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.627E-05	0.0014
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.000E-02	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 08:27 Page 20
Summary : SU11 Elevated Area #2 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 EXCAVATION.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #2 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 EXCAVATION.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #2 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 EXCAVATION.RAD

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	1.450E-04	1.344E-04	1.154E-04	6.777E-05	1.479E-05	7.115E-08	0.000E+00	0.000E+00
Pa-231	Pa-231	1.000E+00	1.691E-05	1.651E-05	1.602E-05	1.413E-05	9.862E-06	2.779E-06	0.000E+00	0.000E+00
Pa-231	Ac-227+D	1.000E+00	2.324E-06	6.688E-06	1.425E-05	3.120E-05	3.956E-05	1.334E-05	0.000E+00	0.000E+00
Pa-231	∑DSR(j)		1.923E-05	2.330E-05	3.027E-05	4.533E-05	4.942E-05	1.612E-05	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	6.113E-07	5.873E-07	5.421E-07	4.096E-07	1.838E-07	1.109E-08	0.000E+00	0.000E+00
Pb-210+D	Po-210	1.000E+00	5.336E-08	8.737E-08	8.654E-08	6.553E-08	2.946E-08	1.794E-09	0.000E+00	0.000E+00
Pb-210+D	∑DSR(j)		6.647E-07	6.747E-07	6.287E-07	4.751E-07	2.132E-07	1.289E-08	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	6.116E-04	6.032E-04	5.868E-04	5.327E-04	4.037E-04	1.494E-04	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	9.523E-09	2.790E-08	6.180E-08	1.544E-07	2.698E-07	1.781E-07	0.000E+00	0.000E+00
Ra-226+D	Po-210	1.000E+00	6.294E-10	2.971E-09	8.329E-09	2.328E-08	4.216E-08	2.836E-08	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		6.116E-04	6.033E-04	5.869E-04	5.329E-04	4.040E-04	1.496E-04	0.000E+00	0.000E+00
Ra-228+D	Ra-228+D	1.000E+00	3.136E-04	2.743E-04	2.099E-04	8.224E-05	5.649E-06	4.695E-10	0.000E+00	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	8.364E-05	2.022E-04	2.955E-04	1.914E-04	1.438E-05	1.172E-09	0.000E+00	0.000E+00
Ra-228+D	∑DSR(j)		3.972E-04	4.765E-04	5.054E-04	2.736E-04	2.002E-05	1.642E-09	0.000E+00	0.000E+00
Th-228+D	Th-228+D	1.000E+00	4.557E-04	3.169E-04	1.533E-04	1.206E-05	9.435E-09	7.441E-20	0.000E+00	0.000E+00
Th-230	Th-230	1.000E+00	1.407E-06	1.406E-06	1.406E-06	1.406E-06	1.405E-06	1.402E-06	0.000E+00	0.000E+00
Th-230	Ra-226+D	1.000E+00	1.327E-07	3.957E-07	9.103E-07	2.597E-06	6.553E-06	1.346E-05	0.000E+00	0.000E+00
Th-230	Pb-210+D	1.000E+00	1.381E-12	9.523E-12	4.864E-11	3.857E-10	2.342E-09	9.643E-09	0.000E+00	0.000E+00
Th-230	Po-210	1.000E+00	7.392E-14	8.191E-13	5.733E-12	5.516E-11	3.580E-10	1.521E-09	0.000E+00	0.000E+00
Th-230	∑DSR(j)		1.539E-06	1.802E-06	2.317E-06	4.004E-06	7.961E-06	1.488E-05	0.000E+00	0.000E+00
Th-232	Th-232	1.000E+00	6.705E-06	6.705E-06	6.705E-06	6.704E-06	6.702E-06	6.695E-06	0.000E+00	0.000E+00
Th-232	Ra-228+D	1.000E+00	1.932E-05	5.467E-05	1.126E-04	2.267E-04	2.918E-04	2.763E-04	0.000E+00	0.000E+00
Th-232	Th-228+D	1.000E+00	3.500E-06	2.138E-05	8.415E-05	3.032E-04	4.652E-04	4.363E-04	0.000E+00	0.000E+00
Th-232	∑DSR(j)		2.952E-05	8.276E-05	2.034E-04	5.367E-04	7.637E-04	7.193E-04	0.000E+00	0.000E+00
U-234	U-234	1.000E+00	5.617E-07	5.519E-07	5.326E-07	4.705E-07	3.302E-07	9.558E-08	0.000E+00	0.000E+00
U-234	Th-230	1.000E+00	6.294E-12	1.873E-11	4.296E-11	1.213E-10	2.982E-10	5.931E-10	0.000E+00	0.000E+00
U-234	Ra-226+D	1.000E+00	3.970E-13	2.753E-12	1.425E-11	1.181E-10	8.033E-10	4.205E-09	0.000E+00	0.000E+00
U-234	Pb-210+D	1.000E+00	3.105E-18	4.588E-17	5.174E-16	1.215E-14	2.117E-13	2.586E-12	0.000E+00	0.000E+00
U-234	Po-210	1.000E+00	1.402E-19	3.366E-18	5.459E-17	1.660E-15	3.184E-14	4.061E-13	0.000E+00	0.000E+00
U-234	∑DSR(j)		5.617E-07	5.519E-07	5.327E-07	4.708E-07	3.313E-07	1.004E-07	0.000E+00	0.000E+00
U-235+D	U-235+D	1.000E+00	4.822E-05	4.737E-05	4.570E-05	4.031E-05	2.816E-05	7.962E-06	0.000E+00	0.000E+00
U-235+D	Pa-231	1.000E+00	1.783E-10	5.266E-10	1.186E-09	3.139E-09	6.366E-09	5.916E-09	0.000E+00	0.000E+00
U-235+D	Ac-227+D	1.000E+00	1.644E-11	1.115E-10	5.487E-10	3.818E-09	1.635E-08	2.361E-08	0.000E+00	0.000E+00
U-235+D	∑DSR(j)		4.822E-05	4.737E-05	4.570E-05	4.032E-05	2.818E-05	7.991E-06	0.000E+00	0.000E+00
U-238	U-238	5.400E-05	2.624E-11	2.578E-11	2.488E-11	2.198E-11	1.543E-11	4.468E-12	0.000E+00	0.000E+00

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Summary : SU11 Elevated Area #2 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 EXCAVATION.RAD

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-238+D	U-238+D	9.999E-01	9.283E-06	9.116E-06	8.791E-06	7.743E-06	5.382E-06	1.485E-06	0.000E+00	0.000E+00
U-238+D	U-234	9.999E-01	7.938E-13	2.344E-12	5.283E-12	1.400E-11	2.855E-11	2.723E-11	0.000E+00	0.000E+00
U-238+D	Th-230	9.999E-01	5.930E-18	4.109E-17	2.123E-16	1.750E-15	1.174E-14	6.070E-14	0.000E+00	0.000E+00
U-238+D	Ra-226+D	9.999E-01	2.808E-19	4.166E-18	4.742E-17	1.151E-15	2.184E-14	3.258E-13	0.000E+00	0.000E+00
U-238+D	Pb-210+D	9.999E-01	1.760E-24	5.373E-23	1.309E-21	9.053E-20	4.548E-18	1.731E-16	0.000E+00	0.000E+00
U-238+D	Po-210	9.999E-01	6.878E-26	3.463E-24	1.253E-22	1.184E-20	6.729E-19	2.706E-17	0.000E+00	0.000E+00
U-238+D	∑DSR(j)		9.283E-06	9.116E-06	8.791E-06	7.743E-06	5.382E-06	1.485E-06	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	1.724E+05	1.860E+05	2.166E+05	3.689E+05	1.690E+06	3.513E+08	*7.232E+13	*7.232E+13
Pa-231	1.300E+06	1.073E+06	8.259E+05	5.516E+05	5.059E+05	1.551E+06	*4.723E+10	*4.723E+10
Pb-210	3.761E+07	3.705E+07	3.977E+07	5.262E+07	1.172E+08	1.940E+09	*7.634E+13	*7.634E+13
Ra-226	4.088E+04	4.144E+04	4.260E+04	4.691E+04	6.188E+04	1.671E+05	*9.885E+11	*9.885E+11
Ra-228	6.294E+04	5.247E+04	4.946E+04	9.137E+04	1.248E+06	1.523E+10	*2.726E+14	*2.726E+14
Th-228	5.487E+04	7.889E+04	1.631E+05	2.073E+06	2.964E+09	*8.195E+14	*8.195E+14	*8.195E+14
Th-230	1.624E+07	1.387E+07	1.079E+07	6.244E+06	3.140E+06	1.680E+06	*2.018E+10	*2.018E+10
Th-232	*1.097E+05	*1.097E+05	*1.097E+05	4.658E+04	3.274E+04	3.476E+04	*1.097E+05	*1.097E+05
U-234	4.451E+07	4.530E+07	4.693E+07	5.310E+07	7.546E+07	2.490E+08	*6.247E+09	*6.247E+09
U-235	5.184E+05	5.278E+05	5.470E+05	6.201E+05	8.872E+05	*2.161E+06	*2.161E+06	*2.161E+06
U-238	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05

*At specific activity limit

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Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ac-227	1.720E+00	0.000E+00	1.450E-04	1.724E+05	1.450E-04	1.724E+05
Pa-231	1.720E+00	21.06 ± 0.04	5.157E-05	4.848E+05	1.923E-05	1.300E+06
Pb-210	8.490E+01	0.584 ± 0.001	6.782E-07	3.686E+07	6.647E-07	3.761E+07
Ra-226	8.490E+01	0.000E+00	6.116E-04	4.088E+04	6.116E-04	4.088E+04
Ra-228	2.727E+01	2.435 ± 0.005	5.090E-04	4.911E+04	3.972E-04	6.294E+04
Th-228	2.727E+01	0.000E+00	4.557E-04	5.487E+04	4.557E-04	5.487E+04
Th-230	5.094E+02	143.1 ± 0.3	1.579E-05	1.583E+06	1.539E-06	1.624E+07
Th-232	2.727E+01	38.81 ± 0.08	7.698E-04	3.247E+04	2.952E-05	*1.097E+05
U-234	3.790E+01	0.000E+00	5.617E-07	4.451E+07	5.617E-07	4.451E+07
U-235	1.720E+00	0.000E+00	4.822E-05	5.184E+05	4.822E-05	5.184E+05
U-238	3.790E+01	0.000E+00	9.283E-06	*3.361E+05	9.283E-06	*3.361E+05

*At specific activity limit

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Summary : SU11 Elevated Area #2 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 EXCAVATION.RAD

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	Ac-227	1.000E+00	2.495E-04	2.312E-04	1.986E-04	1.166E-04	2.544E-05	1.224E-07	0.000E+00	0.000E+00
Ac-227	Pa-231	1.000E+00	3.997E-06	1.150E-05	2.450E-05	5.366E-05	6.804E-05	2.294E-05	0.000E+00	0.000E+00
Ac-227	U-235	1.000E+00	2.828E-11	1.918E-10	9.438E-10	6.566E-09	2.813E-08	4.061E-08	0.000E+00	0.000E+00
Ac-227	∑DOSE(j)		2.535E-04	2.427E-04	2.231E-04	1.702E-04	9.350E-05	2.311E-05	0.000E+00	0.000E+00
Pa-231	Pa-231	1.000E+00	2.908E-05	2.857E-05	2.756E-05	2.430E-05	1.696E-05	4.780E-06	0.000E+00	0.000E+00
Pa-231	U-235	1.000E+00	3.068E-10	9.057E-10	2.040E-09	5.399E-09	1.095E-08	1.018E-08	0.000E+00	0.000E+00
Pa-231	∑DOSE(j)		2.908E-05	2.857E-05	2.756E-05	2.431E-05	1.697E-05	4.791E-06	0.000E+00	0.000E+00
Pb-210	Pb-210	1.000E+00	5.190E-05	4.987E-05	4.603E-05	3.477E-05	1.560E-05	9.420E-07	0.000E+00	0.000E+00
Pb-210	Ra-226	1.000E+00	8.085E-07	2.369E-06	5.247E-06	1.311E-05	2.291E-05	1.512E-05	0.000E+00	0.000E+00
Pb-210	Th-230	1.000E+00	7.036E-10	4.851E-09	2.478E-08	1.965E-07	1.193E-06	4.912E-06	0.000E+00	0.000E+00
Pb-210	U-234	1.000E+00	1.177E-16	1.739E-15	1.961E-14	4.605E-13	8.022E-12	9.802E-11	0.000E+00	0.000E+00
Pb-210	U-238	9.999E-01	6.670E-23	2.036E-21	4.960E-20	3.431E-18	1.724E-16	6.560E-15	0.000E+00	0.000E+00
Pb-210	∑DOSE(j)		5.271E-05	5.224E-05	5.130E-05	4.807E-05	3.970E-05	2.097E-05	0.000E+00	0.000E+00
Po-210	Pb-210	1.000E+00	4.530E-06	7.418E-06	7.347E-06	5.563E-06	2.501E-06	1.523E-07	0.000E+00	0.000E+00
Po-210	Ra-226	1.000E+00	5.344E-08	2.522E-07	7.071E-07	1.977E-06	3.579E-06	2.408E-06	0.000E+00	0.000E+00
Po-210	Th-230	1.000E+00	3.766E-11	4.173E-10	2.920E-09	2.810E-08	1.824E-07	7.746E-07	0.000E+00	0.000E+00
Po-210	U-234	1.000E+00	5.313E-18	1.276E-16	2.069E-15	6.290E-14	1.207E-12	1.539E-11	0.000E+00	0.000E+00
Po-210	U-238	9.999E-01	2.607E-24	1.313E-22	4.749E-21	4.486E-19	2.550E-17	1.025E-15	0.000E+00	0.000E+00
Po-210	∑DOSE(j)		4.584E-06	7.670E-06	8.057E-06	7.568E-06	6.263E-06	3.335E-06	0.000E+00	0.000E+00
Ra-226	Ra-226	1.000E+00	5.192E-02	5.121E-02	4.982E-02	4.523E-02	3.427E-02	1.268E-02	0.000E+00	0.000E+00
Ra-226	Th-230	1.000E+00	6.762E-05	2.016E-04	4.637E-04	1.323E-03	3.338E-03	6.859E-03	0.000E+00	0.000E+00
Ra-226	U-234	1.000E+00	1.505E-11	1.043E-10	5.399E-10	4.477E-09	3.044E-08	1.594E-07	0.000E+00	0.000E+00
Ra-226	U-238	9.999E-01	1.064E-17	1.579E-16	1.797E-15	4.361E-14	8.279E-13	1.235E-11	0.000E+00	0.000E+00
Ra-226	∑DOSE(j)		5.199E-02	5.142E-02	5.028E-02	4.655E-02	3.761E-02	1.954E-02	0.000E+00	0.000E+00
Ra-228	Ra-228	1.000E+00	8.551E-03	7.480E-03	5.723E-03	2.243E-03	1.540E-04	1.280E-08	0.000E+00	0.000E+00
Ra-228	Th-232	1.000E+00	5.268E-04	1.491E-03	3.070E-03	6.183E-03	7.957E-03	7.536E-03	0.000E+00	0.000E+00
Ra-228	∑DOSE(j)		9.078E-03	8.971E-03	8.794E-03	8.425E-03	8.111E-03	7.536E-03	0.000E+00	0.000E+00
Th-228	Ra-228	1.000E+00	2.281E-03	5.514E-03	8.059E-03	5.219E-03	3.920E-04	3.197E-08	0.000E+00	0.000E+00
Th-228	Th-228	1.000E+00	1.243E-02	8.642E-03	4.180E-03	3.289E-04	2.300E-07	2.029E-18	0.000E+00	0.000E+00
Th-228	Th-232	1.000E+00	9.545E-05	5.831E-04	2.295E-03	8.269E-03	1.269E-02	1.190E-02	0.000E+00	0.000E+00
Th-228	∑DOSE(j)		1.480E-02	1.474E-02	1.453E-02	1.382E-02	1.308E-02	1.190E-02	0.000E+00	0.000E+00
Th-230	Th-230	1.000E+00	7.165E-04	7.165E-04	7.164E-04	7.163E-04	7.159E-04	7.143E-04	0.000E+00	0.000E+00
Th-230	U-234	1.000E+00	2.385E-10	7.100E-10	1.628E-09	4.597E-09	1.130E-08	2.248E-08	0.000E+00	0.000E+00
Th-230	U-238	9.999E-01	2.247E-16	1.557E-15	8.045E-15	6.634E-14	4.449E-13	2.300E-12	0.000E+00	0.000E+00
Th-230	∑DOSE(j)		7.165E-04	7.165E-04	7.164E-04	7.163E-04	7.159E-04	7.143E-04	0.000E+00	0.000E+00
Th-232	Th-232	1.000E+00	1.828E-04	1.828E-04	1.828E-04	1.828E-04	1.828E-04	1.826E-04	0.000E+00	0.000E+00
U-234	U-234	1.000E+00	2.129E-05	2.092E-05	2.019E-05	1.783E-05	1.251E-05	3.622E-06	0.000E+00	0.000E+00
U-234	U-238	9.999E-01	3.009E-11	8.885E-11	2.002E-10	5.308E-10	1.082E-09	1.032E-09	0.000E+00	0.000E+00
U-234	∑DOSE(j)		2.129E-05	2.092E-05	2.019E-05	1.783E-05	1.252E-05	3.624E-06	0.000E+00	0.000E+00
U-235	U-235	1.000E+00	8.294E-05	8.147E-05	7.860E-05	6.933E-05	4.843E-05	1.369E-05	0.000E+00	0.000E+00

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 08:27 Page 26
Summary : SU11 Elevated Area #2 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 EXCAVATION.RAD

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-238	U-238	5.400E-05	9.946E-10	9.771E-10	9.431E-10	8.332E-10	5.848E-10	1.694E-10	0.000E+00	0.000E+00
U-238	U-238	9.999E-01	3.518E-04	3.455E-04	3.332E-04	2.934E-04	2.040E-04	5.627E-05	0.000E+00	0.000E+00
U-238	∑DOSE(j)		3.518E-04	3.455E-04	3.332E-04	2.935E-04	2.040E-04	5.627E-05	0.000E+00	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 08:27 Page 27
Summary : SU11 Elevated Area #2 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 EXCAVATION.RAD

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	Ac-227	1.000E+00	1.720E+00	1.594E+00	1.370E+00	8.059E-01	1.769E-01	8.767E-04	2.278E-10	2.036E-33
Ac-227	Pa-231	1.000E+00	0.000E+00	5.226E-02	1.429E-01	3.479E-01	4.569E-01	1.597E-01	4.624E-03	1.891E-08
Ac-227	U-235	1.000E+00	0.000E+00	5.582E-07	4.669E-06	4.035E-05	1.852E-04	2.810E-04	2.775E-05	3.973E-10
Ac-227	∑S(j):		1.720E+00	1.647E+00	1.513E+00	1.154E+00	6.340E-01	1.608E-01	4.652E-03	1.931E-08
Pa-231	Pa-231	1.000E+00	1.720E+00	1.690E+00	1.631E+00	1.441E+00	1.011E+00	2.923E-01	8.438E-03	3.451E-08
Pa-231	U-235	1.000E+00	0.000E+00	3.575E-05	1.035E-04	3.048E-04	6.417E-04	6.190E-04	5.373E-05	7.379E-10
Pa-231	∑S(j):		1.720E+00	1.690E+00	1.631E+00	1.441E+00	1.011E+00	2.929E-01	8.492E-03	3.525E-08
Pb-210	Pb-210	1.000E+00	8.490E+01	8.157E+01	7.531E+01	5.694E+01	2.561E+01	1.562E+00	5.290E-04	3.780E-16
Pb-210	Ra-226	1.000E+00	0.000E+00	2.570E+00	7.313E+00	2.030E+01	3.670E+01	2.472E+01	1.933E+00	2.022E-04
Pb-210	Th-230	1.000E+00	0.000E+00	3.370E-03	2.928E-02	2.883E-01	1.871E+00	7.955E+00	1.267E+01	1.283E+01
Pb-210	U-234	1.000E+00	0.000E+00	7.523E-10	1.961E-08	6.428E-07	1.238E-05	1.581E-04	4.510E-04	4.861E-04
Pb-210	U-238	9.999E-01	0.000E+00	5.331E-16	4.169E-14	4.553E-12	2.617E-10	1.053E-08	6.365E-08	7.795E-08
Pb-210	∑S(j):		8.490E+01	8.415E+01	8.265E+01	7.753E+01	6.418E+01	3.424E+01	1.460E+01	1.284E+01
Po-210	Pb-210	1.000E+00	0.000E+00	6.735E+01	7.316E+01	5.551E+01	2.496E+01	1.523E+00	5.158E-04	3.685E-16
Po-210	Ra-226	1.000E+00	0.000E+00	1.370E+00	5.834E+00	1.861E+01	3.487E+01	2.373E+01	1.858E+00	1.944E-04
Po-210	Th-230	1.000E+00	0.000E+00	1.358E-03	2.004E-02	2.500E-01	1.739E+00	7.561E+00	1.209E+01	1.225E+01
Po-210	U-234	1.000E+00	0.000E+00	2.457E-10	1.182E-08	5.312E-07	1.132E-05	1.497E-04	4.302E-04	4.641E-04
Po-210	U-238	9.999E-01	0.000E+00	1.468E-16	2.251E-14	3.593E-12	2.352E-10	9.926E-09	6.068E-08	7.441E-08
Po-210	∑S(j):		0.000E+00	6.872E+01	7.901E+01	7.436E+01	6.157E+01	3.282E+01	1.395E+01	1.225E+01
Ra-226	Ra-226	1.000E+00	8.490E+01	8.380E+01	8.163E+01	7.448E+01	5.732E+01	2.292E+01	1.671E+00	1.748E-04
Ra-226	Th-230	1.000E+00	0.000E+00	2.192E-01	6.492E-01	2.068E+00	5.473E+00	1.229E+01	1.643E+01	1.649E+01
Ra-226	U-234	1.000E+00	0.000E+00	7.315E-08	6.450E-07	6.673E-06	4.918E-05	2.846E-04	5.957E-04	6.245E-04
Ra-226	U-238	9.999E-01	0.000E+00	6.899E-14	1.818E-12	6.189E-11	1.317E-09	2.196E-08	8.669E-08	1.001E-07
Ra-226	∑S(j):		8.490E+01	8.401E+01	8.228E+01	7.655E+01	6.279E+01	3.521E+01	1.810E+01	1.649E+01
Ra-228	Ra-228	1.000E+00	2.727E+01	2.387E+01	1.829E+01	7.197E+00	5.014E-01	4.472E-05	1.203E-16	0.000E+00
Ra-228	Th-232	1.000E+00	0.000E+00	3.078E+00	8.129E+00	1.816E+01	2.422E+01	2.464E+01	2.457E+01	2.432E+01
Ra-228	∑S(j):		2.727E+01	2.695E+01	2.642E+01	2.536E+01	2.472E+01	2.464E+01	2.457E+01	2.432E+01
Th-228	Ra-228	1.000E+00	0.000E+00	7.729E+00	1.437E+01	1.023E+01	7.920E-01	7.072E-05	1.902E-16	0.000E+00
Th-228	Th-228	1.000E+00	2.727E+01	1.898E+01	9.196E+00	7.279E-01	5.187E-04	5.010E-15	0.000E+00	0.000E+00
Th-228	Th-232	1.000E+00	0.000E+00	5.063E-01	3.347E+00	1.476E+01	2.395E+01	2.464E+01	2.457E+01	2.432E+01
Th-228	∑S(j):		2.727E+01	2.722E+01	2.692E+01	2.572E+01	2.475E+01	2.464E+01	2.457E+01	2.432E+01
Th-230	Th-230	1.000E+00	5.094E+02	5.094E+02	5.094E+02	5.093E+02	5.090E+02	5.082E+02	5.058E+02	4.974E+02
Th-230	U-234	1.000E+00	0.000E+00	3.382E-04	9.968E-04	3.126E-03	7.937E-03	1.596E-02	1.906E-02	1.884E-02
Th-230	U-238	9.999E-01	0.000E+00	4.779E-10	4.201E-09	4.301E-08	3.078E-07	1.628E-06	2.976E-06	3.021E-06
Th-230	∑S(j):		5.094E+02	5.094E+02	5.094E+02	5.093E+02	5.090E+02	5.082E+02	5.058E+02	4.974E+02
Th-232	Th-232	1.000E+00	2.727E+01	2.727E+01	2.727E+01	2.727E+01	2.726E+01	2.723E+01	2.715E+01	2.687E+01
U-234	U-234	1.000E+00	3.790E+01	3.723E+01	3.594E+01	3.175E+01	2.228E+01	6.452E+00	1.870E-01	7.744E-07
U-234	U-238	9.999E-01	0.000E+00	1.056E-04	3.056E-04	9.001E-04	1.895E-03	1.829E-03	1.591E-04	2.198E-09
U-234	∑S(j):		3.790E+01	3.723E+01	3.594E+01	3.175E+01	2.228E+01	6.454E+00	1.871E-01	7.766E-07
U-235	U-235	1.000E+00	1.720E+00	1.690E+00	1.631E+00	1.441E+00	1.011E+00	2.929E-01	8.492E-03	3.525E-08

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 08:27 Page 28
Summary : SU11 Elevated Area #2 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA2 EXCAVATION.RAD

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-238	U-238	5.400E-05	2.047E-03	2.011E-03	1.941E-03	1.715E-03	1.203E-03	3.485E-04	1.010E-05	4.194E-11
U-238	U-238	9.999E-01	3.790E+01	3.723E+01	3.594E+01	3.175E+01	2.228E+01	6.453E+00	1.871E-01	7.766E-07
U-238	∑S(j):		3.790E+01	3.723E+01	3.594E+01	3.175E+01	2.228E+01	6.454E+00	1.871E-01	7.766E-07

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 1.49 seconds

APPENDIX D

RESRAD v6.5 Summary Report for Elevated Area #3 Excavation Scenario Model

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 08:30 Page 1
Summary : SU11 Elevated Area #3 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 EXCAVATION.RAD

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RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 08:30 Page 2
Summary : SU11 Elevated Area #3 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 EXCAVATION.RAD

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-227 (Source: FGR 12)	4.951E-04	4.951E-04	DCF1(1)
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(2)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(3)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(4)
A-1	Bi-211 (Source: FGR 12)	2.559E-01	2.559E-01	DCF1(5)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(6)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(7)
A-1	Fr-223 (Source: FGR 12)	1.980E-01	1.980E-01	DCF1(8)
A-1	Pa-231 (Source: FGR 12)	1.906E-01	1.906E-01	DCF1(9)
A-1	Pa-234 (Source: FGR 12)	1.155E+01	1.155E+01	DCF1(10)
A-1	Pa-234m (Source: FGR 12)	8.967E-02	8.967E-02	DCF1(11)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(12)
A-1	Pb-211 (Source: FGR 12)	3.064E-01	3.064E-01	DCF1(13)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(14)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(15)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(16)
A-1	Po-211 (Source: FGR 12)	4.764E-02	4.764E-02	DCF1(17)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(18)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(19)
A-1	Po-215 (Source: FGR 12)	1.016E-03	1.016E-03	DCF1(20)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(21)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(22)
A-1	Ra-223 (Source: FGR 12)	6.034E-01	6.034E-01	DCF1(23)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(24)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(25)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(26)
A-1	Rn-219 (Source: FGR 12)	3.083E-01	3.083E-01	DCF1(27)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(28)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(29)
A-1	Th-227 (Source: FGR 12)	5.212E-01	5.212E-01	DCF1(30)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(31)
A-1	Th-230 (Source: FGR 12)	1.209E-03	1.209E-03	DCF1(32)
A-1	Th-231 (Source: FGR 12)	3.643E-02	3.643E-02	DCF1(33)
A-1	Th-232 (Source: FGR 12)	5.212E-04	5.212E-04	DCF1(34)
A-1	Th-234 (Source: FGR 12)	2.410E-02	2.410E-02	DCF1(35)
A-1	Tl-207 (Source: FGR 12)	1.980E-02	1.980E-02	DCF1(36)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(37)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(38)
A-1	U-234 (Source: FGR 12)	4.017E-04	4.017E-04	DCF1(39)
A-1	U-235 (Source: FGR 12)	7.211E-01	7.211E-01	DCF1(40)
A-1	U-238 (Source: FGR 12)	1.031E-04	1.031E-04	DCF1(41)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.724E+00	6.700E+00	DCF2(1)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(2)
B-1	Pb-210+D	1.380E-02	1.360E-02	DCF2(3)
B-1	Po-210	9.400E-03	9.400E-03	DCF2(4)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(5)
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(6)

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Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(7)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(8)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(9)
B-1	U-234	1.320E-01	1.320E-01	DCF2(10)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(11)
B-1	U-238	1.180E-01	1.180E-01	DCF2(12)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(13)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.410E-02	DCF3(1)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(2)
D-1	Pb-210+D	5.376E-03	5.370E-03	DCF3(3)
D-1	Po-210	1.900E-03	1.900E-03	DCF3(4)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(5)
D-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(6)
D-1	Th-228+D	8.086E-04	3.960E-04	DCF3(7)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(8)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(9)
D-1	U-234	2.830E-04	2.830E-04	DCF3(10)
D-1	U-235+D	2.673E-04	2.660E-04	DCF3(11)
D-1	U-238	2.550E-04	2.550E-04	DCF3(12)
D-1	U-238+D	2.687E-04	2.550E-04	DCF3(13)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(3,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(3,3)
D-34				
D-34	Po-210 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Po-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(4,2)
D-34	Po-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.400E-04	3.400E-04	RTF(4,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(5,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(6,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(6,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(6,3)
D-34				

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Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(8,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(8,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(9,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(9,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(9,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(10,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(10,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(10,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(11,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(11,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(11,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(12,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(12,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(12,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(13,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(13,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(13,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(2,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2,2)
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
D-5				
D-5	Po-210 , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Po-210 , crustacea and mollusks	2.000E+04	2.000E+04	BIOFAC(4,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(5,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(5,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(6,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(6,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(7,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7,2)
D-5				

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Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(8,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(8,2)
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(9,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(9,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(10,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(10,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(11,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(11,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(12,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(12,2)
D-5				
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(13,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(13,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

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Summary : SU11 Elevated Area #3 Excavation
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Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	5.000E+00	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	3.000E-01	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ac-227	7.200E-01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Pa-231	7.200E-01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Pb-210	9.209E+01	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ra-226	9.209E+01	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Ra-228	8.168E+01	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Th-228	8.168E+01	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): Th-230	5.525E+02	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): Th-232	8.168E+01	0.000E+00	---	S1(9)
R012	Initial principal radionuclide (pCi/g): U-234	1.577E+01	0.000E+00	---	S1(10)
R012	Initial principal radionuclide (pCi/g): U-235	7.200E-01	0.000E+00	---	S1(11)
R012	Initial principal radionuclide (pCi/g): U-238	1.577E+01	0.000E+00	---	S1(12)
R012	Concentration in groundwater (pCi/L): Ac-227	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Pa-231	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Th-228	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): Th-232	not used	0.000E+00	---	W1(9)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(10)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1(11)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(12)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	0.000E+00	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ac-227				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	2.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.398E-02	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Pa-231				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.770E-02	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.870E-03	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

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Summary : SU11 Elevated Area #3 Excavation
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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.266E-02	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.266E-02	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for Th-232				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(10)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(10,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.770E-02	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)
R016	Distribution coefficients for U-235				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(11)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(11,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.770E-02	ALEACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(12)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(12,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(12)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.770E-02	ALEACH(12)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(12)
R016	Distribution coefficients for daughter Po-210				
R016	Contaminated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.706E-02	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R017	Inhalation rate (m**3/yr)	1.227E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	3.500E-05	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	6.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	1.700E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	3.200E-04	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	not used	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

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Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

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Contaminated Zone Dimensions	
Area:	5.00 square meters
Thickness:	0.30 meters
Cover Depth:	0.00 meters

Initial Soil Concentrations, pCi/g	
Ac-227	7.200E-01
Pa-231	7.200E-01
Pb-210	9.209E+01
Ra-226	9.209E+01
Ra-228	8.168E+01
Th-228	8.168E+01
Th-230	5.525E+02
Th-232	8.168E+01
U-234	1.577E+01
U-235	7.200E-01
U-238	1.577E+01

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	2.087E-01	2.069E-01	2.030E-01	1.912E-01	1.704E-01	1.302E-01	0.000E+00	0.000E+00
M(t):	8.348E-03	8.274E-03	8.121E-03	7.648E-03	6.814E-03	5.207E-03	0.000E+00	0.000E+00

Maximum TDOSE(t): 2.087E-01 mrem/yr at t = 0.000E+00 years

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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	1.373E-04	0.0007	2.579E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.992E-07	0.0000
Pa-231	1.549E-05	0.0001	5.467E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.514E-07	0.0000
Pb-210	5.712E-05	0.0003	9.389E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.368E-05	0.0002
Ra-226	9.081E-02	0.4351	4.487E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.562E-06	0.0000
Ra-228	5.227E-02	0.2505	2.618E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.035E-06	0.0000
Th-228	5.988E-02	0.2869	1.309E-04	0.0006	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.235E-06	0.0000
Th-230	1.896E-04	0.0009	9.965E-04	0.0048	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.769E-05	0.0001
Th-232	3.008E-03	0.0144	7.422E-04	0.0036	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.344E-05	0.0001
U-234	6.960E-07	0.0000	1.141E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.583E-07	0.0000
U-235	5.520E-05	0.0003	4.857E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.115E-08	0.0000
U-238	2.234E-04	0.0011	1.021E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.453E-07	0.0000
Total	2.066E-01	0.9902	1.963E-03	0.0094	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.421E-05	0.0004

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.637E-04	0.0008
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.141E-05	0.0001
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.002E-04	0.0005
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.082E-02	0.4352
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.231E-02	0.2506
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.001E-02	0.2876
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.204E-03	0.0058
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.764E-03	0.0180
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.237E-05	0.0001
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.570E-05	0.0003
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.338E-04	0.0011
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.087E-01	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 08:30 Page 15
Summary : SU11 Elevated Area #3 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 EXCAVATION.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	1.272E-04	0.0006	2.391E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.554E-07	0.0000
Pa-231	1.939E-05	0.0001	6.155E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.617E-07	0.0000
Pb-210	5.503E-05	0.0003	1.071E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.597E-05	0.0002
Ra-226	8.957E-02	0.4330	4.747E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.556E-06	0.0000
Ra-228	6.268E-02	0.3030	6.002E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.074E-06	0.0000
Th-228	4.165E-02	0.2013	9.112E-05	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.252E-06	0.0000
Th-230	4.238E-04	0.0020	9.965E-04	0.0048	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.771E-05	0.0001
Th-232	1.001E-02	0.0484	7.476E-04	0.0036	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.430E-05	0.0001
U-234	6.839E-07	0.0000	1.121E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.538E-07	0.0000
U-235	5.422E-05	0.0003	4.773E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.096E-08	0.0000
U-238	2.194E-04	0.0011	1.003E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.410E-07	0.0000
Total	2.048E-01	0.9901	1.962E-03	0.0095	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.738E-05	0.0004

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.517E-04	0.0007
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.600E-05	0.0001
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.017E-04	0.0005
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.958E-02	0.4331
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.275E-02	0.3033
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.174E-02	0.2018
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.438E-03	0.0070
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.077E-02	0.0521
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.215E-05	0.0001
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.471E-05	0.0003
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.296E-04	0.0011
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.069E-01	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #3 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 EXCAVATION.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	1.093E-04	0.0005	2.055E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.773E-07	0.0000
Pa-231	2.608E-05	0.0001	7.327E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.778E-07	0.0000
Pb-210	5.081E-05	0.0003	1.016E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.379E-05	0.0002
Ra-226	8.714E-02	0.4292	5.269E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.048E-05	0.0001
Ra-228	6.647E-02	0.3274	8.656E-05	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.423E-06	0.0000
Th-228	2.014E-02	0.0992	4.415E-05	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.091E-06	0.0000
Th-230	8.823E-04	0.0043	9.965E-04	0.0049	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.776E-05	0.0001
Th-232	2.589E-02	0.1275	7.660E-04	0.0038	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.594E-05	0.0001
U-234	6.603E-07	0.0000	1.083E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.450E-07	0.0000
U-235	5.232E-05	0.0003	4.610E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.060E-08	0.0000
U-238	2.115E-04	0.0010	9.679E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.326E-07	0.0000
Total	2.010E-01	0.9899	1.957E-03	0.0096	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.693E-05	0.0004

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.303E-04	0.0006
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.388E-05	0.0002
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.477E-05	0.0005
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.715E-02	0.4293
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.656E-02	0.3279
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.019E-02	0.0994
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.897E-03	0.0093
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.667E-02	0.1314
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.173E-05	0.0001
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.279E-05	0.0003
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.215E-04	0.0011
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.030E-01	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #3 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 EXCAVATION.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	6.413E-05	0.0003	1.208E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.807E-07	0.0000
Pa-231	4.062E-05	0.0002	9.795E-06	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.993E-07	0.0000
Pb-210	3.837E-05	0.0002	7.690E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.556E-05	0.0001
Ra-226	7.913E-02	0.4139	6.648E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.568E-05	0.0001
Ra-228	3.598E-02	0.1882	5.602E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.070E-06	0.0000
Th-228	1.585E-03	0.0083	3.495E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.637E-08	0.0000
Th-230	2.386E-03	0.0125	9.964E-04	0.0052	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.800E-05	0.0001
Th-232	6.971E-02	0.3646	8.304E-04	0.0043	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.988E-05	0.0001
U-234	5.859E-07	0.0000	9.565E-06	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.165E-07	0.0000
U-235	4.616E-05	0.0002	4.085E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.433E-09	0.0000
U-238	1.863E-04	0.0010	8.551E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.055E-07	0.0000
Total	1.892E-01	0.9894	1.941E-03	0.0102	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.349E-05	0.0004

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.649E-05	0.0004
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.091E-05	0.0003
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.162E-05	0.0004
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.915E-02	0.4140
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.604E-02	0.1885
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.589E-03	0.0083
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.400E-03	0.0178
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.056E-02	0.3691
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.037E-05	0.0001
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.657E-05	0.0002
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.951E-04	0.0010
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.912E-01	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #3 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 EXCAVATION.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	1.398E-05	0.0001	2.653E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.163E-08	0.0000
Pa-231	4.512E-05	0.0003	1.006E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.244E-07	0.0000
Pb-210	1.720E-05	0.0001	3.459E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.149E-05	0.0001
Ra-226	5.999E-02	0.3521	7.963E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.153E-05	0.0001
Ra-228	2.634E-03	0.0155	4.283E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.233E-07	0.0000
Th-228	1.109E-06	0.0000	2.490E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.154E-11	0.0000
Th-230	5.913E-03	0.0347	9.963E-04	0.0058	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.900E-05	0.0001
Th-232	9.959E-02	0.5846	8.801E-04	0.0052	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.253E-05	0.0001
U-234	4.293E-07	0.0000	6.717E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.520E-07	0.0000
U-235	3.226E-05	0.0002	2.904E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.787E-09	0.0000
U-238	1.295E-04	0.0008	6.002E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.442E-07	0.0000
Total	1.684E-01	0.9883	1.918E-03	0.0113	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.557E-05	0.0004

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.670E-05	0.0001
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.561E-05	0.0003
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.215E-05	0.0002
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.002E-02	0.3523
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.638E-03	0.0155
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.111E-06	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.928E-03	0.0407
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.005E-01	0.5899
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.298E-06	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.256E-05	0.0002
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.356E-04	0.0008
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.704E-01	1.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #3 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 EXCAVATION.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	6.689E-08	0.0000	1.315E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.054E-10	0.0000
Pa-231	1.469E-05	0.0001	3.323E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.323E-07	0.0000
Pb-210	1.032E-06	0.0000	2.110E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.013E-07	0.0000
Ra-226	2.223E-02	0.1708	4.541E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.312E-05	0.0001
Ra-228	2.161E-07	0.0000	3.824E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.993E-11	0.0000
Th-228	9.788E-18	0.0000	2.405E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.944E-22	0.0000
Th-230	1.209E-02	0.0929	9.959E-04	0.0077	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.231E-05	0.0002
Th-232	9.384E-02	0.7209	8.831E-04	0.0068	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.271E-05	0.0002
U-234	2.255E-07	0.0000	1.955E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.423E-08	0.0000
U-235	9.152E-06	0.0001	8.888E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.158E-09	0.0000
U-238	3.565E-05	0.0003	1.739E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.178E-08	0.0000
Total	1.282E-01	0.9850	1.891E-03	0.0145	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.905E-05	0.0005

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.034E-08	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.815E-05	0.0001
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.945E-06	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.225E-02	0.1709
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.165E-07	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.812E-18	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.311E-02	0.1007
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.474E-02	0.7278
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.225E-06	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.243E-06	0.0001
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.743E-05	0.0003
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.302E-01	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 08:30 Page 20
Summary : SU11 Elevated Area #3 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 EXCAVATION.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #3 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 EXCAVATION.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

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Summary : SU11 Elevated Area #3 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 EXCAVATION.RAD

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	2.273E-04	2.107E-04	1.810E-04	1.062E-04	2.319E-05	1.116E-07	0.000E+00	0.000E+00
Pa-231	Pa-231	1.000E+00	2.610E-05	2.563E-05	2.473E-05	2.181E-05	1.522E-05	4.289E-06	0.000E+00	0.000E+00
Pa-231	Ac-227+D	1.000E+00	3.643E-06	1.048E-05	2.233E-05	4.890E-05	6.202E-05	2.092E-05	0.000E+00	0.000E+00
Pa-231	ΣDSR(j)		2.974E-05	3.612E-05	4.706E-05	7.071E-05	7.724E-05	2.521E-05	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	1.000E-06	9.611E-07	8.872E-07	6.703E-07	3.008E-07	1.817E-08	0.000E+00	0.000E+00
Pb-210+D	Po-210	1.000E+00	8.753E-08	1.433E-07	1.420E-07	1.075E-07	4.832E-08	2.943E-09	0.000E+00	0.000E+00
Pb-210+D	ΣDSR(j)		1.088E-06	1.104E-06	1.029E-06	7.777E-07	3.491E-07	2.112E-08	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	9.862E-04	9.727E-04	9.463E-04	8.592E-04	6.512E-04	2.413E-04	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.558E-08	4.566E-08	1.011E-07	2.527E-07	4.416E-07	2.917E-07	0.000E+00	0.000E+00
Ra-226+D	Po-210	1.000E+00	1.032E-09	4.873E-09	1.366E-08	3.819E-08	6.915E-08	4.653E-08	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		9.862E-04	9.727E-04	9.464E-04	8.595E-04	6.517E-04	2.416E-04	0.000E+00	0.000E+00
Ra-228+D	Ra-228+D	1.000E+00	5.055E-04	4.422E-04	3.384E-04	1.326E-04	9.112E-06	7.583E-10	0.000E+00	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	1.349E-04	3.260E-04	4.766E-04	3.086E-04	2.319E-05	1.893E-09	0.000E+00	0.000E+00
Ra-228+D	ΣDSR(j)		6.404E-04	7.682E-04	8.149E-04	4.412E-04	3.230E-05	2.651E-09	0.000E+00	0.000E+00
Th-228+D	Th-228+D	1.000E+00	7.348E-04	5.110E-04	2.472E-04	1.945E-05	1.361E-08	1.201E-19	0.000E+00	0.000E+00
Th-230	Th-230	1.000E+00	1.965E-06	1.965E-06	1.964E-06	1.964E-06	1.963E-06	1.958E-06	0.000E+00	0.000E+00
Th-230	Ra-226+D	1.000E+00	2.141E-07	6.381E-07	1.468E-06	4.189E-06	1.057E-05	2.175E-05	0.000E+00	0.000E+00
Th-230	Pb-210+D	1.000E+00	2.260E-12	1.558E-11	7.960E-11	6.312E-10	3.833E-09	1.579E-08	0.000E+00	0.000E+00
Th-230	Po-210	1.000E+00	1.213E-13	1.344E-12	9.404E-12	9.048E-11	5.872E-10	2.494E-09	0.000E+00	0.000E+00
Th-230	ΣDSR(j)		2.179E-06	2.603E-06	3.432E-06	6.154E-06	1.254E-05	2.372E-05	0.000E+00	0.000E+00
Th-232	Th-232	1.000E+00	9.290E-06	9.290E-06	9.289E-06	9.288E-06	9.286E-06	9.276E-06	0.000E+00	0.000E+00
Th-232	Ra-228+D	1.000E+00	3.114E-05	8.814E-05	1.815E-04	3.656E-04	4.706E-04	4.463E-04	0.000E+00	0.000E+00
Th-232	Th-228+D	1.000E+00	5.644E-06	3.448E-05	1.357E-04	4.890E-04	7.504E-04	7.044E-04	0.000E+00	0.000E+00
Th-232	ΣDSR(j)		4.608E-05	1.319E-04	3.265E-04	8.639E-04	1.230E-03	1.160E-03	0.000E+00	0.000E+00
U-234	U-234	1.000E+00	7.843E-07	7.706E-07	7.438E-07	6.570E-07	4.611E-07	1.335E-07	0.000E+00	0.000E+00
U-234	Th-230	1.000E+00	8.791E-12	2.617E-11	6.000E-11	1.694E-10	4.165E-10	8.284E-10	0.000E+00	0.000E+00
U-234	Ra-226+D	1.000E+00	6.401E-13	4.439E-12	2.297E-11	1.905E-10	1.296E-09	6.791E-09	0.000E+00	0.000E+00
U-234	Pb-210+D	1.000E+00	5.082E-18	7.508E-17	8.468E-16	1.988E-14	3.465E-13	4.236E-12	0.000E+00	0.000E+00
U-234	Po-210	1.000E+00	2.299E-19	5.521E-18	8.954E-17	2.722E-15	5.222E-14	6.662E-13	0.000E+00	0.000E+00
U-234	ΣDSR(j)		7.844E-07	7.706E-07	7.438E-07	6.574E-07	4.628E-07	1.411E-07	0.000E+00	0.000E+00
U-235+D	U-235+D	1.000E+00	7.736E-05	7.599E-05	7.331E-05	6.467E-05	4.519E-05	1.279E-05	0.000E+00	0.000E+00
U-235+D	Pa-231	1.000E+00	2.753E-10	8.127E-10	1.831E-09	4.845E-09	9.826E-09	9.130E-09	0.000E+00	0.000E+00
U-235+D	Ac-227+D	1.000E+00	2.578E-11	1.748E-10	8.601E-10	5.985E-09	2.564E-08	3.703E-08	0.000E+00	0.000E+00
U-235+D	ΣDSR(j)		7.736E-05	7.599E-05	7.332E-05	6.469E-05	4.522E-05	1.284E-05	0.000E+00	0.000E+00
U-238	U-238	5.400E-05	3.646E-11	3.582E-11	3.457E-11	3.054E-11	2.144E-11	6.208E-12	0.000E+00	0.000E+00

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Summary : SU11 Elevated Area #3 Excavation
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-238+D	U-238+D	9.999E-01	1.483E-05	1.456E-05	1.404E-05	1.237E-05	8.599E-06	2.374E-06	0.000E+00	0.000E+00
U-238+D	U-234	9.999E-01	1.108E-12	3.273E-12	7.376E-12	1.955E-11	3.986E-11	3.803E-11	0.000E+00	0.000E+00
U-238+D	Th-230	9.999E-01	8.282E-18	5.739E-17	2.965E-16	2.445E-15	1.640E-14	8.477E-14	0.000E+00	0.000E+00
U-238+D	Ra-226+D	9.999E-01	4.527E-19	6.717E-18	7.647E-17	1.856E-15	3.524E-14	5.261E-13	0.000E+00	0.000E+00
U-238+D	Pb-210+D	9.999E-01	2.880E-24	8.792E-23	2.142E-21	1.482E-19	7.444E-18	2.835E-16	0.000E+00	0.000E+00
U-238+D	Po-210	9.999E-01	1.128E-25	5.681E-24	2.055E-22	1.942E-20	1.104E-18	4.438E-17	0.000E+00	0.000E+00
U-238+D	∑DSR(j)		1.483E-05	1.456E-05	1.404E-05	1.237E-05	8.599E-06	2.374E-06	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	1.100E+05	1.187E+05	1.382E+05	2.353E+05	1.078E+06	2.240E+08	*7.232E+13	*7.232E+13
Pa-231	8.406E+05	6.922E+05	5.312E+05	3.535E+05	3.237E+05	9.917E+05	*4.723E+10	*4.723E+10
Pb-210	2.298E+07	2.264E+07	2.429E+07	3.214E+07	7.160E+07	1.184E+09	*7.634E+13	*7.634E+13
Ra-226	2.535E+04	2.570E+04	2.642E+04	2.909E+04	3.836E+04	1.035E+05	*9.885E+11	*9.885E+11
Ra-228	3.904E+04	3.254E+04	3.068E+04	5.666E+04	7.740E+05	9.431E+09	*2.726E+14	*2.726E+14
Th-228	3.402E+04	4.892E+04	1.011E+05	1.285E+06	1.837E+09	*8.195E+14	*8.195E+14	*8.195E+14
Th-230	1.147E+07	9.606E+06	7.284E+06	4.063E+06	1.994E+06	1.054E+06	*2.018E+10	*2.018E+10
Th-232	*1.097E+05	*1.097E+05	7.657E+04	2.894E+04	2.032E+04	2.155E+04	*1.097E+05	*1.097E+05
U-234	3.187E+07	3.244E+07	3.361E+07	3.803E+07	5.402E+07	1.772E+08	*6.247E+09	*6.247E+09
U-235	3.232E+05	3.290E+05	3.410E+05	3.865E+05	5.528E+05	1.947E+06	*2.161E+06	*2.161E+06
U-238	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05

*At specific activity limit

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Summary : SU11 Elevated Area #3 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 EXCAVATION.RAD

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ac-227	7.200E-01	0.000E+00	2.273E-04	1.100E+05	2.273E-04	1.100E+05
Pa-231	7.200E-01	21.11 ± 0.04	8.057E-05	3.103E+05	2.974E-05	8.406E+05
Pb-210	9.209E+01	0.586 ± 0.001	1.110E-06	2.252E+07	1.088E-06	2.298E+07
Ra-226	9.209E+01	0.000E+00	9.862E-04	2.535E+04	9.862E-04	2.535E+04
Ra-228	8.168E+01	2.435 ± 0.005	8.207E-04	3.046E+04	6.404E-04	3.904E+04
Th-228	8.168E+01	0.000E+00	7.348E-04	3.402E+04	7.348E-04	3.402E+04
Th-230	5.525E+02	143.4 ± 0.3	2.522E-05	9.913E+05	2.179E-06	1.147E+07
Th-232	8.168E+01	38.95 ± 0.08	1.240E-03	2.015E+04	4.608E-05	*1.097E+05
U-234	1.577E+01	0.000E+00	7.844E-07	3.187E+07	7.844E-07	3.187E+07
U-235	7.200E-01	0.000E+00	7.736E-05	3.232E+05	7.736E-05	3.232E+05
U-238	1.577E+01	0.000E+00	1.483E-05	*3.361E+05	1.483E-05	*3.361E+05

*At specific activity limit

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Summary : SU11 Elevated Area #3 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 EXCAVATION.RAD

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	Ac-227	1.000E+00	1.637E-04	1.517E-04	1.303E-04	7.649E-05	1.670E-05	8.034E-08	0.000E+00	0.000E+00
Ac-227	Pa-231	1.000E+00	2.623E-06	7.548E-06	1.608E-05	3.521E-05	4.465E-05	1.506E-05	0.000E+00	0.000E+00
Ac-227	U-235	1.000E+00	1.856E-11	1.258E-10	6.193E-10	4.309E-09	1.846E-08	2.666E-08	0.000E+00	0.000E+00
Ac-227	∑DOSE(j)		1.663E-04	1.592E-04	1.464E-04	1.117E-04	6.137E-05	1.517E-05	0.000E+00	0.000E+00
Pa-231	Pa-231	1.000E+00	1.879E-05	1.846E-05	1.780E-05	1.570E-05	1.096E-05	3.088E-06	0.000E+00	0.000E+00
Pa-231	U-235	1.000E+00	1.982E-10	5.852E-10	1.318E-09	3.488E-09	7.075E-09	6.574E-09	0.000E+00	0.000E+00
Pa-231	∑DOSE(j)		1.879E-05	1.846E-05	1.781E-05	1.571E-05	1.097E-05	3.095E-06	0.000E+00	0.000E+00
Pb-210	Pb-210	1.000E+00	9.213E-05	8.851E-05	8.170E-05	6.172E-05	2.770E-05	1.673E-06	0.000E+00	0.000E+00
Pb-210	Ra-226	1.000E+00	1.435E-06	4.205E-06	9.313E-06	2.327E-05	4.067E-05	2.686E-05	0.000E+00	0.000E+00
Pb-210	Th-230	1.000E+00	1.249E-09	8.610E-09	4.398E-08	3.488E-07	2.118E-06	8.727E-06	0.000E+00	0.000E+00
Pb-210	U-234	1.000E+00	8.014E-17	1.184E-15	1.335E-14	3.136E-13	5.464E-12	6.680E-11	0.000E+00	0.000E+00
Pb-210	U-238	9.999E-01	4.542E-23	1.386E-21	3.377E-20	2.336E-18	1.174E-16	4.471E-15	0.000E+00	0.000E+00
Pb-210	∑DOSE(j)		9.356E-05	9.272E-05	9.105E-05	8.534E-05	7.049E-05	3.726E-05	0.000E+00	0.000E+00
Po-210	Pb-210	1.000E+00	8.060E-06	1.320E-05	1.307E-05	9.898E-06	4.450E-06	2.710E-07	0.000E+00	0.000E+00
Po-210	Ra-226	1.000E+00	9.507E-08	4.488E-07	1.258E-06	3.517E-06	6.368E-06	4.285E-06	0.000E+00	0.000E+00
Po-210	Th-230	1.000E+00	6.700E-11	7.424E-10	5.196E-09	4.999E-08	3.245E-07	1.378E-06	0.000E+00	0.000E+00
Po-210	U-234	1.000E+00	3.626E-18	8.707E-17	1.412E-15	4.293E-14	8.235E-13	1.051E-11	0.000E+00	0.000E+00
Po-210	U-238	9.999E-01	1.779E-24	8.958E-23	3.241E-21	3.062E-19	1.741E-17	6.999E-16	0.000E+00	0.000E+00
Po-210	∑DOSE(j)		8.156E-06	1.365E-05	1.434E-05	1.346E-05	1.114E-05	5.934E-06	0.000E+00	0.000E+00
Ra-226	Ra-226	1.000E+00	9.082E-02	8.958E-02	8.714E-02	7.912E-02	5.997E-02	2.222E-02	0.000E+00	0.000E+00
Ra-226	Th-230	1.000E+00	1.183E-04	3.526E-04	8.110E-04	2.314E-03	5.841E-03	1.202E-02	0.000E+00	0.000E+00
Ra-226	U-234	1.000E+00	1.009E-11	7.000E-11	3.623E-10	3.004E-09	2.044E-08	1.071E-07	0.000E+00	0.000E+00
Ra-226	U-238	9.999E-01	7.140E-18	1.059E-16	1.206E-15	2.927E-14	5.557E-13	8.297E-12	0.000E+00	0.000E+00
Ra-226	∑DOSE(j)		9.094E-02	8.993E-02	8.795E-02	8.144E-02	6.581E-02	3.423E-02	0.000E+00	0.000E+00
Ra-228	Ra-228	1.000E+00	4.129E-02	3.612E-02	2.764E-02	1.083E-02	7.442E-04	6.194E-08	0.000E+00	0.000E+00
Ra-228	Th-232	1.000E+00	2.544E-03	7.200E-03	1.483E-02	2.986E-02	3.844E-02	3.645E-02	0.000E+00	0.000E+00
Ra-228	∑DOSE(j)		4.383E-02	4.332E-02	4.246E-02	4.069E-02	3.918E-02	3.645E-02	0.000E+00	0.000E+00
Th-228	Ra-228	1.000E+00	1.102E-02	2.663E-02	3.893E-02	2.521E-02	1.894E-03	1.546E-07	0.000E+00	0.000E+00
Th-228	Th-228	1.000E+00	6.001E-02	4.174E-02	2.019E-02	1.589E-03	1.111E-06	9.812E-18	0.000E+00	0.000E+00
Th-228	Th-232	1.000E+00	4.610E-04	2.816E-03	1.108E-02	3.994E-02	6.129E-02	5.753E-02	0.000E+00	0.000E+00
Th-228	∑DOSE(j)		7.149E-02	7.119E-02	7.020E-02	6.674E-02	6.319E-02	5.753E-02	0.000E+00	0.000E+00
Th-230	Th-230	1.000E+00	1.086E-03	1.085E-03	1.085E-03	1.085E-03	1.085E-03	1.082E-03	0.000E+00	0.000E+00
Th-230	U-234	1.000E+00	1.386E-10	4.126E-10	9.463E-10	2.672E-09	6.569E-09	1.306E-08	0.000E+00	0.000E+00
Th-230	U-238	9.999E-01	1.306E-16	9.051E-16	4.676E-15	3.856E-14	2.586E-13	1.337E-12	0.000E+00	0.000E+00
Th-230	∑DOSE(j)		1.086E-03	1.085E-03	1.085E-03	1.085E-03	1.085E-03	1.082E-03	0.000E+00	0.000E+00
Th-232	Th-232	1.000E+00	7.588E-04	7.588E-04	7.588E-04	7.587E-04	7.584E-04	7.576E-04	0.000E+00	0.000E+00
U-234	U-234	1.000E+00	1.237E-05	1.215E-05	1.173E-05	1.036E-05	7.271E-06	2.105E-06	0.000E+00	0.000E+00
U-234	U-238	9.999E-01	1.748E-11	5.162E-11	1.163E-10	3.084E-10	6.287E-10	5.997E-10	0.000E+00	0.000E+00
U-234	∑DOSE(j)		1.237E-05	1.215E-05	1.173E-05	1.036E-05	7.272E-06	2.105E-06	0.000E+00	0.000E+00
U-235	U-235	1.000E+00	5.570E-05	5.471E-05	5.279E-05	4.657E-05	3.253E-05	9.210E-06	0.000E+00	0.000E+00

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 08:30 Page 26
Summary : SU11 Elevated Area #3 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 EXCAVATION.RAD

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-238	U-238	5.400E-05	5.750E-10	5.649E-10	5.452E-10	4.817E-10	3.381E-10	9.791E-11	0.000E+00	0.000E+00
U-238	U-238	9.999E-01	2.338E-04	2.296E-04	2.215E-04	1.951E-04	1.356E-04	3.743E-05	0.000E+00	0.000E+00
U-238	∑DOSE(j)		2.338E-04	2.296E-04	2.215E-04	1.951E-04	1.356E-04	3.743E-05	0.000E+00	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 08:30 Page 27
Summary : SU11 Elevated Area #3 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 EXCAVATION.RAD

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	Ac-227	1.000E+00	7.200E-01	6.674E-01	5.735E-01	3.373E-01	7.405E-02	3.670E-04	9.534E-11	8.522E-34
Ac-227	Pa-231	1.000E+00	0.000E+00	2.188E-02	5.984E-02	1.456E-01	1.913E-01	6.684E-02	1.936E-03	7.916E-09
Ac-227	U-235	1.000E+00	0.000E+00	2.337E-07	1.954E-06	1.689E-05	7.752E-05	1.176E-04	1.162E-05	1.663E-10
Ac-227	∑S(j):		7.200E-01	6.893E-01	6.334E-01	4.830E-01	2.654E-01	6.733E-02	1.947E-03	8.082E-09
Pa-231	Pa-231	1.000E+00	7.200E-01	7.074E-01	6.827E-01	6.031E-01	4.231E-01	1.223E-01	3.532E-03	1.444E-08
Pa-231	U-235	1.000E+00	0.000E+00	1.497E-05	4.334E-05	1.276E-04	2.686E-04	2.591E-04	2.249E-05	3.089E-10
Pa-231	∑S(j):		7.200E-01	7.074E-01	6.828E-01	6.032E-01	4.233E-01	1.226E-01	3.555E-03	1.475E-08
Pb-210	Pb-210	1.000E+00	9.209E+01	8.848E+01	8.169E+01	6.176E+01	2.778E+01	1.695E+00	5.738E-04	4.100E-16
Pb-210	Ra-226	1.000E+00	0.000E+00	2.788E+00	7.933E+00	2.202E+01	3.981E+01	2.681E+01	2.097E+00	2.194E-04
Pb-210	Th-230	1.000E+00	0.000E+00	3.655E-03	3.176E-02	3.128E-01	2.030E+00	8.628E+00	1.374E+01	1.392E+01
Pb-210	U-234	1.000E+00	0.000E+00	3.130E-10	8.159E-09	2.675E-07	5.152E-06	6.578E-05	1.876E-04	2.023E-04
Pb-210	U-238	9.999E-01	0.000E+00	2.218E-16	1.735E-14	1.894E-12	1.089E-10	4.383E-09	2.648E-08	3.243E-08
Pb-210	∑S(j):		9.209E+01	9.127E+01	8.965E+01	8.409E+01	6.961E+01	3.714E+01	1.584E+01	1.392E+01
Po-210	Pb-210	1.000E+00	0.000E+00	7.306E+01	7.935E+01	6.021E+01	2.708E+01	1.652E+00	5.594E-04	3.997E-16
Po-210	Ra-226	1.000E+00	0.000E+00	1.486E+00	6.329E+00	2.018E+01	3.782E+01	2.574E+01	2.015E+00	2.108E-04
Po-210	Th-230	1.000E+00	0.000E+00	1.473E-03	2.174E-02	2.712E-01	1.886E+00	8.202E+00	1.311E+01	1.329E+01
Po-210	U-234	1.000E+00	0.000E+00	1.022E-10	4.920E-09	2.210E-07	4.709E-06	6.227E-05	1.790E-04	1.931E-04
Po-210	U-238	9.999E-01	0.000E+00	6.109E-17	9.367E-15	1.495E-12	9.787E-11	4.130E-09	2.525E-08	3.096E-08
Po-210	∑S(j):		0.000E+00	7.454E+01	8.570E+01	8.066E+01	6.678E+01	3.560E+01	1.513E+01	1.329E+01
Ra-226	Ra-226	1.000E+00	9.209E+01	9.089E+01	8.854E+01	8.079E+01	6.218E+01	2.486E+01	1.812E+00	1.896E-04
Ra-226	Th-230	1.000E+00	0.000E+00	2.378E-01	7.042E-01	2.243E+00	5.936E+00	1.333E+01	1.782E+01	1.788E+01
Ra-226	U-234	1.000E+00	0.000E+00	3.044E-08	2.684E-07	2.777E-06	2.046E-05	1.184E-04	2.479E-04	2.598E-04
Ra-226	U-238	9.999E-01	0.000E+00	2.871E-14	7.565E-13	2.575E-11	5.478E-10	9.137E-09	3.607E-08	4.166E-08
Ra-226	∑S(j):		9.209E+01	9.113E+01	8.925E+01	8.303E+01	6.811E+01	3.819E+01	1.964E+01	1.788E+01
Ra-228	Ra-228	1.000E+00	8.168E+01	7.149E+01	5.477E+01	2.156E+01	1.502E+00	1.340E-04	3.603E-16	0.000E+00
Ra-228	Th-232	1.000E+00	0.000E+00	9.219E+00	2.435E+01	5.440E+01	7.253E+01	7.382E+01	7.360E+01	7.284E+01
Ra-228	∑S(j):		8.168E+01	8.071E+01	7.912E+01	7.596E+01	7.403E+01	7.382E+01	7.360E+01	7.284E+01
Th-228	Ra-228	1.000E+00	0.000E+00	2.315E+01	4.306E+01	3.064E+01	2.372E+00	2.118E-04	5.698E-16	0.000E+00
Th-228	Th-228	1.000E+00	8.168E+01	5.685E+01	2.754E+01	2.180E+00	1.554E-03	1.501E-14	0.000E+00	0.000E+00
Th-228	Th-232	1.000E+00	0.000E+00	1.516E+00	1.002E+01	4.421E+01	7.174E+01	7.382E+01	7.360E+01	7.284E+01
Th-228	∑S(j):		8.168E+01	8.152E+01	8.062E+01	7.703E+01	7.412E+01	7.382E+01	7.360E+01	7.284E+01
Th-230	Th-230	1.000E+00	5.525E+02	5.525E+02	5.525E+02	5.524E+02	5.521E+02	5.512E+02	5.486E+02	5.395E+02
Th-230	U-234	1.000E+00	0.000E+00	1.407E-04	4.148E-04	1.301E-03	3.303E-03	6.643E-03	7.932E-03	7.839E-03
Th-230	U-238	9.999E-01	0.000E+00	1.989E-10	1.748E-09	1.790E-08	1.281E-07	6.776E-07	1.238E-06	1.257E-06
Th-230	∑S(j):		5.525E+02	5.525E+02	5.525E+02	5.524E+02	5.521E+02	5.512E+02	5.486E+02	5.395E+02
Th-232	Th-232	1.000E+00	8.168E+01	8.168E+01	8.168E+01	8.167E+01	8.164E+01	8.156E+01	8.132E+01	8.048E+01
U-234	U-234	1.000E+00	1.577E+01	1.549E+01	1.495E+01	1.321E+01	9.271E+00	2.685E+00	7.779E-02	3.222E-07
U-234	U-238	9.999E-01	0.000E+00	4.392E-05	1.272E-04	3.745E-04	7.885E-04	7.611E-04	6.619E-05	9.148E-10
U-234	∑S(j):		1.577E+01	1.549E+01	1.495E+01	1.321E+01	9.272E+00	2.685E+00	7.786E-02	3.231E-07
U-235	U-235	1.000E+00	7.200E-01	7.074E-01	6.828E-01	6.032E-01	4.233E-01	1.226E-01	3.555E-03	1.475E-08

RESRAD, Version 6.5 T½ Limit = 30 days 09/24/2013 08:30 Page 28
Summary : SU11 Elevated Area #3 Excavation
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\SU11 EA3 EXCAVATION.RAD

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-238	U-238	5.400E-05	8.516E-04	8.366E-04	8.075E-04	7.134E-04	5.007E-04	1.450E-04	4.204E-06	1.745E-11
U-238	U-238	9.999E-01	1.577E+01	1.549E+01	1.495E+01	1.321E+01	9.272E+00	2.685E+00	7.785E-02	3.231E-07
U-238	∑S(j):		1.577E+01	1.549E+01	1.495E+01	1.321E+01	9.272E+00	2.685E+00	7.786E-02	3.231E-07

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 1.60 seconds